Press Final 27 July 2007

The Cognitive Linguistics Reader

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Press Final 27 July 2007

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LONDON OAKVILLE

Press Final 27 July 2007

Published by

Equinox Publishing Ltd

UK: Unit 6, The Village, 101 Amies St, London, SW11 2JW
USA: DBBC, 28 Main Street, Oakville, CT 06779

www.equinoxpub.com

The Cognitive Linguistics Reader
First published 2007

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library.

ISBN-13 9781845531096 (hardback)
ISBN-13 9781845531102 (paperback)

Library of Congress Cataloging-in-Publication Data
The cognitive linguistics reader / edited by Vyvyan Evans, Benjamin K. Bergen and Jörg Zinken.
p. cm. -- (Advances in cognitive linguistics)
Includes bibliographical references and index.
ISBN-13: 978-1-84553-109-6
ISBN-10: 1-84553-109-4
ISBN-13: 978-1-84553-110-2 (pbk.)
ISBN-10: 1-84553-110-8 (pbk.)
1. Cognitive grammar. I. Evans, Vyvyan. II. Bergen, Benjamin K. III. Zinken, Jörg.
P165.C6454 2006
415--dc22
2006022850

Typeset by Catchline, Milton Keynes (www.catchline.com)
Printed and bound in Great Britain by Antony Rowe, Chippenham, UK.

Contents

Acknowledgements

A large number of people and organisations have contributed to this volume, to whom we are indebted. First and foremost we are grateful to the authors of the articles collected here, not least for agreeing to have their work reprinted, but also in many cases for assisting in obtaining copyright permissions. Several of the authors also undertook revisions of their original articles.

In addition, we gratefully acknowledge the support of all the publishers involved for allowing us to reprint the articles which appear in this volume. A project of this scale has involved a mammoth effort in terms of tracing copyright holders and obtaining permissions for the reprinting of articles. It is no exaggeration to say that without the goodwill and flexibility of the publishers involved we would not have been able to produce this volume. Accordingly, we would like to acknowledge all those publishers who supported this project by granting copyright permissions. These are: John Benjamins, Berkeley Linguistics Society, Cambridge University Press, The Cognitive Science Society, Elsevier, Essays in Arts and Sciences, Hanshin Publishing Company, Peter Lang, The Linguistics Society of America, The Psychonomic Society, and MIT Press.

We gratefully acknowledge the support of Equinox Publishing company for taking cognitive linguistics so seriously, and for inviting us to collaborate on this series and this volume. We would like to acknowledge the support of our editors at Equinox, Tristan Palmer and Janet Joyce. In particular, we are extremely grateful for the boundless patience and enthusiasm of Tristan while at Equinox, not least for persuading us that a 'Cognitive Linguistics Reader', despite the daunting amount of work involved, would be a significant and worthwhile contribution to the field.

Finally, we gratefully acknowledge the support that the International Cognitive Linguistics Association (ICLA) provides to the cognitive linguistics movement. Without active research in cognitive linguistics, in part facilitated by the initiatives of the ICLA, including the biennial International Cognitive Linguistics Conferences, this Reader literally would not exist. Accordingly, all proceeds from this volume are being donated to the ICLA. By purchasing this volume you are directly supporting the ICLA. For more information on the work of the ICLA see the website at: www.cogling.org

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Preface

The nature of cognitive linguistics

The movement known as cognitive linguistics is one of the most rapidly expanding schools in modern linguistics and cognitive science. While it has its roots in work conducted by a small group of pioneering figures in the 1970s, the cognitive linguistics enterprise began to flourish in the 1980s. By the end of that decade it had amassed a relatively large international community of adherents, an International Cognitive Linguistics Association (the ICLA) had been established, a journal (*Cognitive Linguistics*) founded and a series of biennial conferences established. From the outset, cognitive linguistics sought to create a scientific approach to the study of language, incorporating the tools of philosophy, psychology, neuroscience and computer science. While cognitive linguistic approaches to language were initially based on philosophical thinking about the mind, more recent work emphasises the importance of convergent evidence from a broad empirical and methodological base. In the first decade of the 21st century, cognitive linguistics represents one of the most exciting and innovative interdisciplinary approaches on offer for the study of the complex relationship between language and mind.

The nature of this volume

This Reader constitutes a representative collection of articles, many of them classics, from leading figures in cognitive linguistics. The articles have been selected in order to represent the range, scope and diversity of the cognitive linguistics enterprise. Also included is an overview essay, specifically written for this volume, which provides a survey of the cognitive linguistics enterprise, thereby setting the scene for the remaining articles.

The articles have been placed in thematic groupings, reflecting the core areas of research in cognitive linguistics. While each article within a particular section has been selected for its importance, articles have been carefully chosen in order to represent different aspects of the particular area in question. As cognitive linguistics constitutes an enterprise made up of a collection of theories based on a few shared assumptions, rather than forming a single closely-articulated theory, the rationale in selecting articles has been to choose those articles which are most representative of a specific perspective in a given area. The articles in the Reader are drawn from a cross-section of the output from some of the most influential and recognisable figures in cognitive linguistics. The areas which have been selected include all the main areas associated with cognitive linguistics. The sections are entitled: I *Overview*; II *Empirical methods in cognitive linguistics*; III *Prototypes, polysemy and word-meaning*; IV *Metaphor, metonymy and blending*; V *Cognitive approaches to grammar*, VI *Conceptual structure in language*; and VII *Language acquisition, diversity and change*. The Reader also features brief sectional introductions – designed to help readers contextualise the papers in that section – and an annotated further reading list at the end of the volume, designed to provide a route for further study and research.

Who is the Reader for?

The Reader constitutes both an accessible introduction to cognitive linguistics, and forms an important reference work which charts the nature and range of research in cognitive linguistics. Moreover, it serves to provide students and researchers alike with access to the 'primary' literature. The introductory overview article sets the scene for much of what is to follow. The thematic groupings are intended to assist those readers unfamiliar with cognitive linguistics in approaching the range of articles on offer. Accordingly, the Reader can be used as a core text in undergraduate or graduate level courses on cognitive linguistics, or as a resource by interested scholars and lay readers who would like to gain a better understanding of the cognitive linguistics enterprise.

Vyvyan Evans,
Benjamin K. Bergen and
Jörg Zinken.
January 2007.

Section I

Overview

1 The cognitive linguistics enterprise: an overview[1]

Vyvyan Evans, Benjamin K. Bergen and Jörg Zinken

1 Introduction

Cognitive linguistics is a modern school of linguistic thought and practice. It is concerned with investigating the relationship between human language, the mind and socio-physical experience. It originally emerged in the 1970s (Fillmore, 1975; Lakoff & Thompson, 1975; Rosch, 1975) and arose out of dissatisfaction with formal approaches to language which were dominant, at that time, in the disciplines of linguistics and philosophy. While its origins were, in part, philosophical in nature, cognitive linguistics has always been strongly influenced by theories and findings from the other cognitive sciences as they emerged during the 1960s and 1970s, particularly cognitive psychology.[2] Nowhere is this clearer than in work relating to human categorization, particularly as adopted by Charles Fillmore in the 1970s (e.g., Fillmore, 1975) and George Lakoff in the 1980s (e.g., Lakoff, 1987). Also of importance have been earlier traditions such as Gestalt psychology, as applied notably by Leonard Talmy (e.g., 2000) and Ronald Langacker (e.g., 1987). Finally, the neural underpinnings of language and cognition have had longstanding influence on the character and content of cognitive linguistic theories, from early work on how visual biology constrains colour term systems (Kay & McDaniel, 1978) to more recent work under the rubric of the Neural Theory of Language (Gallese & Lakoff, 2005). In recent years, cognitive linguistic theories have become sufficiently sophisticated and detailed to begin making predictions that are testable using the broad range of converging methods from the cognitive sciences.

Early research was dominated in the 1970s and early 1980s by a relatively small number of scholars, primarily (although not exclusively) situated on the western seaboard of the United States.[3] During the 1980s, cognitive linguistic research began to take root in northern continental Europe, particularly in Belgium, Holland and Germany. By the early 1990s, there was a growing proliferation of research in cognitive linguistics throughout Europe and North America, and a relatively large internationally-distributed group of researchers who identified themselves as 'cognitive linguists'. This led, in 1989, with a major conference held at Duisburg, Germany, to the formation of the International Cognitive Linguistics Association, together with, a year later, the foundation of the journal *Cognitive Linguistics*. In the words of one of the earliest pioneers in cognitive linguistics, Ronald Langacker (1991b, p. xv), this event 'marked the birth of cognitive linguistics as a broadly grounded, self conscious intellectual movement.'

Cognitive linguistics is best described as a 'movement' or an 'enterprise', precisely because it does not constitute a single closely-articulated theory. Instead, it is an approach that has adopted a common set of core commitments and guiding principles, which have led to a diverse range of complementary, overlapping (and sometimes competing) theories. The purpose of this article is to trace some of the major assumptions and commitments that make cognitive linguistics a distinct and worthwhile enterprise. We also attempt to briefly survey the major areas of research and theory construction which characterize cognitive linguistics, areas which make it one of the most lively, exciting and promising schools of thought and practice in modern cognitive science.[4]

2 Two key commitments of cognitive linguistics

The cognitive linguistics enterprise is characterized by two fundamental commitments (Lakoff, 1990). These underlie both the orientation and approach adopted by practising cognitive linguists, and the assumptions and methodologies employed in the two main branches of the cognitive linguistics enterprise: *cognitive semantics*, and *cognitive approaches to grammar*, discussed in further detail in later sections.

2.1 The Generalization Commitment

The first key commitment is the *Generalization Commitment* (Lakoff, 1990). It represents a dedication to characterizing general principles that apply to all aspects of human language. This goal is just a special subcase of the standard commitment in science to seek the broadest generalizations possible. In contrast to the cognitive linguistics approach, other approaches to the study of language often separate the language faculty into distinct areas such as phonology (sound), semantics (word and sentence meaning), pragmatics (meaning in discourse context), morphology (word structure), syntax (sentence structure), and so on. As a consequence, there is often little basis for generalization across these aspects of language, or for study of their interrelations. This is particularly true of *formal linguistics*.

Formal linguistics attempts to model language by positing explicit mechanical devices or procedures operating on theoretical primitives in order to produce all the possible grammatical sentences of a given language. Such approaches typically attempt precise formulations by adopting formalisms inspired by computer science, mathematics and logic. Formal linguistics is embodied most notably by the work of Noam Chomsky (e.g., 1965, 1981, 1995) and the paradigm of Generative Grammar, as well as the tradition known as Formal Semantics, inspired by philosopher of language Richard Montague (1970, 1973; see Cann, 1993, for a review).

Within formal linguistics it is usually argued that areas such as phonology, semantics and syntax concern significantly different kinds of structuring principles operating over different kinds of primitives. For instance, a syntax 'module' is an area in the mind concerned with structuring words into sentences, whereas a phonology 'module' is concerned with structuring sounds into patterns permitted by the rules of any given language, and by human language in general. This modular view of mind reinforces the idea that modern linguistics is justified in separating the study of language into distinct sub-disciplines, not only on grounds of practicality, but because the components of language are wholly distinct, and, in terms of organization, incommensurable.

Cognitive linguists acknowledge that it may often be useful to treat areas such as syntax, semantics and phonology as being notionally distinct. However, given the Generalization Commitment, cognitive linguists do not start with the assumption that the 'modules' or 'subsystems' of language are organized in significantly divergent ways, or indeed that wholly distinct modules even exist. Thus, the Generalization Commitment represents a commitment to openly investigating how the various aspects of linguistic knowledge emerge from a common set of human cognitive abilities upon which they draw, rather than assuming that they are produced in encapsulated modules of the mind.

The Generalization Commitment has concrete consequences for studies of language. First, cognitive linguistic studies focus on what is common among aspects of language, seeking to re-use successful methods and explanations across these aspects. For instance, just as word meaning displays prototype effects – there are better and worse examples of referents of given words, related in particular ways – so various studies have applied the same principles to the organization of morphology (e.g., Taylor, 2003), syntax (e.g., Goldberg, 1995), and phonology (e.g., Jaeger & Ohala, 1984). Generalizing successful explanations across domains of language isn't just a good scientific practice – it is also the way biology works; reusing existing structures for new purposes, both on evolutionary and developmental timescales. Second, cognitive linguistic approaches often take a 'vertical', rather than a 'horizontal' approach to the study of language. Language can be seen as composed of a set of distinct layers of organization – the sound structure, the set of words composed by these sounds, the syntactic structures these words are constitutive of, and so on. If we array these layers one on top of the next as they unroll over time (like layers of a cake), then modular approaches are horizontal, in the sense that they take one layer and study it internally – just as a horizontal slice of cake. Vertical approaches get a richer view of language by taking a vertical slice of language, which includes phonology, morphology, syntax, and of course a healthy dollop of semantics on top. A vertical slice of language is necessarily more complex in some ways than a horizontal one – it is more varied and textured – but at the same time it affords possible explanations that are simply unavailable from a horizontal, modular perspective.

2.2 The Cognitive Commitment

The second commitment is termed the Cognitive Commitment (Lakoff, 1990). It represents a commitment to providing a characterization of the general principles for language that accord with what is known about the mind and brain from other disciplines. It is this commitment that makes cognitive linguistics cognitive, and thus an approach which is fundamentally interdisciplinary in nature.

Just as the Generalization Commitment leads to the search for principles of language structure that hold across all aspects of language, in a related manner, the Cognitive Commitment represents the view that principles of linguistic structure should reflect what is known about human cognition from the other cognitive and brain sciences, particularly psychology, artificial intelligence, cognitive neuroscience, and philosophy. In other words, the Cognitive Commitment asserts that models of language and linguistic organization proposed should reflect what is known about the human mind, rather than purely aesthetic dictates such as the use of particular kinds of formalisms or economy of representation (see Croft, 1998, for discussion of this last point).

The Cognitive Commitment has a number of concrete ramifications. First, linguistic theories cannot include structures or processes that violate known properties of the human cognitive system. For instance, if sequential derivation of syntactic structures violates time constraints provided by actual human language processing, then it must be jettisoned. Second, models that use known, existing properties of human cognition to explain language phenomena are more parsimonious than those that are built from a priori simplicity metrics. For example, quite a lot is known about human categorization, and a theory that reduces word meaning to the same mechanisms responsible for categorization in other cognitive domains is simpler than one that hypothesizes a separate system for capturing lexical semantics. Finally, it is incumbent upon the cognitive linguistic researcher to find convergent evidence for the cognitive reality of components of any proffered model or explanation – whether or not this research is conducted by the cognitive linguist (Gibbs, to appear/this volume).

3 Cognitive semantics and cognitive approaches to grammar

Having briefly set out the two key commitments of the cognitive linguistics enterprise, we now briefly map out the two, hitherto, best developed areas of the field.

Cognitive linguistics practice can be roughly divided into two main areas of research: cognitive semantics and cognitive (approaches to) grammar. The area of study known as cognitive semantics is concerned with investigating the relationship between experience, the conceptual system, and the semantic structure encoded by language. In specific terms, scholars working in cognitive semantics investigate knowledge representation (*conceptual structure*), and meaning construction (*conceptualization*). Cognitive semanticists have employed language as the lens through which these cognitive phenomena can be investigated. Consequently, research in cognitive semantics tends to be interested in modelling the human mind as much as it is concerned with investigating linguistic semantics. A cognitive approach to grammar is concerned with modelling the language system (the mental 'grammar'), rather than the nature of mind per se. However, it does so by taking as its starting point the conclusions of work in cognitive semantics. This follows as meaning is central to cognitive approaches to grammar.[5] It is critical to note that although the study of cognitive semantics and cognitive approaches to grammar are occasionally separate in practice, this by no means implies that their domains of enquiry are anything but tightly linked –most work in cognitive linguistics finds it necessary to investigate both lexical semantics and grammatical organization jointly.

As with research in cognitive semantics, cognitive approaches to grammar have also typically adopted one of two foci. Scholars such as Ronald Langacker (e.g., 1987, 1991a, 1991b, 1999) have emphasized the study of the cognitive principles that give rise to linguistic organization. In his theory of *Cognitive Grammar*, Langacker has attempted to delineate the principles that structure a grammar, and to relate these to aspects of general cognition.

The second avenue of investigation, pursued by researchers including Fillmore and Kay (Fillmore et al., 1988; Kay & Fillmore, 1998), Lakoff (Lakoff & Thompson, 1975; Lakoff, 1987) Goldberg (1995, 2003/this volume) and more recently Bergen and Chang (2005/this volume) and Croft (2002), aims to provide a more descriptively and formally detailed account of the linguistic units that comprise a particular language. These researchers attempt to provide a broad-ranging inventory of the units of language, from morphemes to words, idioms, and phrasal patterns, and seek accounts of their structure, compositional possibilities, and relations. Researchers who have pursued this line of investigation are developing a set of theories that are collectively known as *construction grammars*. This general approach takes its name from the view in cognitive linguistics that the basic unit of language is a form-meaning pairing known as a *symbolic assembly*, or a *construction* (particularly in construction grammar accounts, see, e.g., Goldberg, 1995, for discussion).

4 Cognitive semantics: guiding principles

In this section we consider in a little more detail the first of these two best-developed areas of cognitive linguistics. Cognitive semantics, like the larger enterprise of which it is a part, is not a single unified framework. Those researchers who identify themselves as cognitive semanticists typically have a diverse set of foci and interests. However, there are a number of guiding principles that collectively characterize a cognitive approach to semantics. In this section we identify these guiding principles (as we see them). In Section 5 we explore some of the major theories and research areas which have emerged under the 'banner' of cognitive semantics.

The four guiding principles of cognitive semantics are as follows:

i) Conceptual structure is embodied (the 'embodied cognition thesis').
ii) Semantic structure is conceptual structure.
iii) Meaning representation is encyclopaedic.
iv) Meaning construction is conceptualization.

4.1 Conceptual structure is embodied

Due to the nature of our bodies, including our neuro-anatomical architecture, we have a species-specific view of the world. In other words, our construal of 'reality' is mediated, in large measure, by the nature of our embodiment. One example of the way in which embodiment affects the nature of experience is in the realm of colour. While the human visual system has three kinds of photoreceptors (i.e., colour channels), other organisms often have a different number (Varela et al., 1991). For instance, the visual system of squirrels, rabbits and possibly cats, makes use of two colour channels, while other organisms, including goldfish and pigeons, have four colour channels. Having a different range of colour channels affects our experience of colour in terms of the range of colours accessible to us along the colour spectrum. Some organisms can see in the infrared range, such as rattlesnakes, which hunt prey at night and can visually detect the heat given off by other organisms. Humans are unable to see in this range. The nature of our visual apparatus – one aspect of our embodiment – determines the nature and range of our visual experience.

The nature of the relation between embodied cognition and linguistic meaning is contentious. It is evident that embodiment underspecifies which colour terms a particular language will have, and whether the speakers of a given language will be interested in 'colour' in the first place (Saunders, 1995; Wierzbicka, 1996). However, the interest in understanding this relation is an important aspect of the view in cognitive linguistics that the study of linguistic meaning construction needs to be reintegrated with the contemporary study of human nature (e.g., Núñez & Freeman, 1999).

The fact that our experience is embodied – that is, structured in part by the nature of the bodies we have and by our neurological organization – has consequences for cognition. In other words, the concepts we have access to and the nature of the 'reality' we think and talk about are a function of our embodiment. We can only talk about what we can perceive and conceive, and the things that we can perceive and conceive derive from embodied experience. From this point of view, the human mind must bear the imprint of embodied experience. This thesis, central to cognitive semantics, is known as the thesis of embodied cognition. This position holds that conceptual structure (the nature of human concepts) is a consequence of the nature of our embodiment and thus is embodied.

4.2 Semantic structure is conceptual structure

The second guiding principle asserts that language refers to concepts in the mind of the speaker rather than, directly, to entities which inhere in an objectively real external world. In other words, *semantic structure* (the meanings conventionally associated with words and other linguistic units) can be equated with *conceptual structure* (i.e., concepts). This 'representational' view is directly at odds with the 'denotational' perspective of what cognitive semanticists sometimes refer to as *objectivist semantics*, as exemplified by some formal approaches to semantics.

However, the claim that semantic structure can be equated with conceptual structure does not mean that the two are identical. Instead, cognitive semanticists claim that the meanings associated with linguistic units such as words, for example, form only a subset of possible concepts. After all, we have many more thoughts, ideas and feelings than we can conventionally encode in language. For example, as Langacker (1987) observes, we have a concept for the place on our faces below our nose and above our mouth where moustaches go. We must have a concept for this part of the face in order to understand that the hair that grows there is called a *moustache*. However, there is no English word that conventionally encodes this concept (at least not in the non-specialist vocabulary of everyday language). It follows that the set of *lexical concepts*, the semantic units conventionally associated with linguistic units such as words (see Evans, 2004, 2006; Evans & Green, 2006) is only a subset of the full set of concepts in the minds of speaker-hearers.[6]

4.3 Meaning representation is encyclopaedic

The third guiding principle holds that semantic structure is *encyclopaedic* in nature. This means that lexical concepts do not represent neatly packaged bundles of meaning (the so-called *dictionary view*, see Haiman, 1980, for a critique). Rather, they serve as 'points of access' to vast repositories of knowledge relating to a particular concept or conceptual domain (e.g., Langacker, 1987).

Of course, to claim that lexical concepts are 'points of access' to encyclopaedic meaning is not to deny that words have conventional meanings associated with them. The fact that example (1) means something different from example (2) is a consequence of the conventional range of meanings associated with *sad* and *happy*.

(1) James is sad.

(2) James is happy.

Nevertheless, cognitive semanticists argue that the conventional meaning associated with a particular linguistic unit is simply a 'prompt' for the process of *meaning construction*: the 'selection' of an appropriate interpretation against the context of the utterance.

By way of example take the word *safe*. This has a range of meanings, and the meaning that we select emerges as a consequence of the context in which the word occurs. To illustrate this point, consider the examples in (3), discussed by Fauconnier and Turner (2002), against the context of a child playing on the beach.

(3) a. The child is safe.
b. The beach is safe.
c. The shovel is safe.

In this context, the interpretation of (3a) is that the child will not come to any harm. However, (3b) does not mean that the beach will not come to harm. Instead, it means that the beach is an environment in which the risk of the child coming to harm is minimized. Similarly, (3c) does not mean that the shovel will not come to harm, but that it will not cause harm to the child. These examples illustrate that there is no single fixed property that *safe* assigns to the words *child*, *beach* and *shovel*. In order to understand what the speaker means, we draw upon our encyclopaedic knowledge relating to children, beaches and shovels, and our knowledge relating to what it means to be safe. We then 'construct' a meaning by 'selecting' a meaning that is appropriate in the context of the utterance.

4.4 Meaning construction is conceptualization

The fourth guiding principle is that language itself does not encode meaning. Instead, as we have seen, words (and other linguistic units) are only 'prompts' for the construction of meaning. Accordingly, meaning is constructed at the conceptual level. Meaning construction is equated with conceptualization, a process whereby linguistic units serve as prompts for an array of conceptual operations and the recruitment of background knowledge. Meaning is a process rather than a discrete 'thing' that can be 'packaged' by language.

5 Cognitive semantics: major theories and approaches

In this section we briefly introduce some of the most significant theories in cognitive semantics, and consider how they best exemplify the guiding assumptions discussed above.

5.1 Image schema theory

The theoretical construct of the *image schema* was developed in particular by Mark Johnson. In his now classic 1987 book, *The Body in the Mind*, Johnson proposed that one way in which embodied experience manifests itself at the cognitive level is in terms of image schemas. These are rudimentary concepts like CONTACT, CONTAINER and BALANCE, which are meaningful because they derive from and are linked to human *pre-conceptual experience*. This is experience of the world directly mediated and structured by the human body. These image-schematic concepts are not disembodied abstractions, but derive their substance, in large measure, from the sensory-perceptual experiences that give rise to them in the first place.

The developmental psychologist Jean Mandler (e.g. 1992, 1996, 2004) has made a number of proposals concerning how image schemas might arise from embodied experience. Starting at an early age infants attend to objects and spatial displays in their environment. Mandler suggests that by attending closely to such spatial experiences, children are able to abstract across similar kinds of experiences, finding meaningful patterns in the process. For instance, the CONTAINER image schema is more than simply a spatio-geometric representation. It is a 'theory' about a particular kind of configuration in which one entity is supported by another entity that contains it. In other words, the CONTAINER schema is meaningful because containers are meaningful in our everyday experience.

Lakoff (1987, 1990, 1993/this volume) and Johnson (1987) have argued that rudimentary embodied concepts of this kind provide the conceptual building blocks for more complex concepts, and can be systematically extended to provide structure to more abstract concepts and conceptual domains. According to this view, the reason we can talk about being *in* states like love or trouble (4) is because abstract concepts like LOVE are structured and therefore understood by virtue of the fundamental concept CONTAINER. In this way, image-schematic concepts serve to structure more complex concepts and ideas.

(4) a. James is in love.
b. Susan is in trouble.
c. The government is in a deep crisis.

According to Johnson, it is precisely because containers constrain activity that it makes sense to conceptualize POWER and all-encompassing states like LOVE or CRISIS in terms of the CONTAINER schema.

Mandler (2004) describes the process of forming image schemas in terms of a redescription of spatial experience via a process she labels *perceptual meaning analysis*. As she notes, '[O]ne of the foundations of the conceptualizing capacity is the image schema, in which spatial structure is mapped into conceptual structure' (Mandler, 1992, p. 591). She further suggests that 'Basic, recurrent experiences with the world form the bedrock of the child's semantic architecture, which is already established well before the child begins producing language' (Mandler, 1992, p. 597). In other words, it is experience, meaningful to us by virtue of our embodiment, that forms the basis of many of our most fundamental concepts. Again, this basis must be very broad, and it underspecifies the semantic spatial categories that children acquire (see Bowerman & Choi, 2003/this volume). Nevertheless, image schema theory represents an important attempt to relate conceptual structure to the nature of embodiment. Thus, it most transparently reflects the thesis of embodied cognition, and the first guiding principle of cognitive semantics which holds that conceptual structure is embodied.

5.2 Encyclopaedic semantics

The traditional view in formal linguistics holds that meaning can be divided into a dictionary component and an encyclopaedic component. According to this view, it is only the dictionary component that properly constitutes the study of *lexical semantics:* the branch of semantics concerned with the study of word meaning. In contrast, encyclopaedic knowledge is external to linguistic knowledge, falling within the domain of 'world knowledge'. Of course, this view is consistent with the modularity hypothesis adopted within formal linguistics, briefly mentioned earlier.

In contrast, cognitive semanticists typically adopt an encyclopaedic approach to meaning. There are a number of assumptions which constitute this approach to semantics, which we briefly outline here.

i) There is no principled distinction between semantics and pragmatics.
ii) Encyclopaedic knowledge is structured.
iii) Encyclopaedic meaning emerges in context.
iv) Lexical items are points of access to encyclopaedic knowledge.
v) Encyclopaedic knowledge is dynamic.

i) There is no principled distinction between semantics and pragmatics

First, cognitive semanticists reject the idea that there is a principled distinction between 'core' meaning on the one hand, and pragmatic, social or cultural meaning on the other. This means that cognitive semanticists do not make a sharp distinction between semantic and pragmatic knowledge. Knowledge of what words mean and knowledge about how words are used are both types of 'semantic' knowledge.

Cognitive semanticists do not posit an autonomous mental lexicon which contains semantic knowledge separately from other kinds of (linguistic or non-linguistic) knowledge. It follows that there is no distinction between dictionary knowledge and encyclopaedic knowledge: there is only encyclopaedic knowledge, which subsumes what we might think of as dictionary knowledge.

ii) Encyclopaedic knowledge is structured

The view that there is only encyclopaedic knowledge does not entail that the knowledge we have connected to any given word is a disorganized mess. Cognitive semanticists view encyclopaedic knowledge as a structured system of knowledge, organized as a network. Moreover, not all aspects of the knowledge that is, in principle, accessible by a single word has equal standing. For example, what we know about the word *mango* includes information concerning its shape, colour, smell, texture and taste. This holds whether we like or hate mangos, and so on.

iii) Encyclopaedic meaning emerges in context

Encyclopaedic meaning arises in context(s) of use, so that the 'selection' of encyclopaedic meaning is informed by contextual factors. For example, recall our discussion of *safe* earlier. We saw that this word can have different meanings depending on the particular context of use. *Safe* can mean 'unlikely to cause harm' when used in the context of a child playing with a spade. Alternatively *safe* can mean 'unlikely to come to harm', when used in the context of a beach that has been saved from development as a tourist resort.

Compared with the dictionary view of meaning, which separates core meaning (semantics) from non-core meaning (pragmatics), the encyclopaedic view makes very different claims. Not only does semantics include encyclopaedic knowledge, but meaning is fundamentally 'guided' by context. Furthermore, the meaning of a word is 'constructed' on line as a result of contextual information. From this perspective, fully-specified preassembled word meanings do not exist, but are selected and formed from encyclopaedic knowledge, which is called the *semantic potential* (Evans, 2006) or *purport* (Croft & Cruse, 2004; Cruse, 2000) of a lexical item.

iv) Lexical items are points of access to encyclopaedic knowledge

The encyclopaedic approach views lexical items as *points of access* to encyclopaedic knowledge (Langacker, 1987). Accordingly, words are not containers that present neat pre-packaged bundles of information. Instead, they selectively provide access to particular parts of the vast network of encyclopaedic knowledge.

v) Encyclopaedic knowledge is dynamic

Finally, while the central meaning associated with a word is relatively stable, the encyclopaedic knowledge that each word provides access to is dynamic. Consider the lexical concept CAR. Our knowledge of cars continues to be modified as a result of our ongoing interaction with cars, our acquisition of knowledge regarding cars, and so on (see Barsalou, e.g., 1999).

There are two relatively well developed theories of encyclopaedic semantics. The first is the theory of frame semantics, developed in a series of publications by Charles Fillmore (e.g., 1975, 1977, 1982, 1985; Fillmore & Atkins, 1992). A second theory is the theory of domains developed by Ronald Langacker (e.g., 1987).

Fillmore proposes that a *semantic frame* is a schematization of experience (a knowledge structure), which is represented at the conceptual level, and held in long-term memory. The frame relates the elements and entities associated with a particular culturally embedded scene from human experience. Thus, a word cannot be understood independently of the frame with which it is associated.

Langacker's (e.g., 1987) theory of domains (like Fillmore's theory of Frame Semantics), is based on the assumption that meaning is encyclopaedic, and that lexical concepts cannot be understood independently of larger knowledge structures. Langacker calls these knowledge structures *domains.*

5.3 Categorization and Idealized Cognitive Models (ICMs)

A third important theoretical development in cognitive semantics relates to George Lakoff's theory of Idealized Cognitive Models (ICMs), developed in his now classic 1987 book *Women, Fire and Dangerous Things*. Like Fillmore's notion of a semantic frame, and Langacker's domains, ICMs are relatively stable background knowledge structures with respect to which lexical concepts are relativized. However, Lakoff's account was less concerned with developing an approach to encyclopaedic semantics than with addressing issues in categorization which emerged from developments in cognitive psychology.

In the 1970s the *classical theory* of human categorization – so called because it had endured since the time of the ancient Greek philosophers– was called into question. The new ideas that contributed to this development emerged from the research of Eleanor Rosch and her colleagues on prototypes and basic level category research (e.g., Rosch, 1975, 1977, 1978; Rosch & Mervis, 1975; Rosch et al., 1976). Rosch's work on categorization, known as prototype theory, was, in fact, less a theory of knowledge representation than a series of findings which provided new insights into human categorization. In so far as the findings led to a theory, Rosch proposed that humans categorize not by means of the *necessary and sufficient conditions* of the classical theory but with reference to a prototype, a relatively abstract mental representation that assembles the key attributes or features that best represent instances of a given category.

The claim that categories are structured with respect to prototypes, or cognitive reference points, was based on a number of experimental findings. Two of the most striking relate to the notion that many categories appear to have fuzzy boundaries, and the related notion of typicality effects. In terms of fuzziness, consider the category FURNITURE. While TABLE and CHAIR are clearly instances of this category, it is less clear whether CARPET should be considered a member. Rather than having sharply delineated boundaries as predicted by the classical view, human subjects often appear to have difficulty judging in which categories various physical artefacts belong. Moreover, this difficulty is influenced by context, such as the physical situation or how the object in question is being used at a given time.

A related issue concerns the notion of prototype or *typicality effects*. For example, while people judge TABLE or CHAIR as 'good examples' of the category FURNITURE, CARPET is judged as a less good example. These asymmetries between category members are called typicality effects.

Despite Rosch's early claim that conceptual fuzziness and typicality effects are the result of conceptual prototypes, in later work she retreated from this position.

'The fact that prototypicality is reliably rated and is correlated with category structure does not have clear implications for particular processing models nor for a theory of cognitive representations of categories'. (Rosch, 1978: 261).

In other words, while typicality effects are 'real' in the sense that they are empirical findings, it does not follow that these findings can be directly 'translated' into a theory of how categories are represented in the human mind. Lakoff (1987) represents an important attempt to develop a theory of cognitive models that might plausibly explain the typicality effects uncovered by Rosch and her colleagues.

Lakoff argued that categorization relates to *idealized cognitive models (ICMs)*. These are relatively stable mental representations that represent 'theories' about the world. Moreover, ICMs guide cognitive processes like categorization and reasoning. Lakoff argues that typicality effects can arise in a range of ways from a number of different sources. One way in which typicality effects can arise is due to mismatches between ICMs against which particular concepts are understood.

Consider the ICM to which the concept BACHELOR relates. This ICM is likely to include information relating to the institution of marriage, and a standard marriageable age. It is with respect to this ICM, Lakoff argues, that the notion of BACHELOR is understood. Furthermore, because the background frame defined by an ICM is idealized, it may only partially match up with other cognitive models. This can therefore give rise to typicality effects.

Consider the Pope with respect to the category BACHELOR. While an individual's status as a bachelor is an 'all or nothing' affair, because this notion is understood with respect to the legal institution of MARRIAGE, the Pope, while strictly speaking a bachelor, is judged to be a poor example of this particular category. Lakoff's theory accounts for this sort of typicality effect as follows. The concept POPE is primarily understood with respect to the ICM of the CATHOLIC CHURCH, whose clergy are unable to marry. Clearly, there is a mismatch between these two cognitive models. In the ICM against which BACHELOR is understood, the Pope is 'strictly speaking' a bachelor, because he is unmarried. However, the Pope is not a prototypical bachelor because the Pope is more frequently understood with respect to a CATHOLIC CHURCH ICM in which marriage of Catholic clergy is prohibited.

There are a number of other ways in which, according to Lakoff, typicality effects arise, by virtue of the sorts of ICMs people have access to. For instance, a typicality effect arises when an *exemplar* (an individual instance) stands for an entire category. The phenomenon whereby one conceptual entity stands for another is called *metonymy*, discussed later. Thus, typicality effects that arise in this way relate to what Lakoff refers to as *metonymic ICMs*.

An example of a metonymic ICM is the cultural stereotype HOUSEWIFE-MOTHER, in which a married woman does not have paid work, but stays at home and looks after the house and family. The HOUSEWIFE-MOTHER stereotype can give rise to typicality effects when it stands for, or represents, the category MOTHER as a whole. Typicality effects arise from resulting expectations associated with members of the category MOTHER. According to the HOUSEWIFE-MOTHER stereotype, mothers nurture their children, and in order to do this they stay at home and take care of them. A WORKING MOTHER, by contrast, is not simply a mother who has a job, but also one who does not stay at home to look after her children. Hence, the HOUSEWIFE-MOTHER model, by metonymically representing the category MOTHER as a whole, serves in part to define other instances of the category such as WORKING MOTHER, which thus emerges as a non-prototypical member of the category.

Lakoff's work on ICMs is important in a number of respects. For instance, it embodies the two key commitments of cognitive linguistics: the Generalization Commitment and the Cognitive Commitment. Lakoff took what was then a relatively new set of findings from cognitive psychology and sought to develop a model of language that was compatible with these findings. In attempting to model principles of language in terms of findings from cognitive psychology, Lakoff found himself devising and applying principles that were common both to linguistic and conceptual phenomena, which thus laid important foundations for the cognitive approach to language.

5.4 Cognitive lexical semantics

One important consequence of Lakoff's theory of ICMs was the impetus it provided to the cognitive semantic treatment of word-meaning, an area known as *cognitive lexical semantics*. Cognitive lexical semantics takes the position that *lexical items* (words) are *conceptual categories*; a word represents a category of distinct yet related meanings that exhibit typicality effects. Thus, Lakoff argued, words are categories that can be modelled and investigated using the theory of ICMs. In particular, Lakoff argued that lexical items represent the type of complex categories he calls *radial categories*. A radial category is structured with respect to a prototype, and the various category members are related to the prototype by convention, rather than being 'generated' by predictable rules. As such, word meanings are stored in the mental lexicon as highly complex structured categories of meanings or *senses*.

In this section, we briefly present Lakoff's account of the semantics of *over*, which has been highly influential in the development of cognitive lexical semantics. Lakoff's account was based on ideas proposed in a master's thesis by Claudia Brugman, his former student. The idea underpinning Lakoff's approach was that a lexical item like *over* constitutes a conceptual category of distinct but related (polysemous) senses. Furthermore, these senses, as part of a single category, can be judged as more prototypical (central) or less prototypical (peripheral). This means that word senses exhibit typicality effects. For instance the ABOVE sense of *over* in example (5a) would be judged by most native speakers of English as a 'better' example of *over* than the CONTROL sense in example (5b). While the prototypical ABOVE sense of *over* relates to a spatial configuration, the CONTROL sense does not.

(5) a. The picture is over the mantelpiece.
    b. Jane has a strange power over him.

The intuition that the spatial meanings are somehow prototypical led Brugman and Lakoff (1988), and Lakoff (1987) to argue that the CONTROL sense of *over* is derived metaphorically from the more prototypical spatial meaning of *over*.

While Lakoff's theory of lexical semantics has been hugely influential, there nevertheless remain a number of outstanding problems that have attracted significant discussion. For instance, Lakoff's so-called 'full-specification' view has been criticized as it entails a potentially vast proliferation of distinct senses for each lexical item (e.g., Sandra, 1998). For example, Lakoff's approach entails that *over* has, at the very least, several dozen distinct senses. A proliferation of senses is not problematic *per se*, because cognitive linguists are not concerned with the issue of economy of representation. However, the absence of clear methodological principles for establishing the distinct senses is problematic. More recent work (e.g., Tyler & Evans, 2001/this volume, 2003) has sought to address some of the difficulties inherent in Lakoff's approach by providing a methodology for examining senses associated with lexical categories. With the also quite recent use of empirical methods in cognitive linguistics (see Cuyckens et al., 1997/this volume), and particularly the use of corpora and statistical analysis (e.g., Gries, 2005), cognitive lexical semantics has now begun to make serious progress in providing cognitively realistic analyses of lexical categories.

5.5 Conceptual metaphor theory

Conceptual metaphor theory was one of the earliest and most important theories to take a cognitive semantic approach. For a long time in the development of the larger cognitive linguistics enterprise it was one of the dominant theories and despite its limitations (see Evans, 2004; Evans & Zinken, To appear; Haser, 2005; Leezenberg, 2001; Murphy, 1996; Stern, 2000; Zinken, Hellsten, & Nerlich, in press), it still remains an important perspective.

The seminal publication is Lakoff and Johnson's 1980 volume *Metaphors we live by*, the basic premise of which is that metaphor is not simply a stylistic feature of language, but that thought itself is fundamentally metaphorical. According to this view, conceptual structure is organized by *cross domain mappings* or correspondences which inhere in long term memory. Some of these mappings are due to pre-conceptual embodied experiences while others build on these experiences in order to form more complex conceptual structures. For instance, we can think and talk about QUALITY in terms of VERTICAL ELEVATION, as in (6):

(6) She got a really high mark in the test.

where *high* relates not literally to physical height but to a good mark.

According to Conceptual Metaphor Theory, this is because the conceptual domain QUALITY is conventionally structured and therefore understood in terms of the conceptual domain VERTICAL ELEVATION. The claims made by conceptual metaphor theorists like Lakoff and Johnson directly relate to two of the central assumptions associated with cognitive semantics. The first is the embodied cognition thesis, and the second is the thesis that semantic structure reflects conceptual structure.

In a more recent development, conceptual metaphors are held to be derived from more basic 'super-schematic' aspects of conceptual structure known as *primary metaphors* (Grady, 1997; Lakoff & Johnson, 1999). On this view, more culture-specific metaphors such as THEORIES ARE BUILDINGS as exemplified by (7):

(7) a. Is that the *foundation* for your theory?
b. The theory needs more *support*.
c. The argument is *shaky*.

are derived from more fundamental, and arguably universal conceptual mappings which persist in long-term memory. The process whereby more foundational primary metaphors give rise to more complex or *compound metaphors* takes place by virtue of an integration process known as *conceptual blending* (Grady et al., 1999/this volume), which is discussed further below. The account of conceptual metaphor as deriving from primary metaphors has been further fleshed out in terms of the neural operations that could give rise to such cross-domain mappings, as elucidated in great detail by Lakoff and Johnson (1999).

5.6 Conceptual metonymy

In *Metaphors We Live By*, Lakoff and Johnson pointed out that, in addition to metaphor, there is a related conceptual mechanism that is also central to human thought and language: *conceptual metonymy*. Like metaphor, metonymy has traditionally been analysed as a trope: a purely linguistic device. However, Lakoff and Johnson argued that metonymy, like metaphor, was conceptual in nature. In recent years, a considerable amount of research has been devoted to metonymy. Indeed, some scholars have begun to suggest that metonymy may be more fundamental to conceptual organization than metaphor (e.g., Taylor, 2003; Radden, 2001), and some have gone so far as to claim that metaphor itself has a metonymic basis (Barcelona, 2001).

To illustrate the phenomenon of metonymy consider the following example drawn from Evans and Green (2006):

(8) The ham sandwich has wandering hands.

Imagine that the sentence in (8) is uttered by one waitress to another in a restaurant. This use of the expression *ham sandwich* represents an instance of metonymy: two entities are associated so that one entity (the item the customer ordered) stands for the other (the customer). As this example demonstrates, metonymy is *referential* in nature. It relates to the use of expressions to 'pinpoint' entities in order to talk about them. This shows that metonymy functions differently from metaphor. For (8) to be metaphorical we would need to understand *ham sandwich* not as an expression referring to the customer who ordered it, but in terms of a food item with human qualities. As these two quite distinct interpretations show, while metonymy is the conceptual relation 'X stands for Y', metaphor is the conceptual relation 'X understood in terms of Y'.

A further defining feature of metonymy pointed out by Lakoff and Johnson is that it is motivated by physical or causal associations. Traditionally, this was expressed in terms of contiguity. This concerns a close or direct relationship between two entities. This explains why the waitress can use the expression *the ham sandwich* to refer to the customer; there is a direct experiential relationship between then ham sandwich and the customer who ordered it.

A related way of viewing metonymy is that metonymy is often *contingent* on a specific context. Within a specific discourse context, a salient *vehicle* activates and thus *highlights* a particular *target* (Croft, 1993).

Finally, Lakoff and Turner (1989) added a further component to the cognitive semantic view of metonymy. They pointed out that metonymy, unlike metaphor, is not a cross-domain mapping, but instead allows one entity to stand for another because both concepts co-exist within the same domain. This explains why a metonymic relationship is based on contiguity or conceptual 'proximity'. The reason *ham sandwich* in (8) represents an instance of metonymy is because both the target (the customer) and the vehicle (the ham sandwich) belong to the same RESTAURANT domain.

5.7 Mental spaces theory

Mental Spaces Theory is a cognitive theory of meaning construction. Gilles Fauconnier developed this approach in his two landmark books *Mental Spaces* ([1985] 1994), and *Mappings in Thought and Language* (1997). More recently, Fauconnier, in collaboration with Mark Turner in a series of papers and a 2002 book, *The way we think*, has extended this theory, which has given rise to a new framework called *Conceptual Blending Theory*. Together these two theories attempt to provide an account of the often hidden conceptual aspects of meaning construction. From the perspective of Mental Spaces and Blending theory, language provides underspecified prompts for the construction of meaning, which takes place at the conceptual level. Accordingly, these two theories exemplify the fourth of the guiding principles of the cognitive semantics approach. We briefly introduce some key notions from Mental Spaces Theory and then in the next section briefly survey the more recent Conceptual Blending Theory.

According to Fauconnier, meaning construction involves two processes: (1) the building of *mental spaces*; and (2) the establishment of *mappings* between those mental spaces. Moreover, the mapping relations are guided by the local discourse context, which means that meaning construction is always context-bound. Fauconnier defines mental spaces as 'partial structures that proliferate when we think and talk, allowing a fine-grained partitioning of our discourse and knowledge structures.' (Fauconnier, 1997, p. 11). The fundamental insight this theory provides is that mental spaces partition meaning into distinct conceptual regions or 'packets', when we think and talk.

Mental spaces are regions of conceptual space that contain specific kinds of information. They are constructed on the basis of generalized linguistic, pragmatic and cultural strategies for recruiting information. However, because mental spaces are constructed 'on line', they result in unique and temporary 'packets' of conceptual structure, constructed for purposes specific to the ongoing discourse. The principles of mental space formation and the relations or mappings established between mental spaces have the potential to yield unlimited meanings.

As linguistic expressions are seen as underdetermined prompts for processes of rich meaning construction, linguistic expressions have *meaning potential*. Rather than 'encoding' meaning, linguistic expressions represent partial *building instructions*, according to which mental spaces are constructed. Of course, the actual meaning prompted for by a given utterance will always be a function of the discourse context in which it occurs, which entails that the meaning potential of any given utterance will always be exploited in different ways dependent upon the discourse context.

Mental spaces are set up by *space builders*, which are linguistic units that either prompt for the construction of a new mental space, or shift attention back and forth between previously constructed mental spaces. Space builders can be expressions like prepositional phrases (*in 1966*, *at the shop*, *in Fred's mind's eye*), adverbs (*really, probably, possibly*), and subject-verb combinations that are followed by an embedded sentence (*Fred believes* [*Mary likes sausages*], *Mary hopes*…, *Susan states*…), to name but a few. Space builders require the hearer to 'set up' a scenario beyond the 'here and now', whether this scenario reflects past or future reality, reality in some other location, a hypothetical situation, a situation that reflects ideas and beliefs, and so on.

Mental spaces contain *element*s, which are either entities constructed on line, or pre-existing entities in the conceptual system. Mental spaces are also *internally structured* by existing knowledge structures, including frames and ICMs. The space builders, the elements introduced into a mental space, and the properties and relations prompted for, *recruit* this pre-existing knowledge structure. Once a mental space has been constructed, it is linked to the other mental spaces established during discourse. As discourse proceeds, mental spaces proliferate within a network or lattice, as more background knowledge is recruited and links between the resulting spaces are created. One of the advantages of Mental Spaces theory is that it provides an elegant account of how viewpoint shifts during discourse, which in turn facilitates an intuitive solution to some of the referential problems formal accounts of semantics have wrestled with.

5.8 Conceptual blending theory

In terms of its architecture and in terms of its central concerns, Blending Theory is closely related to Mental Spaces Theory. This is due to its central concern with *dynamic* aspects of meaning construction, and its dependence upon mental spaces and mental space construction as part of its architecture. However, Blending Theory is a distinct theory that has been developed to account for phenomena that Mental Spaces Theory (and Conceptual Metaphor Theory) cannot adequately account for. Moreover, Blending Theory adds theoretical sophistication of its own.

The crucial insight of Blending Theory is that meaning construction typically involves integration of structure from across mental spaces, that gives rise to *emergent structure*: structure which is more than the sum of its parts. Blending theorists argue that this process of *conceptual integration* or *blending* is a general and basic cognitive operation, which is central to the way we think.

One of the key claims of cognitive semantics, particularly as developed by conceptual metaphor theorists, is that human imagination plays a crucial role in cognitive processes, and in what it is to be human. This theme is further developed by Gilles Fauconnier and Mark Turner, the pioneers of Blending Theory. Blending Theory was originally developed in order to account for linguistic structure and for the role of language in meaning construction, particularly 'creative' aspects of meaning construction like novel metaphors, counterfactuals, and so on. However, recent research in Blending Theory has given rise to the view that conceptual blending is central to human thought and imagination, and that evidence for this can be found not only in human language, but also in a wide range of other areas of human activity, such as art, literature, religious thought and practice, and scientific endeavour. Fauconnier and Turner also argue that our ability to perform conceptual integration or blending may have been the key mechanism in facilitating the development of advanced human behaviours that rely on complex symbolic abilities. These behaviours include rituals, art, tool manufacture and use, and language.

The mechanism by which dynamic meaning-construction occurs involves, according to Fauconnier and Turner, the establishment of an integration network, resulting in a blend. Integration networks consist of (at least) two *input mental spaces*, a *generic space* which serves to identify counterparts in the inputs, and a fourth *blended space*, which provides the novel emergent structure not contained in either of the inputs. The process of blending or integration resulting in the emergent structure contained in the blended space involves a process termed *compression* which reduces the conceptual 'distance' between counterpart elements in the input spaces.

For instance, consider the following example adapted from John Taylor (2002):

(9) In France, Bill Clinton wouldn't have been harmed by his affair with Monica Lewinsky.

This is a complex counterfactual which is achieved by virtue of conceptual blending. The point of the utterance is to set up a disanalogy between what we know about the US and the behaviours expected by American voters of their political leaders especially with respect to marital fidelity, and the behaviours expected by French voters of their political leaders. Yet, this disanalogy is achieved by establishing a counterfactual scenario, a complex imaginative feat, in order to facilitate inferential work in reality, with respect to American and French attitudes to extramarital affairs. Conceptual blending theory, thus, represents an ambitious attempt to model the dynamic qualities of meaning-construction, by extending the theoretical architecture of Mental Spaces theory. Its applications are wide-ranging, including, for example, the study of the development and cognitive structure of mathematical systems (Lakoff & Núñez, 2000).

6 Cognitive approaches to grammar: guiding principles

Just as we have seen for cognitive semantics, cognitive linguists who study grammar typically have a diverse set of foci and interests. Some cognitive linguists are primarily concerned with elucidating the cognitive mechanisms and principles that might account for the properties of grammar, as Ronald Langacker does in his highly detailed theory *Cognitive Grammar*, and as Leonard Talmy does in developing his model. Others are primarily concerned with characterizing and delineating the linguistic units or constructions that populate a grammar; theories of this kind are called *construction grammars*. Finally, cognitive linguists who focus on grammatical change set out to explain the process of *grammaticalization*, whereby open-class elements gradually transform into closed-class elements. These different paths of investigation are united by certain shared assumptions, which we very briefly set out in this section. We thus identify the two guiding principles that underpin a cognitive approach to grammar (as we see them).

Cognitive approaches to grammar assume a cognitive semantics, and build a model of linguistic knowledge ('grammar') which is consistent with the assumptions and findings of work in cognitive semantics. In addition to this, the two guiding principles of cognitive approaches to grammar are:

i) The symbolic thesis.
ii) The usage-based thesis.

6.1 The symbolic thesis

The symbolic thesis holds that the fundamental unit of grammar is a form-meaning pairing, or *linguistic unit* (called a 'symbolic assembly' in Langacker's Cognitive Grammar, or a 'construction' in construction grammar approaches). In Langacker's terms, the symbolic unit has two poles: a semantic pole (its meaning) and a phonological pole (its sound). The idea that language has an essentially symbolic function, and that the fundamental unit of grammar is the symbolic unit, has its roots in Ferdinand de Saussure's (1857–1913) theory of language. Central to Saussure's theory was the view that language is a symbolic system in which the linguistic expression (*sign*) consists of a mapping between a concept (*signified*) and an acoustic signal (*signifier*), where both signified and signifier are psychological entities. While there are important differences between Saussure's work and the approach taken in cognitive linguistics, the cognitive approach adopts the idea of the Saussurean symbol. In cognitive approaches the semantic pole corresponds to the 'signified', and the phonological pole to the 'signifier'. These are both 'psychological entities' in the sense that they belong within the mental system of linguistic knowledge (the 'grammar') in the mind of the speaker.[7]

It follows that cognitive approaches to grammar are not restricted to investigating aspects of grammatical structure, largely independently of meaning, as is often the case in formal traditions. Instead, cognitive approaches to grammar encompass the entire inventory of linguistic units defined as form-meaning pairings. These run the gamut from skeletal syntactic configurations such as the ditransitive construction (expressed in *John baked Mary a cake*) to idioms (like *kick the bucket*), to bound morphemes like the *–er* suffix, to words. This entails that the received view of clearly distinct 'sub-modules' of language cannot be meaningfully upheld within cognitive linguistics, where the boundary between cognitive semantics and cognitive approaches to grammar is less clearly defined. Instead, meaning and grammar are seen as mutually interdependent and complementary. To take a cognitive approach to grammar is to study the units of language, and hence the language system itself. To take a cognitive approach to semantics is to attempt to understand how this linguistic system relates to the conceptual system, which in turn relates to embodied experience.

The adoption of the symbolic thesis has an important consequence for cognitive approaches to grammar. Because the basic unit is the linguistic or symbolic unit, meaning achieves central status. That is, as the basic grammatical unit is a symbolic unit, then form cannot be studied independently of meaning. This entails that the study of grammar, from a cognitive perspective, is the study of the full range of units that make up a language, from the lexical to the grammatical. For example, cognitive linguists argue that the grammatical form of a sentence is paired with its own (*schematic*) meaning in the same way that words like *cat* represent pairings of form and (*content*) meaning. The idea that grammatical units are inherently meaningful is an important theme in cognitive approaches to grammar, and gives rise to the idea of a *lexicon-grammar continuum*, in which content words like *cat* and grammatical constructions like the passive or the ditransitive both count as symbolic units, but differ in terms of the quality of the meaning potential associated with them.

6.2 The usage-based thesis

The usage-based thesis holds that the mental grammar of the speaker (his or her knowledge of language) is formed by the abstraction of symbolic units from situated instances of language use. An important consequence of adopting the usage-based thesis is that there is no principled distinction between knowledge of language and use of language (competence and performance, in generative terms), since knowledge of language *is* knowledge of how language is used. The usage-based thesis is central not just to cognitive approaches to grammar but approaches to both language change and language acquisition which take a cognitive linguistic perspective, as represented by articles by Tomasello (2000/this volume) and by Croft (1996/this volume).

7 Major theories and approaches

In this section we consider some of the major theoretical approaches in cognitive linguistics which focus on language as a system of knowledge ('grammar'). The ultimate objective of a cognitive theory of grammar is to model speaker-hearer knowledge of language in ways that are consistent with the two key commitments underlying the cognitive linguistics enterprise, the Generalization and Cognitive commitments discussed earlier. From this perspective, language emerges from general cognitive mechanisms and processes.

7.1 Talmy's grammatical vs. lexical sub-systems approach

The model of grammar developed by Leonard Talmy (e.g., Talmy, 2000, Chapter 1/this volume), assumes the symbolic thesis and, like other cognitive approaches to grammar, views grammatical units as inherently meaningful. However, Talmy's model is distinguished by its emphasis on the qualitative distinction between grammatical (closed-class) and lexical (open-class) elements. Indeed, Talmy argues that these two forms of linguistic expression represent two distinct conceptual subsystems, which encode qualitatively distinct aspects of the human conceptual system. These are the *grammatical subsystem* and the *lexical subsystem*. For Talmy, while closed-class elements encode schematic or structural meaning, open-class elements encode meanings that are far richer in terms of content. In his research output Talmy is primarily interested in delineating the nature and organization of the grammatical subsystem. In particular, Talmy is concerned with establishing the nature and function of the conceptual structure subsystem, which is to say the conceptual structure encoded by closed class elements. For Talmy this issue is a particularly fascinating one as in principle, language could function with a lexical or conceptual content system alone. The fact that languages do not makes establishing the distinction in terms of the respective contributions of the two subsystems in encoding and externalizing our cognitive representation(s) a particularly fascinating one. Because Talmy assumes the bifurcation of the conceptual system into two distinct subsystems, his cognitive model of grammar focuses more on the closed-class system than it does on the open-class system.

According to Talmy, the closed-class subsystem is semantically restricted and has a *structuring function*, while the open-class system is semantically unrestricted and has the function of providing conceptual content. To illustrate the restricted nature of the closed-class system, Talmy observes that while many languages have nominal inflections that indicate NUMBER, no language has nominal inflections that indicate COLOUR. For example, many languages have a grammatical affix like plural *-s* in English, but no language has a grammatical affix designating, say, REDNESS. Furthermore, the grammatical system reflects a restricted range of concepts within the relevant domain. For example, the grammatical NUMBER system can reflect concepts like SINGULAR, PLURAL or PAUCAL (meaning 'a few') but not concepts like MILLIONS or TWENTY-SEVEN. Talmy accounts for such restrictions by means of the observation that grammatical categories display *topological* rather than *Euclidean* properties. In other words, the meaning encoded by closed-class elements remains constant despite contextual differences relating to size, shape and so on. For example, the demonstrative determiner *that* in the expressions *that book in your hand* and *that city* encodes DISTANCE FROM THE SPEAKER regardless of the expanse of that distance. As these examples illustrate, the function of the grammatical/closed-class system is to provide a 'pared-down' or highly abstract conceptual structure. This structure provides a 'scaffold' or a 'skeleton' over which elements from the lexical/open-class system are laid in order to provide rich and specific conceptual content.

Talmy argues that while no inventory of concepts expressible by open-class forms can ever be specified (because there is no limit to human experience, knowledge and understanding), there is a restricted inventory of concepts expressible by closed-class forms. Each individual language has access to this inventory, but it does not follow that any given language will exploit all the available possibilities. Thus, one of the major impulses behind Talmy's work is to provide a descriptively adequate account of the major semantic content associated with the grammatical subsystem. He does this by identifying what he refers to as schematic systems within which closed-class elements appear to cluster. These systems include (at least) a configurational system, an attentional system, a perspectival system and a force-dynamics system. Thus, Talmy's approach represents an attempt to characterize that aspect of our cognitive representation that is encoded by the closed-class subsystem, and to describe how that system is organized.

7.2 Cognitive Grammar

Cognitive Grammar is the theoretical framework that has been under development by Ronald Langacker since the mid 1970s, and is best represented in his two *Foundations of Cognitive Grammar* volumes published in 1987 and 1991. This is also arguably the most detailed and comprehensive theory of grammar to have been developed within cognitive linguistics, and to date has been the most influential.

Langacker's approach attempts to model the cognitive mechanisms and principles that motivate and license the formation and use of symbolic units of varying degrees of complexity. Like Talmy, Langacker argues that grammatical or closed-class units are inherently meaningful. Unlike Talmy, he does not assume that open-class and closed-class units represent distinct conceptual subsystems.

Instead, Langacker argues that both types of unit belong within a single structured inventory of conventionalized linguistic units which represents knowledge of language in the mind of the speaker. Accordingly, Langacker's model of grammar has a rather broader focus than Talmy's.

For Langacker, knowledge of language (the mental grammar) is represented in the mind of the speaker as an inventory of symbolic units (Langacker, 1987, p. 73). It is only once an expression has been used sufficiently frequently and has become *entrenched* (acquiring the status of a habit or a *cognitive routine*) that it becomes a *unit*. From this perspective, a unit is a symbolic entity that is not built compositionally by the language system but is stored and accessed as a whole. Furthermore, the symbolic units represented in the speaker's grammar are *conventional*. The *conventionality* of a linguistic unit relates to the idea that linguistic expressions become part of the grammar of a language by virtue of being shared among members of a speech community. Thus conventionality is a matter of degree. For instance, an expression like *dog* is more conventional (shared by more members of the English-speaking community) than an expression like *allophone*, which is shared only by a subset of English speakers with specialist knowledge relating to the study of linguistics. The role of entrenchment and conventionality in this model of grammar emerge from the usage-based thesis (see Langacker, 2000, for detailed discussion; see also Evans & Green, 2006, Chapter 4, for a review).

Symbolic units can be *simplex* or *complex* in terms of their symbolic structure. For example, a simplex symbolic unit like a morpheme may have a complex semantic or phonological structure, but is simplex in terms of symbolic structure if it does not contain smaller symbolic units as subparts. The word *dog* and the plural marker *-s* are examples of simplex symbolic units. Complex units vary according to the level of complexity, from words (for example, *dogs*) and phrases (for example, *John's brown dog*) to whole sentences (for example, *Geoff kicked the dog*). Langacker refers to complex symbolic units as *constructions*.

The repository of entrenched symbolic units is conceived by Langacker as a mental inventory. Yet, the contents of this inventory are not stored in a random way. The inventory is structured, and this structure lies in the relationships that hold between the units. For example, some units form subparts of other units which in turn form subparts of other units (for example, morphemes make up words and words make up phrases which in turn make up sentences). This set of interlinking and overlapping relationships is conceived as a *network*.

There are three kinds of relation that hold between members of the network: (i) *symbolization*–the symbolic links between semantic pole and phonological pole; (ii) *categorization*–for example, the link between the expressions *rose* and *flower*, given that ROSE is a member of the category FLOWER; and (3) *integration* (the relation between parts of a complex symbolic structure like *flower-s*).

As a constraint on the model, Langacker (1987, pp. 53–54) proposes the *content requirement*. This requirement holds that the only structures permissible within the grammar of a language are (i) phonological, semantic and symbolic units; (ii) the relations that hold between them (described above); and (iii) *schemas* that represent these units. This requirement excludes abstract rules from the model. Instead, knowledge of linguistic patterns is conceived in terms of schemas.

7.3 Constructional approaches to grammar

Constructional approaches to grammar are based on the observation that the meaning of a whole utterance is more than a combination of the words it contains – the meaning of the whole is more than the meaning of the parts (Lakoff, 1977). There are (at least) four main varieties of constructional approach to grammar. The first is the theory called *Construction Grammar* that was developed by Charles Fillmore, Paul Kay and their colleagues (e.g., Fillmore et al., 1988/this volume). While this theory is broadly generative in orientation, it set the scene for the development of cognitively realistic theories of construction grammar which adopted the central thesis of Fillmore and Kay's approach. This thesis is the position that grammar can be modelled in terms of constructions rather than 'words and rules'. In part, Construction Grammar is motivated by the fact that certain complex grammatical constructions (e.g. idioms like *kick the bucket* or *throw in the towel*) have meaning that cannot be predicted on the basis of their sub-parts and might therefore be 'stored whole' rather than 'built from scratch'.

We also briefly introduce three other constructional approaches that are set firmly within the cognitive linguistics framework: (1) a model that we call *Goldberg's Construction Grammar*, developed by Adele Goldberg (e.g., 1995, 2003/this volume); (2) *Radical Construction Grammar*, developed by William Croft (e.g., 1996/this volume, 2001); and (3) *Embodied Construction Grammar*, a recent approach developed by Benjamin Bergen and Nancy Chang (2005/this volume). It is worth pointing out that Cognitive Grammar could also be classified as a constructional approach to grammar because Langacker also adopts a constructional view of certain types of grammatical unit. However, Langacker defines the notion of a construction in a different way from these models.

Cognitive Grammar and constructional approaches to grammar share another feature in common. Both are *inventory-based* approaches to the study of grammar (Evans & Green, 2006). In other words, both types of approach view the grammar as an inventory of symbolic units rather than a system of rules or principles. This amounts to the claim that the language system does not work predominantly by 'building' structure (as in generative models of grammar) but by 'storing' it.

Fillmore et al.'s Construction Grammar

In their 1988 paper (this volume), Fillmore, Kay and O'Connor argue in favour of a model in which, like the lexical item, the complex grammatical construction (the phrase or the clause), has semantic and pragmatic properties directly associated with it. To illustrate they examine formal idioms, complex expressions which have syntax that is unique to the complex construction of which it is part. In principle, the number of instances of a formal idiom constructions is infinitely large. Despite this, such constructions often have a clearly identifiable semantic value and pragmatic force. For this reason, formal idioms pose a particularly interesting challenge to the 'words and rules' model of grammar. They are productive and therefore rule-based, yet often defy the 'usual' rules of grammar. Fillmore et al. therefore took as their case study the idiomatic *let alone* construction.

In light of their findings concerning the *let alone* construction, Fillmore et al. argue against the 'words and rules' view (which they call the 'atomistic' view) of grammatical operations, where lexical items are assembled by phrase structure rules into complex units that are then assigned compositional meaning and only subsequently subjected to pragmatic processing. In other words, they argue against a modular view of the language system. Instead of a model in which syntactic, semantic, phonological and pragmatic knowledge is represented in encapsulated subsystems, the constructional model proposes that all this information is represented in a single unified representation, which is the construction.

In later work, for example Kay and Fillmore (1999), Fillmore, Kay and their collaborators develop their theory of Construction Grammar further. This model is *monostratal:* containing only one level of syntactic representation rather than a sequence of structures linked by transformations, a feature that characterizes transformational generative models like Principles and Parameters Theory. Furthermore, the representations in Construction Grammar contain not only syntactic information but also semantic information relating to argument structure as well as pragmatic information.

Goldberg's Construction Grammar

The contribution of Fillmore et al. (1988) and Kay and Fillmore (1999) in developing Construction Grammar was to establish the symbolic thesis from first principles. These researchers observed that the 'words and rules' approach to grammar, while accounting for much that is regular in language, had failed to account for the irregular, which represents a significant subset of language. They then set out to explain the irregular first, on the assumption that once principles have been developed that account for the irregular, then the same principles should be able to explain the regular as trivial cases.

The next stage in developing the constructional perspective was to apply this approach to what is regular in the grammar. Perhaps the most important development in this area has been Adele Goldberg's work, most notably her landmark 1995 book, *Constructions* (see also Goldberg, 2003/this volume). In this work Goldberg developed a theory of construction grammar that sought to extend the constructional approach from 'irregular' idiomatic constructions to 'regular' constructions. In order to do this, she focused on *verb argument constructions*. In other words, she examined 'ordinary' sentences, like ones with transitive or ditransitive structure, and built a theory of construction grammar for the argument structure patterns she found there. One of Goldberg's notable achievements, in addition to making a compelling case for the constructional approach to verbal argument structure, was in showing that 'sentence-level' constructions exhibit the same sorts of phenomena as other linguistic units including polysemy and metaphor relations and extensions.

Radical Construction Grammar

The Radical Construction Grammar model was developed by Croft (1996/this volume, 2001), and sets out to explore the implications of linguistic typology for syntactic theory. Linguistic typology is the subdiscipline of linguistics that examines the structural properties of language from a crosslinguistic perspective and describes patterns of similarity as well as observing points of diversity. Although typological studies can in principle be theory neutral, relying on large-scale comparisons and statistical findings, explanations for the patterns observed are usually couched in *functional* terms. *Functional typology* is in a number of ways compatible with the approach adopted by cognitive linguists, and it is this link that Croft seeks to exploit in developing a model of language that marries typological insights with a meaning-based model of language structure.

Croft argues that instead of taking grammatical *universals* across the world's languages as a starting point and building a model of language that assumes a universal grammar (the formal approach), we should instead take grammatical *diversity* as a starting point and build a model that accounts adequately for patterns of typological variation. Croft argues that a constructional approach is best placed to provide this type of model, since a constructional approach enables the articulation of the *arbitrary* and the unique, in contrast to most formal approaches which place the emphasis on *generalization*.

What makes Croft's constructional approach 'radical' emerges as a consequence of the typological stance he adopts. In Croft's theory, the existence of constructions is the only primitive theoretical construct. All other linguistic elements, including word classes, such as nouns and verbs, word order patterns, and grammatical relations such as subject and object are epiphenomenal. In this way, the notion of syntax, as usually understood, is eradicated from the picture altogether.

Embodied Construction Grammar

Embodied Construction Grammar (ECG) is a recent theory of construction grammar developed by Benjamin Bergen and Nancy Chang, together with various collaborators. In this model, the emphasis is on language processing, particularly language comprehension or understanding. In other words, while the approaches we have discussed thus far place the emphasis on modelling linguistic knowledge rather than on on-line processing, the ECG model takes it for granted that constructions form the basis of linguistic knowledge, and focuses on exploring how constructions are processed in on-line or *dynamic* language comprehension. Moreover, ECG is centrally concerned with describing how the constructions of a given language relate to embodied knowledge in the process of language understanding. Therefore much of the research to date in ECG has been focused on developing a formal 'language' to describe the constructions of a language like English; this formal language also needs to be able to describe the embodied concepts that these constructions give rise to in dynamic language comprehension. For further details see Bergen and Chang (2005/this volume).

7.4 Cognitive approaches to grammaticalization

The final group of theories that we mention, albeit briefly, are cognitive approaches to *grammaticalization*: the process of language change whereby grammatical or closed-class elements evolve gradually from the open-class system. Because it relates to language change, the process of grammaticalization falls within the domain of historical linguistics. Grammaticalization is also of interest to typologists (see Croft, 1996/this volume), because patterns of language change can inform their explanations of current patterns in language. A subset of these historical linguists and typologists have developed models that are informed by cognitive linguistics, which attempt to explain the grammaticalization process. See in particular Heine et al. (1991), Sweetser (1990) and Traugott and Dasher (2002).

8 Empirical approaches in cognitive linguistics

A criticism that has been levelled against cognitive linguistics, particularly early on in the development of the enterprise, related to a perceived lack of empirical rigour. This criticism arose in response to some of the early foundational studies conducted under the banner of cognitive semantics. For example, while intuitively appealing, early research on lexical polysemy networks (see Brugman & Lakoff, 1988) and early research on conceptual metaphors (Lakoff & Johnson, 1980) was largely based on speaker intuition and interpretation. The studies on *over* by Brugman ([1981] 1988; Brugman & Lakoff, 1988) and Lakoff (1987), for instance, were criticized for lacking a clear set of methodological decision principles (see Sandra, 1998), particularly given semantic network analyses of the same lexical item often differed quite radically from one theorist to another (see Sandra & Rice, 1995, for a review). In recent years, the empirical foundations of cognitive linguistics have become stronger. For example, experimental research (e.g., Gibbs, 1994; Boroditsky, 2000) and discourse analytic research (e.g., Musolff, 2004; Zinken et al., in press) have begun to provide an empirical basis for drawing conclusions about conceptual metaphor. Research by Seana Coulson (e.g. Coulson & Van Petten, 2002/this volume) has begun to provide an empirical basis for assessing conceptual integration networks. Research by psycholinguists Sandra and Rice (1995) and Cuyckens et al. (1997/this volume), together with cognitively oriented corpus studies as illustrated by Gries (2005) have begun to strengthen the empirical basis of cognitive approaches to lexical semantics, and research by Tyler and Evans (e.g. 2001/this volume), among others, has begun to provide a sound theoretical and methodological basis for investigating lexical polysemy. Finally, experimental work in the area of mental simulation (Zwaan et al., 2002; Glenberg & Kaschak, 2002; Bergen, to appear) offers experimental confirmation of the role of mental imagery in the construction of sentential meaning. With respect to cognitive approaches to grammar, William Croft's (e.g. 1996/this volume, 2001) proposals concerning the integration of typological methods with cognitive linguistic theory has strengthened the empirical basis of constructional accounts of grammar.

Indeed, the last few years have witnessed an increase in the influence of empirical methods from neighbouring disciplines upon cognitive linguistics, including brain-scanning techniques from experimental psychology. The increased concern with empirical methods is attested by Gonzales-Marquez et al. (to appear), a collection of papers emerging from a recent workshop entitled 'Empirical Methods in Cognitive Linguistics'.

Despite these advances, outstanding challenges remain. For example, Gibbs (2000, p. 349) observes that many psychologists complain that work in cognitive linguistics that attempts to infer 'aspects of conceptual knowledge from an analysis of systematic patterns of linguistic structure leads to theories that appear to have a post hoc quality'. In other words, psychologists have argued that cognitive linguistic theories are not predictive but assume without adequate evidence that the conceptual system has certain properties in order to account for the properties of language.

For example, Blending Theory purports to be a theory about conceptual processes but is forced to posit underlying mental spaces and integration networks in order to account for linguistic expressions. In other words, it infers the conceptual structures that it attempts to demonstrate evidence for rather than seeking independent evidence for these conceptual structures (from psychology or psycholinguistics, for example). This means that the theory cannot be empirically falsified, since it does not make predictions about the properties of conceptual structure that can be empirically tested. Falsifiability is a necessary property of any theory that seeks to achieve scientific rather that purely ideological status. Accordingly, if cognitive linguistic accounts of conceptual structure are to achieve a theoretical status beyond ideology, it will be necessary for them to continue to develop the means by which they can be empirically tested.

9 Achievements of the cognitive linguistics enterprise

In this final section we briefly review some of the most significant achievements of the cognitive linguistics enterprise, as we see them.

9.1 An integrated view of language and thought

The Generalization Commitment and the Cognitive Commitment, the two key commitments which underpin a cognitive linguistics approach, have given rise to an integrated approach to linguistic and conceptual organization. This has been particularly evident in cognitive semantics and cognitive approaches to grammar, the two areas we have focused upon in this review article. Other areas, such as cognitive approaches to phonology, cognitive approaches to pragmatics and applications of cognitive linguistics to areas such as psycholinguistics and language teaching, while increasingly the focus of research in cognitive linguistics, remain at this point less well developed.

9.2 Re-examination of the empiricist thesis

The rationalist view that underpins generative approaches to language has dominated the field of linguistics for over half a century. A notable achievement of the cognitive linguistics enterprise has been to refocus interest on the empiricist perspective, and thus to reopen channels of investigation into language and mind that take into account embodiment, experience and usage while remaining firmly committed to the study of cognitive structures and processes.

9.3 Focus on conceptual phenomena

Cognitive linguistics has also contributed to extending the range of conceptual phenomena studied by cognitive scientists. For example, the idea of conceptual projection or 'mappings', which is addressed by the frameworks of Conceptual Metaphor Theory, Mental Spaces Theory and Conceptual Blending Theory, attempts to model the richness and complexity of the human imagination. Until relatively recently, it was assumed either that the human imagination was peripheral to cognition or that it could not be systematically studied. The cognitive linguistics enterprise has provided an approach for studying the imagination, and has shown that language reveals systematic processes at work in human imagination which cognitive linguists have argued are central to the way we think.

9.4 Integration of formalist and functionalist concerns

A further achievement of the cognitive linguistics enterprise has been to integrate formalist and functionalist concerns. While formalists are particularly concerned with developing descriptively adequate accounts of linguistic phenomena and with modelling the representation of knowledge of language in the mind, functionalists have been primarily concerned with exploring the social and communicative functions of situated language use. Cognitive linguistics, while functionalist in spirit, is concerned both with achieving descriptive adequacy and with modelling language as a cognitive phenomenon.

9.5 A final caveat

Despite these achievements, there remain, of course, other kinds of challenges for the cognitive linguistics enterprise. Indeed, it is worth pointing out that the detailed and precise claims made by cognitive linguists about conceptual organization, e.g., conceptual metaphors, are largely based on the properties of language and are therefore, for the most part, inferential. Until we learn a good deal more about the human mind and brain, this remains a sobering caveat for any theory that attempts to model the cognitive representation of language.

Notes

1 We are grateful to Michael Israel, George Lakoff and Chris Sinha for helpful comments on an earlier draft of this paper.

2 For a review of historical antecedents of cognitive linguistics see Nerlich and Clarke (in press).

3 This applies to the history of cognitive linguistics in the English-speaking academic world. It adds to the importance of cognitive linguistics as a new 'paradigm' to note that cognitive linguistic theories with very similar commitments were independently being developed around the same time in other academic discourses, e.g., in countries where the language of international scientific discourse is Russian (see, for example, Bartmiński, 1993).

4 Cognitive linguistics has by now been applied to a wide range of areas, including non-verbal communication (e.g., gesture, sign language(s)), and applied linguistics (including literature, and language teaching/pedagogy), as well as a by now bewildering array of disciplines in the social and cognitive sciences, and humanities. Consideration of such applications and areas is clearly beyond the scope of this review article, which is primarily concerned with the theoretical and ideological underpinnings of the enterprise and a review of some of the notable theoretical approaches. For a fuller review, and copious references to some of the applications to which cognitive linguistic theories have been put, see Evans and Green (2006).

5 This centrality of meaning for cognitive linguistics is another way in which this enterprise is necessarily 'cognitive', as pointed out by Talmy (2000).

6 One objection that has been levelled at cognitive semantics is that some proponents appear to straightforwardly equate semantic structure with conceptual structure (see Levinson, 1997, for a critical appraisal of such a view). As Sinha (1999) observes, such a position, if accepted, would be deeply problematic. Recent work, such as the theory of Lexical Concepts and Cognitive Models, developed by Evans (e.g., 2006) argues for a level of semantic structure, 'lexical concepts', which are distinct from conceptual structure.

7 Note that the adoption of such a bi-polar semiotic model is not an intrinsic, but a historical aspect of cognitive linguistic research. In fact, many cognitive linguists argue for a 'triangular' semiotics that can model the grounding of linguistic meaning construction in the intersubjectively shared world (e.g., Sinha, in press).

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Section II
Introduction

Empirical methods in cognitive linguistics

Benjamin Bergen

From a historical perspective, cognitive linguistics, a field founded in cross-disciplinary empirical methodologies, has undergone a remarkable cycle of growth. Work in cognitive linguistics in the 1970s and 1980s, the time when it began organizing as a self-conscious enterprise, was in large part driven by results from cognitive psychology and cognitive anthropology. This is especially clear in the areas of lexical semantics (e.g. Lakoff, 1987/this volume) and cognitive grammar (Langacker, 1986/this volume), where results on categorization and attention motivated theoretical constructs like *radial category structure* and *profiling*. The field subsequently underwent a rapid expansion in which the major emphasis was on developing theoretical apparatus, and noticeably less contact was made between the empirical methods of cognitive psychology and the increasingly detailed theories of cognitive linguistics. The late 1990s saw a rebirth of interest in crossing this line, with a new slant – rather than building linguistic theory on the basis of psychological evidence, the cognitive linguistic theories had by now developed to such a point that they could generate empirically testable claims, well suited to evaluation using the paradigms of cognitive psychology and computational modeling. Cross-disciplinary work by cognitive psychologists, like Gibbs et al. (1997), Boroditsky (2000), Zwaan et al. (2002), Glenberg and Kaschak (2002), Richardson et al. (2003), and Matlock (2004), was pivotal during this period in supplying experimental evidence pertaining to cognitive linguistic models. At the same time, the empirical evaluation of claims of cognitive linguistic models came to be tested through systematic corpus investigations (Boas 2003, Stefanowitsch & Gries, 2003/this volume).

In terms of the precise empirical methods used, cognitive linguistics originally grew out of a prevailing academic context in which introspection about grammaticality or acceptability was the normal basis for determining the empirical substrate over which linguistic theories were to operate. As elsewhere within the field of linguistics, cognitive linguistics has since substantially expanded its emphasis on the use of convergent empirical methods. Included among these are the empirical tools of other subdisciplines of linguistics, including longitudinal (Johnson, 1999) and experimental (Tomasello, 2000) studies of acquisition, psycholinguistic methods like lexical priming (Gibbs et al., 1997) and self-paced reading (Zwaan & Taylor, 2006), and quantitative investigations of large bodies of corpus data (Stefanowitsch & Gries, 2003/this volume). Standard experimental methods from cognitive psychology (Boroditsky, 2001/this volume) and from cognitive neuroscience (Coulson & Van Petten, 2002/this volume) are similarly gaining in popularity. Other notable recent sources of convergent evidence are historical change (Sweetser, 1990), and paralinguistic gesture (Núñez & Sweetser, 2006).

This section opens with Gibbs' persuasive argument for the importance to cognitive linguistics of defining theoretical models that make empirical predictions suitable for testing. While he argues that cognitive linguists need not be cognitive psychologists as well, it is clear from the increased interest among cognitive linguists in using the methods of cognitive psychology, and among cognitive psychologists in operationalizing the claims of cognitive linguistics, that promising cross-disciplinary work is on the rise. Cuyckens, Rice, and Sandra subsequently present a range of studies investigating classic questions pertaining to the structure of word meaning, using experimental methods from psycholinguistics. Stefanowitsch and Gries present straightforwardly implementable statistical means to investigate how words interact with larger constructions in large language corpora. Finally, the section ends with a study by Coulson and Van Petten exemplifying recent work investigating neural activity underlying the use of metaphor and conceptual integration, central areas of cognitive linguistic study.

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2 Why cognitive linguists should care more about empirical methods

Raymond W. Gibbs, Jr.

Linguistics and psychology have always had a curious relationship. Ever since the early days of generative linguistics when Chomsky started to argue that linguistics was a subfield of cognitive psychology, there has always been intense debate as to whether linguistic theories are 'psychologically real'. In the early and mid 1960s, for example, psychologists were quite enthusiastic about transformational grammar being part of the underlying principles organizing sentence processing. But a vast body of experimental research showed by the early 1970s that this was simply not the case (Fodor, Bever, & Garrett, 1974). Since that time, psychologists have struggled to apply various linguistic theories to explain language acquisition, production, and comprehension, with many psychologists expressing significant skepticism toward any theory of language use that is not based on objective, scientific experiments. This has most recently been true in regard to how psychologists view the various theories and claims of cognitive linguistics. Many psychologists suggest that linguistic intuitions alone, even those of trained linguists, are insufficient sources of evidence for establishing 'what people ordinarily do' when using and understanding language (Glucksberg, 2001; Murphy, 1996; Veraeke & Kennedy, 1996). The best, and in some people's view, the only, way to study ordinary language use is to objectively study the behavior of naïve human participants in controlled experimental settings.

My aim in this chapter is to present the case for why cognitive linguists should care more about empirical methods given the skepticism from people outside their field. First, I outline in a bit more detail some of the reasons for why the skilled intuitions of cognitive linguists may be useful, but not at all conclusive, in arguing for the specific influences of thought and embodied experience in everyday language use. Second, I suggest several principles that cognitive linguists should adopt in articulating psychologically plausible theories of mind and language. At the same time, I urge cognitive linguists to more fully explain the methods they use in analyzing linguistic phenomena and in making claims about human conceptual systems. I do not believe, contrary to some of my colleagues in psychology, that cognitive linguists must do experiments to have their ideas be considered as psychological theories. Nonetheless, there are various empirical, experimental techniques that are part of the arsenal of 'indirect methods' used in psycholinguistics which have proven to be quite useful in providing support for many of cognitive linguists' claims about mind and language. I briefly outline several of these in the third part of this chapter. My overall goal is to provide ways of drawing cognitive linguists and psychologists closer together, while simultaneously respecting these scholars' different theoretical goals and empirical methods.

1 The problem with introspection

Despite their differences with generative linguists, cognitive linguists mostly employ traditional linguistic methods of examining native speakers' intuitions about the grammaticality and meaningfulness of linguistic expressions in order to uncover idealized speaker/hearer linguistic knowledge. In most cases, the linguistic expressions examined are made-up (i.e., not derived from actual spoken and written discourse), and the intuitions studied are those of the scholar actually conducting the work. Many linguists argue that their own intuitions about linguistic matters should count for something more than asking ordinary speakers who lack linguistic training. Within cognitive linguistics particularly, a scholar's trained intuitions seem essential in being able to uncover language-mind links, such as the mental spaces, the image schemas, the conceptual metaphors, and so on that have now become a major foundation for cognitive linguistic theories of human conceptual systems.

I personally have a split view about the kinds of practices that cognitive linguists engage in when doing their work. On the one hand, I continue to be impressed with the different systematic analyses of linguistic patterns that point to different underlying conceptual structures that may provide partial motivation for the existence of words, utterances, and discourse structures within contemporary language. Psychologists should not ignore these findings simply because they are not the products of experiments. Many of my own experimental studies within cognitive psychology and psycholinguistics suggest that cognitive linguistic conclusions about the nature of human conceptual systems may indeed be correct and thus psychologically real (Gibbs, 1994, in press; Gibbs, Lima, & Francuzo, in press). In this manner, the trained intuitions of cognitive linguists have provided detailed insights into possible language-mind-body interactions that serve as the source of experimental hypotheses on the workings of the cognitive unconscious.

Yet I share with my colleagues in Psychology, and other disciplines, some skepticism about trusting cognitive linguists' arguments and conclusions because these are so heavily based on individual introspections about matters of linguistic structure and behavior. Although introspections can be valuable sources for constructing hypotheses, we must always be cautious in accepting any individual analyst's linguistic judgments. Linguists assume that each scholar's intuitions should be representative of all speakers of a language, because each person within a linguistic community presumably shares the same underlying linguistic competence (Psychology does this in psychophysics where only a few participants' perceptual judgments are presumably needed to establish the real workings of the visual system given the belief that everyone's visual system is alike). But there is considerable variation in linguists' introspections. For instance, different linguistic theories of idiomaticity often rest with scholars varying intuitions about the acceptability, and/or grammaticality, of different word strings (under different syntactic permutations). Not surprisingly, linguists' introspections on such matters often are most consistent with their own particular view of idiomaticity, and more generally, the interface between the grammar and the lexicon (see Bresnan, & Kaplan, 1982; Gibbs, 1994; Nunberg, Sag, & Wasow, 1994). An outside observer may ask 'Whose intuitions, and ultimately which theory, should I trust?'

The second concern with linguists' introspections has to do with the possibly biased nature of any one person's observations about the cognitive unconscious. Smart people like to believe that they can articulate the inner workings of their own minds. My undergraduate students in Psychology often report, after I have presented them some recent empirical findings about the nature of mind 'Ray, my brain doesn't work like that!' as if they somehow have privileged access to their unconscious cognitive processes that we psychologists on the outside can never see. But psychological studies, across a wide range of subfields within the discipline, have long demonstrated that people actually have very poor insights into the underlying cognitive processes at work when they perceive, learn, solve-problems, use language, and, most interestingly, have different emotional reactions to their own predicaments and to other people (Wilson, 2003). The fact that we think we can introspect about the inner workings of our minds does not mean that such intuitions, even if trained, are either consistent or accurate. Research from both social psychology and cognitive psychology shows that people often give explanations for their decisions which vary significantly from what is shown by more objective means (Wilson, 2003), and that people can significantly vary from one day to the next in reporting their beliefs or knowledge, even for simple things like the names of all the birds or furniture they know (Barsalou, 1997). People may sometimes have reasonable access to certain kinds of knowledge, such as some autobiographical events, but even here there are studies showing significant degrees of self-illusion about the accuracy of what one putatively knows with people often reporting as 'it really happened' events that they only imagined.

Our conscious ideas about the workings of the unconscious mind may be flawed for a number of reasons, even for those individuals who are trained in providing detailed analyses of their intuitions, such as many linguists and philosophers. In general, the adaptive unconscious mind differs from the conscious mind along a number of different dimensions that have been understood through many years of scientific study (adapted from Wilson, 2003):

Adaptive/cognitive unconscious	**Consciousness**
Multiple systems	Single system
Online pattern detector	After the fact check and balance
Concerned with the here and now	Taking the long view
Automatic, fast, unintentional	Slow, effortful, intentional
Uncontrollable	Controlled
Rigid	Flexible
Precocious	Slower to develop

This list of differences between consciousness and the adaptive/cognitive unconscious reinforces the idea that it may be impossible to understand the operations of the unconscious mind through conscious introspection alone (i.e., a first-person approach). Even psychotherapy, which studies show can be quite effective, works more because it allows a person to construct a better conscious narrative about one's thoughts, feeling, and experiences than it does in providing deeper, and accurate, insights into unconscious mental functioning. One may argue that the unconscious and conscious minds are still part of the same overall system (i.e., the person) and therefore must work in some harmonious way together as part of some grand overall design. But even this idea may not necessarily be true, as many cognitive scientists now question whether consciousness has any direct bearing on unconscious mental processes (Libet, 2004; Wegner, 2002).

It is not surprising, then, that many cognitive scientists are skeptical of theoretical claims based simply on one's intuitions or introspections, no matter how well trained these may be. Cognitive psychologists, and others, criticize cognitive linguistic work because it is so heavily based on individual analysts' intuitions (i.e., cognitive linguists- a first-person approach), and thus does not constitute the kind of objective, replicable data preferred by many scholars in the cognitive and natural sciences (e.g., data collected on large numbers of naïve participants under controlled laboratory conditions). This desire for objective evidence, based on experiments that can be replicated, and that test falsifiable hypotheses (more on this below) is especially needed if one wishes to make generalization about the way that people ordinarily, and automatically, engage in cognitive and linguistic processing. Cognitive psychologists argue that indirect methods (i.e., not based on first-person assessments of unconscious cognition) must be employed to examine what people do, and how they do it, without asking them to say what they are doing, precisely because we now know how unreliable such reports can be.

2 Do cognitive linguists use empirical methods?

Beyond the concern about the reliability of linguists' introspections, and whether it is possible to understand the cognitive unconscious mind through introspection, there is also the deeper problem of specifying exactly what it is that cognitive linguists do when they do their work. Consider a case close to my own research interests- identifying conceptual metaphors from the systematic analyses of linguistic expressions. For instance, read the following set of expressions.

(1) (a) 'Look how far we have come.'
(b) 'We are not making any progress with this research.'
(c) 'I am just spinning my wheels trying to get a Ph.D.'
(d) 'I am at a turning point in my life.'

Since Lakoff and Johnson (1980), cognitive linguists have argued that these conventional expressions are not isolated, but are related in slightly different ways to a single underlying conceptual metaphor LIFE IS A JOURNEY. This conceptual metaphor is presumed to be part of people's ordinary conceptual system that functions automatically in how people conceive of their own, and others', experiences. Linguistic research, across a wide-range of languages, including signed languages, now shows that conceptual metaphors are critical in motivating the creation and continued existence of systematic conventional expressions, polysemous words, many novel metaphors, and play a role in gesture (Gibbs, 1994, in press; Gibbs & Steen, 1999; Lakoff & Johnson, 1999).

Yet how accurate are these claims? Do ordinary speakers really have conceptual metaphors and use them automatically in everyday thought and language? How does one even establish that a given word or expression in context expresses metaphorical meaning? Part of the resistance to cognitive linguists' claims is that these scholars do not sufficiently explain the methods employed in doing their linguistic analyses, and most importantly in drawing inferences from systematic patterns of language (a problem by itself) to claims about the underlying nature of human conceptual systems. We may be impressed by possible relationships between so-called conventional expressions when these are presented out of context. But how does any scholar really determine what words and phrases express metaphorical meanings or reflect metaphorical concepts?

To get a better sense of these difficulties, consider the following short paragraphs from an editorial published in the San Francisco Chronicle, April 29, 2003 (A22), titled 'Toward a new Iraq'.

> The job of constructing a new, democratic Iraq from the social wreckage left by Saddam Hussein will take many months and a steely determination by U.S. sponsors of the process to stay focused on the rights of all Iraqis- and to maintain order in the country until those rights are sufficiently protected by a new government.
>
> In the meantime, improved security in the streets and the restoration of war-damaged services should help create a climate in which people can think about their political options beyond the task of just staying alive.
>
> President Bush sought to boost the democracy-building effort in a speech Monday to Iraqi Americans in Michigan. He walks a fine line in assuring that the United States has 'no intention of imposing our form of government or our culture,' but insisting that all Iraqis will enjoy a voice and legal protections.

What words and phrases in this excerpt are metaphorical? Some readers immediately point out that the word 'Toward' in the editorial title is metaphorical in that the writer is not speaking of physically moving to a new place called Iraq, but is conceiving of metaphorically moving toward a new nation-state that emerges from the Iraq war. But what about the phrase 'constructing a new Iraq'? Is this being used metaphorically, or might it simply refer to the physical rebuilding of Iraq after the devastation of the war and Hussein's long-time neglect of the country? Might this phrase have both a literal and metaphorical meaning? The term 'social wreckage' seems metaphorical, or at least it does to some speakers. The adjective in the phrase 'steely determination' seems quite metaphorical, precisely because 'determination' is an abstract concept that has no physical dimensions. Finally, what about the preposition 'on' in 'stay focused on the rights of all Iraqis'? Is there something physical here that actually represents some contact between two entities, as in 'The cat is on the mat'?

When asked, cognitive linguists will typically have strong responses to these important questions, and frequently explain, on a case-by-case basis, the reason for why, for example, a set of conventional expressions may be motivated by some underlying conceptual metaphor (or primary metaphor). Cognitive linguists go on to argue that these methods are reliable, are taught regularly in linguistic classes, and have successfully illuminated many facets of language and mind that were undiscoverable by other linguistic methods. However, the remarkable fact is that there are very few published writings on methods in cognitive linguists (see Kovecses, 2002, for an exception). For example, there is virtually no set of reliable, replicable methods that can be employed to identify words as metaphorical, or for relating systematic patterns of entire expressions to underlying conceptual metaphors. I am not claiming that cognitive linguists do not have empirical methods. But they really should place far more effort toward explicating their methods, and strive to show that the methods they employ are reliable, and replicable. On a personal note, the need for such explications is perhaps the single main complaint I encounter from metaphor scholars in many disciplines, ranging from applied linguistics to experimental psychology. Cognitive linguistics, as a discipline, would have much greater status within the cognitive sciences if they paid more attention to explicating the methods they use, and demonstrate that these provide for consistent, replicable research results.

3 Challenges for cognitive linguistics

In addition to trying to better explicate their methods for analyzing linguistic data, and better justifying their claims for different language-mind, and language-mind-body connections, cognitive linguists need to better frame their work so that it may be more amenable to experimental test. A common complaint from scholars outside of cognitive linguistics is that it is difficult to falsify aspects of theories within the discipline. Some cognitive linguists respond to these complaints by saying 'That's not my problem or concern,' while others go so far as to reject falsification as an important part of their theoretical work. Nonetheless, cognitive linguists still strongly maintain that their research provides detailed accounts of linguistic and cognitive behavior, and as such should have scientific credibility. Even if cognitive linguists do not conduct experiments, their work would significantly benefit from adherence to several general principles in framing their theories and research implications (Gibbs, 2000).

First, different hypotheses must be falsifiable! Thus, each hypothesis must be stated in such a way that it can be experimentally/empirically examined and shown to be possibly false (and if not shown to be false, then one can reject the null hypothesis and conclude that there is evidence in support of the hypothesis). The problem of falsifying theories/ideas from cognitive linguistics is a big problem, and leads me to remain somewhat skeptical about certain claims (e.g., from conceptual blending theory). Ideas are very appealing, but it is unclear how one would go out and test this as compared to reasonable alternative hypotheses.

This point leads to the second recommendation- consider alternative explanations. For instance, might there be alternative reasons for the apparent systematicity among conventional expressions? Might systematicity just be a historical product, but have no role at all in how contemporary speakers think and use language? Might the systematicity among various words and expressions be a matter of polysemy, instead of conceptual metaphor, as some psychologists have claimed, incorrectly in my view (Glucksberg, 2001; Murphy, 1996). An example of the failure to consider alternative hypotheses in cognitive linguistics is seen in some, but not all, work on conceptual blending theory (Fauconnier & Turner, 2001). Conceptual blending theory predicts that various sorts of blending processes should occur when people understand certain kinds of complex linguistic expressions (Coulson, 2001). One can go out and do an experiment which shows that, indeed, people take longer to process certain utterances compared to others, or that some parts of utterances, where blending should occur, specifically take extra time to comprehend or engage more complex brain activity. But many other theories of linguistic processing would predict the very same finding! Thus, it is not clear that conceptual blending theory, despite its different conceptual and terminological perspective, is sufficiently unique to be considered the most viable psychological theory. Making the case for the 'psychological reality' of any cognitive linguistic theory demands that such arguments be situated within the context of ongoing debates, and alternative theories within cognitive science.

Finally, cognitive linguists must realize that language understanding is not a single kind of mental process. Thus, the kind of mental activity used when a person listens to real speech, or reads a text in real-time, is quite different from the processes involved when a person reflects on what one is hearing or reading. This too is a major concern and perhaps the main reason why many cognitive scientists, especially in psychology, are deeply skeptical of ideas from cognitive linguistics. For example, cognitive linguists have written that conceptual metaphors are 'used constantly and automatically, with neither effort or awareness' (Lakoff, 1993). But is this true? Does the linguistic evidence alone provide the right kind of evidence to judge this idea? Many say no (see Glucksberg, 2001; Gibbs, 1994).

What is needed, then, is a more detailed set of specific hypotheses that can be individually examined using, perhaps, different experimental techniques. Among the possible hypotheses are (see Gibbs, 1994; Katz, Cacciari, Gibbs, & Turner, 1999):

- Conceptual metaphors motivate why certain words and expressions have acquired their various figurative/metaphorical meanings over time (i.e., diachronically), but play no role in how contemporary speakers use and understand conventional and novel metaphorical expressions.

- Conceptual metaphors motivate why certain words and expressions have their specific figurative meanings within linguistic communities and these motivations can, under the right circumstances, be determined by contemporary speakers. Thus, knowledge of conceptual metaphors reflects something about idealized speakers-hearers. BUT conceptual metaphors are not 'psychologically real' in the sense of being parts of ordinary, contemporary speakers' conceptual systems.

- Conceptual metaphors motivate why certain words and expressions have their specific figurative meanings and these metaphors underlie why contemporary speakers tacitly recognize why these words and phrases have the particular meanings they do. Thus, conceptual metaphors are part of ordinary speakers' conceptual systems. But conceptual metaphors are not necessarily employed 'automatically' each and every time people use and understand particular kinds of language.

- Conceptual metaphors motivate why certain words and expressions have the meanings they do, are part speakers' conceptual systems and enable people to recognize something of why these words and phrases have the meanings they do AND are employed automatically each and every time when people use and understand language.

These different hypotheses must be examined by appropriate empirical methods. Thus, 1 and 2 are surely within the domain of cognitive linguistics research. But 3 and 4 require the 'indirect methods' of cognitive psychology/psycholinguistics. These methods are, again, 'indirect' in that they do not require people to introspect about their own, mostly unconscious, mental processes. Rather, the right method will provide data that enables the researchers to draw inferences about underlying mental processes (e.g., people automatically accessing tacit conceptual metaphors during on-line metaphor comprehension). My point here, more generally, is that cognitive linguists must be sensitive to the different levels at which 'linguistic understanding' can be studied and explained, and recognize that their own methods of systematic, conscious analysis of linguistic expressions cannot provide the needed insights into 'automatic' language production or processing.

4 Examples of relevant methods

Let me now briefly describe some methods that experimental psycholinguists have successfully employed in testing various implications of cognitive linguistic ideas, primarily about conceptual metaphors, as described above. These various techniques are aimed at examining hypotheses 3 and 4 above.

4.1 Mental imagery

The first method for examining hypothesis 3 is to investigate people's mental imagery for conventional phrases. For instance, do people know why an expression 'spill the beans' has the figurative meaning 'reveal the secret.' People are poor at answering this question, but one can elicit people's mostly unconscious knowledge about, in this case, conceptual metaphors, using a more indirect method by having people form mental images for linguistic expressions (Gibbs & O'Brien, 1990; Gibbs, Strom, & Spivey-Knowlton, 1997).

Consider the idiom 'spill the beans.' Try to form a mental image for this phrase and then ask yourself the following questions. Where are the beans before they are spilled? How big is the container? Are the beans cooked or uncooked? Is the spilling accidental or intentional? Where are the beans once they've been spilled? Are the beans in a nice, neat pile? Where are the beans supposed to be? After the beans are spilled, are they easy to retrieve?

Most people have definite responses to these questions about their mental images for idioms. They generally say that the beans were in some pot that is about the size of a person's head, the beans are uncooked, the spilling of the beans is accidental, the spilled beans are all over a floor and are difficult to retrieve. This consistency in people's intuitions about their mental images is quite puzzling if one assumes that the meanings of idioms are arbitrarily determined. People's descriptions about their mental images for idioms reveal some of the metaphorical knowledge that motivates the meanings of idiomatic phrases. One study examined people's mental images for groups of idioms with similar figurative meanings, such as anger (e.g., 'blow your stack,' 'hit the ceiling,' 'flip your lid') (Gibbs & O'Brien, 1990). Participants were asked to describe their mental images for these idioms and to answer questions about the causes, intentionality, and manner of actions in their mental images for these phrases.

Not surprisingly, people give many different responses across the different idioms presented, and one challenge for researchers is to systematically categorize these into different, meaningful groups. Psychologists are reasonably good at coding different human behaviors, but experience greater difficulty analyzing naturalistic linguistic expressions. This is one place where my own study of cognitive linguistics has served me quite well in helping me to do experimental research.

Gibbs and O'Brien (1990) actually found that participants' descriptions of their mental images were remarkably consistent for different idioms with similar figurative meanings. The general schemas underlying people's images were not simply representative of the idioms' figurative meanings, but captured more specific aspects of the kinesthetic events with the images. For example, the anger idioms such as 'flip your lid' and 'hit the ceiling' all refer to the concept of 'getting angry,' but participants specifically imagined for these phrases some force causing a container to release pressure in a violent manner. There is nothing in the surface forms of these different idioms to tightly constrain the images participants reported. After all, lids can be flipped and ceilings can be hit in a wide variety of ways, caused by many different circumstances. But the participants' protocols in this study revealed little variation in the general events that took place in their images for idioms with similar meanings.

Participants' responses to the questions about the causes and consequences of the actions described in their images were also highly consistent. Consider the most frequent responses to the probe questions for the anger idioms (e.g., 'blow your stack,' 'flip your lid,' 'hit the ceiling'). When imagining anger idioms, people reported that pressure (i.e., stress or frustration) causes the action, that one has little control over the pressure once it builds, its violent release is done unintentionally (e.g., the blowing of the stack) and that once the release has taken place (i.e., once the ceiling has been hit, the lid flipped, the stack blown), it is difficult to reverse the action. We speculated that people's images for the anger idioms are based on folk conceptions of certain physical events. That is, people use their embodied knowledge about the behavior of heated fluid in containers (e.g., the bodies as containers and bodily fluids within them) and map this knowledge onto the target domain of anger to help them conceptualize in more concrete terms what is understood about the concept of anger. Various specific entailments result from these general metaphorical mappings, ones that provide specific insight into people's consistent responses about the causes, intentionality, manner, and consequences of the activities described by stacks blowing, lids flipping, ceilings being hit and so on.

We did not claim that people necessarily form mental images during ordinary idiom comprehension. But asking people to form mental images, and answer specific questions about them, reveals significant constraints that conceptual metaphors play in motivating why conventional phrases have the meanings they do. Thus, conceptual metaphors appear to be the main link between many idioms and their figurative meanings. Once more, this tacit knowledge could not be uncovered by simply asking people about why idioms mean what they do. Yet the indirect method of forming mental images can provide such insights.

4.2 Context-sensitive judgments about metaphorical meaning

A different method for examining hypothesis 3 is to assess people's judgments of similarity between idioms and different discourse contexts. Nayak and Gibbs (1990) hypothesized that contexts provide information about specific metaphoric mappings that cue readers to the specific figurative meanings of idioms. Participants in one experiment were presented with short scenarios about a particular emotion concept that were constructed to prime one of the metaphorical mappings inherent in its prototypical structure. Consider the following example:

> Mary was very tense about this evening's dinner party. The fact that Bob had not come home to help was making her fume. She was getting hotter with every passing minute. Dinner would not be ready before the guests arrived. As it got closer to five o'clock the pressure was really building up. Mary's tolerance was reaching its limits. When Bob strolled in at ten minutes to five whistling and smiling, Mary
> blew her stack
> bit his head off

The story was written to prime the metaphorical mapping ANGER IS HEAT IN A PRESSURIZED CONTAINER by depicting Mary's increasing anger in terms of increasing pressure and heat. The use of phrases such as 'very tense, making her fume, getting hotter, the pressure was really building up' and 'reaching its limits' are specific references to this mapping. Participants rated the appropriateness of each idiom ending for the given scenario. If people access the metaphoric mapping reflected in an idiom's lexical structure, they should interpret 'blew her top' as being more appropriate than 'bit his head off' even though both phrases are grammatically and conceptually (at the same stage of the prototype) appropriate for the given scenario.

But now consider a slightly different scenario that primes a different conceptual metaphor, ANGRY BEHAVIOR IS ANIMAL BEHAVIOR, and should result in different expectations:

> Mary was getting very grouchy about this evening's dinner party. She prowled around the house waiting for Bob to come home to help. She was growling under her breath about Bob's lateness. Her mood was becoming more savage with every passing minute. As it got closer to five o'clock Mary was ferociously angry with Bob. When Rob strolled in at 4.30 whistling and smiling, Mary
> bit his head off
> blew her top

In this case, 'bit his head off' appears to be more appropriate than in the earlier contexts because the mental model is structured according to the metaphor ANGRY BEHAVIOR IS ANIMAL BEHAVIOR. This suggests that idioms must reflect the same metaphorical mapping information as its context to be considered most appropriate. In fact, the results clearly showed that the metaphoric mappings underlying idiomatic phrases affect participants' interpretation of the meanings and appropriate use of these figurative expressions. Participants were sensitive to the congruence between the metaphoric information in idioms and contexts. It appears that the mapping of the conceptual information in discourse contexts to people's knowledge about conceptual metaphors determines readers' intuitions about the appropriate use of idioms. These findings provide experimental evidence in support of hypothesis 3 that conceptual metaphors influence people's interpretation of why idioms mean what they do and are used in specific discourse contexts.

4.3 Embodied intuitions and metaphorical inferences

One of the reasons why cognitive psychologists are skeptical of cognitive linguistic work is because of the inherent circularity in reasoning from language to underlying concepts to language again. Cognitive psychologists seek ways of stepping outside of the language to language circle by having independent ways of predicting in advance something about linguistic meaning, as opposed to postulating backward-looking reasons or motivations for why some specific word or phrase has the meaning it does. One strategy for doing this in respect to hypothesis 3 is to look independently at people's nonlinguistic knowledge about source domains and then use this to make predictions about the meanings of metaphorical phrases referring to target domains. My experimental strategy to see if this might be true was to make specific predictions about what various idioms, say those, motivated by ANGER IS HEATED FLUID IN A CONTAINER, actually mean by looking at the inferences that arise from the mapping of people's nonlinguistic knowledge of heated fluid in a container onto the idea of anger (Gibbs, 1992).

Participants in this study were asked about their understanding of events corresponding to particular source domains in various conceptual metaphors (e.g., the source domain of heated fluid in a container for ANGER IS HEATED FLUID IN A CONTAINER).

For instance, participants were asked to imagine the embodied experience of a sealed container filled with fluid, and then they were asked something about causation (e.g., 'What would cause the container to explode?'), intentionality (e.g., 'Does the container explode on purpose or does it explode through no volition of its own?'), and manner (e.g., 'Does the explosion of the container occur in a gentle or a violent manner?').

Participants gave highly consistent responses to these questions. Thus, people responded that the cause of a sealed container exploding its contents out is the internal pressure caused by the increase in the heat of the fluid inside the container, that this explosion is unintentional because containers and fluid have no intentional agency, and that the explosion occurs in a violent manner. This provides a rough, nonlinguistic profile of people's understanding of a particular source domain concept (i.e., 'image-schematic structures') of the source domains.

If hypothesis 3 is correct, people's intuitions about various source domains should then map onto their conceptualizations of different target domains in very predictable ways. Not surprisingly, when people understood anger idioms, such as 'blow your stack,' 'flip your lid,' or 'hit the ceiling,' they inferred that the cause of anger is internal pressure, that the expression of anger is unintentional, and is done is an abrupt violent manner. People did not draw the same inferences about causation, intentionality, and manner when comprehending literal paraphrases of idioms, such as 'get very angry.' Additional experiments showed that people find idioms to be more appropriate and easier to understand when they are seen in discourse contexts that are consistent with the various entailments of these phrases, which, again, were predicted in advance from the nonlinguistic analysis of the source domain concepts. In general, these psycholinguistic studies are significant for hypothesis 3 because they provide independent, nonlinguistic ways of predicting something about the specific metaphorical meanings some linguistic expressions are likely to possess. These psychological findings are hard to reconcile with the view that the figurative meanings of idioms are determined only on the basis of their individual lexical items or have the meanings they do for arbitrary, or historically opaque reasons. Contemporary speakers appear to have tacit intuitions about their metaphorical understanding of certain abstract concepts that leads them to talk about these concepts in particular metaphoric ways. No other theory of idiomaticity comes close to being able to describe exactly why it is that idioms have the very specific meanings they do for contemporary speakers or why people appear to quickly draw specific inferences about what idioms mean.

4.4 Not all methods work!

In all fairness, the debate over conceptual metaphors in cognitive psychology has provided evidence that seems contrary to some of the putative predictions of cognitive linguistics. Consider the work of McGlone (1996) who examined people's verbal paraphrases for linguistic metaphors. Participants in a first experiment paraphrased verbal metaphors, such as 'The lecture was a three-course meal.' Only 24% of these paraphrases contained any references consistent with underlying conceptual metaphors, such as IDEAS ARE FOOD. Even when participants were asked to give figurative paraphrases of the verbal metaphors, they still most frequently produced paraphrases inconsistent with related conceptual metaphors. Thus, when given the verbal metaphor 'Dr. Moreland's lecture was a three-course meal for the mind,' only 1/3 of the paraphrased mentioned source domain terms (e.g., food) related to the conceptual metaphor IDEAS ARE FOOD. Nonetheless, almost all of the metaphorical paraphrases reflected some recognition of the stereotypical properties of three-course meals that might be attributed to lectures, such as 'large quantity,' and 'variety.' A third study asked participants to rate the similarity between different metaphorical expressions. The data showed that people do not perceive expressions motivated by conceptual metaphor to be any more similar in meaning than they did expressions motivated by different conceptual metaphors. Thus, 'Dr. Moreland's lecture was steak for the mind' was not seen as more similar to 'Dr. Moreland's lecture was a three-course meal for the mind' than was 'Dr. Moreland's lecture was a full tank of gas for the mind.' A final study showed that conceptual metaphors consistent with a verbal metaphor were not better recall cues for participants trying to remember the verbal metaphors than were unrelated cues. Overall, the findings from these studies were taken to imply that people's interpretations of verbal metaphors are not necessarily related to their putative, underlying conceptual metaphors.

McGlone's data are interesting in many respects, although they are not especially surprising. First, it is not clear that having people verbally paraphrase a metaphor is the best method for tapping into different types of, possibly metaphorical, knowledge that might be used when people interpret, or make sense of, verbal metaphors. After all, various other empirical methods have shown some influence of conceptual metaphors on comprehension of, at least, idiomatic and proverbial phrases. One shouldn't imply that the failure to find effects using one task invalidates the positive evidence in favor of hypothesis 3 using different tasks unless some principled reasons are given for preferring one task over another. Paraphrase tasks are notoriously insensitive as measures of people's, especially children, ability to understand metaphors.

5 Bodily movement and metaphor comprehension

I now turn to two instances of methods for exploring the plausibility of hypothesis 4, namely that conceptual metaphors influence people's immediate comprehension of conventional, metaphorical phrases. Imagine that one hears the idiomatic expression 'John blew his stack' in a conversation in which it is clear that the speaker's intended meaning is roughly 'John got very angry.' The figurative meaning of 'blew his stack' is partly motivated by the conceptual metaphor ANGER IS HEATED FLUID IN A CONTAINER. The question is whether people compute or access some conceptual representation for ANGER IS HEATED FLUID IN A CONTAINER when they immediately process the figurative meaning of 'John blew his stack.' Participants in one series of studies read stories one line at a time on a computer screen. Each story ended with an idiom ('John blew his stack'), a literal paraphrase of the idiom ('John got very angry'), or an unrelated literal statement ('John saw the dented door') (Gibbs, Bogdonovich, Sykes & Barr, 1997). The computer measured how long it took people to read each line and then push a button signifying that they had understood what they just read. After reading the last line, participants were presented with a letter string and asked to decide as quickly as possible if this was a meaningful word in English. These letter-strings reflected either something about the conceptual metaphors underlying these idioms (e.g., 'heat' for ANGER IS HEATED FLUID IN A CONTAINER having just read 'John blew his stack') or letter-strings that were unrelated to these conceptual metaphors (e.g., 'lead').

There were two important findings. First, people were faster to make lexical decision responses to the related metaphor targets (i.e., 'heat) having just read idioms than they were to either literal paraphrases of idioms (e.g., 'John got very angry') or control phrases (e.g., phrases still appropriate to the context such as 'John saw many dents'). Second, people were faster in recognizing related metaphorical targets than unrelated ones having read idioms, but not literal paraphrases or unrelated phrases. This pattern of results suggests that people are immediately computing or accessing at least something related to the conceptual metaphor ANGER IS HEATED FLUID IN A CONTAINER when they read idioms.

In another experiment, participants were faster to make lexical decision responses to metaphor targets (e.g., 'heat') having read an idiom motivated by a similar conceptual metaphor (e.g., 'John blew his stack') than an idiom with roughly the same figurative meaning but motivated by a different conceptual metaphor (e.g., 'John bit her head off' which is motivated by the conceptual metaphor ANGER IS ANIMAL BEHAVIOR). People were also faster to respond to related targets having read idioms motivated by similar conceptual metaphors than when they read idioms motivated by different conceptual metaphors. In general, these online priming studies reveal that people appear to compute or access the relevant conceptual metaphor for an idiom during some aspect of their immediate processing of these phrases. It is not clear from these results whether the activated conceptual metaphor is used to interpret an idiom's meaning, or whether conceptual metaphors are simply tagged onto different idioms without serving as the causal basis for interpreting these conventional phrases. Nonetheless, this kind of data, and the methods involved in collecting it, is exactly what is required to test hypothesis 4.

A different, more recent, line of research investigated the possible influence of bodily action on people's speeded processing of simple metaphoric phrases, as 'stamp out a feeling,' 'push an issue,' 'sniff out the truth' and 'cough up a secret,' each of which denote physical actions upon abstract items. Wilson and Gibbs (2004) hypothesized that if abstract concepts are indeed understood as items that can be acted upon by the body, then performing a related action should facilitate sensibility judgments for a figurative phrase that mentions this action. For example, if participants first move their arms and hands as if to grasp something, and then read 'grasp the concept,' they should verify that this phrase is meaningful faster than when they first performed an unrelated body action. Our hypothesis was that engaging in body movements associated with these phrases should enhance the simulations that people create to form a metaphorical understanding of abstract notions, such as 'concept,' even if 'concepts' are not things that people can physically grasp. People's conceptual understandings of what a 'concept' is, for example, need not be completely embodied and metaphorical.

However, our suggestion is that some simulated construals of 'concept' are rooted in embodied metaphor that may be highlighted by engaging in body actions relevant to what people mentally do with ideas.

Participants in this study first learned to perform various specific bodily actions (e.g., throw, stamp, push. swallow, cough, grasp) given different nonlinguistic cues. Following this, participants were individually seated in front of a computer screen. The experiment consisted of a series of trials where an icon flashed on the screen, prompting the participant to perform the appropriate bodily action. After doing this, a string of words appeared on the screen and participants had to judge as quickly as possible whether that word string was 'sensible.'

Analysis of the speeded sensibility judgments showed that participants responded more quickly to the metaphorical phrases that matched the preceding action (e.g., the motor action grasp was followed by 'grasp the concept'), than to the phrases that did not match the earlier movement (e. g, the motor action kick was followed by 'grasp the concept'). People were also faster in responding to the metaphor phrases having performed a relevant body moment than when they did not move at all. In short, performing an action facilitates understanding of a figurative phrase containing that action word, just as it does for literal phrases. A second study showed that same pattern of bodily priming effects when participants were asked to imagine performing the actions before they made their speeded responses to word strings. This result reveals that real movement is not required to facilitate metaphor comprehension, only that people mentally simulate such action.

Most generally, people do not understand the nonliteral meanings of these figurative phrases as a matter of convention. Instead, people actually understand 'toss out a plan,' for instance, in terms of physically tossing something (i.e., plan is viewed as a physical object). In this way, processing metaphoric meaning is not just a cognitive act, but involves some imaginative understanding of the body's role in structuring abstract concepts. People may create embodied simulations of speakers' messages that involve moment-by-moment 'what must it be like' processes that make use of ongoing tactile-kinesthetic experiences. These simulation processes operate even when people encounter language that is abstract, or refers to actions that are physically impossible to perform.

6 Conclusion: cognitive linguists need not do experiments

Cognitive linguistics is firmly embedded within the cognitive sciences, and as such is both a disciplinary and interdisciplinary endeavor. The interdisciplinary side of cognitive linguistics is evident in the increasing body of research in which linguists have collaborated with scholars from other disciplines, or have started to engage in research utilizing experimental and computational methods. I now talk with many younger cognitive linguistics students who are quite interested in doing informal experiments to test their ideas as part of their dissertation projects, in some cases using some of the methods described above, such as mental imagery and context-matching tasks. This is obviously a good thing for the field of cognitive linguistics overall, and for our understanding of human thought and language more generally.

However, my personal belief is that cognitive linguists need not become experimental psychologists or computer scientist for their work and ideas to be seen as legitimate with significant theoretical implications. There is a trend in cognitive science in which scholars in any one discipline always turn toward the right to seek evidence from a neighboring field to find additional, usually more empirical, support for their ideas and theories. For instance, philosophers often turn to linguistics, linguistics has historically turned to developmental and cognitive psychology, linguistics and psychology has often turned toward computer science, and most recently, cognitive scientists of all colors have turned toward neuroscience. Once more, these developments are natural and in many cases lead to important new work and empirical findings. But cognitive linguists are skilled in being able to conduct the sorts of systematic analyses, even if their methods for doing this are not always explicit, and have provided a huge body of work that simply could not be done by people in any other field. Why ask cognitive linguists to turn away from what they do best to secure their work on a different empirical foundation? My research has benefited greatly from cognitive linguistics studies, and we need more of this work and would hate to see cognitive linguists all try to become experimental psychologists, computer scientists, or neuroscientists. Doing experiments is hard work, and one does not casually pick up the skills needed to engage in this kind of research. What is needed, again, is for cognitive linguists to be more sensitive to some of the important properties of framing experimental hypotheses (e.g., constructing falsifiable hypotheses, considering alternative hypotheses), and trying to articulate their ideas, and empirical findings in ways that may be tested by scholars in other disciplines. This does not mean, however, that cognitive linguists must themselves run out and be something that they are not.

Finally, I have focused in this chapter on why cognitive linguists should care more about empirical methods, and suggested some of the ways that they could alter their work to better situate their findings within cognitive science. Yet psychologists, at the same time, would greatly benefit from learning more about cognitive linguistics, and learning to conduct some of the systematic analyses of linguistic expressions that are critical to understanding the conceptual/embodied motivation for linguistic meaning. Doing cognitive linguistics is, of course, hard work also. But the best way to appreciate the insights from cognitive linguistics, and apply these ideas to experimental tests, is to do cognitive linguistics. Some of us need help in doing such work, and my hope is that cognitive linguists will put more effort into sharing their knowledge and working methods with scholars from other disciplines.

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3 Towards an empirical lexical semantics*

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1 Cognitive-linguistic approaches to lexical semantics

In cognitive linguistics language is considered to be a means of organising, processing, and conveying informational structures in the mind that reflect our interaction with the world. 'Language, then, is seen as a repository of world knowledge, a structured collection of meaningful categories that help us deal with new experiences and store old ones' (Geeraerts, 1995a, pp. 112–113). Both lexical categories and grammatical constructs are considered to be meaningful units, i.e. repositories of conceptual information and world knowledge. For instance, the study of the semantic value of grammatical categories and constructions – e.g. transitivity, grammatical relations, voice, case – has found its best representatives in Langacker's Cognitive Grammar (Langacker, 1982, 1987, 1991a, 1991b) and in Fillmore's and Goldberg's Construction Grammar (Fillmore, 1988, 1990; Fillmore, Kay & O'Connor, 1988; Goldberg, 1992, 1995).

The present paper will focus on lexical-semantic categories. In cognitive lexical semantics, research interests can be grouped under two general headings: (i) the internal structure of monosemous and polysemous lexical items taken separately: prototype structure, family-resemblance structure, lexical networks (Brugman, 1981, Lakoff, 1987, Taylor, 1989, Geeraerts, 1989a, 1989b, 1993) and (ii) larger conceptual structures: metaphor research (Lakoff & Johnson, 1980; Lakoff & Turner, 1989), frame semantics (Fillmore, 1982), idealised cognitive models (Lakoff, 1987).

One of the major issues in cognitive lexical semantics over the past two decades has been the analysis of polysemous lexical items in terms of a family-resemblance network of multiple, interrelated senses or usage types. The different senses of a polysemous lexical item have been represented by different network models (see Sandra & Rice, 1995): a radially structured network (Brugman, 1981, Lakoff, 1987), a schematic network (Langacker, 1991b), or yet different network versions.[1] The links between the different senses in a lexical network are manifold (conceptual/semantic overlap, metaphor, metonymy, image-schema transformation) and are supposed to represent the cognitive principles behind the processes of meaning extension. This description of polysemous lexical items owes a great deal to Rosch's psychological research in the mid-seventies into prototype effects in lexical categories (Rosch & Mervis, 1975, Rosch, 1978).[2] Later, it got a major impetus when Brugman and Lindner presented their seminal analyses of the polysemous structure of the preposition *over* (Brugman, 1981) and the verbal particles *up* and *out* (Lindner, 1981). It has been increasingly popular ever since (Cuyckens, 1991, Goldberg, 1992, Taylor, 1992, Casad, 1992, Schulze, 1993, Tuggy, 1993).

The cognitive-linguistic approach to (polysemous) lexical meaning is diametrically opposed to the classical (structuralist and generative) view, with its emphasis on economy of representation. Highly abstract or unitary senses have been replaced by networks of richly interconnected usage types,[3] with the separate usage types differing in rather minor ways, i.e. along a number of different very concrete dimensions. Prepositional networks especially, feature an abundance of fine-grained distinctions (for instance, the presence or absence of physical contact between landmark and trajector underlies the purported different usages of *over* in *The car drove over the bridge* and *The plane flew over the bridge*).

While these lexical network models may be welcomed as an improvement over classical approaches to polysemy (e.g. Caramazza & Grober, 1976), they are not uncontroversial. First, cognitive linguists have often been vague on important aspects of these models. In particular, lexical network models show a lack of explicit criteria for distinguishing between usages. 'Given this vagueness, different linguists are likely to make different distinctions between usage types and to propose different networks for the same preposition' (Sandra & Rice, 1995, p. 92). Furthermore, the diversity of network models that are currently around leads to uncertainty about the correct model type for the phenomena under study. In general, then, 'network models are especially dependent on the particular analytic skills or subjective aesthetic of the individual researcher' (Rice, 1996a, pp. 137–138). Finally, some linguists have presented network analyses with cognitive-psychological overtones, thus suggesting that the models reveal aspects of the language user's mind. However, it is far from clear how these analyses relate to mental structures. At any rate, at this point in time there is no reason for maintaining that lexical-semantic networks in cognitive linguistics are a blueprint of the conceptual territory associated with a lexical item in the mind of the speaker.

2 The need for empirical support

The assumption that linguistic analysis can shed light on aspects of the mind (i.e. that lexical-semantic networks reflect aspects of the language user's mental representation) probably results from the foundational assumption of the paradigm, i.e. the claim that language cannot be insulated from general cognition and that linguistic analysis should therefore be informed by cognitive principles. However, even if this general view of language may hold true, it does not automatically follow that a linguist's semantic analysis of a lexical item should map onto cognition in any direct way. Even if the general theory behind the analysis may be correct (i.e. that there is a relationship between language and cognition), cognitive linguists might lack the methodology for actually relating language to the very specific level of mental representation. As a matter of fact, the appropriate methods for studying the way language is represented in the mind are not linguistic but psycholinguistic ones. For that reason, cognitive-semantic network analyses are entirely neutral with respect to issues of mental representation unless the issues are studied with techniques of psycholinguistic experimentation.

When psychological aspects of lexical-semantic networks in cognitive linguistics are at stake, a number of research issues figure prominently. One set of issues pertains to prototypes (e.g. What are the prototypes around which particular lexical categories are organised? Are prepositional categories, for instance, organised around spatial prototypes? Are there multiple prototypes? Is the nature of the prototype a schema, a specific exemplar, or an average over a cluster of exemplars?). Another set of research issues, one that we will mainly deal with in this paper, concerns the presence and/or degree of polysemy in the mental lexicon of the language user. A number of questions are involved here: (i) Do language users subsume the usage variability of a word under an abstract schematic sense (strong monosemy)? (ii) If not, do they tend to mentally represent a lexical item's different senses as interrelated (polysemy) or as unrelated (homonymy)? (iii) If they have a preference for polysemy, how fine-grained are the distinctions they make? Do they correspond to relatively generalised senses like, for instance, spatial versus temporal – in this case, any further, minor distinctions would be instances of vagueness – or do they correspond to highly specific ones like, for instance, the different spatial senses of the preposition *over* in the examples given earlier? (iv) In contrast, if language users have a preference for a homonymous set of fairly generalised senses, do they view any further, fine-grained distinctions within each such sense as interrelated (yielding a polysemous mini-network), or do they treat any further distinctions as instances of vagueness – in which case each sense can be viewed as monosemous? (v) What principles of semantic extension do language users appeal to and where do they play a role in actual language use (at the time of lexical acquisition, in processing individual senses)?

In our research over the past few years we have begun to investigate empirically some of these issues. In all cases we studied prepositional categories. We investigated (i) the initial acquisition/learning of prepositional usages (child language acquisition, foreign language learning) and (ii) the ultimate representation of such usages in the mind of the adult language user. Two types of experimental techniques were used: (i) off-line tasks, which invite subjects to perform a task where they can reflect on their performance (e.g. sorting, rating) and are assumed to indirectly reflect aspects of the underlying representational structure (perception being mediated by memory structures), and (ii) on-line tasks, which have subjects perform a task – usually under time-pressure – that is contingent on the mental process/representation under study (e.g. speeded decision). Below we will present an overview of our results. We will use the experimental task as an ordering principle.

3 Psycholinguistic studies

First we will present research on how prepositional categories are acquired/learnt in child language acquisition (3.1.) and in foreign language learning (3.2. and 3.3.). Then we will discuss experiments investigating the way the internal semantic structure of prepositions is perceived (3.4. through 3.7.) and mentally represented (3.8.) by adult language users.

3.1 Child language acquisition

One line of empirical enquiry into the lexical semantics of prepositions has examined the development of sense types for the prepositions *in*, *on*, *at*, *to*, *for*, *from*, *with*, *by*, and *of*. It is hoped that charting the progress of lexical acquisition (especially by children) might shed light on the way language users treat word meaning. For instance: Which usages appear first? Is there a pattern in the acquisition sequence? Cognitive linguistics lacks any explicit theory about the time-course, nature, and mechanics of language acquisition except for the rather minimalist claim by Langacker (1991b, p. 265):

> We know, for example, that speakers learn and manipulate specific expressions; but we do not know, in any direct way, precisely what degree of schematicization they achieve, i.e. how abstract and general the rules are that they manage to extract from more specific structures. I suspect that speakers differ somewhat in this regard, and do not invariably arrive at the highest-level schemas that the data would support. In any event, the omnipotence of high-level generalizations is not a matter of apriori necessity.

As is evident in the underspecificity of this quote, further investigation is required. In effect, the claim that grammar is meaning- and usage-based as well as experientially grounded, while obviously true, must be supported with empirical evidence. More flesh needs to be put on these statements if they are to carry any degree of descriptive let alone explanatory weight.

In a study being conducted by the third author, data from regularly sampled transcript files of four non-impaired children were taken from the CHILDES Archive (MacWhinney & Snow, 1990). The sampling window covered a period of at least two years for each child from roughly the ages 2;2 to 4;6. Each usage of one of the targeted prepositions was coded for a wide variety of factors, including imitative usages, repetitions, spatial usages, temporal usages, usages in fixed expressions, grammatical usages, etc. Patterns observed for these children and for these prepositions suggest that onset and mastery of a particular sense type of a given item of this alleged lexical class is partly regular and partly idiosyncratic; is motivated by conceptual, linguistic, and pragmatic factors; can be rapid or slow; and that the successful acquisition of other parts of a child's lexicon plays a big role in the acquisition of individual prepositions. In short, not a lot of pattern was noted. Each child displayed rather distinctive styles and sequences of prepositional acquisition.

A few examples should suffice to illustrate. Although the first usages of *in* and *on* for all four children were spatial, the first usage to emerge for *at* did not seem to be spatial at all and only marginally prepositional (synchronically speaking). In all four children, its first emergence was in the collocation *look at* and in several of the children, this usage either dominated or persisted as the major usage throughout the sampling period. Although spatial usages quickly emerged, as did temporal ones, so did extremely abstract, semantically opaque usages such as *at all* or *at the same time*, thus suggesting that parental input is an important factor along with conceptual basicness (cf. Rice, 1996b). For the preposition *by*, its use by one child was confined throughout the sampled files to use in the expression *by myself*, whereas another child first used it as a spatial locative, then rather unexpectedly as a marker of a passive agent, and only much later in productive *by -self* constructions. Likewise, benefactive usages of *for* emerged much earlier for all four children than did those same usages of *to*, suggesting that linguistic factors, rather than conceptual ones are partly responsible for extension within a lexical category.

Although such findings remain anecdotal, they certainly underscore one aspect of the Langacker quote given above: there may be considerable speaker variation with respect to the acquisition process itself and possibly with respect to the specific structures (schemas or extensions) that the language user arrives at. In effect, by studying trends or sequences in a child's development of a lexical category, we hope to relate empirical data to cognitive linguistic models of the lexicon. For instance, is there evidence to suggest that lexical extension processes like metaphor and other grammaticalisation mechanisms, which have been shown to operate diachronically, are recapitulated in the course of language acquisition? To give another example, what is the status, judged from a developmental perspective, of the claim that semantic extension is on the whole conceptually (rather than linguistically) motivated or proceeds outwards through image-schematic transformations applying to a basic sense type? In many cases, it seems that the emergence of a lexical item's initial or subsequent sense types is motivated more by frequency of exposure or contrastive pressures exerted by other lexical items than by purely conceptual factors.

3.2 Lexical learning process

Whereas child language acquisition data might reveal a natural course of acquisition (a hypothesis which is thus far not supported by the above data), the study of foreign language learning might show that semantic relationships between word usages are functional at the time of learning. We set out from the following hypothesis. If two usages of a preposition are interrelated in a semantic network, i.e. if one is a conceptually motivated extension of the other, it would seem that language learners will put this relationship to use for their benefit. More particularly, if a usage U2 is an extension of usage U1, it seems likely that knowledge of U1 will make it easier to learn U2. Frisson et al. (1996) tested this prediction in a set of learning experiments.

The task involved concept formation. Subjects (all native speakers of Dutch) were seated in front of a computer screen, on which individual English sentences appeared. In each sentence the same non-existing preposition *yeath* was used. The semantics of this item matched the meaning potential of the English preposition *beyond*, a word that the subjects did not master. Subjects were told that the unfamiliar form was a Scottish preposition, whose meaning they had to learn, and that the rest of the sentence was in English to make the task doable. Their task was to decide for each sentence whether the preposition had been used correctly or not (by pressing the appropriate response button). Initially, of course, subjects had to guess but gradually they were able to induce the meaning of the item by using the computer's feedback on the correctness of their responses.

As the basic question was whether learning U1 in the first trial block would make it easier to learn U2 in the second block, subjects learning U1-U2 were compared to control subjects learning U2 after a block of trials on a different preposition. The results showed no transfer effects from the spatial sense of *yeath/beyond* to its figurative sense of 'exceeding' (e.g. *the temperature rose yeath* 'beyond' *35 degrees C*), whereas such transfer effects were found from the 'exceeding' sense to the 'out of reach' sense (e.g. *That goes yeath* 'beyond' *my imagination*).

This outcome suggests (i) that the spatial and 'exceeding' meanings of the preposition were unrelated for our subjects, i.e. were homonyms, and (ii) that the two figurative meanings were related. A straightforward interpretation of these results is difficult. The first effect may result both from subjects' failure to perceive a semantic relationship between the spatial and figurative usages or, alternatively, from their assumption that trials in block 2 will instantiate the same meaning as those in block 1 (equal form = equal meaning). The second effect can be explained by assuming a polysemous relationship between the 'exceeding' and 'out of reach' meanings or by considering these usages as vague instantiations of a more schematic usage type.

3.3 Intermediate states in lexical learning

In Cornelis & Cuyckens (1996), the Dutch preposition *door* is regarded as a polysemous lexical item in that it displays a variety of interrelated readings within the spatial, the temporal and the causal domains. In particular, *door*'s semantics can be described as a family resemblance network in which, going from one end of the network to the other, the notion 'causal participant' becomes increasingly important, while, at the same time, the notion 'intermediary' becomes less important.[4]

Dutch *door* can be translated in English as *through* (for its spatial and temporal uses) and as *by* (for the passive agent and the causee in causative constructions). For Dutch learners of English, the choice between these two English prepositions seems at first sight not to be very difficult. This should come as no surprise if we assume – along with more traditional semantic descriptions of *door* – that there are two homonymous kinds of *door*, one with the meaning 'intermediary' (*through*), and one which functions as a grammatical operator in passives (*by*). As such, the relative ease with which Dutch learners of English learn to choose between *through* and *by* seems to point at the need for positing homonymy, and hence, for rejecting a polysemy account of *door*.

In an experiment (reported in Cornelis & Cuyckens, 1995), 148 Dutch-speaking students of English were asked to translate 15 instances of *door* covering the entire range of uses as exemplified in the family resemblance structure. The results of the experiment show that, for intermediate learners of English, the translation of *door* is not as easy as might be expected. Indeed, when learners translated *door* as if there were two kinds of *door*, they ran into interesting difficulties for those usages in which *door*'s landmark denotes an instrument (e.g. *Hij verpestte alles door zijn rare gedrag* 'He spoiled everything through/by his strange behaviour') rather than a spatial/temporal intermediary (e.g. *De trein reed door de tunnel* 'The train went through the tunnel') or a causal participant

(*Mijn zus werd ontslagen door haar baas* 'My sister was fired by her boss') and which can be situated in the middle of the cline from spatial to causal usages. Often, subjects did not translate *door* by means of either *through* or *by*, but they resorted to other prepositions (e.g. *with*, *because of*), which are at best only approximate translations.

While this experiment does not bring conclusive proof in favour of the polysemous structure of *door*, at least it is evidence which is commensurate with such a structure. Precisely because subjects have difficulties translating the intermediate usages, one might assume that a representation in terms of two homonymic uses/senses is not satisfactory. Alternatively, one could also argue, of course, that the spatial/temporal intermediary and the causal participant are indeed two homonymous usages and that the insecurity in the translation of the other usages of *door* simply results from learners not having learned a third, unrelated sense of the preposition. It is quite difficult to disentangle these two possible accounts on the basis of the data.

In the experiments to be presented below we were interested in the internal semantic structure of a preposition in the mind of the adult language user, who has reached a relatively steady (final) state of semantic representation. Whereas one experiment (3.4.) is concerned with prototypes, all the others focus on aspects of the monosemy/polysemy/homonymy debate: the language user's perception of distinctions and relationships within a prepositional category (3.5. through 3.7.) and his mental representation of prepositional usages (3.8.).

3.4 Sentence generation task

What are the prototypical usage types of a given preposition? Are they spatial in nature? There seems to be a tendency in cognitive linguistic work to consider the spatial domain as the most cognitively salient one and other domains as derived from it (for references see Rice et al., 1999). The basic question in the present experiment was whether spatial usages of heavily grammaticalised prepositions like *in*, *on*, and *at* would still be the most prototypical.

Research on prototype effects and human categorisation suggests that the more prototypical members of a category should be the most cognitively salient. Defining, let alone explaining, cognitive salience is a tricky matter, but prototypicality has been successfully operationalised across a number of categories and tasks (cf. Rosch, 1975, 1978; Lakoff, 1987; MacLaury, 1991). One index of prototypicality is ease of production. It has been found that prototypical class members are produced more frequently than non-prototypical class members (Rosch, 1975).

The sentence generation task was based on the assumption that the most prototypical usages of a preposition should be remembered and produced most often across a number of speakers. We asked speakers in an off-line experiment to produce sentences containing these prepositions and then analysed the types of usages they came up with.[5]

Three hundred undergraduate students, all in the first weeks of an introductory linguistics course, were asked to compose ten sentences containing a given English preposition as quickly as possible. They were asked to write one sentence each on one of ten numbered and ordered index cards which they found inside an envelope, on the flap of which was written the target preposition. They were given no more than a few minutes to carry out the task. One hundred sample sentences were produced for the prepositions *in*, *on*, and *at* (singled out especially because they share the semantic property of contiguity between trajector and landmark) and sorted into very general categories by the third author and two of her research assistants. These categories were determined on the basis of the general background domain invoked by the usage (that is, SPATIAL, TEMPORAL, or ABSTRACT). The results are shown in Table 1 below.

Table 1 Frequency of response types for each preposition in sentence generation task

at	**57**	**21**	**22**	**100**
on	57	9	34	100
in	60	7	33	100

For each of the three prepositions, usages which were spatial in nature comprised nearly 60% of the responses. These findings suggest that spatial usages *are* somehow privileged for these prepositions. Taken together with other experimental findings (cf. Rice 1996a), they suggest that there are prototypical semantic values for the English prepositions *at*, *on*, and *in*, which are definitely spatial in meaning. Furthermore, the fact that temporal usages and/or abstract usages were also produced in sizeable percentages indicates that these usage types are also important members of the category. The present data do not pertain to the polysemy/homonymy discussion, as the experiment was not design to address this issue.

3.5 Similarity judgement task

The extremely fine level of granularity that cognitive linguists apply to their analyses of purportedly polysemous lexical items has long been of particular interest. Most of these analyses have proposed a high degree of similarity within a single domain. Indeed, some analyses have described a multiplicity of distinctions within the spatial domain alone. By domain, we mean the broadly construed spheres of, for example, space, time, social interaction, causality, and so forth, against or within which we conceive of events as happening. One may wonder to what extent such analyses are artifactual, reflecting characteristics imposed on the data set by the analyst. In the absence of notable differences in the set of usages under study, minor differences may have been magnified. We changed this standard procedure in two respects: (i) the data were gathered from a group of ordinary language users rather than a highly trained linguist[6] and (ii) the pattern of usages under study reflected a broader range of meaning and function, more particularly was not restricted to usages drawn from the spatial domain. We wondered whether intra-domain usage differences might not be reduced in the presence of inter-domain stimulus sets. Moreover, we wanted to know which intra- or cross-domain comparisons would be judged most similar or dissimilar.

Since semantic network analyses represent the set of similarities and dissimilarities in the linguist's perception, a similarity judgement task was used. By having subjects rate the similarity between two usages of a preposition we wanted to ascertain native speakers' perception of differences, if any, between usages of a purportedly polysemous lexical item (cf. Rice et al., 1999, for a more detailed presentation).

In order to arrive at a fairly unbiased set of response patterns, naive native speakers (paid undergraduates in an introductory linguistics course) rated usages of a target preposition embedded in two sentences appearing simultaneously on a computer screen. Twenty subjects made similarity judgements on pairs of sentences containing spatial (S), temporal (T), and abstract (A) usages of 7 English prepositions. They were presented in every possible paired combination of 3 spatial, 3 temporal, and 3 abstract usages of the preposition.

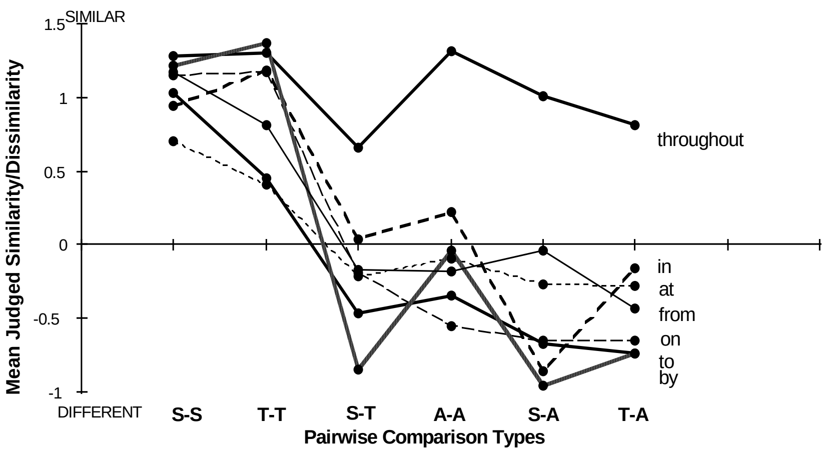

Figure 1 Average ratings for all pairwise comparisons of sentences in similarity judgement task

The graph in Figure 1 shows that, although there was a parallelism between the prepositions (note the general downward curve), the individual prepositions behaved differently. Moreover, the response patterns for the six different usage type pairings varied significantly. As can be seen from this graph, only the intra-domain comparisons involving space and time (S-S and T-T pairings) were judged to be at all similar (except in the case of *throughout*). As far as the inter-domain comparisons are concerned, paired S-T usages were on average rated as dissimilar as the intra-domain comparisons between abstract usages and the other two types of cross-domain comparisons (S-A and T-A). This is remarkable, as in all cases the temporal usages of the preposition can be regarded as instantiations of the more general TIME IS SPACE metaphor (see Rice et al., 1999).

These findings suggest that background domain is of critical importance as an indicator of perceived dissimilarity. While this perceived dissimilarity between spatial, temporal, and abstract usages can be taken as evidence against the strong monosemy hypothesis, one cannot draw further conclusions for the inter-domain level. It could be the case that the perceived dissimilarity is truly relative and assumed to be embedded within an overall perception of similarity, in keeping with a polysemous analysis at this level. But it could also be the case that the perceived dissimilarity is absolute (i.e. subjects perceive spatial and temporal uses as unrelated), in keeping with a homonymous interpretation.

At the intra-domain level of purported minor distinctions, these experimental findings (i.e. the similarity in the S-S and T-T comparisons) – along with similar results from an earlier similarity judgement experiment (cf. Sandra & Rice, 1995, pp. 111–117) – are compatible with intra-domain polysemy. At the same time, however, the perceived similarity in intra-domain pairings is not incongruent with viewing minor distinctions as instances of vagueness.

3.6 Sentence sorting task

Linguists arrive at semantic network analyses by grouping or sorting individual usages into clusters and then relating these clusters to each other.[7] The purpose of the present experiment was to obtain a network-like structure by having many (non-linguist) language users sort a set of prepositional usages and then averaging over all these individual sortings. To what extent does the ensuing structure resemble the kind of analysis presented by cognitive linguists?

In a sorting task (cf. Sandra & Rice, 1995, Rice, 1996a, Rice et al., 1999, for a more detailed presentation), naive subjects were asked to sort 50 sentences containing different usages of the same preposition into groups based on how the preposition was being used in each sentence. Each set of 50 sentences contained exactly 10 temporal usages and at least 10 clearly spatial usages and 10 either abstract or quite grammaticalised usages (the relative proportions varied across experimental conditions).

Statistical analysis indicated that (i) subjects were quite able to sort sentences in a non-random way since there were discernible patterns in each of the three sorts; (ii) a major division among the 50 sentences was brought about by the presence or absence of a spatial sense; (iii) within the non-spatial division, temporal usages were tightly clustered indicating a high degree of perceived similarity; (iv) both spatial and temporal usages were treated in a more unitary or congruent fashion than abstract usages, which did not tend to cluster at all (a result echoed in the similarity judgement task reported earlier).

These findings suggest that subjects perceive a profound difference between concrete and non-concrete experiential domains for the purpose of semantic classification, which, again, argues against the strong monosemy position. This perceived dissimilarity at the level of major, inter-domain distinctions is in keeping with a polysemy or homonomy hypothesis of lexical meaning.[8] However, it gives us cause to speculate about the degree of granularity that is minimally detectable in cases of purported polysemy. We argue that first and foremost shifts in background domain (as in the case of metaphor) rather than image-schematic transformations (affecting paths and landmark configurations along the lines of those proposed for *over* in Lakoff, 1987, pp. 418–430) induce a perception of appreciably distinct usage types for a given lexical item. Of course, this does not exclude that subjects also make intra-domain distinctions of a more fine-grained nature. The tight clustering of minor distinctions in the spatial and temporal domain do not allow firm conclusions on this issue. Sandra & Rice (1995) present the results as compatible with the fine-grained distinctions made by cognitive linguists, but the data are congruent with vagueness as well as with polysemy.

3.7 Translation task

The question whether the relationship between major usage types (such as the purported relation between space and time) is part of the language user's mental representation could not be conclusively answered in the previous experiments. The following experiment looks for further evidence in favour of the relationship between usage types in the conceptual system.

In many languages the conceptual domain of time is metaphorically conceived of in terms of the conceptual domain of space (*in the house/in the afternoon*). The pervasiveness of the TIME IS SPACE metaphor suggests that there is a natural tendency in the human conceptual system to relate these two domains. Given this, it would seem that language users can easily perceive the conceptual relationship between spatial and temporal word usages. Rice et al. (1999) designed a number of experiments in which this hypothesis was tested.

The experimental methodology was based on the assumption that, if language users are 'aware' of the strong conceptual relationship between time and space, they will expect this metaphor to occur in other languages as well. Hence, the task was designed to tap subjects' intuitions on translation equivalents for the different usages of a single word. The typical experimental item consisted of two prepositional phrases: a probe, which exemplified the spatial use of an invented Turkish preposition *weh* (the equivalent of English *in* as in *in the box*), and a target, which exemplified another trajector/landmark configuration. The subjects' task was to decide whether the appropriate preposition for the target expression was *weh*, as in the probe, or a different preposition. All subjects were native speakers of Dutch with no knowledge of Turkish. It was pointed out to them that there were no right or wrong answers as we were only interested in what they thought would be the preferred choice of preposition in Turkish.

In order to make sure that a response tendency for the spatial probe/temporal target pairs would reflect subjects' perception of the semantic relationship, a number of control conditions were included: pairs of homonymic usages (where the *different* response should dominate), obvious cases of polysemy (*same* response expected), and pairs in which the same usage type appeared in both probe and target (*same* response expected). We found that the latter three types of semantic relationships gave rise to highly reliable response behaviour in the expected direction, which justifies the assumption that the task is sensitive to subjects' intuitions on the co-occurrence strength of semantic and formal relationships in the lexicon. In the case of homonymy the two meanings are accidentally expressed by the same form, which makes it unlikely that this meaning-form relationship will recur in a non-related language; in the case of clear polysemy the integrity of the meaning-form relationship makes it very likely that another language too will use a single lexical item for expressing these two meanings.

The major finding was that subjects reliably chose the *different-translation* response for the spatial probe/temporal target pairs (*in the box/in the afternoon*). If the rationale behind the experiment is correct, this would indicate that language users do not experience the TIME IS SPACE metaphor for the preposition *in* as a very natural one. Unfortunately, this interpretation is not based on firm ground, as a response effect may be involved. The presence of clear cases of polysemy and of items where the same usage appeared in probe and target may have caused subjects to set a very high criterion for making *same-translation* decisions. Indeed, in another experiment, in which these two item types were removed and where pairs of spatial/idiomatic usages were used (i.e. clearly unrelated), subjects did not reliably choose for either of the response options in the case of space/time pairs. This indicates that the responses in this type of experiment were sensitive to the composition of the stimulus list.

Even though the methodology seems to work well for cases that are situated at either end of the continuum ranging from vagueness to homonymy, it turns out to be less effective for other cases. The problem is that the task can conceptually be decomposed into two distinct stages: (i) determination of the semantic overlap between probe and target and (ii) determination of the response. Whereas degree of semantic overlap is a continuous variable, response type is a dichotomous one. Hence, subjects have to set a criterion at the semantic variable to be able to determine their response. Apart from the problem that this criterion is dependent on the composition of the stimulus list, there is the problem that a *different* response does not necessarily mean that subjects fail to experience a semantic relationship. The only conclusion that one can draw from a *different* response is that, comparatively speaking, the experienced semantic relationship is weaker than in cases where a *same-translation* response is given. As a result, no firm conclusions can be drawn on the experienced naturalness of the TIME IS SPACE metaphor.

3.8 Primed semantic decision

Whereas some of the experimental techniques described above were used to find out whether ordinary language users *perceive* word usages in the same way as linguists do, the present experiment was designed to find out how language users actually store different word usages in their *mental lexicon*. Are word usages that are distinguished by cognitive linguists also distinguished in the mental lexicon? Are word usages that are related in cognitive linguistic analyses also structurally linked in the language user's representational system for word meaning?

In order to study mental representations one needs an on-line technique. Considering the fact that these representations must be accessed in real time, a favoured research tool in psycholinguistics is a reaction time experiment in which the response must follow access to the representation under study (such that the access time is reflected in the data). Sandra & Rice (1995) report one such experiment.

Subjects had to make speeded decisions on the semantic acceptability of prepositional phrases (acceptable versus non-acceptable). In all these so-called target phrases, the preposition was Dutch *in*. On each trial the target phrase was preceded by a so-called prime (to be read silently), which was either an instantiation of the spatial prototype or a neutral prime (a row of hash marks, #####). The neutral primes were needed in order to have a baseline against which the effect of the spatial primes could be measured. The rationale behind this priming technique is the following: if the prepositional usages in prime and target access the same mental representation, the second access event will be faster. This should be reflected in faster decisions relative to the neutral prime condition, where no repeated access can take place. If, on the other hand, prime and target elicit different representations, the representation accessed by the prime may temporarily inhibit access to the representation of the target (as both representations are being accessed by the same lexical item, they are competitors in an activation process).

The most important outcome of the study was that a spatial usage in prime position preceding a temporal usage in target position caused a significant increase in errors. This suggests that these two usages have different representations in the semantic representational system, i.e. that the temporal usage accesses a different semantic representation than the prototypical spatial usage. Selection of the spatial usage inhibits access to the temporal usage, which leads to more erroneous decisions in conditions of time pressure. This finding, then, seems to refute the strong monosemy hypothesis at the level of mental representation. The experimental results also revealed inhibition effects between certain spatial usages, indicating that subjects also make distinctions of a rather fine-grained nature. Probably, this is the best evidence so far that minor distinctions are not instances of vagueness. Again, these inhibition effects do not preclude that major, inter-domain distinctions or minor, intra-domain distinctions are related by polysemous links.

4 Asking the right questions (the right way)

In the set of experiments reported above we focused on prepositions, lexical-semantic categories that are purportedly highly polysemous and primarily spatial in meaning. Two questions were central to the research: (i) what is the role of polysemous relationships in lexical acquisition/learning? and (ii) what is the internal structure of these lexical-semantic categories (prototypes, degree of polysemy)?

The data from child language acquisition and foreign language learning do not directly demonstrate the involvement of polysemous relationships in the process of adding novel usages/senses to the mental lexicon. However, a polysemy account is not refuted by the data either. In one experiment (L2 knowledge at intermediate level) subjects' reluctance to extend word meaning to unfamiliar usages is even predicted by the polysemy view.

The results which focus on the internal semantic structure of prepositions can be summarised as follows. First, even for highly grammaticalised prepositions such as English *in*, *on* and *at*, the spatial usages appear to be the most prototypical ones. Second, a number of experiments on the way language users perceive semantic relationships (similarity rating, sorting, intuitions on translation equivalents) have shown that coarse *distinctions* (like spatial versus temporal versus abstract) are readily made but have not indicated that subjects are aware of the *semantic relations* between these distinct usages (e.g. between spatial and temporal usages). Effects of item context and task-specific effects may have played a role here. The data of these perception experiments do not allow us to distinguish the homonymy from the polysemy view, although the results are hardly compatible with a strong monosemy view. Finally, the on-line reaction time experiment corroborates the finding in the perception experiments that the distinction between spatial and temporal usages is a real one and extends this finding to the level of the mental lexicon. At the same time, the experimental outcome suggests that some fine-grained distinctions of the type made in cognitive semantic network models have psychological reality as well. The experiment sheds no light on the relationship between these usages, again leaving the homonymy/polysemy issue unresolved.

Even though these experiments have not yielded conclusive results or results that support concepts from cognitive linguistic theory, we believe that there is a need for the empirical approach they represent. If cognitive linguistics claims lexico-grammatical meaning and form to be products of human cognition and wants to be taken seriously as a form of theoretical psychology (which seems to be a shared intention of all post-structuralist frameworks in linguistics) it will have to develop a means and a will for formulating and testing explicit hypotheses. One of the most pressing hypotheses, of course, concerns the presence and/or degree of polysemy relevant for language representation and processing by actual speakers, the users of cognitive linguistics' usage-based approach. The main challenge will be to demonstrate that language users make more discriminations within the semantic usage potential (i.e. the set of all permissible usages) of a word than is logically necessary.

The empirical approach that needs to be developed is not necessarily restricted to experimental research but may cover a set of convergent methodologies. There are a number of empirical proving grounds available to cognitive linguists, each with its virtues and limitations. Diachronic studies allow scholars to propose explanatory mechanisms of linguistic change, lexical shift and expansion, and grammaticalisation. Thus observed patterns may be attributed to cognitive principles in the mind of the language user. However, as far as the particular language elements under (diachronic) study are concerned, these mechanisms do not necessarily have any psychological reality in the minds of contemporary speakers. Cross-linguistic verification of cognitive linguistic hypotheses is another way of gathering empirical data. Although few proposals in the theory are intended to have predictive power or universal scope (by virtue of being wedded to usage-based description), the same basic mechanisms must be in evidence in a broad range of linguistically diverse languages or the very cognitive basis of cognitive linguistics would be in doubt. Again, whereas cognitive principles may thus be identified, it is a hazardous undertaking to extrapolate from such data to the level of mental representation and processing. If one wants to take that step, controlled psycholinguistic experimentation is the appropriate methodology. However, as has become clear in the above review of experiments, the psycholinguistic study of particulars of word meaning beyond obvious cases of homonymy (i.e. ambiguity resolution) presents a real challenge to the researcher. Considering the complexity of the study object, there certainly needs to be an intense communication between cognitive linguists and psycholinguists, so that the right questions can be asked (i.e. theoretically interesting ones) and can be formulated in a testable way.

Even though cognitive linguists may not necessarily intend their analyses to be exact renderings of the content of a language user's mind, they must surely commit themselves to at least some psycholinguistically relevant claims. Quite clearly, cognitive linguistics research calls for broad-based empirical investigation, heretofore lacking. Otherwise, the tension between formal and usage-based analyses can never be resolved except on purely aesthetic, that is, wholly theoretical grounds (e.g. by appeals to descriptive economy, naturalness, generality, and explanatory power), and it is that theoretic aesthetic that cognitive linguists have explicitly rejected from the beginning, opting for a view of grammar as an inventory of symbolic resources rather than as a constructive device. Be that as it may, the symbolic inventory is still the product of a human conceptual system that operates through mechanisms such as analogy, schematicisation, and re-perspectivisation for purposes of extending the linguistic inventory of form and meaning. No linguistic framework, least of all one calling itself cognitive, should feel comfortable hypothesising about that conceptual system in the absence of empirical evidence.

Notes

* This research was made possible in part by research grants to the second (Bijzonder Onderzoeksfonds Universiteit Antwerpen, project DTL-G03) and third (Social Science Humanities Research Council of Canada, grant # 410–930205) authors.

1 Another representational format is the overlapping sets model introduced by Geeraerts (1989b). This model, he argues, is a notational variant of the network models in that it exhibits the same representational potentialities (cf. Geeraerts, 1995b).

2 'We viewed natural semantic categories as networks of overlapping attributes; the basic hypothesis was that members of a category come to be viewed as prototypical of the category to the extent to which they bear a family resemblance to (have attributes which overlap those of) other members of the category.' (Rosch & Mervis, 1975, p. 575)

3 The terms 'usage type' and 'usage' reflect a more neutral position than the term 'sense' in the debate on the status of lexical network nodes as either reified meanings or as contextualized variations of a single meaning or restricted set of meanings. For ease of exposition, we will continue to vacillate between the two terms.

4 *Door*'s reading in the spatial domain is probably the basic one: it indicates a spatial relation between two entities, i.e. a trajector and a landmark, whereby *door*'s landmark operates as an intermediary on the path occupied by *door*'s trajector. *Door*'s causal usages, now, cannot just be described as straightforward extensions from its spatial ones. Indeed, in *door*'s most prototypical causal usages (i.e. in passive sentences), *door*'s

landmark denotes a passive agent, the initiator of the causal event, and can thus hardly be seen as an intermediary.

5 The production of sample sentences containing a target lexical item (in this case, an English preposition) is no different from what many linguists working on their native language have traditionally done in the course of their research. It has not been uncommon for theoreticians to originate and analyse the product of their own mind, relying on their own intuition, all the while being guided by their own theoretical imperatives. Unfortunately, most analysts disregard the possibility that the data they compose do not reflect the full range of some particular linguistic phenomena, but rather a very narrow set of the most typical response patterns. Such a lack of generality has been a chronic problem in traditional generative approaches to language study. However, in the experimental task reported here (described in greater detail in Rice, 1996a), the lack of broad data coverage was deliberately being exploited. Moreover, naive native speakers rather than trained linguists were asked to provide the data. It was anticipated that these speakers would produce on demand the most typical usages of a lexical item.

6 Judging the similarity or dissimilarity of two occurrences of a linguistic element in two different sentential contexts is, again, not unlike what many linguists have to do routinely in their work. Nevertheless, it is a task that is impossible for a linguist to carry out in a neutral fashion. For the linguist, there are always theoretical expectations that can potentially magnify or minimise the importance of certain common or distinctive features.

7 Rather than relying exclusively on language examples of their own devising, linguists are increasingly turning to text and conversational sources for their data.

8 As Sandra and Rice (1995, p. 110) point out, 'it is unclear whether such sharp 'boundaries' result from the absence of a relationship between these usages in most subjects' mental lexicon or from a task-dependent response component, i.e. since discriminations are asked for, the first step may have been to keep the most obviously different usages apart, even if the relationship between them was appreciated.'

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4 Collostructions: investigating the interaction of words and constructions

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1 Introduction

In this paper, we develop and demonstrate an extension of collocational analysis specifically geared to investigating the interaction of lexemes and the grammatical structures associated with them. This method is based on an approach to language that has been emerging in various frameworks in recent years, and that does not draw a fundamental distinction between lexicon and syntax, but instead views all of language as consisting of linguistic signs.

Traditionally, the lexicon and the grammar of a language are viewed as qualitatively completely different phenomena, with the lexicon consisting of specific lexical items, and the grammar consisting of abstract syntactic rules. Various expression types that fall somewhere in between lexicon and grammar (i.e. various types of fully or partially fixed multi-word expressions) have been recognized but largely ignored (or at least relegated to the periphery) by mainstream syntactic theories (notably, the various manifestations of Chomskyan generative grammar).

The predominance of this view may be part of the reason why corpus linguists, until recently, have largely refrained from detailed investigations of many grammatical phenomena. The main focus of interest was on collocations, i.e. (purely linear) co-occurrence preferences and restrictions pertaining to specific lexical items. If syntax was studied systematically at all, it was studied in terms of colligations, i.e. linear co-occurrence preferences and restrictions holding between specific lexical items and the word-class of the items that precede or follow them.

More recently, however, the focus within corpus linguistics has shifted to a more holistic view of language. Several theories – for example, Hunston and Francis' *Pattern Grammar* and Lewis' theory of *lexical chunks* (Hunston & Francis, 2000, Lewis, 1993, cf. also Sinclair, 1991, Barlow & Kemmer, 1994) – have more or less explicitly drawn attention to the fact that grammar and lexicon are not fundamentally different, and that the long-ignored multi-word expressions serve as an important link between them.

In this respect, Pattern Grammar and Lexical-Chunk Theory are two relatively recent arrivals among a variety of approaches that have been emerging over the past two decades, and that share a view of both lexicon and (some or all of) grammar as consisting of linguistic signs, i.e. pairs of form and meaning – most notably the group of theories known as Construction Grammar (e.g. Fillmore, 1985, 1988, Kay & Fillmore, 1999, Lakoff, 1987, Goldberg, 1995, 1999), but also Emergent Grammar (Hopper, 1987, Bybee, 1998), Cognitive Grammar (Langacker, 1987, 1991), and at least some versions of LFG (cf. Pinker, 1989) and HPSG (cf. Pollard & Sag, 1994); note also that various approaches in ELT have advocated this insight more or less explicitly (cf. e.g. Pawley & Syder, 1983). The meaningful grammatical structures that are seen to make up (most or all of) the grammar of a language are variously referred to by terms such as *constructions*, *signs, patterns, lexical/idiom chunks*, and a variety of other labels.

As we will show, this view of language makes the study of grammar more similar to the study of the lexicon, and it also makes it more amenable to investigation by corpus-linguistic methods. The method we propose has two main applications: first, to increase the descriptive adequacy of grammatical description, and second, to provide data for linguistic theorizing and model-building. Descriptive adequacy is improved, for example, because the method provides an objective approach to identifying the meaning of a grammatical construction and of determining the degree to which particular slots in a grammatical structure prefer or are restricted to a particular set or semantic class of lexical items. Linguistic model-building is improved for example because the method provides data that may be used in answering questions like 'Are there significant associations between words and grammatical structure at all levels of abstractness', or 'How do children identify the meaning of grammatical structures during language acquisition.'

This paper is structured as follows. Section 2.1 explicates the view that both lexicon and grammar are essentially repositories of meaningful units of various degrees of specificity. Section 2.2 introduces and justifies the methodology in some detail. Section 3 then sketches out how this methodology may be applied to successively more abstract grammatical phenomena, beginning with the verb *cause* with three different argument structures – *transitive*, *ditransitive*, and *prepositional dative* and moving on to a partially-fixed expression, [X *think nothing of* $\mathrm{VP}_{\mathrm{gerund}}$] (Section 3.1), to argument structures, specifically, the *into*-causative [S V O *into* $\mathrm{VP}_{\mathrm{gerund}}$] and the *ditransitive* [S V O_{i} O_{d}] (Section 3.2), and finally to even more abstract grammatical phenomena – progressive aspect, imperative mood, and past tense (Section 3.3).

2 Collostructional analysis

2.1 The theoretical background

While the method which we will develop below can yield insightful results for any of the frameworks mentioned in the introduction, we will – for the purposes of this paper – adopt the terminology and the basic assumptions of *Construction Grammar*, specifically, the version developed e.g. in Lakoff (1987) and Goldberg (1995). This theory sees the construction as the basic unit of linguistic organization, where *construction* is defined as follows:

> A construction is … a pairing of form with meaning/use such that some aspect of the form or some aspect of the meaning/use is not strictly predictable from the component parts or from other constructions already established to exist in the language (Goldberg, 1996, p. 68, cf. also Goldberg, 1995, p. 4 for a slightly less informal definition).

In other words, a construction is any linguistic expression, no matter how concrete or abstract, that is directly associated with a particular meaning or function, and whose form or meaning cannot be compositionally derived. The linguistic system is then viewed as a continuum of successively more abstract constructions, from words to fully-fixed expressions, to variable idioms to partially filled constructions to abstract constructions.[1]

At the most specific end of the continuum are single morphemes (like [*mis*-V]/'wrongly, astray', [V-*ing*]/'act of', [N-*s*]/'plural') and mono-morphemic words (like *give* and *away*), followed by multi-morphemic words like *misgivings* or *giveaway*. We will retain the terms morpheme and lexeme for these (but they are sometimes referred to as morphological and lexical constructions). The definition also covers fully-fixed multi-word expressions (e.g. proverbial expressions like *He gives twice who gives quickly* or *Don't give up the day job*). Next, and slightly more abstract, there are fixed or variable multi-word-expressions including compounds (like *give-and-take*, or *care-giver*), phrasal verbs (like *to give up on sb*), lexically fully or partially filled idiomatic expressions (like *to give lip-service to sth* or [SUBJ *be given to* $N_{activity}$]/'X habitually does Y', as in *Linguists are given to making wild claims*). Finally, and crucially for the methodology we develop here, the definition also covers abstract syntactic structures like phrasal categories, argument structures, tense, aspect, mood, etc.

As an example of an abstract construction, take the English ditransitive subcategorization frame [S V O_i O_d], exemplified by *John gave Mary a book*. This subcategorization frame assigns a transfer meaning (the notion that the referent of the subject transfers the referent of the second object to the referent of the first object) to all expressions instantiating it, irrespective of the particular verb occurring in this frame. This is shown, for example, by the use of *hit* in *Pat hit Chris the ball*. *Hit* is a two-place verb whose meaning can roughly be glossed as '(some part of) X comes into forceful contact with (some part of) Y'. Clearly, nothing in its meaning points to a transfer of Y to some third participant. However, a sentence like *Pat hit Chris the ball* will consistently receive the interpretation 'Pat transferred the ball to Chris by coming into forceful contact with it' (cf. Goldberg, 1995, pp. 34–35). Since the syntactic configuration [S V O_i O_d] is directly associated with the meaning 'X transfer Y to Z', and hence with the semantic roles Agent, Recipient, and Theme, and since this meaning is not strictly predictable from its components or from other constructions of English, the ditransitive subcategorization frame must be seen as a construction.

Any actual utterance larger than a word is a simultaneous manifestation of several constructions. For example, the sentence *Pat hit Chris the ball* instantiates the subject-predicate construction (i.e. [SUBJ PRED]), the ditransitive construction just discussed, the past tense construction (i.e. [V-*ed*]/'past'), the noun-phrase construction, and the lexemes (or lexical constructions) corresponding to the individual words (cf. Goldberg, 1996, p. 68).

Once words and the grammatical constructions they are associated with (for example, verbs and their argument structures) are seen as independent but meaningful units, the question arises, which words can co-occur with which constructions. Put simply, the answer given by Construction Grammar is that a word may occur in a construction if it is *semantically compatible* with the meaning of the construction (or, more precisely, with the meaning assigned by the construction to the particular slot in which the word appears). For example, the verb *give* may occur in the ditransitive construction because verb and construction have the same meaning ('sb transfers sth to sb'). Note, however, that semantic compatibility does not have to mean semantic identity. For example, as just pointed out, the word *hit* does not have a transfer meaning; however, its meaning is compatible with a transfer meaning – hitting something may be a way of setting something in motion, which may serve as a *means* of transferring it to someone. Here, the ditransitive construction is said to *coerce* a transfer reading of *hit*. In such cases, a more abstract construction may add properties that are unspecified or underspecified in the more specific construction (such as a lexical item). For example, the verb *hit* only specifies an Agent (a Hitter) and a Theme (a Hittee). These are compatible with two of the roles specified by the ditransitive construction. Since *hit* does not specify a third role, this can be added by the ditransitive construction itself. With a semantically non-compatible word, this is not possible. For example, the verb *deprive* is not compatible with the meaning of the ditransitive construction: it is almost an antonym of it, and it specifies three roles that are not all compatible with those specified by the construction: an Agent (a Depriver) a Patient (a Deprivee), and a Theme (the Deprived Thing). Thus, **Pat deprived Chris the ball* sounds unacceptable (and is highly unlikely ever to occur in a corpus).

2.2 The methodology

The view of constructions introduced in the preceding section places particular emphasis on the pairing of linguistic forms with linguistic meaning. In contrast, corpus linguistic approaches to language frequently focus on form (at least in the initial stages of investigation). Corpus-based studies usually start from the (automatic or semi-automatic) collection of data from a corpus;[2] the treatment of semantic issues, for example in the areas of computer-aided lexicography and word-sense disambiguation, is typically based on a more-or-less-systematic interpretation of patterns emerging from a manual inspection of (i) the KWIC concordance display providing the node word in its context and/or (ii) the node word's collocates, i.e. frequent words within a user-specified span around the node word. An example of the former is Oh (2000), who analyzes the meaning differences between *actually* and *in fact* in American English; examples of the latter include Kennedy's (1991) investigation of the distributional characteristics of the semantically similar words *between* and *through* and Biber's (1993) collocate-based identification of word senses. The kind of collocational analysis exemplified by the latter two studies lends itself to a high degree of automatic preprocessing and has yielded many important insights, but it is extremely probabilistic with respect to grammatical structure. For the sake of computational ease, such analyses (tend to) disregard the grammatical structures in which a search word and its collocates occur and instead assume that sufficiently high raw frequencies of the collocates will sort out relevant results from accidental ones. Given the view of language introduced in section 2.1 above, this approach is too imprecise. First, the more abstract constructions often do not contain any specific morphological or even lexical material that would allow the researcher to identify them in a traditional collocational analysis. Second, a given configuration of formal elements may represent more than one construction (for example [V-*ed*] may represent the past-participle construction in addition to the past-tense construction for many verbs, and [S *be given to* N] may represent a simple passive use of *give*, as in *This diamond ring was given to Mary (by John)*, or it may represent the habituality-marking construction mentioned in section 2.1, as in *John was given to generosity*]. A traditional collocational analysis could never distinguish such cases.

In response to these shortcomings, we propose a type of collocational analysis which is sensitive not only to various levels of linguistic structure, but to the specific constructions found at these levels. We will refer to this method as *collostructional analysis*. Collostructional analysis always starts with a particular construction and investigates which lexemes are strongly attracted or repelled by a particular slot in the construction (i.e. occur more frequently or less frequently than expected);[3] crucially, such 'slots' can exist at different levels of linguistic structure (for example, the ditransitive construction may be said to have four slots corresponding to the subject, the verb, and the first and second object, and the past-tense construction may be said to have a slot corresponding to the verb occurring in the past tense). Lexemes that are attracted to a particular construction are referred to as *collexemes* of this construction; conversely, a construction associated with a particular lexeme may be referred to as a *collostruct*; the combination of a collexeme and a collostruct will be referred to as a *collostruction*.[4]

Let us illustrate this methodology and the way it differs from traditional collocational analysis by means of the construction [N *waiting to happen*]. Table 1 gives a complete KWIC concordance of this construction from the British National Corpus 1.0 (BNC) sorted after L1. On the basis of such data, a standard concordancer will produce the collocate display shown in Table 2.

Table 1 KWIC concordance for the ***waiting to happen*** construction (sorted after L1)

#	left context	node	right context
1	Stewart said that there was an accident	**waiting to happen**	and he feared lives would be lost.
2	the horse's knees. It was an accident	**waiting to happen.'**	Recall stewards, dressed in day-glo bibs,
3	you had a cartoon about an accident	**waiting to happen.**	You could have saved the cartoonist's fee
4	Unless, of course, it was an accident	**waiting to happen.**	That insurer has 1,500 appointed
5	'Why?' 'Because Stud's like an accident	**waiting to happen,**	that's why.' 'Oh, fuck off, Joey! I'm
6	the site say it was an accident	**waiting to happen.**	Video-Taped report follows JESSICA
7	the building means it was an accident	**waiting to happen.**	Unfortunately last night an accident did
8	the horse's knees. It was an accident	**waiting to happen.'**	Blow for 'blot on landscape' golf range
9	the return of his body. An accident	**waiting to happen.**	Charity stunt team warned you're playing
10	of it. Bands like that are accidents	**waiting to happen**	in a world where 99 per cent
11	actions which are little more than accidents	**waiting to happen.**	A little more patience and consideration on
12	yesterday: 'I think the recovery has been	**waiting to happen**	for the last couple of months. It
13	Saturday was an accident that had been	**waiting to happen.**	I wrote to Sir Bob Reid, the
14	accident at the heart of the company	**waiting to happen:**	now IBM's signalling of the death of
15	not matter was the real constitutional crisis	**waiting to happen,**	vindication to all those Euro-sceptics who
16	which Coleman warned him of the 'disaster	**waiting to happen'.**	The identity papers seized by the FBI
17	-I'm pulling. 'This is a disaster	**waiting to happen,'**	he added, in a prophecy that would

#	left context	node	right context
18	who said that it was 'a disaster	**waiting to happen'.**	Our hospitals are so short of cash
19	just had to be one monumental disaster	**waiting to happen,**	Leith later realised. But to start with,
20	marriage to Mandy Smith was a disaster	**waiting to happen.**	Urging Jagger to rebuild his marriage with
21	is a graphic example of a disaster	**waiting to happen.**	Over the weekend all attempts to salvage
22	one of these may be a disaster	**waiting to happen.**	In Lancashire towns like Oldham, Bolton
23	described in The Independent as' a disaster	**waiting to happen'.**	The management of the economy has
24	-'Well -for a business disaster	**waiting to happen,**	you seem to have come off remarkably
25	develops this theme, identifying 'disasters	**waiting to happen'**	associated with liquified natural gas, oil and
26	events of this week were an earthquake	**waiting to happen.**	Historians will argue over what was the
27	the first-half goal rush was an event	**waiting to happen.**	Young wingers are like young spin bowlers;
28	As if it [sex]'s just over the horizon,	**waiting to happen**	to me, as weird and wonderful as
29	residents are certain that 'an accident is	**waiting to happen'.**	Their fears -which focus on a
30	arguments that a new industrial revolution is	**waiting to happen**	in space are, for now, unconvincing. The
31	Cause' was a carefully planned invasion just	**waiting to happen,**	poised at the starting gate for the
32	and I can feel the dream just	**waiting to happen,**	gathering its energies from somewhere on
33	a graphic illustration of the disaster that's	**waiting to happen**	out there.' Stuck fast: the Bettina Danica
34	in food production. A disaster was	**waiting to happen.**	Like so many cash crops, sugar is
35	that there may be many more Welkoms	**waiting to happen,**	and if racial conflict does spread in

Table 2 Collocate frequencies for the [N waiting to happen] construction

L2		L1		R1		R2	
an	11	accident, disaster	9	in	3	the	2
a	6	accidents, been, is, just	2	and, the, you	2	a, added, at, could, fears, for, he, hospitals, IBM's, identity, if, insurer, its, Jagger, Lancashire, last, later, little, management, me, report, seem, so, space, stewards, stunt, there, to, why, will, wingers, with, wrote	1
the	3	company, crisis, disasters, earthquake, event, horizon, that's, was, Welkoms	1	a, associated, blow, charity, for, gathering, he, historians, I, Leith, like, now, our, out, over, poised, recall, that, that's, their, to, unfortunately, urging, video-taped, vindication, young	1		
disaster	2						
accident, are, business, constitutional, dream, had, has, identifying, invasion, monumental, more, revolution, than	1						

This kind of collocate list has a variety of obvious drawbacks which are all due to the fact that linear structure is at best a partial indicator of syntactic structure. Specifically, it implies that *business*, *horizon* and *company* occur in the N slot of this construction. However, as concordance lines 24, 28 and 14 in Table 1 show, this is not the case. Conversely, two words that do occur in this slot (*recovery* and *it* in lines 12 and 28 respectively) are not shown in Table 2 because they are at position L3. This is partly due to the fact that words like *just* may occur between N and *waiting to happen*, but, perhaps more importantly, it is also due to the fact that there are two syntactic realizations of the pattern, a noun post-modified by a participial clause (i.e. [$_{NP}$ *an* [$_{N'}$[$_N$ *accident*] [$_S$ *waiting to happen*]]], cf. e.g. line 1) and a copular construction with N as the subject (i.e. [$_S$ [$_{NP}$ *an accident*] [$_{AuxP}$ *is*] [$_{VP}$ *waiting to happen*]]], cf. e.g. line 29). Thus, with a construction like this, it is not actually enough to pay attention to syntactic (tree) structure; instead, we need to analyze the construction at a more abstract level of syntactic representation, which could be informally represented as [$_{Head}$N [$_{Modifier}$ *waiting to happen*]]. Extracting the lexemes occurring in the N slot under this definition requires item-by-item inspection and manual coding, but it guarantees an error-free list of collexemes for further analysis.

We will present such a list shortly. Finally, note that *accident* and *disaster* occur in both the singular and the plural in Table 1; collostructional analysis would involve collapsing these into one figure for each corresponding lemma unless there is reason to believe that the construction is associated with only one particular word form.

Before we return to this construction, let us turn to the issue of attraction and repulsion and, thus, the issue of a suitable measure of association. Researchers have been interested in determining association strengths between word forms at least since Berry-Rogghe (1974), for example in the context of identifying semantic differences between near synonyms (cf., e.g., Church & Hanks, 1990). This strand of research has convincingly demonstrated that raw cooccurrence frequencies are not an ideal measure of association strength for both theoretical and empirical reasons: raw frequency counts do not take into account the overall frequencies of a given word in the corpus, and therefore the most frequent collocates of any given word are typically function words, which are often of little use, for example for the identification of subtle semantic differences between near-synonyms (cf. Manning & Schütze, 2000, p. 153).

In a series of papers, Church and his collaborators address these problems and argue in favor of statistical, information-theoretical methods of quantifying (significant) degrees of association between words (i.e. degrees of collocational strength) (Church et al., 1990, 1991, 1994). However, while the basic argument is by now generally accepted, it is far from clear which method is optimally suited for linguistic research, and Church et al.'s work has triggered a number of studies proposing a variety of measures for this purpose (cf. Dunning, 1993, Pedersen, 1996; cf. Oakes, 1998, as well as Manning & Schütze, 2000, for overviews).

In principle, any of the measures proposed could be applied in the context of collostructional analysis, but most of them are problematic in (at least) one of the following ways: first, many of the proposed statistics involve distributional assumptions that are not justified: normal distribution and homogeneity of variances are just two such assumptions which are hardly ever met when dealing with natural language data, and which render suspicious any statistical results based on them (e.g. Berry-Rogghe's (1974) *z*-score, Church et al.'s (1991) *t*-score). Second, some statistics are particularly prone to strongly overestimating association strengths and/or underestimating the probability of error once extremely rare collocations are investigated (e.g. MI) – even proposed non-parametric improvements like the Chi-square statistic or Dunning's (1993) log-likelihood coefficient still rely on the

Chi-square distribution for significance testing and are, thus, unreliable given the kind of extremely sparse data frequently encountered in corpus-linguistic tasks (cf. Manning & Schütze, 2000, p. 175 n. 7, and Weeber, Vos & Baayen, 2000, for examples). As will become evident, the unreliability of these tests with respect to rare collocations is particularly problematic in the case of collostructions, since the vast majority of collexemes occurring within any given construction have a very low frequency in that construction (cf. Zipf's law).

There is one statistic that is not subject to such theoretical and/or distributional shortcomings, namely the Fisher exact test (cf. Pedersen, 1996). It neither makes any distributional assumptions, nor does it require any particular sample size. Its only disadvantage is that a single test may require the summation of thousands of point probabilities, making it a computationally extremely intensive test procedure. Since precision is of the utmost importance in calculating collostruction strength, we will use the Fisher exact test in spite of its computational cost.

Like virtually all measures of collocation strength between two words w_1 and w_2, the Fisher exact test can be performed on a two-by-two table representing the single and joint frequencies of w_1 and w_2 (or in our case, between a construction an a potential collexeme) in the corpus. To return to the [N *waiting to happen*] construction, consider Table 3, which represents the single and joint frequencies of the noun lemma *accident* and the [N *waiting to happen*] construction in the BNC. The figures in italics are derived directly from the corpus data, the remaining ones result from subtractions; the total number of constructions was arrived at by counting the total number of verb tags in the BNC, as we are dealing with a clause-level construction centering around the verb *wait*.

Table 3 Crosstabulation of accident and the [N waiting to happen] construction

	accident	*¬ accident*	**Row totals**
[N *waiting to happen*]	*14*	21	*35*
¬ [N *waiting to happen*]	8,606	10,197,659	10,206,265
Column totals	*8,620*	10,197,680	*10,206,300*

On the basis of this information, the Fisher exact test computes the probability of this distribution and all more extreme distributions (in the direction of H_1) with the same marginal frequencies. For the data in Table 3, the p-value is 2.1216E-34,[5] indicating that, as would be expected, the association between *accident* and the [N *waiting to happen*] construction is very strong. The same computation can be performed for all other Ns occurring in this construction, and the Ns can then be ranked according to their strength of association (the Fisher exact p-values, that is) with the construction. This procedure results in Table 4.[6,7]

Table 4 Collexemes most strongly attracted to the [N waiting to happen] construction[8]

Collexeme (n)	p_{Fisher} exact (collostruction strength)
accident (14)	2.12E-34
disaster (12)	1.36E-33
welkom (1)	4.46E-05
earthquake (1)	2.46E-03
invasion (1)	7.10E-03
recovery (1)	1.32E-02
revolution (1)	1.68E-02
crisis (1)	2.21E-02
dream (1)	2.45E-02
it (sex) (1)	2.83E-02
event (1)	6.92E-02

Although the main point of this analysis (as of the case studies presented below) is to exemplify the method, let us briefly point out some interesting aspects of our results. First, this construction is not typically found in dictionaries, the only exception being the *Collins Cobuild* family of dictionaries. This omission is maybe due to the fact that lexicographers perceived this construction as having no unique head noun under which to list it. Second, the one dictionary (or family of dictionaries) that does have an entry for it, Collins Cobuild, lists it under the head noun *accident*, which receives *a posteriori* support by the collostructional analysis (although collostructional analysis would suggest that it also be included under the head word *disaster*, where Collins Cobuild at least gives an example). Finally, Collins Cobuild gives the following definition.

> If you describe something or someone as **an accident waiting to happen**, you mean that they are likely to be a cause of danger in the future, for example because they are in poor condition or behave in an unpredictable way. (Collins Cobuild E-Dict. s.v. *accident*)

The negative connotation here is clearly due to the word *accident* rather than the construction. Note the absence of such negative connotations with the words *recovery* (line 12), *dream* (line 32), *it/sex* (line 28) and *event* (line 27). This would perhaps suggest that the construction should receive its own entry under *wait* with a more neutral definition along the lines of 'if you describe something as **waiting to happen**, you mean that it will almost certainly occur and that this is already obvious at the present point in time (often used with a negative connotation)'. The fact that *accident* and *disaster* are so strongly associated with the construction could be conveyed by an appropriate choice of examples.

3 Case studies

In this section, we will investigate a variety of constructions with respect to their most strongly attracted and repelled collexemes. The principal focus throughout this section is on the methodology itself; although we will provide some discussion of the results in each case, this discussion is aimed at pointing out the potential of the method rather than at providing detailed analyses of specific phenomena. The order of presentation approximately reflects the degree of abstractness of the constructions as discussed above. Unless otherwise noted, all case studies are based on the British component of the International Corpus of English (ICE-GB).

3.1 Words and variable idioms

3.1.1 Cause

We will begin with the analysis of a single word, the verb *cause*. As will presently become clear, collostructional analysis allows for a more fine-grained analysis than traditional collocational analysis even in the case of a single word.

Previous collocational analyses have shown that the verb *cause* collocates predominantly with words that have a negative connotation (i.e., that *cause* predominantly has a 'negative semantic prosody', cf. e.g. Stubbs, 1995). Some typical examples are shown in (1):

(1) (a) There's a bone in my nose that's slightly bent and it's progressively **caused** slight breathing problems (ICE s1a-051 97)
(b) Instead so Mill argued the only ground for making something illegal was that it **caused** harm to others (ICE s2b-029 106)
(c) I am sorry to have **caused** you some inconvenience by misreading the subscription information (ICE w1b-026 115)

As these examples show, the negative prosody is due to the words that occur in the logical object position of *cause*. Table 5 shows the results of a collostructional analysis of the lexemes occurring in this position.

Table 5 Collexemes of *cause* (all nouns encoding the result argument of *cause*)

Collexeme (n)	Collostruction strength	Collexeme (n)	Collostruction strength
problem (22)	9.03E-23	wear (2)	7.63E-05
damage (9)	1.86E-13	swelling (2)	1.92E-04
harm (5)	3.9E-11	concern (3)	2.7E-04
havoc (3)	1.24E-08	trouble (3)	4.64E-04
distress (3)	1.08E-07	collapse (2)	4.83E-04
inconvenience (3)	2.58E-07	disruption (2)	4.83E-04
cancer (4)	6.93E-07	casualty (2)	1.09E-03
injury (5)	1.25E-06	crack (2)	1.23E-03
injustice (3)	1.39E-06	acrimony (1)	1.46E-03
stampede (2)	6.39E-06	drowsiness (1)	1.46E-03
congestion (2)	1.28E-05	head-crash (1)	1.46E-03
extrusion (2)	1.28E-05	hiccough (1)	1.46E-03
stress (3)	2.51E-05	hyperinflation (1)	1.46E-03
change (6)	2.73E-05	neuropraxia (1)	1.46E-03
hardship (2)	4.46E-05	perplexity (1)	1.46E-03

The results clearly confirm the claim that *cause* has a negative connotation. However, note that *cause* occurs in three different constructions: the transitive, as in (1a), the prepositional dative, as in (1b), and the ditransitive, as in (1c).[9] Using the collostructional method, we can go beyond the type of general analysis that is possible on the basis of Table 5, and look at the result arguments of each of these constructions separately (i.e. the objects of transitive and prepositional dative uses, and the second (or 'direct') objects of ditransitives, as well as the subjects of passives for each construction). The results of such a separate analysis are shown in Table 6.

Clearly, *cause* has a 'negative prosody' in all three constructions, however, there are fundamental differences between the three constructions with respect to the exact type of negative result. The transitive construction occurs exclusively, and the prepositional dative predominantly, with external states and events; in contrast, the ditransitive construction encodes predominantly internal (mental) states and experiences.

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Table 6 Collexemes of *cause* by construction

TRANSITIVE		PREPOSITIONAL DATIVE		DITRANSITIVE	
Collexemes	Coll. strength	Collexemes	Coll. strength	Collexemes	Coll. strength
problem (18)	3.30E-18	harm (3)	4.37E-10	distress (1)	4.54E-04
damage (7)	2.52E-10	damage (2)	5.47E-05	hardship (1)	4.54E-04
havoc (3)	8.74E-09	modification (1)	6.56E-04	discomfort (1)	5.19E-04
cancer (4)	4.39E-07	inconvenience (1)	8.43E-04	inconvenience (1)	5.84E-04
injury (5)	7.12E-07	famine (1)	9.37E-04	problem (2)	8.57E-04
injustice (3)	9.84E-07	delight (1)	1.59E-03	pain (1)	3.24E-03
stampede (2)	5.08E-06	problem (2)	1.83E-03	difficulty (1)	7.83E-03
congestion (2)	1.01E-05	disruption (1)	2.06E-03	night up (1)	1.89E-02
extrusion (2)	1.01E-05	accident (1)	1.66E-02		
change (6)	1.43E-05				

The difference between the transitive and the ditransitive use of *cause* is intriguing, and has been missed by traditional collocational analyses. One reason for this difference may be found in the different argument structure of these two uses. In the transitive use, there are two participants – an Agent (the causer) and an (Effected) Patient (the result); in contrast, in the ditransitive there are three participants – an Agent (the causer) and a Theme (the result) that is (metaphorically) transferred to a Recipient; the metaphorical recipient of the result of an action is naturally interpreted as an experiencer of this result (see section 3.2.2 below). This inclusion of an experiencer makes the ditransitive suitable for encoding mental states and experiences.

3.1.2 The [X think nothing of V_{gerund}] construction

Let us now move beyond the level of single words, beginning with a relatively concrete idiomatic expression, [X *think nothing of* V_{gerund}], exemplified in (2).

(2) (a) In their present mood people would **think nothing of** mortgaging themselves for years ahead in order to acquire some trifling luxury like a jar of brandied peaches or a few leaves of tobacco. (BNC: EWF)

(b) As a bachelor it seemed slightly shocking to Rupert that a colleague, even though an anthropologist, should **think nothing of** abandoning his wife when she was ill. (BNC: HA4)

We will be concerned with the verbs that appear in the V_{gerund} slot. This construction is found in many dictionaries; a typical definition is the following:

If you think nothing of doing something that other people might consider difficult or strange, you consider it to be easy or normal, and you do it often or would be quite willing to do it (Collins Cobuild, s.v. *think*)

This definition makes clear that we are in fact dealing with a construction, as this meaning is not predictable from the component parts or other constructions of English; if we attempted to identify the meaning of this construction compositionally, we would expect it to mean something like 'to have a very low opinion of', in analogy to expressions like *think {the world/highly/not much/poorly/little} of* (and indeed this is a possible interpretation, although the OED is the only dictionary which lists it we are aware of).

Given a definition like the one cited, we would expect the construction to strongly attract verbs that refer inherently to undesirable and/or risky activities. However, it is not clear that there are many such verbs since what is undesirable or risky depends very much on context.

Thus, this construction provides an extreme test for the collostructional method. Table 7 lists the results (from the BNC).

Table 7 Collexemes most strongly attracted to the [*X think nothing of VGerund* construction]

Collexeme (n)	Collostruction strength	Collexeme (n)	Collostruction strength
haggle (1)	4.83E-04	beat (1)	2.74E-02
mortgage (1)	1.79E-03	check up (1)	3.38E-02
confide (1)	2.01E-03	eat (1)	3.92E-02
motor (1)	2.23E-03	stay (1)	5.36E-02
spend (2)	3.28E-03	walk (1)	7.45E-02
offer (2)	4.13E-03	hear (1)	1.17E-01
rip (1)	4.18E-03	take (2)	1.21E-01
leap (1)	6.02E-03	pay (1)	1.21E-01
hire (1)	7.50E-03	bring (1)	1.36E-01
wave (1)	9.78E-03	call (1)	1.54E-01
blow (1)	1.29E-02	get (2)	1.67E-01
abandon (1)	1.45E-02	go (2)	1.85E-01
hand (1)	1.70E-02	put (1)	2.09E-01
fly (1)	2.66E-02		

As might perhaps be expected given our concerns about the context dependence of the notions 'desirability' and 'riskiness,' there are no verbs that occur very frequently in this construction; also, note that there are no great differences in the frequencies of the verbs that do occur in it. However, even under these circumstances, our measure of collostruction strength is able to rank the verbs; what is more, this ranking does indeed pick out a number of verbs denoting potentially risky activities (like *mortgage*, *confide*, *motor*, *leap* and *fly*) and verbs denoting potentially undesirable activities (like *haggle*, *rip*, *abandon* and *beat* – especially the first-ranked *haggle* seems to have a strongly negative connotation). Although one may not want to claim that the meaning of this construction could be deduced with a high degree of certainty from the list of verbs in Table 7, especially if taken individually, their prominence among the top collexemes clearly conveys a 'semantic prosody' that meshes well with the meaning of the construction. Incidentally, there are two lexemes identified by collostructional analysis as being repelled by the construction: the high frequency, low-content verbs *be* and *do*. Note that these would not help at all in identifying the meaning of the construction (for *be*, p=7.52E-06; for *do*, p is only 0.469).

3.2 Partially filled and unfilled argument structure constructions

3.2.1 The into-causative

We will now turn to an argument-structure construction, albeit one that still includes a specific function word, [S_{agent} V $O_{patient/agent}$ into-$A_{gerund\ resulting\text{-}action}$]. This construction, which we refer to as the into-causative, is exemplified in (3).

(3) (a) He tricked me into employing him.
(b) They were forced into formulating an opinion.
(c) We conned a grown-up into buying the tickets.

In a brief discussion of this construction, Hunston and Francis (2000, pp. 102–4, 106) impressionistically provide some raw frequency data concerning the verbs found in the V slot of the construction. On the basis of these data, they identify a strong tendency of the construction to occur with verbs denoting negative emotions (e.g. *frighten*, *intimidate*, *panic*, *scare*, *terrify, embarrass, shock, shame* etc.) or ways of speaking cleverly and deviously (e.g. *talk, coax*, *cajole*, *charm*, *browbeat* etc.). They propose that verbs entering into the *into*-causative usually (i) do not mean 'talk reasonably' and (ii) can also be used transitively; they go on to argue that both of the senses they have identified are associated with 'some kind of forcefulness or even coercion' (Hunston & Francis, 2000, p. 106). Before we present our own results, however, two aspects of Hunston and Francis's work are worth noting. First, although this construction has two slots for verbs (V and A_{gerund}), Hunston and Francis confine themselves to a discussion of the V slot. Second, while Hunston and Francis comment on the notions 'force' or 'coercion' that at least one sense of the construction is associated with, the verbs *force* and *coerce* themselves are completely absent from their discussion and from the list of verbs they present.

Consider now Table 8, which shows the 30 verbs most strongly attracted to the V slot of the construction (data from the BNC).

Table 8 Collexemes most strongly attracted to the V slot of the into-causative

Collexeme	Collostruction strength	Collexeme	Collostruction strength
trick (92)	2.11E-267	delude (19)	8.83E-49
fool (77)	1.68E-187	talk (62)	2.38E-48
coerce (53)	1.15E-158	goad (18)	1.35E-46
force (101)	6.31E-136	shame (19)	1.28E-45
mislead (57)	9.57E-110	brainwash (13)	2.42E-37
bully (45)	2.53E-109	seduce (17)	2.56E-35
deceive (48)	5.94E-109	push (34)	6.66E-35
con (34)	4.41E-102	tempt (22)	3.37E-32
pressurise (39)	4.8E-101	manipulate (19)	3.3E-31
provoke (48)	4.05E-87	inveigle (10)	1.04E-30
pressure (30)	3.88E-85	hoodwink (10)	1.52E-29
cajole (28)	4.08E-85	panick (15)	7.75E-28
blackmail (25)	3.31E-64	lure (14)	1.23E-27
dupe (19)	7.77E-52	lull (11)	4.62E-26
coax (22)	6E-51	dragoon (8)	1.63E-25

Cleary, the results of the collostructional analysis differ strongly from the more impressionistic results presented by Hunston and Francis. First, the verb is most strongly attracted to this construction is *trick*, whose collostruction strength is eighty orders of magnitude larger than that of the next-strongest collexeme, *fool*, or that of the most frequent verb in this construction, *force* (also note that second-ranked *fool* has a similar meaning to *trick*). Interestingly, neither of these verbs is mentioned by Hunston and Francis, nor do they fit the proposed semantic generalization ('negative emotions' or 'speaking cleverly'). Second, the verbs ranked third and fourth again share some semantic characteristics, namely those of 'force' and 'coercion' mentioned by Hunston and Francis. However, the collostructional analysis demonstrates that the construction is not only associated with the semantic notions 'force' or 'coercion' but also with the actual verbs *force* and *coerce*.

The data in Table 8 also show an interesting tendency: the collexemes appear to be ordered such that the very top of the list features verbs instantiating the two major sub-senses of the construction, namely 'trickery' (as exemplified by *trick/fool* as well as *mislead*, *deceive*, *con*, *dupe*, *delude*, *hoodwink* and *lull*) and 'force' (exemplified by *coerce/force* as well as *bully*, *pressurize*, *pressure*, and *push*). Intuitively less central senses of the *into*-causative appear much further down the list, for example:

- 'verbal coercion', instantiated by *blackmail* (as well as by *threaten*, which is not among the top thirty collexemes, but still a significant collexeme);
- 'positive persuasion', i.e. A's providing B with a positive stimulus in order to cause B to do something, instantiated by *cajole* and *coax*;
- 'negative persuasion', i.e. A's providing B with a negative stimulus in order to cause B to do something, instantiated by *goad* and *shame*.

Collostructional analysis has more to offer though. While space does not permit an exhaustive characterization of the *into*-causative, note that the A_{gerund} slot of the construction can be subjected to the same kind of collostructional analysis; furthermore, it is possible to establish intra-constructional correlations between lexemes occurring in the V slot and lexemes occurring in the A slot. We will very briefly mention three interesting findings (cf. Gries & Stefanowitsch, in preparation a).

First, the most strongly attracted verb, *trick*, does not exhibit any semantic restrictions or preferences with respect to the (kinds of) A_{gerund} lexemes it co-occurs with frequently; these include

- action verbs (e.g. *do*, *give*, *work*);
- transfer verbs (e.g. *give*, *hand*);
- mental activity verbs (e.g. *believe*, *think*, *like*);
- perception verbs (e.g. *see*, *feel*);
- communication verbs: (e.g. *tell*, *talk*, *say*).

Second, the A slots of other verbs of the same semantic group (that of 'trickery') are much more restricted: they prefer A_{gerund}s encoding mental activity or transfer, but generally disprefer action, perception, and communication verbs. Finally, the lexemes in the A_{gerund} slots of 'force' verbs exhibit a markedly different semantic tendency: the 'force' sense is mainly used with action verbs and transfer verbs, whereas communication verbs are rare and mental activity and perception verbs hardly occur at all.

In sum, collostructional analysis yields intriguing results: first, as before, it shows that there are associations between this construction and individual verbs, and that these are ranked in a way that lends itself to a meaningful interpretation; second, it allows us to expand on such an interpretation by potentially identifying the most strongly attracted gerunds as well as $\text{V-A}_{\text{gerund}}$ correlations within the construction.

3.2.2 The ditransitive

Traditionally, ditransitivity is viewed as a verbal complementation pattern or subcategorization frame, i.e. as a purely syntactic property of individual verbs. In other words, it is assumed that verbs like *give*, *promise*, or *tell* are 'ditransitive verbs'; cf. the examples in (4)a to (4)c:

(4) (a) Mary gave John a book.
(b) Chris promised Pat a car.
(c) John told Mary a story.

If this view were correct, there would be no point in performing a collostructional analysis of ditransitivity, since it would result trivially in a frequency list of ditransitive verbs. However, there are several reasons for assuming that ditransitive syntax (i.e. [S V O_i O_d]) is a (meaningful) construction that exists independently of the specific verbs that occur in it. First, so-called 'ditransitive verbs' may also occur with other types of syntax (cf. e.g. *Mary gave freely to the poor* (intransitive prepositional), *Chris promised to be on time* (clausal complement), and *John told Mary of his adventures at sea* (transitive prepositional). Second, typical 'intransitive' verbs (like *blow*) or transitive verbs (like *throw*) may also occur with ditransitive syntax, as in *Mary blew John a kiss* or *Chris threw Pat the ball*), and if they do so, they receive an interpretation that is very similar to that of 'ditransitive' verbs. As mentioned in Section 2.1, the ditransitive construction can be represented in its active declarative form as [S_{agent} V $O_{\text{recipient}}$ O_{theme}].

It is crucial to the idea that all cases of ditransitive syntax instantiate a single argument-structure construction that such a construction may have a basic sense with several semantic extensions. In the case of the ditransitive, the basic sense is generally assumed to be 'X causes Y to have/receive Z' (cf. Goldberg, 1995, p. 38, Pinker, 1989, p. 73). Example (4a) instantiates this sense, while examples (4b) and (4c) instantiate extensions: the former is linked to the basic sense by virtue of the fact that the satisfaction conditions of the speech-act verb *promise* imply a transfer; the latter is a metaphorical extension based on the idea that communication is the exchange of objects (cf. Reddy, 1979). The polysemy of the ditransitive construction has been most extensively discussed in Goldberg (1995); the extensions she posits are summarized in Table 9.

Table 9

Sense	Sample verbs
Basic sense:	
Agent causes recipient to receive theme	*give, pass, hand, …* *throw, kick, …* *bring, send, take, …*
Extensions on the basis of general semantic processes (Goldberg 1995: 38):	
A. *Satisfaction conditions imply that* agent causes recipient to receive theme	*guarantee,promise, owe, …*
B. *Agent enables* recipient to receive theme	*permit, allow, …*
C. Agent causes recipient *not* to receive theme	*refuse, deny, …*
D. *Agent acts to* cause recipient to receive theme *in the future*	*leave, bequeath, grant, …*
E. *Agent intends to* cause recipient to receive theme	*bake, make, build, …* *get, grab, earn, …*
Extensions on the basis of metaphor (Goldberg 1995: 147–50):	
F. Communication as transfer, e.g. *She told Joe a fairy tale.*	*tell, teach, fax, …*
G. Perceiving as receiving, e.g. *He showed Bob the view.*	*show, give a glimpse, …*
H. Directed action as transfer, e.g. *She blew him a kiss.*	*blow (a kiss), give (a wink), …*
Exceptions based on individual verbs (Goldberg 1995: 131–6):	*cost, charge, envy, forgive …*

Table 10 Collexemes most strongly attracted to the ditransitive construction

Collexeme	Collostruction strength	Collexeme	Collostruction strength
give (461)	0	allocate (4)	2.91E-06
tell (128)	1.6E-127	wish (9)	3.11E-06
send (64)	7.26E-68	accord (3)	8.15E-06
offer (43)	3.31E-49	pay (13)	2.34E-05
show (49)	2.23E-33	hand (5)	3.01E-05
cost (20)	1.12E-22	guarantee (4)	4.72E-05
teach (15)	4.32E-16	buy (9)	6.35E-05
award (7)	1.36E-11	assign (3)	2.61E-04
allow (18)	1.12E-10	charge (4)	3.02E-04
lend (7)	2.85E-09	cause (8)	5.56E-04

Collexeme	Collostruction strength	Collexeme	Collostruction strength
deny (8)	4.5E-09	ask (12)	6.28E-04
owe (6)	2.67E-08	afford (4)	1.08E-03
promise (7)	3.23E-08	cook (3)	3.34E-03
earn (7)	2.13E-07	spare (2)	3.5E-03
grant (5)	1.33E-06	drop (3)	2.16E-02

Again, collostructional analysis demonstrates not only that there are associations between the ditransitive and specific verbs, and that these can be ranked, but it also yields results that bear on analyses of the ditransitive such as that presented by Goldberg.

The strongest collocate is *give*, which is clearly the verb most closely associated with the form and the meaning of the ditransitive construction, both in the minds of native speakers (cf. the informal experiment in Goldberg, 1995, pp. 35–6) and in the literature on the ditransitive. It is also, of course, the verb most similar in meaning to the ditransitive (the OED, for example, defines the relevant meaning using words like 'transfer' and 'provide with', which are clearly close paraphrases of 'cause to receive'. It seems, then, that for the ditransitive, collostruction strength confirms the importance of semantic compatibility, and it also seems that strong collexemes of a construction provide a good indicator of its meaning (although the extreme polysemy of the ditransitive construction must be taken into account for a detailed analysis of both of these issues, a point to which we will return presently).

The list of significant collexemes also provides a crucial clue as to why some verbs are thought of as inherently ditransitive even though they also occur in other constructions, and why some verbs are not thought of as ditransitive even though they occur regularly in the ditransitive construction. Essentially, the stronger its collostruction strength with the ditransitive, the more likely a given verb is to be thought of as ditransitive. Most native speakers would agree that the first twenty verbs in Table 10 are felt to be ditransitive, but intuitions become considerably more varied below this point; the non-significant collexemes include mostly verbs that we would not think of as ditransitive.

Turning to the polysemy of the ditransitive, it is interesting to note that the basic 'transfer' sense is not overwhelmingly dominant in the list of the next most strongest collocates after *give*; in fact, it is only instantiated by four or five other verbs among the complete list of significant collocates: *send*, *award*, *lend*, *drop*, and perhaps *assign*. Instead, the next strongest collocates after *give* mainly instantiate extended senses: eight of the nine extensions listed in Table 10 are instantiated by one or more of the fifteen strongest collocates; extension A by *offer*, *owe*, and *promise*, extension B by *allow*, extension C by *deny*, extension D by *grant*, and extension E by *earn*, extension F by *tell* and *teach*, extension G by *show*, and the exceptional uses by *cost*.

Thus, collostructional analysis may provide us with evidence for the high degree of polysemy of some constructions (such as the *into*-causative or the ditransitive) as compared to others (such as [N *waiting to happen*] or [*think nothing of* V_{gerund}].

3.3 Tense/aspect/mood

3.3.1 The progressive

Let us now turn to even more abstract constructions, beginning with the progressive aspect. It is generally assumed that the progressive construction presents the action denoted by the verb as an ongoing process (cf., e.g., Jespersen, 1931, p. 178, Dowty, 1979, p. 145). It has also been noted that, as a consequence, verbs with a stative *aktionsart* (which inherently present a process as ongoing) do not generally occur in the progressive construction except under very specific circumstances (Lakoff, 1970, p. 121).

From a corpus-based perspective, we would certainly not expect absolute restrictions on the ability of any verb to occur the progressive aspect construction. However, it seems plausible that stative verbs will be infrequently instantiated among the most strongly attracted collexemes, but will make up a substantial proportion of the most strongly repelled collexemes.

Table 11 lists the 30 most strongly attracted and repelled collexemes. The results lend an overwhelming support to the traditional analysis. A full twenty of the 30 most strongly repelled collexemes are stative (namely all verbs except for *call*, *put*, *find*, *base*, *set*, *let*, *mention*, *get*, *marry*, *stop*); note especially that the ten most strongly repelled verbs are all stative.

Table 11 Collexemes most strongly attracted to the progressive construction

attracted		**repelled**	
Collexeme (n)	Collostruction strength	Collexeme (n)	Collostruction strength
talk (234)	1.32E-94	be (448)	0
go (640)	1.08E-89	know (31)	1.01E-63
try (282)	8.86E-84	think (160)	4.05E-34
look (371)	4.41E-77	see (72)	6.36E-31
work (250)	2.14E-68	have (247)	1.93E-29
sit (100)	2.55E-57	want (44)	6.51E-21
wait (88)	6.17E-38	mean (15)	7.72E-17
do (539)	2.16E-36	need (5)	1.11E-14
use (264)	3.18E-29	seem (3)	1.02E-10

attracted		**repelled**	
come (348)	9.65E-26	believe (11)	3.44E-09
run (113)	1.75E-25	call (30)	3.32E-08
move (104)	5.8E-19	put (93)	6.7E-08
live (101)	1.97E-17	remember (12)	9.49E-08
deal (57)	2.19E-16	find (56)	4.58E-07
walk (55)	9.34E-16	include (6)	2.76E-06
watch (46)	2E-15	agree (9)	4.45E-06
wear (48)	3.76E-14	base (2)	2.04E-05
write (123)	1.58E-13	set (34)	3.39E-05
listen (42)	2.18E-12	sound (6)	3.55E-04
seek (48)	8.66E-11	concern (3)	3.92E-04
fight (32)	2.63E-10	imagine (2)	4.97E-04
stand (57)	4.97E-10	let (10)	5.83E-04
study (31)	1.67E-09	mention (8)	1.04E-03
plan (28)	1.87E-09	exist (4)	1.13E-03
increase (54)	2.36E-09	get (294)	1.27E-03
sing (25)	3.54E-09	regard (2)	1.27E-03
approach (25)	5.13E-09	require (12)	1.3E-03
depend (43)	6.21E-09	marry (1)	1.86E-03
speak (71)	1.24E-08	stop (7)	2.13E-03
sell (38)	1.46E-08	indicate (3)	2.29E-03

In addition, a number of observations emerge regarding semantic verb classes. For example, motion/posture verbs (e.g. *go, sit*, *come*) as well as communication verbs (e.g. *talk*, *listen*, *speak*) are reasonably frequent among the most strongly attracted verbs, but are not instantiated at all among the most strongly repelled verbs. Also, among the stative verbs strongly repelled by the progressive, verbs denoting mental processes are particularly prominent.[10]

3.3.2 The imperative

It is received wisdom that the imperative sentence type (or mood) serves a 'directive' function, more specifically, that of a request (at least in its 'direct' or 'prototypical' use). Characterizations of requests typically include the idea the speaker wants the hearer to perform the requested action, i.e. that it is desirable to the speaker (cf. Searle, 1969, pp. 66–7, Wierzbicka, 1991, p. 205, Sadock, 1994, p. 401). In addition, it is sometimes claimed that the imperative expresses the speaker's assumption that the hearer will actually perform the requested action (cf. Wierzbicka, 1991, p. 205), or even that it places the hearer under an obligation to do so (cf. Sadock, 1994, p. 401), or that it presupposes a 'power (authority) gradient' between speaker and hearer (Givón, 1989, p. 145).

We might, thus, minimally expect a prevalence of verbs encoding actions that yield results desirable from the point of someone else, i.e. the speaker; note that the verb most frequently used to exemplify the imperative is *pass* (as in *Pass the salt!*). In addition, we might expect some reflex of the authority or obligation aspect of the imperative.

The data, however, tell a different story. Consider Table 12, which lists the 30 most strongly attracted collexemes of the imperative construction.[11]

Table 12 Collexemes most strongly attracted to the imperative construction

Collexeme	Collostruction strength
let (86)	1.99E-97
see (171)	7.47E-80
look (74)	1.18E-24
listen (26)	4.05E-23
worry (21)	5.18E-22
fold (16)	9.25E-22
remember (35)	1.83E-18
check (21)	2.09E-17
process (15)	2.16E-17
try (47)	5.13E-17
hang on (17)	7.90E-17
tell (46)	1.30E-15
note (16)	2.96E-15
add (21)	2.64E-12
keep (28)	1.13E-11

Let us begin with the classes of verbs found to be strongly attracted to the imperative. Four of the verbs in Table 12 are clearly not action verbs in any sense (*see*, *worry*, *remember*, *note*). Furthermore, many of the action verbs that do occur are atypical in that they do not yield tangible results (*look*, *listen*, *hang on*, *check*, *try*, *keep*). While result-yielding action verbs do also occur, they are not nearly as dominant as might be expected (making up only a third of the top fifteen collexemes).[12]

Let us now turn to the issue of the desirability of the requested action: a cursory glance at Table 12 suggests that what is at issue is a result desirable from the point of the hearer rather than the speaker. This is confirmed by a closer look at the top ten verbs.

First-ranked *let* requires little discussion in this context. It occurs predominantly in the combination *let me*, as in example (5a) and rarely in other combinations as in (5b).

(5) (a) **Let** me also point out what could happen to companies that don't innovate (ICE s2a-037 045)
(b) **Let** the racket do the work with very little follow-through (ICE w2d-013 060)

Such examples could plausibly be omitted from the analysis on the same grounds as those with *let's*; cf. above n. 11. However, the basic fact, namely that *let* is used to encode situations that are portrayed as desirable to the hearer, holds for other verbs as well, specifically, for the verbs *see*, *look*, *listen* and *remember*, which are typically used as in examples (6) to (9).

(6) (a) Just try it and **see** what happens (ICE s1b-002 064)
(b) **See** also the section below on 'Students from abroad' (ICE w2d-003 049)

(7) (a) **Look** what happened to Jimmy Carter (ICE s2b-021 012)
(b) Just **look** at the beautiful scenery here (ICE s2a-016 037)

(8) Uhm <,> but then they said **listen** we need to you know <,> decide very promptly (ICE s1a-092 048)

(9) **Remember** that alcohol affects your judgment of both people and situations (ICE w2d009 081)

Each of these verbs would merit its own discussion, but suffice it here to point out what they all seem to share (in addition to the hearer-desirability) is an attention-directing (or perhaps even discourse-organizational) function, the same can, of course, be said of *note* and *hang on*. Clearly, the requested actions are (portrayed as being) beneficial to the hearer rather than the speaker: the examples convey a sense of suggesting or advising rather than commanding or requesting (actually, these actions are also beneficial to the speaker, but not in the way typically associated with the imperative – rather, the requested actions serve to support the future cooperation and interaction between speaker and hearer in a way that is very similar to the use of *let me* exemplified in (5a) above). A very clear case of desirability to the hearer is also presented by fifth-ranked *worry*, which occurs exclusively in the phrase *don't worry*.

This leaves us with four more canonical imperatives, namely *fold*, *check*, *process*, and possibly *tell*. Of these, *fold* and *process* are typical result-yielding action verbs, but (i) as imperatives they both occur only in a single file of the corpus (cf. below section 4) and (ii) any sense of beneficiality to the speaker is notably absent (cf. (10) and (11)). *Check* in (12) is result-yielding in some sense, but some of the examples also bear resemblance to the uses of *see*, *look* and *listen* exemplified above in (6) to (9).

(10) **Fold** the short edge to the centre (ICE w2d-019 044)

(11) **Process** until the mixture has formed a smooth purée (ICE w2d-020 137)

(12) (a) **Check** it out (ICE s1a-033 186)
(b) **Check** the condition of the drive belt periodically and replace it if it is excessively worn (ICE w2d-018 016)

Tell has some clearly directive uses, as in (13) but many uses are discourse-organizational (cf. (14)), and thus not unlike *see*, *look*, *listen*, and *note*.

(13) **Tell** him we are waiting for the order (ICE s1a-004 046)

(14) **Tell** us about Barcelona then (ICE s1a-046 422)

Although this analysis does not even begin to address the intriguing facts that collostructional analysis may ultimately reveal about the imperative, it clearly shows one thing: imperatives are apparently avoided with typical action verbs. This is doubtless due to the fact that such a use would be highly imposing. Instead, one major function of the imperative seems to be the organization of discourse (or, more generally, texts).

To sum up, collostructional analysis has again picked out and ranked a number of verbs as significant collexemes of the construction in question, but, in contrast to the analysis of the progressive presented in the preceding section, the results do not straightforwardly support simple traditional analyses. Instead, the verbs picked out by collostruction strength provide evidence that one of the typical uses of the imperative is to direct attention in a low-imposition fashion.

3.3.3 The past tense

Before we conclude, we would like to emphasize that the applicability of collostructional analysis is not limited to the type of semantically relatively specific construction discussed so far. To drive home this point, let us briefly look at one of the most abstract constructions of the English language: the past tense. Intuitively, there are no strong expectations, if any, that the past tense should be strongly associated with any particular verb at all. However, as Table 13 shows, there are both strongly attracted and strongly repelled collexemes even for this construction. For the top two collexemes, it is possible to come up with a partial motivation for this attraction: the attraction of *be* is at least in part due to its function as a passive marker (which – at least in the ICE-GB – is more frequent in the past tense, a fact that is in itself in need of explanation), while *say* is the verb standardly used in introducing direct and indirect speech in narratives (which are typically in the past tense for obvious reasons). Beyond this, we do not pretend to have even the beginning of a plausible explanation for the facts in Table 13 (although it does not seem impossible that such an explanation may ultimately be found); however the very fact that there are such relations of attraction and repulsions seems noteworthy enough to be reported, since it presents a huge problem for rule-based approaches to language.

Table 13 Collexemes most strongly attracted to the past tense construction

attracted		**repelled**	
Collexeme	Collostruction strength	Collexeme	Collostruction strength
be (6620)	0	know (159)	1.35E-26
say (1359)	1.81E-278	do (257)	7.23E-26
have (841)	1.1E-16	use (76)	3.01E-22
nod (19)	3.54E-14	put (106)	9.77E-19
die (57)	2.02E-12	get (339)	1.14E-15
become (150)	6.71E-12	see (184)	8.11E-15
tell (192)	8.86E-12	suppose (3)	1.18E-13
feel (152)	1.34E-11	saw (1)	4.84E-13
come (383)	1.13E-10	like (34)	1.22E-12
arrive (47)	4.08E-10	cut (10)	7.07E-12
start (90)	2.57E-08	work (49)	1.34E-11
decide (71)	2.94E-07	read (39)	3.16E-11
fall (54)	1.71E-06	talk (28)	3.98E-11
ring (34)	1.91E-06	remember (17)	7.8E-11
sit (47)	1.97E-06	hope (13)	3.62E-10

4 Conclusions

The collostructional analyses of a number of constructions have demonstrated several advantages of the method.

First, the descriptive adequacy of grammatical description is strongly increased. While simpler and more traditional collocate-based approaches already provide a huge improvement on purely intuitive analyses, we believe that collostructional analysis with its emphasis on (i) the grammatical structures in which collexemes are embedded and (ii) the quantification of the degree of attraction/repulsion has more precise results and more rewarding perspectives to offer, for example for lexicography and language pedagogy, to name just two fields of application where there are obvious practical advantages to knowing which lexical items are strongly associated with or repelled by a particular construction.

Second, the results presented above have implications for linguistic theorizing and model-building. Most importantly, the very fact that there are any dependencies at all between particular words and particular grammatical structures provides strong support for theories that view grammatical structures as signs, specifically for theories that view language as a repository of linguistic units of various degrees of specificity. If syntactic structures served as meaningless templates waiting for the insertion of lexical material, none of the results presented above would be expected in the first place (proponents of rule-based, open-choice theories could of course shift variable idioms out of core grammar to the lexicon, but this strategy would seem counterintuitive in the case of more abstract constructions, such as argument structure, tense, aspect, mood, etc.).

Finally, collostructional analysis in our view has implications for psycholinguistic studies of language acquisition. Goldberg suggests that the semantics of some of the most basic argument structure constructions (including the ditransitive) are identified by the child on the basis of the fact that a few flexible and semantically light verbs (e.g. *give* for the ditransitive) tend to account for the majority of the occurrences of these constructions in both input and output (Goldberg, 1999, Goldberg et al., 2003, p. 7–10). Goldberg et al. (2003, p. 11) also hypothesize that

> it is the high frequency of particular verbs in particular constructions that allows children to note a correlation between the meaning of a particular verb in a constructional pattern and the pattern itself.

They emphasize the importance of token frequency with respect to (i) non-linguistic categorization and prototype formation and (ii) the identification of the semantic properties of novel constructions (they provide experimental support for the latter point, concluding that 'high token frequency of a single general exemplar does indeed facilitate the acquisition of constructional meaning'; p. 13). We believe that collostruction strength is even more promising than raw frequency with respect to these issues. Since collostructional analysis goes beyond raw frequencies of occurrence, it identifies not only the expressions which are frequent in particular constructions' slots; rather, it computes the degree of association between the collexeme and the collostruction, determining what in psychological research has become known as one of the strongest determinants of prototype formation, namely the cue validity of, in this case, a particular collexeme for a particular construction. That is, collostructional analysis provides the analyst with those expressions which are highly characteristic of the construction's semantics and which, therefore, are also relevant to the learner.

Future research will have to refine and extend collostructional analysis in several ways. Extensions include, for example, a method for the analysis of distinctive collocates, which will enable the researcher to tease apart distributional and/or semantic differences between semantically similar constructions. Church et al. (1991) introduce a variant of the *t*-test as a measure of differences between near synonyms. The general logic of their procedure can be transferred to collostructional analysis, where it can serve to identify those collexemes that differentiate most strongly between two constructions. Gries and Stefanowitsch (in preparation b) develop an appropriate extension of the methodology presented here applying it to various cases of grammatical alternations and choices.[13] Additionally, a systematic well-founded methodology for the investigations of intra-constructional correlations of the type mentioned in section 3.2.1 needs to be developed (see Gries & Stefanowitsch, in preparation a). Finally, collostructional analysis took the perspective of investigating the elements (e.g. verbs) occurring in particular slots within a construction. Reversing this perspective would mean to look at one particular verb to determine in which constructions it occurs significantly frequently. This would result in a statistically sound version of what Hanks (1996) referred to as a verb's behavioural profile.

On the computational level, the identification of important collexemes and, in fact, of most collocate-based analyses, can be further improved by weighing all collexemes according to their degree of dispersion in the analyzed corpus (using, say, Carroll's D_2). Consider the following example: the verb *process* occurs in the imperative 15 times, yielding a collostructional strength of 8.54E-17 while *hang on* occurs in the imperative 17 times, yielding a smaller collostructional strength of 3.66E-16. On the basis of collostructional strength, thus, *process* is more important for a subsequent interpretation. However, *hang on* occurs as an imperative within 12 corpus files (i.e., D_2=0.36) while *process* occurs as an imperative in a single corpus file only (i.e., D_2=0). Thus, one might in fact weigh *hang on*'s collostructional strength more heavily since the high collostructional strength of *process* to the imperative is only due a single author/writer.

To conclude, we believe that collostructional analysis and its potential refinements open up many rewarding avenues of research in corpus linguistics as well as in syntactic theory, and we hope to stimulate further research in this area.

Notes

1 Obviously, there are many differences between Construction Grammar and the other approaches mentioned in the introduction, and this definition glosses over many of these: most importantly, Cognitive Grammar does not include the idea of non-compositionality in its definition of a construction, and Pattern Grammar and ELT approaches typically require some lexical material to be present in an expression in order to count it as a lexical/idiom chunk or pattern.

2 We do not invoke the specific distinction here between corpus-driven and corpus-based studies; corpus-based studies is to be understood in the general sense of the term.

3 For the moment, we will only consider as repelled items those which do occur, but occur less frequently than expected, although it would of course also be possible to include items that should have occurred on statistical grounds, but did not.

4 The technical terms *collostruction* and *collexeme* are obvious blends of the words *construction* and *lexeme* with *collocation*. Likewise, the term *collostruct* is derived from *collostruction* by analogy to the derivation of *collocate* from *collocation*.

5 All statistics reported in this paper were computed with the current version of the R package.

6 Table 3 is an instance where, strictly speaking, the application of the Chi-square test would have been possible. However, since the collostruction strengths of all lexemes occurring in the N slot and the [N *waiting to happen*] construction were ranked according to the p-values as explained above, it was necessary to compute them all in the same way so as to avoid different computational procedures influencing the ranking. A computationally less demanding alternative to the Fisher exact test is Dunning's (1993) log-likelihood coefficient LL. Especially with large sample sizes, LL yields very similar results (for many practical purposes at least).

One might nevertheless object to our ranking the lexemes occurring in the N slot according to the p-values obtained by the Fisher exact test since this would normally have to be done using effect sizes (like Chi^2 for ANOVAs, d for *t*-tests or r^2 for product-moment correlations; cf., e.g., Rietveld & van Hout, 1993, p. 59). However, the advantage of the Fisher exact p-value is that in addition to incorporating the size of the effect observed in any particular cross-tabulation (as, e.g. MI or the odd's ratio would also do), it also weighs the effect on the basis of the observed frequencies such that a particular attraction (or repulsion, for that matter) is considered more noteworthy if it is observed for a greater number of occurrences of the lexeme in the N slot. For instance, in Table 3 14 of the 35 occurrences of the [N *waiting to happen*] construction involved *accident* (i.e. 40%), yielding the p-value of 2.12E-34 mentioned above. If we had only observed 8 instances of *accident* in a total of 20 cases of the [N *waiting to happen*] construction in the same corpus with the same frequency of *accident* (i.e. again 40%), the p-value would accordingly be raised to 3.22E-20, indicating that this hypothetical collostruction is less noteworthy than the actually observed one. This sensitivity to frequency seems a desirable property for a measure of collostruction strength, given that frequency plays an important role for the degree to which constructions are entrenched and the likelihood of the production of lexemes in individual constructions (cf. Goldberg, 1999). Finally, note that we will not place much emphasis on the question of whether a particular collostruction strength falls below standard levels of significance such as 0.05 or 0.01 – instead, we will mainly use the p-values as an indicator of relative importance of a collostruction (following, e.g., earlier work by Pedersen, 1996, Pedersen et al., 2003).

7 It might be useful to return briefly to the weaknesses of traditional techniques of mere collocate analysis pointed out above in connection with Table 1 and Table 2 above. Without belaboring the obvious, note that the inclusion of the false hits *horizon*, *company* and *business* would distort the accurate results on the basis of manual coding considerably. *Horizon*, *company* and *business* result in p-values of 0.006, 0.059 and 0.127 respectively; in other words, merely using collocates would promote the false hit *horizon* to the fifth most strongly attracted lexeme in the N slot of the construction.

8 Given the low frequencies involved in this rare construction, no lexemes were found that are repelled by the construction. However, although it has sometimes been argued that such instances of repulsion will be fairly infrequent (cf., e.g., Church & Hanks,

1990, p. 24, Church et al., 1991, p. 124), such lexemes are found for several of the constructions discussed below.

9 In addition, *cause* can occur as the matrix verb of a causative construction, as in *x caused y to do z*. However, this use is relatively infrequent, and it seems to us that the claims of a negative semantic prosody do not necessarily apply to it (Stubbs, 1995, does not list any verbal collocates of *cause* that could be contributed by this use). We therefore ignore this use here.

10 The claim that communication verbs do not occur at all among the repelled collexemes is clearly too strong a statement. Note the verbs *call* and *agree*, which must be regarded as communication verbs in at least some of their uses (further examples among the strongly repelled collexemes not listed here include *mention, guess, thank, express, acknowledge, reject, state, conclude, answer, accuse*). However, note that all of these are speech-act verbs (i.e. they convey an illocutionary force). As is well known, speech-act verbs are a systematic exception to the constraint that prevents non-stative verbs to occur in the simple present without a habitual reading: they standardly occur in the simple present in performatives or performative-like utterances. Thus, they often appear in the simple present where all other non-stative verbs would require the progressive aspect (cf. Langacker, 1991, pp. 251–252 for discussion). The fact that mental verbs are particularly prominent among the strongly repelled stative collexemes can be explained along similar lines (cf. Wierzbicka, 1991, p. 238 who analyses such verbs as quasi-performative).

11 The strongly associated collexemes in Table 12 are based on a concordance of imperatives in the ICE-GB excluding hortative cases such as *Let's stop it for the moment* (ICE s1a-001 050). However, the results do not change substantially even if such hortative cases are included in the analysis.

12 In this connection note that the verb used most frequently in the literature to exemplify the imperative, *pass*, is only ranked 187th by the collostructional analysis.

13 Consider as a brief example the so-called 'dative alternation':

(i) a. Mary gave John a book. ditransitive (cf. above section 3.2.2)

b. Mary gave a book to John. prepositional dative

The results of our distinctive-collostruct analysis demonstrate that there are a variety of distinctive collexemes, i.e. collexemes that significantly distinguish between the constructions by significantly preferring one construction over the other. Consider (ii) and (iii) for just a few collexemes that are most clearly distinctive for the ditransitive and the prepositional dative respectively.

(ii) give >>> tell >>> show >> offer > allow > cost >> teach >> buy, wish > earn > ask

(iii) put > bring > add > attach >> play > say >> limit > take >commit, confine

Note that, the collexemes distinctive for the ditransitive comprise several verbs of directed communication (e.g. *tell*, *offer*, *teach*, *ask*) whereas no such communication verb is distinctive for the prepositional dative. Also, while the distinctive collexemes of the ditransitive instantiate most of the constructional extensions listed above in Table 9, those of the prepositional dative comprise several verbs of causedmotion (e.g. *put*, *bring*, *attach*, *take*); this finding lends some support to the Construction Grammar analysis according to which the prepositional dative is analyzed as an instance of the caused-motion construction on independent grounds (see Gries & Stefanowitsch, in preparation b, for more detailed discussion).

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Press Final 27 July 2007

5 Conceptual integration and metaphor: an event-related potential study

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Studied for centuries by rhetoricians, metaphor is considered the paradigmatic example of the *trope* – that is, a word used in its figurative sense (Aristotle, trans. 1952; Quintillian, trans. 1921). Itself somewhat metaphoric, trope is the Greek word for *twist*, or *turn*. Nonliteral language has traditionally been viewed as a deviation from normal language use and one that takes extra effort to understand. The *standard pragmatic model* (Grice, 1975; Searle, 1979) stipulates that (1) metaphors are 'special' and consequently are processed with qualitatively different mechanisms than those for literal language, and (2) the computation of literal meaning precedes that of metaphoric meaning.

Cognitive linguists have attacked the *specialness* assumption by noting that metaphor is pervasive in everyday language and that it plays a pivotal role in historical language change (Lakoff & Johnson, 1980; Sweetser, 1990; Turner, 1991). Given systematic relationships between literal and metaphoric uses of the same words, Lakoff (1993) has suggested that metaphors reflect the output of a cognitive process by which we understand a *target* domain by exploiting cognitive models from an analogically related *source* domain. In *conceptual metaphor theory*, clusters of related expressions (e.g., *fuming*, *boiling*, *blowing one's top*) are the manifestation of underlying conceptual metaphors (e.g., *anger is fluid in a heated container*). Lakoff has further argued that 'the system of conventional conceptual metaphor is mostly unconscious, automatic, and is used with no noticeable effort, just like our linguistic system and the rest of our conceptual system' (pp. 227–228).

A variety of reaction time measures have indicated that metaphor interpretation is neither slow nor optional, casting doubt on the second tenet of the standard model. When the metaphoric interpretation of a sentence has adequate contextual support, metaphors are read no more slowly than literal language (Gibbs, Bogdanovich, Sykes, & Barr, 1997; Inhoff, Lima, & Carroll, 1984; Ortony, Schallert, Reynolds, & Antos, 1978). Futhermore, readers take longer to reject statements that are literally false but metaphorically true than to reject nonmetaphoric false statements (Gildea & Glucksberg, 1983; Glucksberg, Gildea, & Bookin, 1982; Keysar, 1989). This finding suggests that literal and metaphoric meanings become available simultaneously, thus producing response competition. Also, Blasko and Connine (1993) showed that following metaphors rated as *apt* (viz. readily interpretable), lexical decisions for target words related to figurative meanings were made just as fast as those for targets related to literal meanings. For example, after a phrase like *hard work is a ladder*, *advance* and *rungs* both received faster responses than did *pastry*. Because the target words were presented immediately after the offset of the last word of a spoken metaphor, these authors concluded that the figurative meaning was rapidly available.

In contrast to the standard model, current processing models of metaphor comprehension all assume that literal and nonliteral language comprehension invoke the same mechanisms (Gibbs, 1994; Glucksberg, McGlone, & Manfredi, 1997; Wolff & Gentner, 2000). These mechanisms include one's noting the potential correspondence between semantic attributes or relational structure associated with the source and target domains (*alignment)* and a selective projection of properties from one to the other (Shen, 1999). Most models also assume that metaphor comprehension involves the selection of some attributes at the expense of others, a process previously described as necessary for the interpretation of both ambiguous and unambiguous literal words in context (Tabossi, 1991). Similarly, Gernsbacher and Robertson (1999) have suggested that metaphor comprehension necessitates suppression of irrelevant semantic attributes, but that the same general mechanism is invoked during the interpretation of anaphors, lexical ambiguities, and syntactically ambiguous phrases. In contrast to Lakoff's (1993) claim that metaphor processing is effortless, current processing models suggest that, ceteris paribus, metaphoric language places heavier demands on the mechanisms of alignment, selective projection, and inference than does literal language. For instance, Blasko (1999) writes, 'If metaphor involves creating a bridge between dissimilar semantic domains and filtering out or suppressing unimportant characteristics while selecting relevant ones, then it should require considerable working memory capacity for both access and mapping processes' (p. 1679).

Surprisingly, data supporting the prediction that comprehension of metaphoric language should involve some extra effort is largely absent from psycholinguistic research. As is noted above, most studies suggest that when metaphors are preceded by sufficient context to be interpretable, literal and metaphoric language are processed in the same amount of time. However, equivalent processing times need not imply equivalent effort. By analogy, it may take the same amount of time to lift a 5- and a 20-pound weight, but the latter recruits more resources. The failure to demonstrate longer processing times for metaphoric language might also reflect a mismatch between the power of the dependent measures and the subtlety of the processing differences between literal and nonliteral language. In many studies, reading times for entire sentences or large sentence fragments have been found, so minor slowing on critical words might have gone undetected (e.g., Gibbs, 1990; Gibbs et al., 1997; Glucksberg et al., 1997; see a similar critique by Blasko, 1999). Frisson and Pickering (2001) have noted that word frequency, plausibility, and cloze probability have not always been adequately controlled in studies in which reading times for literal and figurative language are compared.

We suggest that the *continuity claim* (that literal and nonliteral language processing occur in the same time course and involve the same processing mechanisms) common to modern accounts of metaphor processing, is very different from the *equivalence claim* (that metaphoric language is no more difficult to comprehend than literal language). If the same operations are involved in literal and nonliteral language comprehension (the continuity claim), principles governing the difficulty of metaphor comprehension ought also to apply to literal language. The goals of the present study were (1) to determine whether metaphors are more difficult to understand than literal sentences by investigating processing difficulty independent of reaction time, and (2) to evaluate the continuity of literal and metaphoric language by including a condition hypothesized to be midway between the overtly metaphorical and the clearly literal. Dubbed *literal mappings*, these instances of literal language impose similar, but lighter, demands on processes of mapping, selective projection, and conceptual integration as metaphor. Below, we explain the construction of this intermediate condition and explain why we used electrical brain activity as a dependent measure.

1 Conceptual blending and literal mappings

Our selection of a condition midway between metaphoric and literal language was inspired by a general theory of conceptual integration known as *conceptual blending* (Fauconnier & Turner, 1998). As it pertains to metaphor interpretation, conceptual blending theory suggests that a subset of the attributes and relational structure from the source and target domains are imported into a blended space where they can be combined and supplemented with information from background knowledge (Coulson, 1996, 2000). These hybrid models, or *blends*, are useful in explaining discrepancies between the way that shared representations function in the source and target domains, as well as emergent properties evoked by metaphoric expressions (Tourangeau & Rips, 1991). For example, blending theory explains why it is insulting to call a surgeon a *butcher*, even though meat cutters are not customarily considered incompetent. Grady, Oakley, and Coulson (1999) suggest that the incompetence inference arises from the composition of the butcher's techniques and instruments with the surgeon's goals in the blend. In the blend, the hybrid surgeon–butcher performs surgery on a human in the same manner a butcher might operate on a cow carcass. This unpleasant juxtaposition is the origin for the abstract notion of a butcher as someone who uses coarse methods for a job that requires finesse.

Blending theory suggests that metaphor taxes the comprehension system for two reasons: First, it involves the establishment of mappings between elements in distantly related domains, and second, it often requires the activation of background knowledge for information from the two domains to be integrated. However, neither of these operations is unique to metaphor comprehension. Conceptual blending theory suggests that all language comprehension involves the construction of multiple cognitive models and the establishment of mappings between their components. For example, in the literal use of *gem* in (1), the reader must establish a mapping between *the stone we saw in the natural history museum* and *a gem*, on the basis of category membership.

(1) That stone we saw in the natural history museum is a gem.

Comprehension of the grammatically cued mapping in this literal sentence can be achieved with fairly minimal retrieval and comparison of conceptual structure associated with the two objects in question.

In contrast, the metaphoric use of *gem* in (2) appeals to particular abstract and relational aspects of the reader's concept of gems.

(2) After giving it some thought, I realized the new idea was a gem.

In (2), the speaker's idea is mapped analogically onto the concept of a gem. Only some of a gem's typical qualities are imported into the new blended space in which jewels and thoughts overlap, and these qualities are related to a real gem's properties only analogically. Although *clarity* in a gem refers to the unimpeded passage of light, *clarity* in an idea refers to the unimpeded passage of knowledge. Similarly, both gems and ideas can be *beautiful*, but standards of attractiveness are qualitatively different. In the blending model, such mappings are made possible because of the incorporation of background knowledge, which sometimes includes underlying conceptual metaphors. In the corresponding *literal-mapping* condition in (3) the use of *gem* is fully literal but involves fairly extensive mapping between the pebble in the tin ring and the gem in a more prototypical ring.

(3) The ring was made of tin, with a pebble instead of a gem.

Some common properties of pebbles and gems – shape, size, and hardness – allow them to fill the same slots in the relational structure of a ring. Successful mapping involves one's understanding that a pebble can top a toy ring, just as a gem can top a piece of fine jewelry, while discounting noncorresponding properties of pebbles and gems that are irrelevant (expense, rarity, brightness, etc.). We suggest that such cases are intermediate between fully literal and clearly metaphoric uses. Like other literal uses, literal mappings appeal to the literal meaning of the term and invoke concrete attributes of the relevant concepts. But like metaphors, their comprehension requires the apprehension of mappings between two cognitive models. Our literal mapping sentences include contexts in which one thing is substituted for another, mistaken for another, or used to represent another in child's play, drama, or deception (see additional examples in Table 1). Disparate though these examples may be, they all require the reader to recognize the similarities and differences between two cognitive models as in true metaphors like (2). When one uses a chair instead of a ladder, for example, it is important to understand that one can stand on a chair (as well as sit in it) and that it is possible to reach elevated heights when standing on a chair, just as it is with a ladder. When a boy in a sheet represents a ghost, it is important to understand that he shares some attributes of a ghost (e.g., being white), as well as some relations (he scares other children participating in the game). Our prediction is that comprehension of these literal mappings, like the comprehension of metaphors, will mandate an evaluation of the correspondence between two cognitive models and the selection and alignment of some shared attributes and relations.

Table 1 Examples of the Experimental Sentences

Literal:	*He knows that whiskey is a strong intoxicant.*
Literal mapping:	*He has used cough syrup as an intoxicant.*
Metaphor:	*He knows that power is a strong intoxicant.*
Literal:	*The carnival featured an orangutan, a sword swallower, and even a cannibal.*
Literal mapping:	*He wondered why the African tribesman was portrayed as a cannibal.*
Metaphor:	*She was sexy, but he'd heard she was a real cannibal.*
Literal:	*The secret ingredient in her stew is cayenne.*
Literal mapping:	*The chef apparently uses salt instead of cayenne.*
Metaphor:	*My crazy uncle says jokes are conversation's cayenne.*
Literal:	*They had a few chickens in the yard, and in the barn was a goat.*
Literal mapping:	*On our last trip into the mountains, Dad thought a bighorn sheep was a goat.*
Metaphor:	*Someone had to take the fall, and unfortunately your husband was the goat.*
Literal:	*Turns out, it wasn't any rare species of insect, just a flea.*
Literal mapping:	*Some subjects got the disease from a mosquito instead of a flea.*
Metaphor:	*The independent prosecutor thought he was a bulldog, but he was really more of a flea.*
Literal:	*They just announced that the governor was charged with grand larceny.*
Literal mapping:	*What I thought was petty theft, the judge thought was grand larceny.*
Metaphor:	*I knew she was out to steal his heart, but that kiss was grand larceny.*
Literal:	*The U.N. committee found evidence of widespread malnutrition.*
Literal mapping:	*He mistook their crowd's stylish look for malnutrition.*
Metaphor:	*He complained that prison life was spiritual malnutrition.*
Literal:	*He knew he'd have to work all night, so the last thing he needed was a headache.*
Literal mapping:	*The doctor diagnosed his tumor as a headache.*
Metaphor:	*The actor says interviews are always a headache.*
Literal:	*The conductor had no idea the train had been boarded by a known villain.*
Literal mapping:	*In the best part of the movie, the hero has to impersonate the villain.*
Metaphor:	*Many people in the agency now believe that plastics are an environmental villain.*
Literal:	*I read that one of Canada's major exports is maple syrup.*
Literal mapping:	*In the movie Psycho, the blood was really cherry syrup.*
Metaphor:	*He didn't understand the words, but her voice was sweet syrup.*

Thus, in the present study, we used triplets of sentences hypothesized to fall on a gradient of processing difficulty, from literal statements of class inclusion as in (1), to literal mappings as in (3), to the fully metaphoric uses as in (2). We note, however, that although blending theory provides a ready definition of literal mappings as falling midway between literal and metaphoric language, it is quite possible that other models of metaphor comprehension would provide convergent definitions.

2 Event-related brain potentials

The second relatively innovative aspect of the present study is that we recorded event-related brain potentials (ERPs), a record of synaptic potentials that are synchronized to stimulus presentation (see Rugg & Coles, 1995, for a review). Quantitative differences in neurophysiological processes are indexed by ERPs that have the same polarity, wave-shape, and scalp distribution, but differ in amplitude or latency. Qualitative differences are indexed by ERPs that differ in polarity, waveshape, and scalp distribution. Although both total reading and lexical decision times have suggested that times to comprehend metaphoric and literal statements do not differ, measurement of ongoing brain activity might either indicate more effortful comprehension or detect a qualitative difference in metaphoric and literal comprehension mechanisms.

A second general motivation for using a neurophysiological measure is that neuropsychology provides the one bit of evidence that has not been well accommodated by the continuity claim assumed in most contemporary models of metaphor comprehension. In contrast to the aphasias associated with left hemisphere damage, more subtle communicative deficits are observed after right hemisphere strokes, one of which has been characterized as difficulty understanding nonliteral language (Brownell, Potter, & Michelow, 1984; Brownell, Simpson, Bihrle, & Potter, 1990; Winner & Gardner, 1977). If indeed right hemisphere damage can selectively impair the comprehension of nonliteral language, this bolsters the standard model's claim that figurative language requires qualitatively different processing mechanisms than does 'normal' language. Because laterally asymmetric ERPs are commonly observed in both perceptual and psycholinguistic studies (see King, Ganis, & Kutas, 1998, for a review), ERPs might provide a good measure of the differential contribution of the two cerebral hemispheres to processing metaphoric language.

In the present study, one ERP component of particular interest is the N400 (N for its negative polarity, and 400 for its peak latency at 400 msec after the onset of the stimulus). All words elicit N400, and the amplitude of this component indexes the ease or difficulty of semantic integration in literal sentences (see Brown & Hagoort, 1994; Kutas, Federmeier, Coulson, King, & Muente, 2000; Kutas & Van Petten, 1994, for reviews). For sentence-final words, N400 amplitude is inversely related to cloze probability, an off-line measure of semantic constraint (Kutas & Hillyard, 1984). For sentence-intermediate words, N400 is large at the beginning of a sentence, particularly for low-frequency words, but declines with increasing semantic constraints as a sentence proceeds (Van Petten, 1995). Our a priori prediction was that the N400 component of the ERP would show graded amplitudes across the literal, literal mapping, and metaphor conditions, reflecting a concomitant gradient of processing difficulty.

The present design provides a partial replication and extension of a study by Pynte, Besson, Robichon, and Poli (1996). Those investigators compared ERPs elicited by final words of familiar French metaphors like *Those fighters are lions*, unfamiliar metaphors like *Those apprentices are lions*, and literal statements of class inclusion like *Those animals are lions*. Although the same set of words was used and they were matched on cloze probability, familiar metaphoric endings elicited larger N400s than did literal endings, and unfamiliar metaphors elicited larger N400s than did familiar metaphors. However, no behavioral data were collected for the unfamiliar metaphors, and it is possible that some of these were not correctly interpreted by the participants, but read as literal incongruities. Because the present study was conducted in order to compare the processing difficulty of literal, literal mapping, and metaphoric sentences, a critical aspect of experimental design was to ensure that all three sentence types were equally interpretable. Three steps were taken to ensure that none of the stimuli were perceived as semantically anomalous and that they were indeed interpreted correctly. First, the metaphors were embedded in sentences that supplied some context (as opposed to the simple *some xs are ys* format sometimes used in metaphor research). Second, the three sentence types were subjected to a cloze procedure in which the participants predicted the final words on the basis of the sentence frames. The final stimulus set was selected so that the same final words were offered equally often as completions of literal, literal mapping, and metaphoric sentences by a normative group. Third, each sentence in the experiment was followed by a comprehension question, and only those accompanied by correct answers were included in the data set. If processing difficulty is related to the difficulty of mapping and integration, we should observe a gradient of N400 amplitude that reflects the hypothesized mapping and integration difficulty in literal, literal mapping, and metaphoric uses of the same set of words. However, the continuity thesis would be falsified if metaphors elicited ERPs with a different scalp distribution, such as being differently lateralized than ERPs in the literal conditions.

3 Method

3.1 Participants

Eighteen native English speakers (14 men, 4 women) were paid for their participation. Their average age was 26 years (range 21–34). Five were left-handed, and 5 were right-handers who reported familial sinistrality. All had normal visual acuity; none had any reported history of neurological or psychiatric disorders. The participants were given the reading span test of working memory (Daneman & Carpenter, 1980), and the Peabody Picture Vocabulary Test (PPVT–R; Dunn & Dunn, 1981). Data were collected from 3 additional participants, but not analyzed: 2 participants displayed excessive eye movement artifacts, and 1 had test scores that suggested a learning disability (77 on PPVT-R and 1.5 on the reading span test, as compared with means of 119 [*SD* = 9.7] and 3.5 [*SD* = 0.93] for the rest of the participants).

3.2 Materials

The experimental materials included 165 triplets like those in Examples 1– 3 above, in which the same word was used literally, metaphorically, or in the literal mapping condition. More triplets are shown in Table 1. Prospective sentence frames were given to at least 80 people from the University of Arizona community in a cloze task. Mean cloze probabilities were equal (3%; range 0% – 88%) across the three conditions, as were sentence lengths (12 words; range 5–19). The triplets were divided into three lists, each consisting of 55 literals, 55 literal mappings, and 55 metaphors, so that while a given participant saw each critical (sentence-final) word in only one of its three possible sentence frames, each word occurred in every condition across participants.

Table 2 Sample sentences and their comprehension questions

Amidst all the trappings of success, his wife was his anchor.
His wife held him back and kept him from enjoying life. (True/False)
Once suffused with hope, the priest had become a broken vessel.
The priest had lost some of his youthful idealism. (True/False)
Tony knew he'd blown it when he mistook his boss's wife for his mistress.
Tony got confused between his own wife and his mistress. (True/False)
He pretended the soup was a narcotic.
He wanted to believe the soup would calm him down and make him feel better. (True/False)
The secret ingredient in her stew is cayenne.
It's the spices that make her stew special. (True/False)
She's tired of his continual grumbling.
She doesn't mind his constant complaining. (True/False)

3.3 Procedure

The sentences were presented one word at a time, for a duration of 200 msec each. The interword interval was length dependent: 100 msec plus an additional 37 msec for each character in the word. Sentence-final words were presented for 200 msec, with a 2,600msec period before the onset of the true/false question. Table 2 includes examples of the comprehension questions. In contrast with the word-by-word presentation of experimental stimuli, comprehension questions were presented in their entirety for free reading. The questions were displayed for 6 sec, and the participants responded true or false via a buttonpress (response hands were counterbalanced across subjects). Accuracy on these questions was encouraged over speed. After each question, there were 2 sec of blank screen before the beginning of the next trial.

After the presentation of experimental stimuli, the participants were asked to perform a pencil-and-paper task of rating each sentence for its metaphoricity. The scale ranged from 1 to 5, where 1 was *very literal,* 2 was *somewhat literal,* 3 was *not sure*, 4 was *somewhat metaphoric,* and 5 was *very metaphoric* . Mean ratings for literal, literal mapping, and metaphor stimuli were 1.4, 1.9, and 4.4, respectively. The metaphor stimuli were thus rated as more metaphoric than were literals [$F(1,17) = 612.0$, $p < .0001$] and literal mappings [$F(1,17) = 451.7$, $p < .0001$]. Literal mappings were rated as more metaphoric than were literals [$F(1,17) = 38.9$, $p < .001$]. The low metaphoricity rating of the literal mappings indicates that they were largely interpreted as literal statements, although they were less likely to be rated as *very literal* than were the literals (55% vs. 74% of items, respectively).

3.4 Electrophysiological recording

The electroencephalogram (EEG) was recorded with tin electrodes mounted in a commercially available elastic cap. Midline frontal (Fz), central (Cz), and parietal (Pz) recording sites were used, along with lateral pairs of electrodes over parietal (P3 and P4) and occipital (O1 and O2) scalp as defined by the 10 –20 system (Jasper, 1958). Three lateral pairs were also used: (1) a frontal pair placed midway between F7– 8 and T3– 4 (approximately over Broca's area and its right hemisphere homologue, BL and BR, respectively), (2) a temporal pair placed 33% lateral to Cz (TL and TR), (3) a temporoparietal pair placed 30% of the interaural distance lateral and 12.5% of the nasion– inion distance posterior to Cz (approximately over Wernicke's area and its right hemisphere homologue, WL and WR, respectively). Each scalp site was referred to the left mastoid on line and later re-referenced to an average of the left and right mastoid sites. The electrodes were also placed under the right eye and at the outer canthi to monitor blinks and eye movements. The EEG was amplified by a Grass Model 12 polygraph with half-amplitude cutoffs of 0.01 and 30 Hz, digitized on line with a sampling rate of 170 Hz and stored on disk for subsequent averaging. Trials with eye movement, muscle, or amplifier blocking artifacts were rejected off line prior to averaging. This resulted in the rejection of an average of 26% of all trials. ERPs were timelocked to the onset of sentence-final words in each of the three conditions.

4 Results

4.1 Comprehension

All participants responded correctly to at least 84% of the comprehension questions, with a mean of 91% correct (*SD* = 4%). A repeated measures analysis of variance (ANOVA) with the factors metaphoricity (three levels) and participants (18) revealed no difference in performance on questions following literal, literal mapping, and metaphoric stimuli ($F < 1$). Sentences followed by incorrect answers were not included in the analyses below.

4.2 Event-related potentials

Figure 1 displays the ERPs elicited by sentence-final words in each of the three conditions. As in other paradigms using visual words, the ERPs were characterized by an N100 at frontal and central scalp sites, a P100 and N180 at occipital sites, and a broadly distributed P2 component. These were followed by an N400 visible at all scalp sites, followed by a late positivity largest at parietal sites. Metaphors elicited larger N400s than did literal sentences, with literal mappings falling between metaphors and literals. Metaphors elicited a larger late positivity than did the other two conditions at posterior (parietal and occipital) scalp sites. At frontal scalp sites (Fz, Bl, Br), the literal mapping condition elicited the largest late positivity. In many previous studies in which sentence stimuli have been used, N400 effects are longer in duration than those observed here, often spanning a latency window of 300–700 msec (e.g., Van Petten, 1993). In the present study, visual inspection of the data (and the statistical analyses below) suggest that at least two distinct components of the ERP were modulated by sentence type and that the N400 and a late positivity (or positivities) overlapped in time. We consider the 300–500-msec latency window to provide a relatively pure measure of N400 amplitude and the later windows to reflect primarily the late positivities. In contrast, the 500 to 700-msec latency range is likely to be the time region with maximal overlap between the earlier N400 and the later positivities, providing no clear measure of either. Indeed, analysis of the 500 to 700-msec time window yielded no significant main effect of sentence condition. Consequently, the data were quantified by measuring mean voltages in two time windows: the first in the peak latency range of the N400 (300 to 500 msec after sentence-final word onset) and a second window of 700–1,100 msec that spans the post N400 positivity.

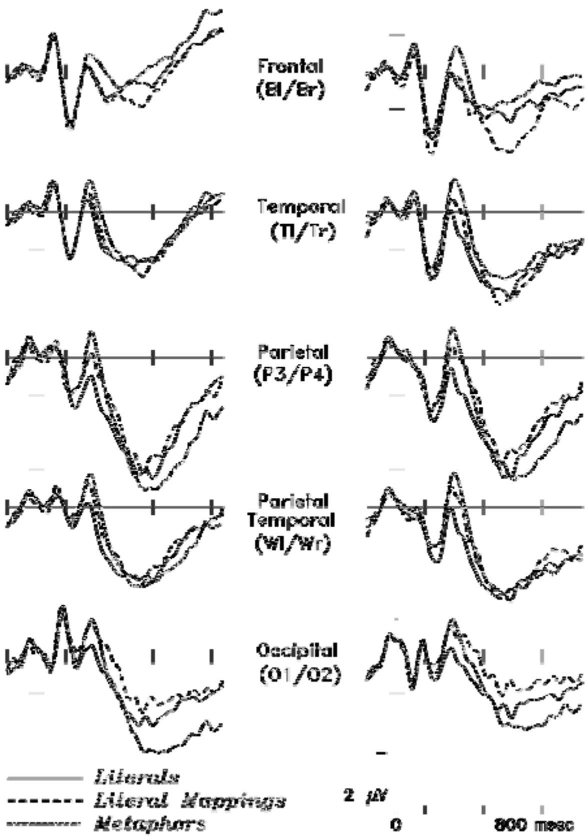

Figure 1 Grand average event-related brain potentials elicited by the sentence-final words, at the lateral scalp sites.

N400. An initial ANOVA of the 300- to 500-msec latency range, with sentence (metaphors vs. literal mappings vs. literals) and scalp site (13 levels) as factors yielded a main effect of sentence [$F(2,34) = 3.90$, $p < .05$, $e = .95$].[1] Simple pairwise comparisons showed that the metaphors elicited significantly larger N400s than did the literal statements [$F(1,17) = 6.86$, $p < .02$]. The literal mapping condition did not differ significantly from either the metaphors [$F(1,17) = 2.03$] or the literal sentences [$F(1,17) = 2.18$]. This pattern of results is not surprising, since the literal mapping sentences were designed to be a bridge between metaphorical and literal sentences. An ANOVA with orthogonal trend analysis was used to assess whether N400 amplitudes followed a gradient across the three conditions. In this analysis, the literal, literal mapping, and metaphor conditions were specified as three ordered points (*literal* = 1, *literal mapping* = 2, *metaphor* = 3), rather than as simply three different points as in the standard ANOVA. The gradient of metaphoricity ratings yielded a significant linear effect on N400 amplitude [F linear $(1,17) = 6.86$, $p < .02$]. The quadratic trend component was not significant ($F < 1$). The trend analysis thus indicates that the gradient of N400 amplitude across the three conditions was robust, although the differences between literal mapping and literal, and between literal mapping and metaphor were small ones. The linear trend across the three sentence types accounted for more than 98% of the total variance due to sentence type. In contrast, a linear trend analysis that stipulated that the literal and literal mapping conditions occupy the same position on a *metaphoricity gradient* (points 1, 1, and 3 for literal, literal mapping, and metaphor, respectively) accounted for much less of the total variance due to sentence type (i.e., only 40%). These analyses indicate that treating the three conditions as a graded continuum provides a better account of the data[2] than does a theory that stipulates a binary cut dividing the two literal conditions from the metaphor condition.

Although the analyses above revealed no interactions between sentence type and scalp site, the spatial distributions of the condition differences were examined in more detail via analyses of the five pairs of lateral scalp sites, taking metaphoricity (3 levels), anterior to posterior location (AP, 5 levels), and laterality (left vs. right) as factors. This ANOVA yielded a main effect of sentence condition [$F(2,34) = 4.47$, $p < .05$, $e = .94$], but no significant interaction between sentence condition and AP [$F(8,136) = 2.09$] and no significant interactions involving hemisphere ($F < 1$).

Late positivities. In contrast to the spatially widespread gradient of N400 amplitude, Figure 1 shows that the late positive difference across conditions had a more restricted scalp distribution: Literal mappings elicited a larger positivity than did the other two conditions at frontal sites, whereas metaphors elicited a larger positivity than did the other two conditions at parietal, parietotemporal, and occipital sites. Differences among the sentence types in frontal and posterior positivities are also shown in Figure 2. An initial analysis of the 700- to 1,100-msec time window with sentence type (3 levels) and scalp site (13 levels) as factors yielded only an interaction of sentence type χ site [$F(24,408) = 10.4$, $p < .001$, $e = .40$], unaccompanied by a main effect of sentence type. A follow-up analysis of the lateral electrode pairs showed that the interaction between condition and site was driven by sentence differences between the front and back of the head, rather than lateralized differences [sentence χ anterior/posterior, $F(8,136) = 16.8$, $p < .001$, $e = .45$; sentence χ hemisphere, $F(2,34) = 1.48$].

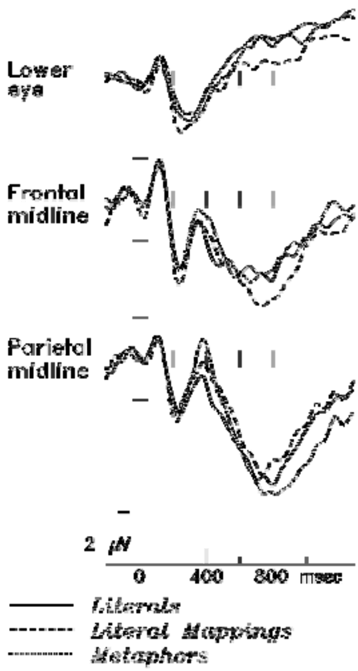

Figure 2 Grand average event-related brain potentials elicited by the sentence-final words, from sites below the left eye, frontal midline (Fz), and parietal midline (Pz).

Significant interactions between sentence type and scalp site afford two general sorts of interpretations. On the one hand, such interactions might reflect an amplitude modulation of an ERP component that is present in all experimental conditions and that is always larger at some scalp sites than at others. For instance, doubling the strength of a single hypothetical cortical 'source' will similarly produce multiplicative changes in amplitude across scalp locations – numerically large changes at sites with large initial amplitudes and smaller changes at sites with small initial amplitudes. Because the ANOVA uses an additive rather than a multiplicative model, such changes in amplitude might yield condition χ site interactions, although the spatial distribution of the component is identical across conditions (McCarthy & Wood, 1985). On the other hand, true changes in scalp distribution across conditions might also be indexed by condition χ site interactions, and it is of some interest to detect such changes because they reflect the activity of different populations of neurons across conditions. In order to discriminate between these two interpretations, we used a normalization procedure that eliminates overall amplitude differences between conditions (McCarthy & Wood, 1985). After normalization, significant condition χ site interactions would indicate genuine differences in the scalp distribution of ERPs elicited by different conditions. Pairwise comparison of normalized measures from the literal and metaphor conditions yielded no such significant interaction [sentence χ anterior/posterior, $F(4,68) = 2.03$]. This result suggests that the posterior positivity elicited by metaphors is merely an amplitude enhancement of the posterior positive component present for all three sentence types.

In contrast, comparisons of the literal mapping condition and each of the other two sentence types did yield significant interactions between sentence type and the anterior/posterior factor after normalization [literal mapping vs. literal, $F(4,68) = 6.10$, $p < .01$, $e = .46$; literal mapping vs. metaphor, $F(4,68) = 16.9$, $p < .001$, $e = .44$]. The latter results indicate that the large frontal positivity was distinctive of the literal mapping condition. Figure 1 suggests that the frontal positivity was slightly larger over the right than the left, reflected in a three-way interaction of the factors of sentence type, anterior/posterior, and hemisphere in the comparison of literal mapping with literal sentences [$F(4,68) = 3.24$, $p < .05$, $e = .58$], although not in the comparison of literal mappings with metaphors.

Figure 2 suggests that the posterior positivity was not only largest for metaphors, but also of slightly longer latency. Across the posterior sites (Pz, P3, P4, Wl, Wr, O1, O2), the positive component reached peak amplitude at 804 msec ($SE = 9$) for literal sentences, 819 msec ($SE = 10$) for literal mappings, and 845 msec ($SE = 10$) for metaphors [$F(2,34) = 3.41$, $p < .05$, $e = .95$]. Pairwise comparisons showed that the latency shift between literal and metaphor sentences was significant [$F(1,17) = 5.62$, $p < .05$], whereas the literal mapping condition did not differ significantly from either of the other two conditions (much like the results for the N400 amplitude described above). An ANOVA with orthogonal trend analysis showed that the gradient of peak latency across the three sentence conditions was linear with respect to the mean metaphoricity ratings offered by the participants [$F_{linear}(1,17) = 4.73$, $p < .05$].

5 Discussion

The results confirmed our central prediction of graded N400 amplitude across sentence-final words used literally, metaphorically, and in the intermediate literal mapping condition. Because N400 amplitude has generally been correlated with factors suspected to increase semantic processing difficulty (i.e., weak or absent semantic context, presence of low-frequency words), we interpret this finding as indicating a gradient of difficulty in sentence comprehension across the three conditions. The N400 amplitude difference between literal and metaphoric sentences replicates that reported by Pynte et al. (1996). As in that study, the N400 difference between literals and metaphors observed here was rather small. The absolute magnitude of the literal/metaphor difference is most comparable with that previously observed in comparisons of sentence-final words with a cloze probability discrepancy of some 20%, or between high- and low-frequency words in the absence of semantic context (Kutas & Hillyard, 1984; Van Petten, 1993). But given that the literal/metaphor difference cannot be attributed to either cloze probability or word frequency, we conclude that it was more difficult for readers to process the metaphors. Also, as in Pynte et al.'s (1996) study, the N400 elicited by metaphoric and literal words was not differentially lateralized, despite reports that right hemisphere damage specifically impairs the comprehension of nonliteral language (Brownell et al., 1990).[3]

The novel finding here was the identification of a sentence type that behaved midway between frankly metaphorical and transparently literal. The gradient of N400 amplitude is consistent with the continuity claim that literal and metaphoric language share some processing mechanisms, but inconsistent with the equivalence claim that comprehension of metaphoric language is no more effortful than literal language.[4] These findings, then, raise the question of the nature of the processing difficulty. Namely, what made both the metaphoric and literal mapping sentences more 'difficult' so that they yielded enhanced N400s? One prominent psycholinguistic model of metaphor comprehension – Glucksberg's *property attribution model* – has little to say on this point. In that model, metaphors are read as statements of class inclusion, so that the *shark* in *My lawyer is a shark*, refers to a class of predatory creatures that also includes the speaker's lawyer. The source domain in this model is an abstract superordinate category that has not yet been lexicalized (e.g., *things that are vicious and aggressive*), and successful metaphor comprehension consists of attributing the properties of this category to the target term (Glucksberg, 1998; Glucksberg & Keysar, 1990). The sentences in all three of the conditions used here can be read as class inclusion statements of the sort described by Glucksberg. Even for the literal sentences, the 'source' terms were rarely lexicalized categories (e.g., *furniture* or *animals*), but were more often complex propositions such as *a major export of Canada* or *the last thing one needs when working all night* (see Table 1). By itself, a definition of metaphor as a class inclusion statement does not explain the gradation of difficulty indexed by the graded amplitude of the N400 across literal, literal mapping, and metaphoric sentences.

As noted above, blending theory suggests that metaphor taxes the comprehension system because it involves (1) the establishment of mappings between elements in distantly related domains, and (2) the retrieval of information from memory to integrate these elements. Consequently, we attribute the enhanced N400 in both the literal mapping and metaphor conditions to the fact that they both include an invitation to discover the similarity between two entities and that the similarity is only partial. We suggest that initial semantic conflicts between source and target domains are responsible for the larger N400s in both the metaphor and literal mapping conditions. The differential N400 across conditions might thus arise during an early stage of comparison between source and target terms that might correspond to *alignment* in Gentner and colleagues' model or to *mapping* in conceptual blending theory (Coulson, 2000; Gentner & Wolff, 1997; Wolff & Gentner, 2000). In addition to larger N400s, metaphors also elicited a larger and later positivity at posterior scalp sites than did either literal or literal mapping sentences, which did not differ from each other.[5] Although the latency of this positive peak was a graded function of figurativity (shortest for literals, longest for metaphors, with literal mappings falling in between), the amplitude of this positive peak was specifically sensitive to metaphors. This finding is consistent with the continuity claim, since the literal condition elicited a positivity with the same distribution across the scalp, only smaller in amplitude and earlier in peak latency.

Moreover, literal sentence-final words have occasionally been observed to elicit a positive peak after the N400 in previous ERP studies. Little has been written about the psychological factors affecting this sentence-ending positivity, although its intermittent presence suggests that it is dissociable from the N400 and reflects different cognitive operations.

In published studies, the only factor that has reliably influenced the amplitude of the sentence-ending positivity is word frequency. With weak semantic support, low-frequency words simply elicit larger N400s than do high-frequency words (Van

Petten, 1993). But when they serve as semantically predictable sentence completions, low-frequency words elicit a larger posterior positivity than do highfrequency words. Van Petten, Kutas, Kluender, Mitchiner, and McIsaac (1991) have suggested that the word-frequency effect for the sentence-ending positivity reflects a difference in the lexical semantics of high- and low-frequency words, specifically that the more detailed and precise meanings of low-frequency words (Zipf, 1945) mandate more extensive retrieval of information from semantic memory in the course of arriving at a sentence-level interpretation.

The sensitivity of the posterior positivity to word frequency suggests a possible interpretation for the positivity observed here for metaphoric sentence completions. Although the metaphoric and literal endings were identical in orthographic form, their comprehension required retrieval of different aspects of conceptual structure. Given that the metaphors were relatively novel, the relevant concepts were unlikely to have been strongly associated with the orthographic form of the word, but instead required the recovery and integration of additional material from semantic memory,[6] including conceptual metaphors of the sort described by Lakoff (1993). A search for such information might be triggered by the initial semantic mismatches indexed by the N400; successful retrieval of the relevant conceptual metaphor (indexed by the posterior positivity) would then provide the necessary bridge between the distantly related source and target terms and allow the appropriate blended concepts to be constructed.

Notes

1 Huyhn-Feldt correction for nonsphericity of variance. For all *F* values with more than one degree of freedom in the numerator, we report the original degrees of freedom, the corrected probability level, and the epsilon correction factor.

2 The mean metaphoricity ratings offered by the participants (1.4 for literals, 1.9 for literal mappings, and 4.4 for metaphors) were also used to specify the ordering of the three conditions in a trend analysis. This analysis also yielded a significant linear trend [$F_{linear}(1,17) = 7.31$, $p < .02$], although it did not capture as much of the total variance due to sentence type (79%) as did the simple 1–2–3 spacing reported in the text.

3 Note, however, that we did not observe the right-greater-than-left asymmetry typically associated with the N400. We attribute the symmetric topography of these ERPs to the fact that our participants included 5 people with familial sinistrality, a group known for its laterally symmetric N400s (Kutas, Van Petten, & Besson, 1988), as well as 5 lefthanders. Although the impact of handedness on ERPs to figurative language is an interesting topic in its own right (Coulson, Van Petten, & Folstein, 2000), handedness of the participants is orthogonal to the within-subjects comparisons that are the focus of the present study.

4 We examined a potential confound for interpreting the gradient of N400 amplitudes across conditions. Although cloze probability was matched across the three conditions, the use of different sentence contexts for identical targets raises the possibility that some sentences included more intermediate words that were lexically associated with the critical final words than others. We searched a large database of free associations

(Edinburgh Associative Thesaurus; Kiss, Armstrong, Milroy, & Piper, 1973), which included 93 of the 165 critical target words as responses to cue words. The number of cue (associated) words appearing in the experimental sentences was 16 for the literal, 21 for the literal mapping, and 16 for the metaphor condition, with associative strengths of .11, .03, and .09, respectively. These observations are not consistent with the gradient of N400 amplitudes. Because associative priming effects in sentences are short lived and rapidly attenuated by intervening words (Foss, 1982; Simpson, Peterson, Casteel, & Burgess, 1989; Van Petten, Weckerly, McIsaac, & Kutas, 1997), we also examined a three-word window immediately preceding the critical sentence-final words. In this window, only 15 of the 279 experimental sentences examined included associates of the final words: seven associates with mean strength of .08 for literal, five associates with strength of .08 for literal mapping, and three associates with strength of .11 for metaphors. The small numbers and weak associative strengths between intermediate and final words suggest that this factor had little impact on the observed N400 gradient.

5 In a similar comparison between cloze-matched literal and metaphorical sentences, Pynte et al. (1996, Experiment 1) did not observe a reliably larger late positivity for metaphors. In another experiment in which unfamiliar metaphors with supporting context were used, Pynte et al. did observe a larger late positivity, but the control condition consisted of familiar metaphors with irrelevant context, so that it is difficult to directly compare these results with the present ones.

6 Although the metaphoric and literal sentences proved to differ only quantitatively, the results included one striking qualitative difference among sentence types. The literal mapping sentences were designed to be an intermediate condition (and behaved accordingly in N400 amplitude), but elicited a large frontal positivity distinct from both the literal and metaphor conditions. The frontal positive peak elicited by literal mappings does not resemble any phenomenon in the sentence processing literature to our knowledge, so this finding requires replication and extension. It is worth noting, however, that a substantial proportion (74%) of the literal mapping sentences describe situations of pretense, lying, and mistaken identification, so their comprehension depends on understanding the mental states of actors. One speculation is that the unusual frontal positivity elicited by literal mappings is related to the observation that narratives placing heavy demands on *theory of mind* elicit greater blood flow in prefrontal cortex than do narratives that do not (Fletcher, Happe, Frith, & Baker, 1995).

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Section III Introduction

Prototypes, polysemy and word-meaning

Vyvyan Evans

This section of the book is concerned with cognitive linguistic approaches to the nature, structure and organisation of word-meaning. This general perspective is known as 'cognitive lexical semantics'. There are two major, and inter-related, research concerns which have dominated research in cognitive lexical semantics, and which are exemplified by the articles which follow.

The first is concerned with employing insights from non-linguistic aspects of general cognitive function in order to model lexical structure. In other words, work in cognitive lexical semantics, informed by the Cognitive commitment described by Evans, Bergen and Zinken (this volume), seeks to treat the nature of lexical structure as reflecting other aspects of mental function. One of the most important ways in which this perspective has been pursued is by applying empirical findings from relatively recent research on human categorisation to lexical organisation.

The empirical research of Eleanor Rosch in the 1970s (e.g., 1975, 1977; Rosch & Mervis, 1975) revealed that human categorisation is graded rather than criterial in nature. That is, categories are associated with goodness-of-example judgements in an inter-subjectively robust way. Rosch stated this finding in terms of the notion of a 'prototype', arguing that categories appear to be structured with respect to prototypes, which serve as conceptual reference points for categorisation judgements. Since the work of Rosch, Prototype Theory has been extensively criticised (see Laurence & Margolis 1999 for a review; and Evans & Green 2006: Chapter 8). Nevertheless, Rosch's research has been highly influential, not least because the findings with respect to so-called (proto)typicality effects still stand, notwithstanding the inadequacies of Prototype Theory.

The notions 'prototype' and 'typicality effect' were first introduced into linguistics by Fillmore (1975) and later by Lakoff (e.g., 1982), and Geeraerts (e.g., 1983). The application of the notions to cognitive lexical semantics has been most heavily influenced by the work of Lakoff. One of the most influential aspects of his work relates to so-called 'radial categories'. These constitute categories which, while related ultimately to a prototype, exhibit 'chaining'–the phenomenon whereby category members exhibit differential instance and similarity relations and links to other members of the category, resulting in distinctions in terms of more or less central and peripheral members of a given category (see Lakoff, 1987). That is, within a radial category, constituent members are related to one another by convention and by degree. Radial categories thus exhibit family resemblance relations. Lakoff applied his notion of radial categories to lexical categories, particularly in modelling the extensive polysemy associated with lexical items.

Polysemy is the phenomenon whereby a single lexical form, for instance, the English preposition *over*, exhibits a range of distinct but related semantic units or 'senses', as exemplified by the following:

(1) a. The picture is over the sofa [ABOVE]
b. The clouds are over the sun [COVERING]
c. She has a strange power over me [CONTROL] etc.

While traditional accounts in lexical semantics have attempted to model polysemy as a superficial or 'surface' manifestation of a single more abstract lexical entry, Lakoff argued that lexical polysemy reflects distinctions in the way in which the conceptual system is organised and structured. That is, polysemous word senses can be modelled in terms of radial categories, which exhibit typicality effects. The consequence of this perspective is that cognitive lexical semantics treats words as constituting conceptual categories of senses. On this view, polysemy is a manifestation of underlying conceptual distinctions, rather than being a superficial symptom of, for instance, contextual processes operating on abstract underlying representations.

Several papers in this section of the Reader relate to this major perspective. For instance, the first paper in this section, by Lakoff, lays out his theory of cognitive models, and their idealised character, a response to Rosch's work on categorisation. This paper includes brief applications of the notion of radial categories to the Japanese lexical item *hon* and the English preposition *over*. The next two papers, by Geeraerts, and Tyler & Evans, apply the findings from Rosch's research to two distinct, albeit related, issues in lexical semantics. Geeraerts is concerned with employing the notion of prototypes to understand the diachronic development of two near-synonyms in Dutch: *vernielen* and *vernietigen*. Tyler & Evans specifically address the issue of polysemy, and offer a novel theory of lexical representation termed Principled Polysemy which attempts to account for some of the perceived shortcomings in earlier work on polysemy employing the construct of radial categories.

The second major research concern in cognitive lexical semantics, and on display here, has been to take what has become known as an encyclopaedic approach to word-meaning (see Evans & Green, 2006, Chapter 7, for a review). This view holds that words, rather than being definitional in nature, the so-called dictionary view of word meaning (see Haiman, 1980, and Langacker, 1987), are merely 'points of access' to large scale conceptual knowledge structures (Langacker, 1987). In other words, and in contrast to the received view, words do not 'carry' simple definitional meanings. Rather, the 'meaning' of any given word can only be understood in terms of the complex background knowledge structure(s) with respect to which it is relativised. This perspective is exemplified by several of the papers in this section, but most clearly focused on in the paper by Fillmore, who argues for the construct of the 'semantic frame' with respect to which word meaning is relativised. In other words, word-meaning cannot be separated from the larger-scale semantic frame with respect to which a given word is understood.

We now briefly consider each of the papers, and examine how they relate to these two major concerns. The first paper, by George Lakoff, summarises his seminal work on categorisation and the theory of Idealised Cognitive Models (ICMs) which he proposed. Lakoff argues that mental representation ('cognitive models') has an idealised character. The nature and interaction of various idealised cognitive models gives rise to typicality effects of varying kinds, accounting for the findings reported by Rosch. Particularly important for the development of cognitive lexical semantics is his discussion of radial categories, as noted. In particular, one important reason for modelling the cognitive underpinnings of typicality effects relates to the arena of word-meaning. Lakoff (1987; see also Brugman & Lakoff, 1988) argued that words constitute categories of senses which exhibit prototypicality in the same way, in principle, as non-linguistic categories.

The notion of prototypicality is taken up by Geeraerts in his paper which is representative of his important work on diachronic aspects of lexical semantic change (Geeraerts, 1994). Geeraerts examines the case of two Dutch words *vernielen* and *vernietigen*. While etymologically distinct, *vernielen* originally related to material destruction and *vernietigen* to abstract destruction. By the 19th century their usage had evolved so that they had the same range of application. Geeraerts employs the notion of prototypes in order to study these two verbs so as to establish whether they really are synonyms. After all, research in lexical semantics reveals that true synonyms are scarce, if they exist at all. Geeraerts argues, on the basis of usage-based and introspective findings, that the prototype structure associated with the two verbs is distinct. That is, the conceptual core of each verb is distinct, and thus, the two verbs are near rather than absolute synonyms. Geeraerts' paper is important for a number of reasons. Not only does he apply the notion of prototypes to diachronic cognitive lexical semantics, his paper also sheds light on ways of determining prototype structure for linguistic categories.

One of the difficulties emanating from the tradition inspired by Lakoff was that some of the specific semantics networks proposed appeared to be methodologically unconstrained. Indeed, this was particularly true of Lakoff's so-called 'full-specification' model of *over* (for critiques see Deane, 2005; Kreitzer, 1997; Vandeloise, 1990; Sandra & Rice, 1995; Sandra, 1998; Tyler & Evans, 2003). In response, Evans and Tyler (2004a, 2004b, Tyler & Evans, 2001/this volume, 2003) developed their model of Principled Polysemy. The third paper in this section presents their reanalysis of the English preposition *over*, employing the Principled Polysemy network. This model attempts to provide a methodologically constrained, which is to say principled, account of the semantics associated with *over*. The importance of the contribution by Tyler and Evans is that this paper represents the first serious and detailed attempt to provide a methodologically or principled basis for capturing and describing lexical polysemy. Indeed, Tyler and Evans provide detailed criteria for determining the prototypical sense in a semantic network and for distinguishing between distinct senses. Their Principled Polysemy model has become one of the most influential current models of polysemy within cognitive lexical semantics.

The final paper, by Fillmore, is less concerned with the polysemy of lexical categories. Rather, Fillmore in his paper entitled *Frame Semantics* is primarily exercised by the need to account for and model the conceptual knowledge that lexical items provide access to, or, in Fillmore's termed are relativised to. He presents these knowledge structures in terms of the important and influential theoretical construct of a semantic frame. For Fillmore a semantic frame constitutes a schematisation of experience (a knowledge structure), represented at the conceptual level and held in long-term memory, which relates elements and entities associated with a particular culturally-embedded scene from human experience. Most crucially of all, words, and grammatical constructions, are relativised to frames such that the 'meaning' associated with a particular word (or grammatical construction) cannot be understood apart from the frame with which it is associated. In his paper, Fillmore presents an overview of his theory of Frame Semantics. This approach takes an encyclopaedic approach to word-meaning by viewing linguistic units such as words as providing a means of accessing more complex conceptual knowledge structures. More recent developments in Frame Semantics include Fillmore (1985), and Fillmore and Atkins (1992, 2002).

In sum, the papers in this section relate, in broad terms, to cognitive lexical semantics–the cognitive linguistic approach to word-meaning. This general approach has been characterised by a concern for applying insights from research on non-linguistic aspects of general cognition, particularly categorisation, to the study of lexical categories such as words. A second and equally important perspective has been the attempt to model the encyclopaedic nature of word-meaning. Frame Semantics constitutes one such influential approach which represents an 'encyclopaedic' theory of lexical semantics.

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Press Final 27 July 2007

6 Cognitive models and prototype theory

George Lakoff

My purpose in this paper is to point out what I think is a deep misunderstanding of the nature of prototype theory. In well-replicated experiments, Eleanor Rosch and her coworkers have demonstrated the existence of *prototype effects:* scalar goodness-of-example judgments for categories. Thus, for a category like *bird,* subjects will consistently rate some kinds of birds as better examples than others. The best examples are referred to as *prototypes.* Such effects are superficial. They show nothing *direct* about the nature of categorization. As Rosch (1978) has observed,

> The pervasiveness of prototypes in real-world categories and of prototypicality as a variable indicates that prototypes must have some place in psychological theories of representation, processing, and learning. However, prototypes themselves do not constitute any particular model of processes, representations, or learning. This point is so often misunderstood that **it** requires discussion. . . to speak of a *prototype* at all is simply a convenient grammatical fiction; what is really referred to are judgments of degree of prototypicality.. . . Prototypes do not constitute a theory of representation for categories.

Despite Rosch's admonitions to the contrary, prototype effects have often been interpreted as showing something *direct* about the nature of human categorization. There are two common interpretations of prototype effects:

> *The Effects = Structure Interpretation:* Goodness-of-example ratings are a direct reflection of degree of category membership.

According to the Effects = Structure interpretation, scalar goodness-of-example ratings occur if and only if category membership is not all-or-none, but a matter of degree. The Effects = Structure interpretation thus makes a claim that Rosch has explicitly denied – that category membership is scalar whenever goodness-of-example ratings are scalar.

> *The Prototype = Representation Interpretation:* Categories are represented in the mind in terms of prototypes (that is, best examples). Degrees of category membership for other entities are determined by their degree of similarity to the prototype.

There are at least two variations on the Prototype = Representation interpretation: one in which the prototype is an abstraction, say a schema or a feature bundle, and another in which the prototype is an exemplar, that is, a particular example.

Despite the fact that Rosch has specifically disavowed both of these interpretations, and despite the fact that they are incompatible with much of what is known about prototype effects, they have remained popular. In fact, a whole school of research has developed within cognitive psychology that takes these interpretations as defining prototype theory. Smith and Medin (1981) is a survey of research based on these interpretations.

The purpose of this chapter is to suggest a different interpretation of prototype effects: Prototype effects result from the fact that knowledge is organized in terms of what I will call *cognitive models.* There are various kinds of cognitive models, and hence prototype effects come from a variety of sources.

1 Interactional properties

Before we proceed, there is one more common misconception about prototype theory that ought to be cleared up. In her early work, Rosch claimed that prototypes could be characterized by clusters of real-world attributes. She later recanted (Rosch 1978:29, 4 1 – 42):

> When research on basic objects and their prototypes was initially conceived (Rosch et al. 1976), I thought of such attributes as inherent in the real world. On contemplation of the nature of many of our attributes listed by our subjects, however, it appeared that three types of attributes presented a problem for such a realistic view. (1) some attributes, such as 'seat,' for the object 'chair,' appear to have names which showed them not to be meaningful prior to the knowledge of the object as chair; (2) some attributes, such as 'large' for the object 'piano' seem to have meaning only in relation to categorization of the object in terms of a superordinate category – piano is large for furniture, but small for other kinds of objects such as buildings; (3) some attributes, such as 'you eat on it' for the object 'table' were functional attributes that seemed to require knowledge about humans, their activities, and the real world in order to be understood.

As I have argued elsewhere (Lakoff 1987), the properties that are relevant for the characterization of human categories are not objectively existing properties that are 'out there' in the world. Rather they are 'interactional properties,' what *we* understand as properties by virtue of our interactive functioning in our environment. The properties mentioned in cognitive models are properties of this sort, not objectively existing properties of objects completely external to human beings.

This view is in keeping with results on basic-level categorization. The determinants of basic-level categorization are all interactional in this respect: perception of overall shape, motor movements relative to objects, mental images. Each of these is a matter of interaction between people and objects. They are neither wholly objective nor wholly subjective.

With this in mind, we can turn to the role of cognitive models in prototype theory.

2 Cognitive models

The study of cognitive models of a certain sort has been fashionable in cognitive science for some years now. Rumelhart's 'schemas,' Minsky's 'frames,' and Schank and Abelson's 'scripts' are tools for representing knowledge that are used by a wide range of cognitive scientists. To my knowledge, all of these developed out of Fillmore's earlier concept of a 'case frame,' which has been superseded by his frame semantics. Cognitive models of this sort are all roughly equivalent and I will refer to them as *propositional models*. Four other types of cognitive models are now being investigated within cognitive linguistics. These are: image-schematic, metaphoric, metonymic, and symbolic models (for detailed discussion, see Lakoff 1987). Cognitive models in general are used to structure and make sense of our experience, and each element in such a model can correspond to a category of mind.

3 Graded models

A cognitive model characterizing a concept may be either graded or ungraded. A concept such as *rich* is characterized in part by a scale with gradations; individuals are rich to some degree, and not all individuals are clearly rich or not rich. This is the sort of category described by Zadeh (1965), and fuzzy-set theory has been set up to deal with such graded categories. I find them relatively uninteresting and will not discuss them any further. Prototype effects of the sort discovered by Rosch can occur in the case of such graded categories. They can also occur in a wide variety of other cases, and it is those cases that I will primarily be addressing.

4 The idealized character of cognitive models

Fillmore has observed that prototype effects can occur even when a cognitive model fits the classical definition of a category – that is, when the model is defined as having clear boundaries and necessary and sufficient conditions. Such prototype effects arise because cognitive models are *idealized* – that is, they may be defined relative to idealized circumstances rather than circumstances as they are known to exist. Fillmore (1982a) gives the example of the concept *bachelor:*

The noun *bachelor* can be defined as an unmarried adult man, but the noun clearly exists as a motivated device for categorizing people only in the context of a human society in which certain expectations about marriage and marriageable age obtain.

Male participants in long-term unmarried couplings would not ordinarily be described as bachelors; a boy abandoned in the jungle and grown to maturity away from contact with human society would not be called a bachelor: John Paul II is not properly thought of as a bachelor.

As a result of the background conditions with respect to which a bachelor is defined, certain fuzzy cases arise: homosexuals, Moslems who are permitted four wives but only have three, and so on. The fuzziness is not due to any gradience in the model of the concept *bachelor.* It is instead due to the inexactness of fit between the background conditions of that model and other knowledge that we have about the world. Thus, we can find cases where an individual might appropriately be described as 'sort of a bachelor,' 'a bachelor to a degree.' These are prototype effects, but they are not due to any graded category. In such cases, even classically defined models may give rise to prototype effects.

The moral is clear: Prototype effects are real, but superficial. They may arise from a variety of sources. It is important not to confuse prototype effects with the structure of the category as given by cognitive models.

5 Cognitive models versus feature bundles

One of the most common versions of the P = R interpretation is the theory of weighted feature bundles. According to this theory, the prototype can be represented by a collection of features with associated weights indicating their importance. An example of such an analysis of prototype effects is the classic study by Coleman and Kay (1981), of the use of the verb *lie.* Coleman and Kay found that their informants did not appear to have necessary-and-sufficient conditions for characterizing the meaning of *lie.* Instead they found a cluster of three conditions, not one of which was necessary, and which varied in relative importance:

> a consistent pattern was found: falsity of belief is the most important element of the prototype of *lie,* intended deception the next most important element, and factual falsity is the least important. Information fairly easily and reliably assigned the word *lie* to reported speech acts in a more-or-less, rather than all-or-none, fashion, ... [and]...informants agree fairly generally on the relative weights of the elements in the semantic prototype of *lie.*

Thus, there is agreement that if you, say, steal something and then say you didn't, that's a good example of a lie. A less representative example of a lie is when you compliment a hostess when you hated her dinner, or if you say something true but irrelevant, like 'I'm going to the candy store, Ma,' when you're really going to the poolhall but will be stopping by the candy store on the way.

An important anomaly, however, turned up in the Coleman-Kay study. When informants were asked to define a lie, they consistently said it was a false statement, even though actual falsity turned out consistently to be the least important element by far in the cluster of conditions. Sweetser (1986) provides an important argument against the feature-bundles model and in favor of a cognitive-models account of lying. What she shows is that there are independently needed cognitive models of communication and belief that are used in understanding what a lie is. Sweetser shows that these cognitive models automatically predict the weightings found in the Coleman-Kay study and, moreover, permit one to define a lie as a false statement relative to these models, and still get the correct results. For details, see Sweetser (1984, 1986) or Lakoff (1987). Sweetser's study shows that it is the structure of the cognitive models that permits an adequate explanation of the Coleman-Kay findings, and that weighted feature bundles do not even constitute an adequate description, much less an explanation. As we will see below, feature bundles cannot account for most of the prototype phenomena discussed by cognitive linguists.

6 Mother

Some categories are characterized by *clusters* of cognitive models. There is an all-important difference between clusters of models and clusters of features: models have an internal structure that features do not have. An example of a concept characterized by a cognitive model cluster is the concept *mother.* According to the classical theory of categorization, it should be possible to give clear necessary-and-sufficient conditions for *mother* that will fit all the cases and apply equally to all of them. Such a definition might be something like: *a woman who has given birth to a child.* But as we will see, no such definition will cover the full range of cases. *Mother* is a concept that is based on a complex model in which a number of individual cognitive models converge, forming an experiential cluster. The models in the cluster are as follows.

> The birth model: the person giving birth is the *mother.*

The birth model is usually accompanied by a genetic model, although, since the development of egg and embryo implants, they do not always coincide.

> The genetic model: the female who contributed the genetic material is the *mother.*
>
> The nurturance model: the female adult who nurtures and raises a child is the *mother* of that child.
>
> The marital model: the wife of the father is the *mother.*
>
> The genealogical model: the closest female ancestor is the *mother.*

The concept mother normally involves a complex model in which all of these individual models converge to form a cluster. There have always been divergences from this cluster;

stepmothers have been around for a long time. But because of the complexities of modern life, the models in the cluster have come to diverge more and more. Still, many people feel the pressure to pick one model as being the right one, the one that 'really' defines what a mother is. But, although one might try to argue that only one of these characterizes the 'real' concept of mother, the linguistic evidence does not bear this out. As the following sentences indicate, there is more than one criterion for 'real' motherhood:

> I was adopted and I don't know who my real mother is.
>
> I am not a nurturant person, so I don't think I could ever be a real mother to any child.
>
> My real mother died when I was an embryo, and I was frozen and later implanted in the womb of the woman who gave birth to me.
>
> I had a genetic mother who contributed the egg that was planted in the womb of my real mother, who gave birth to me and raised me.
>
> By genetic engineering, the genes in the egg my father's sperm fertilized were spliced together from genes in the eggs of twenty different women. I wouldn't call any of them my real mother. My real mother is the woman who bore and raised me, even though I don't have any single genetic mother.

In short, more than one of these models contributes to the characterization of a *real mother,* and any one of them may be absent from such a characterization. Still, the very idea that there is such a thing as a *real mother* seems to require a choice among models where they diverge. It would be bizarre for someone to say:

> I have four real mothers: the woman who contributed my genes, the woman who gave birth to me, the woman who raised me, and my father's current wife.

When the cluster of models that jointly characterize a concept diverge, there is still a strong pull to view one as the most important. This is reflected in the institution of dictionaries. Each dictionary, by historical convention, must list a primary meaning when a word has more than one. Not surprisingly, the human beings who write dictionaries vary in their choices. Dr. Johnson chose the birth model as primary, and many of the applied linguists who work for the publishers of dictionaries, as is so often the case, have simply played it safe and copied him. But not all. Funk and Wagnall's *Standard Dictionary* chose the nurturance model as primary, while the *American College Dictionary* chose the genealogical model. Though choices made by dictionary-makers are of no scientific importance, they do reflect the fact that, even among people who construct definitions for a living, there is no single, generally accepted cognitive model for such a common concept as 'mother.'

When the situation is such that the models for *mother* do not pick out a single individual, we get compound expressions like *stepmother, surrogate mother, adoptive mother, foster mother, biological mother, donor mother,* and so on. Such compounds, of course, do not represent simple subcategories, that is, kinds of ordinary mothers. Rather, they describe cases where there is a lack of convergence of the various models.

Not surprisingly, different models are used as the basis of different extended senses of *mother.* For example, the birth model is the basis of the metaphorical sense in

Necessity is the mother of invention.

whereas the nurturance model is the basis for the derived verb in *He wants his girlfriend to mother him*.

The genealogical model is the basis for the metaphorical extension of *mother* and *daughter* used in the description of the tree diagrams that linguists use to describe sentence structure. If node A is immediately above node B in a tree, A is called the *mother* and B, the *daughter.* Even in the case of metaphorical extensions, there is no single privileged model for *mother* on which the extensions are based. This accords with the evidence cited above, which indicates that the concept *mother* is defined by a cluster of converging models.

This phenomenon is beyond the scope of the classical theory. The concept *mother* is not clearly defined, once and for all, in terms of common necessary-and-sufficient conditions. There need be no necessary-and-sufficient conditions for motherhood shared by normal biological mothers, donor mothers (who donate an egg), surrogate mothers (who bear the child, but may not have donated the egg), adoptive mothers, unwed mothers who give their children up for adoption, and stepmothers. They are all mothers by virtue of their relation to the ideal case, where the models converge. That ideal case is one of the many kinds of cases that give rise to prototype effects.

So far we have seen three sources of prototype effects: models with a graded scale (e.g., *rich),* classical models with background conditions (e.g., *bachelor),* and cluster models (e.g., *mother).* But there are two other types of sources of prototype effects that are even more interesting: metonymic models and radial categories. Let us begin with metonymic models.

7 Metonymic models

Metonymy is one of the basic characteristics of cognition. It is extremely common for people to take one well-understood or easy-to-perceive aspect of something and use it to stand either for the thing as a whole, or for some other aspect or part of it. The best-known cases are those like the following:

One waitress says to another: The ham sandwich just spilled beer all over himself.

Here *the ham sandwich* is standing for the person eating the sandwich. Another well-known example is the slogan:

Don't let El Salvador become another Vietnam.

Here the place is standing for the events that occurred at that place. As Lakoff and Johnson (1980) showed, such examples are instances of general patterns; they do not just occur one-by-one. We will refer to such patterns as *metonymic models.*

A particularly interesting case of metonymy occurs in giving answers to questions. It is common to give an answer that evokes the information requested, and there seem to be language-particular metonymic models used to do so. Take, for example, the case described by Rhodes (1976). Rhodes is a linguist who does field work on Ojibwa, a Native American language of central Canada. As part of his field work, he asked speakers of Ojibwa who had come to a party how they got there. He got answers like the following (translated into English):

I started to come.

I stepped into a canoe.

I got into a car.

He figured out what was going on when he read Schank and Abelson's *Scripts, Plans, Goals, and Understanding*. Going somewhere in a vehicle involves a structured scenario (or in our terms, an Idealized Cognitive Model, or ICM):

Precondition:	You have (or have access to) the vehicle.
Embarcation:	You get into the vehicle and start it up.
Center:	You drive (row, fly, etc.) to your destination,
Finish:	You park and get out.
End Point:	You are at your destination.

What Rhodes found was that in Ojibwa it is conventional to use the embarcation point of an ICM of this sort to evoke the whole ICM. That is, in answering questions, part of an ICM is used to stand for the whole. In Ojibwa, that part is the embarcation point.

Ojibwa does not look particularly strange when one considers English from the same point of view. What are possible normal answers to a question such as 'How did you get to the party?'

I drove. (Center stands for whole ICM)

I have a car. (Precondition stands for whole ICM)

I borrowed my brother's car. (This entails the Precondition, which in turn stands for the whole ICM)

English even has special cases that look something like Ojibwa.

I hopped on a bus. (Embarcation stands for whole ICM)

I just stuck out my thumb. (Embarcation stands for whole ICM)

In short, English can use the Embarcation metonymically to stand for the whole ICM, just in case there is no further effort involved, as in taking a bus or hitchhiking.

There are many metonymic models in a rich conceptual system, and they are used for a wide variety of purposes. The kind of most interest for our present purposes are those in which a member or subcategory can stand metonymically for the whole category for the purpose of making inferences or judgments.

8 Metonymic sources of prototype effects

As Rosch observed, prototype effects are surface phenomena. A major source of such effects is metonymy – a situation in which some sub-category or member or submodel is used (often for some limited and immediate purpose) to comprehend the category as a whole. In other words, these are cases where a part (a subcategory or member or sub-model) stands for the whole category – in reasoning, recognition, and so on. Within the theory of cognitive models, such cases are represented by metonymic models.

9 The housewife stereotype

We have seen how the clustering of cognitive models for *mother* results in prototype effects. However, an additional level of prototype effects occurs in the *mother* category. The source of these effects is the stereotype of the mother as housewife. Social stereotypes are cases of metonymy – where a subcategory has a socially recognized status as standing for the category as a whole, usually for the purpose of making quick judgments about people. The housewife-mother subcategory, though unnamed, exists. It defines cultural expectations about what a mother is supposed to be. Because of this, it yields prototype effects. On the whole in our culture, housewife-mothers are taken as better examples of mothers than non-housewife-mothers.

Such goodness-of-example judgments are a kind of prototype effect. But this effect is not due to the clustering of models, but rather to the case of a metonymic model in which one subcategory, the housewife-mother, stands for the whole category in defining cultural expectations of mothers. Other kinds of metonymic models will be discussed below.

10 Working mothers

A *working mother* is not simply a mother who happens to be working. The category *working mother* is defined in contrast to the stereotypical housewife-mother. The housewife-mother stereotype arises from a stereotypical view of nurturance, which is associated with the nurturance model. According to the stereotypical view, mothers who do not stay at home all day with their children cannot properly nurture them. There is also a stereotypical view of work, according to which it is done away from the home, and housework and child-rearing do not count. This is the stereotype that the bumpersticker 'Every Mother Is A Working Mother' is meant to counter.

The housewife-mother stereotype is therefore defined relative to the nurturance model of motherhood. This may be obvious, but it is not a trivial fact. It shows that metonymic models like stereotypes are not necessarily defined with respect to an entire cluster. In this case, the metonymic model is characterized relative to only one of the models in the cluster – the nurturance model. Here is some rather subtle evidence to prove the point:

> Consider an unwed mother who gives up her child for adoption and then goes out and gets a job. She is still a mother, by virtue of the birth model, and she is working – but she is not a *working mother!*

The reason is that it is the nurturance model, not the birth model, that is relevant for the interpretation of the phrase. Thus, a biological mother who is not responsible for nurturance cannot be a working mother, though an adoptive mother, of course, can be one.

This example shows the following:

> A social stereotype (e.g., the housewife-mother) may be defined with respect to only one of the base models of an experiential cluster (e.g., the nurturance model).
>
> Thus, a metonymic model where a subcategory stands for the whole category may be defined relative to only one model in a complex cluster.
>
> A subcategory (e.g., working mother) may be defined in contrast with a stereotype (e.g., the housewife – mother).
>
> When this occurs, it is only the relevant cognitive model (e.g., the nurturance model) that is used as a background for defining the subcategory (e.g., working mother).

Thus, only those mothers for whom nurturance is an issue can be so categorized. Stepmothers and adoptive mothers may also be working mothers, but biological mothers who have given up their children for adoption and surrogate mothers (who have only had a child for someone else) are not working mothers – even though they may happen to be holding down a job.

Such models of stereotypes are important for a theory of conceptual structure in a number of ways. First, as we have seen, they may be used to motivate and define a contrasting subcategory like *working mother.* This is important because, according to the classical theory, such cases should not exist. In the classical theory, social stereotypes, by definition, play no role in defining category structure because they are not part of any necessary and sufficient conditions for category membership! In the classical theory, only necessary and sufficient conditions can have a real cognitive function in defining category membership. For this reason, the classical theory permits no cognitive function at all for social stereotypes. But the fact that the conceptual category *working mother* is defined by contrast with the housewife-mother stereotype indicates that stereotypes do have a role in characterizing concepts.

Second, stereotypes define a normal expectation that is linguistically marked. For example, the word *but* in English is used to mark a situation that is in contrast to some model that serves as a norm. Stereotypic models may serve as such a norm:

> **NORMAL:** She is a mother, but she isn't a housewife.
>
> **STRANGE:** She is a mother, but she's a housewife.

The latter sentence could only be used if stereotypical mothers were not housewives. Conversely, a category defined in contrast to a stereotype has the opposite properties:

> **NORMAL:** She is a mother, but she has a job.
>
> **STRANGE:** She is a mother, but she doesn't have a job.

In summary, we have seen two kinds of models for *mother:*

> A cluster of converging cognitive models.
>
> A stereotypic model, which is a metonymic model in which the housewife-mother subcategory stands for the category as a whole and serves the purpose of defining cultural expectations.

Both models give rise to prototype effects, but in different ways. Together, they form a structure with a composite prototype: the best example of a mother is a biological mother who is a housewife, principally concerned with nurturance, not working at a paid position, and married to the child's father. This composite prototype imposes what is called a *representativeness structure* on the category: the closer an individual is to the prototype, the more representative a mother she is.

Representativeness structures are linear. They concern nothing but closeness to the prototypical case, and thus they hide most of the richness of structure that exists in the cognitive models that characterize the category. Representativeness structures, though real, are mere shadows of cognitive models.

It is important to bear this in mind, as prototype theory is sometimes thought of as involving only such linear representativeness structures and not cognitive models.

The study of representativeness structures has played an important role in the history of prototype theory – largely in demonstrating that prototypes do exist and in making a bare first approximation to finding out what they are and what properties they have. But a full study of category structure must go well beyond just isolating a prototype and giving a linear ranking of how close nonprototypical cases are. At the very least, it must provide an account of the details of the cognitive models that give rise to the representativeness structure.

11 Radial structures

Here are some kinds of mothers:

> The central case, where all the models converge. This includes a mother who is and always has been female, and who gave birth to the child, supplied her half of child's genes, nurtured the child, is married to the father, is one generation older than the child, and is the child's legal guardian.
>
> Stepmother: She didn't give birth or supply the genes, but she is currently married to the father.
>
> Adoptive mother: She didn't give birth or supply the genes, but she is the legal guardian and has the obligation to provide nurturance.
>
> Birth mother: This is defined in contrast to *adoptive mother:* given an adoption ICM, the woman who gives birth and puts the child up for adoption is called the *birth mother.*
>
> Natural mother: This used to be the term used to contrast with *adoptive mother,* but it has been given up owing to the unsavory inference that adoptive mothers were, by contrast, 'unnatural.' This term has been replaced by *birth mother.*
>
> Foster mother: She is being paid by the state to provide nurturance.
>
> Biological mother: She gave birth to the child, but is not raising **it,** and there is someone else who is and who qualifies to be called a mother of some sort.
>
> Surrogate mother: She has contracted to give birth and that's all. She may or may not have provided the genes, and she is not married to the father and is not

obligated to provide nurturance. Also, she has contractually given up the right to be legal guardian.

Unwed mother: She is not married to the father at the time of the birth.

Genetic mother: This is a term I have seen used for a woman who supplies an egg to be planted into someone else's womb, and has nothing else whatever to do with the child. It has not yet to my knowledge become conventional.

These subcategories of mother are all understood as deviations from the central case. But not all possible variations on the central case exist as categories. There is no category of mothers who are legal guardians but do not personally supply nurturance, hiring someone else to do it. There is no category of transsexuals who gave birth but have since had a sex-change operation. Moreover, some of the above categories are products of the twentieth century, and simply did not exist earlier: The point is that the central case does not productively generate all of these subcategories. Instead, the subcategories are defined by convention as variations on the central case. There is no general rule for generating kinds of mothers. They are culturally defined and have to be learned. They are by no means the same in all cultures. In the Trobriands, a woman who gives birth often gives the child to an old woman to raise. In traditional Japanese society, it was common for a woman to give her child to her sister to raise. Both of these are cases of kinds of mothers of which we have no exact equivalent.

The category of *mother* in this culture has what we will call a *radial structure.* A radial structure is one where there is a central case and conventionalized variations on it that cannot be predicted by general rules. Categories that are generated by central cases plus general principles – say, the natural numbers – are not radial structures, as we are defining the term. We are limiting radial structures only to cases where the variations are conventionalized and have to be learned. We are also ruling out cases where the central case is just more general than the noncentral case – that is, where the noncentral cases just have more properties than the central case, but no different ones. Radial structures are extremely common, and we will discuss them in very great detail below.

12 Some kinds of metonymic models

So far, we have looked at one case of a metonymic model: the housewife-mother stereotype. It defines a subcategory that is used to stand for the entire category of mothers in defining social expectations. Any time a subcategory (or an individual member of a category) is used for some purpose to stand for the category as a whole, it is a potential source of prototype effects. For this reason, metonymic models play an important role in prototype theory. Let us look at them a bit more closely.

In general, a metonymic model has the following characteristics:

There is a 'target' concept A to be understood for some purpose in some context.

There is a conceptual structure containing both A and another concept B.

B is either part of A, or is closely associated with **it** in that conceptual structure. Typically, a choice of B will uniquely determine A, within that conceptual structure.

Compared to A, B is either easier to understand, easier to remember, easier to recognize, or more immediately useful for the given purpose in the given context.

A metonymic model is a model of how A and B are related in a conceptual structure; the relationship is specified by a function from B to A.

When such a conventional metonymic model exists as part of a conceptual system, B may be used to stand, metonymically, for A. If A is a category, the result is a metonymic model of the category, and prototype effects commonly arise.

Most metonymic models are, in fact, *not* models of categories; they are models of individuals. Lakoff and Johnson (1980:Ch. 8) have shown that there are many types of metonymic models for individuals. There are also many types of metonymic models for categories; each type is a different *kind* of source for prototype effects. There are as many types of metonymic prototype effects as there are kinds of metonymic models for categories. Following are some of the types I have come across so far.

13 Social stereotypes

As we saw in the case of the housewife-mother, social stereotypes can be used to stand for a category as a whole. Social stereotypes are usually conscious and are often the subject of public discussion. They are subject to change over time, and they may become public issues. Because they define cultural expectations, they are used in reasoning and especially in what is called 'jumping to conclusions.' However, they are usually recognized as not being accurate, and their use in reasoning may be overtly challenged.

Here are some examples of contemporary American stereotypes:

The stereotypical politician is conniving, egotistical, and dishonest.

The stereotypical bachelor is macho, dates a lot of different women, is interested in sexual conquest, hangs out in singles' bars, etc.

The stereotypical Japanese is industrious, polite, and clever.

Since social stereotypes are commonly used to characterize cultural expectations, they tend to be exploited in advertising and in most forms of popular entertainment.

Incidentally, the *bachelor* stereotype provides a second level of prototype effects in addition to those that are a consequence of the *bachelor* ICM not fitting certain situations. Let us take a situation where the background conditions of the *bachelor* ICM do fit, a situation in which there are no cases that the concept was not defined to deal with: no priests, no gays, no Moslems with only three wives, no Tarzans. In these situations, there can still be prototype effects, but the effects will arise *within the clear boundaries of the category.* In such cases, the social stereotype of a *bachelor* will characterize the best examples, and those undisputed bachelors who do not fit the social stereotype will be less good examples.

A bachelor who is macho, promiscuous, and nondomestic fits the stereotype of *bachelor* better than, say, a non-macho man who likes to take care of children, prefers stable relationships with one person, is not interested in sexual conquest, loves housework and does it well, and so on. Stereotypes are used in certain situations to define expectations, make judgments, and draw inferences. Thus, for example, if all one knew about someone was that he was a bachelor, one might be surprised to find that he loves housework and does it well, likes to care for children, and so on. Even though the *bachelor* ICM is defined within the classical theory and has clear boundaries in situations that conform to the background assumptions, prototype effects may still occur *internal* to the category boundaries because of the presence of a social stereotype.

Incidentally, we often have names for stereotypes, for example, Uncle Tom, Jewish Princess, stud. These are categories that function as stereotypes for other categories.

14 Typical examples

Examples of typical cases are as follows:

> Robins and sparrows are typical birds.
>
> Apples and oranges are typical fruits.
>
> Saws and hammers are typical tools.

Social stereotypes are usually conscious and subject to public discussion – and may even have names. However, the use of typical category members is usually unconscious and automatic. Typical examples are not the subject of public discussion, and they seem not to change noticeably during a person's lifetime. They are not used to define cultural expectations. They are used in reasoning, as Rips (1975) showed, in the case where subjects inferred that if the robins on a certain island got a disease, then the ducks would, but not the converse. Such examples are common. It is normal for us to make inferences from typical to non-typical examples. If a typical man has hair on his head, we infer that atypical men (all other things being equal) will have hair on their heads. Moreover, a man may be considered atypical by virtue of not having hair on his head. There is nothing mysterious about this. An enormous amount of our knowledge about categories of things is organized in terms of typical cases. We constantly draw inferences on the basis of that kind of knowledge. We do it so regularly and automatically that we are rarely aware that we are doing it.

Reasoning on the basis of typical cases is a major aspect of human reason. Our vast knowledge of typical cases leads to prototype effects. The reason is that there is an asymmetry between typical and nontypical cases. Knowledge about typical cases is generalized to nontypical cases, but not conversely.

15 Ideals

Many categories are understood in terms of abstract ideal cases – which may be neither typical nor stereotypical. For example:

> The ideal husband: a good provider, faithful, strong, respected, attractive. The stereotypical husband: bumbling, dull, pot-bellied,

Naomi Quinn (personal communication) has observed, based on extensive research on American conceptions of marriage, that there are many kinds of ideal models for a marriage: *successful* marriages, *good* marriages, *strong* marriages, and so on. *Successful* marriages are those where the goals of the spouses are fulfilled. *Good* marriages are those where both partners find the marriage beneficial. *Strong* marriages are those likely to last. Such types of ideals seem to be of great importance in culturally significant categories – categories where making judgments of quality and making plans are important.

A lot of cultural knowledge is organized in terms of ideals. We have cultural knowledge about ideal homes, ideal families, ideal mates, ideal jobs, ideal bosses, ideal workers, and so on. Cultural knowledge about ideals leads to prototype effects. There is an asymmetry between ideal and nonideal cases: we make judgments of quality and set goals for the future in terms of ideal cases, rather than nonideal cases. This asymmetry is a consequence of a pattern of inference that we use with ideals. Ideals are assumed to have all the good qualities that nonideal cases have, but not conversely.

16 Paragons

We also comprehend categories in terms of individual members who represent either an ideal or its opposite. Thus, we have institutions like the ten-best and ten-worst lists, the Halls of Fame, Academy Awards, and the Guinness book of World Records. We have baseball paragons:

Babe Ruth, Willie Mays, Sandy Koufax. Paragons are made use of in constructions in the language: *a regular Babe Ruth, another Willie Mays, the Cadillac of vacuum cleaners,* and so on. Scientific paradigms are also characterized by paragons. Thus, for example, The Michaelson-Morley Experiment is the paragon of physics experiments – and is used by many people to comprehend what a great experiment in physics is.

A great many of our actions have to do with paragons. We try to emulate them. We are interested in the life stories of great men and women. We use paragons as models to base our actions on. We have a great deal of interest in experiencing paragons: we watch All-Star games, go to Academy Award-winning movies, travel to the Seven Wonders of the World, and seek to own the paragons of consumer goods. We are constantly acquiring knowledge of paragons, and regularly base our actions on that knowledge. Incidentally, we also commonly base inferences on a folk theory that people who are paragons in some domain are paragons *as people.* Thus, people are shocked to find great baseball players or powerful politicians engaging in normal rotten human behavior.

17 Generators

There are cases where the members of a category are defined, or 'generated', by the central members plus some general rules. The natural numbers are perhaps the best-known example. The natural numbers are, for most people, characterized by the integers between zero and nine, plus addition and multiplication tables and rules of arithmetic. The single-digit numbers are central members of the category *natural number;* they generate the entire category, given general arithmetic principles. In our system of numerical representation, single-digit numbers are employed in comprehending natural numbers in general. Any natural number can be written as a sequence of single-digit numbers. The properties of large numbers are understood in terms of the properties of smaller numbers, and ultimately in terms of the properties of single-digit numbers.

The single-digit numbers, together with addition and multiplication tables and rules of arithmetic, constitute a model that both generates the natural numbers and is metonymic in our sense: the category as a whole is comprehended in terms of a small subcategory.

The natural numbers, in addition, have other models that subdivide the numbers according to certain properties – odd and even, prime and nonprime, and so on. Such models are not metonymic. They work by classical Aristotelian principles. But they only define *subcategories* of the natural numbers. The category as a whole is defined metonymically and generatively by the single-digit numbers plus rules of arithmetic.

To make matters more complicated, other kinds of numbers are also defined by metonymic generative models: the rationals, the reals, the imaginaries, the transfinite cardinals, and so on. Thus rational numbers are understood as ratios of natural numbers, and real numbers are understood as infinite sequences of natural numbers. In other words, the rationals and the reals are understood metonymically in terms of the natural numbers – a subcategory used to generate the larger categories.

18 Submodels

Another way to comprehend a category is via a submodel. Take the category of natural numbers again. The most common submodel used is the subcategory of powers often: ten, a hundred, a thousand, and so on. We use this submodel to comprehend the relative size of numbers. The members of such a submodel are among what Rosch refers to as *Cognitive Reference Points,* which have a special place in reasoning, especially in making approximations and estimating size. Cognitive reference points within a submodel show prototype effects of the following sort:

> Subjects will judge statements like *98 is approximately 100* as being true more readily than statements like *100 is approximately 98.*
>
> Some submodels have a biological basis: the primary colors, the basic emotions, etc. Others are culturally stipulated, for example, the Seven Deadly Sins.

19 Salient examples

It is common for people to use familiar, memorable, or otherwise salient examples to comprehend categories. For example, if your best friend is a vegetarian and you don't know any others well, you will tend to generalize from your friend to other vegetarians. After a widely publicized DC-10 crash in Chicago, many people refused to *fly* DC-10s, choosing other types of planes despite the fact that they had overall worse safety records than DC-10s. Such people used the salient example of the DC-10 that crashed to stand metonymically for the entire category of DC-10s with respect to safety judgments.

Similarly, California earthquakes are salient examples of natural disasters. A. Tversky and Kahneman (1983) demonstrated that people use such salient examples in making probability judgments about the category of natural disasters. The reasoning used is what Tversky and Kahneman refer to as the *conjunction fallacy.* We know from probability theory that the probability of two events, A and B, occurring is always less than the probability of just one of the events, say B. Thus the probability of coins A and B both coming down heads is less than the probability of just B coming down heads.

The theory of probability is defined for events A and B, which are not related to one another. Cognitive models may, however, relate events in our minds that are unrelated in the external world. What Tversky and Kahneman found was that when we have a salient cognitive model relating events A and B, it affects our judgments of the probability of A and B both occurring.

The following is a typical example of the kind Tversky and Kahneman used. One group of subjects was asked to rate the probability of

> A massive flood somewhere in North America in 1983, in which more than 1000 people drown.

A second group was asked to rate the probability of

> An earthquake in California sometime in 1983, causing a flood in which more than 1000 people drown.

The estimates of the conjunction of earthquake and flood were considerably higher than the estimates of the flood. Tversky and Kahneman conclude:

> The attempts to predict the uncertain future, like the attempts to reconstruct the uncertain past, which is the domain of history and criminal law, are commonly based on the construction of hypothetical scenarios, These scenarios, or 'best guesses,' tend to be specific, coherent, and representative of our mental model of the relevant worlds.

In short, a cognitive model may function to allow a salient example to stand metonymically for a whole category. In such cases, our probability judgments about the category are affected.

To summarize, we have seen the following kinds of metonymic models: social stereotypes, typical examples, ideal cases, paragons, generators, submodels, and salient examples. They have a cognitive status, that is, they are used in reasoning. And they all yield prototype effects of some sort.

20 Radial categories

Radial categories are perhaps the most interesting source of prototype effects. Radial categories have the following properties:

1. There can be no single cognitive model that represents the entire category.
2. There is a central submodel characterizing a central subcategory.
3. Representations for noncentral subcategories cannot be predicted either by rule or by a general principle such as similarity.
4. There are nonarbitrary *links* between the central and noncentral subcategories. These links are other cognitive models existing independently in the conceptual system.
5. Though the noncentral subcategories cannot be predicted from the central subcategory, they are *motivated* by the central subcategory plus other, independently existing cognitive models.

6 Motivated subcategories can be learned, remembered, and used more efficiently than arbitrary, unmotivated subcategories.

Elsewhere I have given a number of very detailed examples of radial categories (Lakoff 1987). Although there is no room here to go through all those examples in sufficiently convincing detail, I will provide one relatively short example, using data provided by Pamela Downing (Downing 1984) and Haruo Aoki (personal communication).

21 Japanese *hon*

The Japanese classifier, *hon*, in its most common use, classifies long, thin, rigid objects: sticks, canes, pencils, candles, trees, and so on. Not surprisingly, it can be used to classify dead snakes and dried fish, both of which are long and rigid. But *hon* can be extended to what are presumably less representative cases:

martial arts contests, with staffs or swords (which are long and rigid)

hits (and sometimes pitches) in baseball (straight trajectories, formed by the forceful motion of a solid object, associated with baseball bat, which is long, thin, and rigid)

shots in basketball, serves in volleyball, and rallies in Ping-Pong

judo matches (a martial arts contest, but without a staff or sword)

a contest between a zen master and student, in which each attempts to stump the other with zen koans

rolls of tape (which can be unrolled into something long and thin)

telephone calls (which come over wires and which are instances of the CONDUIT metaphor as described by Reddy [1979] and Lakoff and Johnson [1980])

radio and television programs (like telephone calls, but without the wires)

letters (another instance of communication; moreover, in traditional Japan, letters were scrolls and hence sticklike)

movies (like radio and television; moreover they come in reels like rolls of tape)

medical injections (done with a needle, which is long, thin, and rigid)

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These cases, though not predictable, are nonetheless not arbitrary. They do not all have something in common with long, thin rigid objects, but it *makes sense* that they might be classified in the same way. Let us ask exactly what kind of sense it makes.

Let us begin with martial arts contests using staffs or swords. Staffs and swords are long, thin, rigid objects, which are classified by *hon.* They are also the principal functional objects in these matches. A win in such a match can also be classified by *hon.* That is, the principal goal in this domain of experience is in the same category as the principal functional object.

Baseball bats are central members of the *hon* category. They are one of the two most salient functional objects in the game, the other being the ball. Baseball is centered on a contest between the pitcher and the batter. The batter's principal goal is to get a hit. When a baseball is hit solidly, it forms a trajectory – that is, it traces a long, thin path along which a solid object travels quickly and with force. The image traced by the path of the ball is a *hon* image – long and thin.

The extension of the *hon* category from bats to hits is another case of an extension from a principal functional object to a principal goal. It is also an extension from one principal functional object with a *hon* shape to a hon-shaped path formed by the other principal functional object. Incidentally, in the small amount of research done on *hon* to date, it appears that, whereas base hits and home runs are categorized with *hon,* foul balls, pop flies, ground balls, and bunts appear not to be. This is not surprising because these are not principal goals of hitting, nor do their trajectories form a *hon* shape.

The relationship between the shape of the bat and the trajectory formed by the batted ball – between a long, thin thing and a trajectory – is a common relationship between image-schemas that form the basis for the extension of a category from a central to a noncentral case. Let us consider three examples from English.

The man ran into the woods.

The road ran into the woods.

In the first case, *run* is used for a case where there is a (long, thin) trajectory. In the second case, *run* is used for a long, thin object, a road.

The bird flew over the yard.

The telephone line stretched over the yard.

In the first case, *over* is used for a (long, thin) trajectory. In the second case, *over* is used for a long, thin object, a telephone line.

The rocket shot up.

The lamp was standing up.

In the first case, *up* is used for a trajectory. In the second case, *up* is used for a long, thin object, a standing lamp.

Such relationships are common and suggest that there exists what might be called an *image-schema transformation* of the following sort:

TRAJECTORY SCHEMA ↔ LONG, THIN OBJECT SCHEMA

This image-schema transformation is one of the many kinds of cognitive relationship that can form a basis for the extension of a category.

Some speakers of Japanese extend the *hon* category to baseball pitches, as well as hits – again on the basis of such an image-schema relationship within the same domain of experience. Some speakers extend *hon* to pitches using both the trajectory and the contest-perspective, in which the hitter and pitcher are engaged in a contest. These speakers use *hon* only for pitches seen from the point of view of the hitter. There are also speakers who classify pitches with *hon* only if they achieve the principal goal of pitching. Since getting strikes is the principal goal of pitching, such speakers can classify strikes, but not balls, with *hon.* No speakers have been found who use *hon* to classify balls but not strikes. Similarly, no speakers have been found who classify bunts and foul balls with *hon,* but not home runs and base hits.

There are similar motivations behind the extensions of *hon* to other concepts in sports. Thus, *hon* can classify shots and free throws in basketball, but not passes. And it can classify serves in volleyball and rallies in Ping-Pong. These are cases where there is both a trajectory and a possibility of scoring (achieving a principal goal).

There are several morals to be drawn from these examples:

1 What are taken to be the central cases for the application of *hon* appear to be concrete basic-level objects: sticks, pencils, bamboo staffs, baseball bats, etc. The direction of extension appears to go from concrete basic-level objects to other things, like hits and pitches.

2 A theory of motivations for the extension of a category is required. Among the things we need in such a theory are image-schema transformations and conceptual metonymies – cases where a principal object like a staff or bat can stand for a principal goal like a win or hit.

3 Hits in baseball and long, thin rigid objects do not have anything objective in common. The relationship between the bat and the hit is given by an image-schema transformation and a metonymy. Hence the classical theory, which requires that categorization be based on common properties, is inadequate.

4 The application of *hon* to hits in baseball may make sense, but it is not predictable. It is a matter of convention – not an arbitrary convention, but a *motivated* convention. Thus, the traditional view that everything must be

> either predictable or arbitrary is inadequate here. There is a third choice: motivation. In this case, the independently needed image-schema transformation and the object-for-goal metonymy provide the motivation.

Ideally, each instance of the use of a classifier outside the central sense should have a motivation. The motivation cannot be ad hoc – one cannot make up a metonymy or image-schema just to handle that case. It must be justified on the basis of other cases. This imposes a criterion of adequacy on the analysis of classifier languages.

Some investigators have suggested that such a criterion of adequacy is too strong; they have claimed that some classifications simply are arbitrary and that no non-ad hoc motivation exists. That is an empirical question, and the facts are by no means all in. But arbitrariness is a last resort. Even if there are some completely unmotivated cases, one can still apply a slightly weakened criterion of adequacy. Find out which extensions 'make sense' to speakers and which extensions seem 'senseless,' and account for those that make sense. Each sensible extension of a category needs to be independently motivated. No analysis of a classifier system is complete until this is done.

So far, we have seen that metonymies and image-schema transformations can provide motivation for the extension of a category. Another important kind of motivation comes from conventional mental images. Take the example of a roll of tape, which can be classified by *hon*. We know what rolls of tape look like, both when they are rolled up and when they are being unrolled. That is, we have conventional mental images of tape, both when it is in storage form and when it is being put to use. We also know that we unroll tape when we are about to use it, and that the tape is functional when it is unrolled. A conventional image of tape being unrolled has two parts: the rolled part and the unrolled, functional part. The image of the unrolled, functional part fits the long, thin object image-schema associated with the central sense of *hon*. The image of the nonfunctional rolled part does not fit the central *hon* image-schema. Metonymy is involved here; the functional part of the conventional image is standing for the whole image, for the sake of categorization. The functional part fits the *hon* schema. This is, presumably, the motivation for the use of *hon* to classify rolls of tape. Again, we cannot predict the use of *hon* for rolls of tape; but we can do something that is extremely important. We can show why it makes sense. Making sense of categorization is no small matter. And doing so in a manner that shows in detail how basic cognitive mechanisms apply is anything but trivial. If the cognitive aspects of categorization are to be understood, it will require attention to detail at this level. For example, *hon* can be used to classify medical injections. Why does this make sense?

Medical injections are another case where the principal functional object (the needle) is long and thin; the needles can be classified with *hon* and, by metonymy, so can the injections.

So far we have seen how image-schema transformations, conventional mental images, and metonymy all enter into categorization by a classifier. Let us turn to a case that involves all of these plus metaphor. Recall that *hon* can be used to classify telephone calls. The conventional mental image of engaging in a telephone call involves using the most functional part of the telephone – the receiver, which is a long, thin, rigid object and fits the central image-schema for *hon.* The other principal conventional image related to telephone calls involves telephone wires. These are understood as playing a principal functional role in telephonic communication. These fit the long, thin object image-schema. They also fit the CONDUIT of the CONDUIT metaphor – the principal metaphor for communication. In short, there are two related but different motivations for the use of *hon* for telephone calls. That is, there are two ways in which this use of *hon* fits the conceptual system, and, where motivation is concerned, the more kinds of motivation, the better. That is, it is not a matter of finding which is right; both can be right simultaneously.

So far, we have seen that extended senses of *hon* can be based on the central sense of *hon.* But extended senses may themselves serve as the basis for further extensions via category chaining. Recall that letters are classified with *hon.* There are a number of considerations that motivate such a categorization. First, letters were originally in the form of scrolls, often wound around long, thin, wooden cylinders. They have been categorized with *hon* ever since, and that image remains very much alive in Japanese culture through paintings and the tradition of calligraphy. Second, the conventional image of writing a letter involves the use of a pen, which plays a principal functional role, and is also a long, thin object. Third, letters are a form of communication, and therefore an instance of the CONDUIT metaphor. These diverse motivations allow *hon* with all these senses to fit the ecology of the Japanese classifier system.

Letters and telephone calls are intermediate steps in a chain. Radio and television programs are also classified with *hon.* They are forms of communication at a distance, like letter-writing and telephone communication. They too are motivated by the CONDUIT metaphor for communication. Given that letters and telephone calls are classified by *hon,* radio and television programs constitute a well-motivated extension. Movies are also classified by *hon.* They are also instances of communication at a distance; in addition, one of the principal conventional images associated with movies is the movie reel, which looks like a spool of tape, which is classified with *hon.*

The phenomenon of category-chaining shows very clearly that the classical account of categorization is inadequate. Sticks and television programs are both in the *hon* category, but they share no relevant common properties. They are categorized in the same way by virtue of the chain structure of the *hon* category.

Finally, let us turn our attention to judo matches and contests between Zen masters and students. Judo matches are in the same domain of experience as martial arts contests with staffs or swords. A win in judo match can also be classified as a *hon.* Similarly, Zen contests are, in Japanese culture, in the same experiential domain as martial arts contests, and a win there also can be classified as a *hon.*

Incidentally, the noncentral cases of the *hon* category vary in some cases from speaker to speaker. Thus some speakers do not include baseball pitches and some do not include wins in Zen contests. But to my knowledge, every speaker of Japanese includes the central members – the candles, staffs, baseball bats, and so on. Moreover, many of the extensions have become conventionalized for speakers in general: letters, telephone conversations, home runs, spools of thread. The variation just displayed involves chaining that has not yet stabilized but which shows the same principles at work as in the stable conventionalized extensions.

22 Categories of mind, or mere words

A possible objection to the kind of analyses we have been discussing is that classifiers are mere linguistic devices and do not reflect conceptual structure. That is, one might object that, say, the things categorized by *hon* in Japanese do not form a single conceptual category. Thus, one might suggest that the analysis of *hon* may show something about rules of language, but that it shows nothing about our conceptual system.

Let us, for the sake of argument, consider such a suggestion. Whatever their precise cognitive status is, rules of language are some part or other of our cognitive apparatus. Just what would such 'rules of language' involve? In particular, they would involve all the things we discussed above in the analysis of *hon:*

Central and peripheral members
Basic-level objects at the center
Conventional mental images
Knowledge about conventional mental images
Image-schema transformations
Metonymy applied to mental imagery
Metonymy applied to domains of experience
Metaphors (which map domains into other domains)

These mechanisms are needed, no matter whether one calls them linguistic or not. Moreover, they appear to be the kinds of things that one would tend to call conceptual – mental images and image transformations do not appear to be merely linguistic. Moreover, linguistic categories can be used in nonlinguistic tasks, as Kay and Kempton (1984) have demonstrated. But whether they are used in nonlinguistic tasks or not, linguistic categories *are* categories – and they are part of our overall cognitive apparatus. Whether one wants to dignify them with the term 'conceptual' or not, linguistic categories are categories within our cognitive system and a study of *all* categories within our cognitive system will have to include them.

23 What is prototype theory?

From the point of view of a theory of cognitive models, prototype theory is a theory of how prototype effects arise. The claim implicit in the theory of cognitive models is that *prototype effects are a consequence of conceptual structure.* In some cases, they arise directly: when cognitive models contain scales, for example, a scale of wealth for the concept *rich.* They may also arise directly as a consequence of the radial structure of a category. On the other hand, they may arise indirectly, as in the case of metonymic and classical models that are idealized (as in the *bachelor* example). All of these are cases where conceptual structure results in prototype effects.

24 The core + identification procedure proposal

Within recent years there has been a reactionary movement on the part of certain cognitive psychologists to return to the classical theory of categorization. The principal works are papers by Osherson and Smith (1981) and Armstrong, Gleitman, and Gleitman (1983). These papers purport to present arguments against prototype theory. Instead, they really present arguments – correct arguments – against two clearly incorrect interpretations of prototype effects: the Effects = Structure and Prototype = Representation interpretations.

These papers claim that prototype effects have nothing whatever to do with conceptual structure. Instead, they claim that all such effects result from procedures for *identifying* category members. They claim that the classical theory of categories can be kept if such procedures are postulated. Both papers make the following assumptions:

> The classical theory is workable for all phenomena having to do with reasoning.
>
> Prototype phenomena have nothing to do with reasoning.
>
> Prototype effects result only from identification procedures and not from anything in conceptual structure.

Before we turn to examining these papers in detail, it would be worthwhile to recall how the core versus identification procedure idea came into cognitive psychology. Oddly enough, the source was a paper of mine.

A bit of history is in order. In my 1972 paper, 'Hedges,' I began by taking for granted the Effects = Structure Interpretation, and I observed that Zadeh's fuzzy-set theory could represent degrees of category membership. Later in the paper, I observed that the Effects = Structure Interpretation was inadequate to account for hedges like *strictly speaking, loosely speaking, technically,* and *regular.* To account for the use of *regular* one must distinguish *definitional* properties from *characteristic but incidental* properties. This corresponds to the semantics-pragmatics distinction in the objectivist paradigm, the distinction between what the word 'really means' and encyclopedic knowledge that you happen to have about the things the word refers to.

However, my observation that the distinction is necessary was not in the service of supporting the semantics-pragmatics distinction; my purpose was to provide a counterexample. Here is the relevant passage (Lakoff 1972:197 – 198):

> But hedges do not merely reveal distinctions of degree of category membership. They can also reveal a great deal more about meaning. Consider (6).
>
> (6) a. Esther Williams is a fish.
>
> b. Esther Williams is a regular fish.

> (6a) is false, since Esther Williams is a human being, not a fish. (6b), on the other hand, would seem to be true, since it says that Esther Williams swims well and is at home in water. Note that (6b) does not assert that Esther Williams has gills, scales, fins, a tail, etc. In fact, (6b) presupposes that Esther Williams is not literally a fish and asserts that she has certain other characteristic properties of a fish. Bolinger (1972) has suggested that *regular* picks out certain 'metaphorical' properties. We can see what this means in an example like (7).
>
> (7) a. John is a bachelor.
>
> b. John is a regular bachelor.
>
> (7b) would not be said of a bachelor. It might be said of a married man who acts like a bachelor – dates a lot, feels unbound by marital responsibilities, etc. In short, *regular* seems to assert the connotations of 'bachelor,' while presupposing the negation of the literal meaning.

Edward Smith (personal communication) has remarked that this passage started him on a line of research that he has pursued ever since. What interested him was the distinction between definitional and incidental properties. The passage had provided counterevidence to the objectivist view of this distinction, which *absolutely requires* that 'semantics' be kept independent of 'pragmatics'; that is, definitional properties are completely independent of incidental properties. The use of the hedge *regular* violates this condition, since it makes use of incidental properties in *semantics*. Kay (1979, see also 1983) has argued that the definitional-incidental distinction is not objectively correct, but rather part of our folk theory of language. The hedge *regular* makes use of this folk theory. If Kay's argument is correct, then the semantics-pragmatics and definitional-incidental distinctions are invalidated in even a deeper way than I first suggested.

Smith seems not to have been aware that this example was in conflict with the theory of semantics in which the classical theory of categorization is embedded. He drew from the distinction a way to keep the classical theory of categories, while still accounting for prototype effects. His idea was that the definitional properties fit the classical theory and that the incidental properties gave rise to prototype effects. This idea is developed in Osherson and Smith's classic 1981 paper. That paper claims that the definitional properties characterize the conceptual 'core' of a category, that which permits reasoning; incidental properties, on the other hand, have nothing to do with reasoning, but are used only to *identify* category members. Prototype effects, they claim, have to do with identification and not with reason or conceptual structure.

I find it ironic that a passage providing counterevidence to the classical view should provide the impetus for a defense of that view.

25 Osherson and Smith

Osherson and Smith begin their paper with the following definition of prototype theory:

> Prototype theory construes membership in a concept's extension as graded, determined by similarity to the concept's 'best' exemplar (or by some other measure of central tendency).

Here Osherson and Smith are assuming both the Effects = Structure Interpretation and the Prototype = Representation Interpretation.

Their paper is an argument against these interpretations. Osherson and Smith also make additional assumptions:

> They assume that fuzzy-set theory in the earliest of its many versions (Zadeh 1965) is the appropriate way of modeling the Effects = Structure Interpretation.
>
> They assume *atomism,* that is, that the meaning of the whole is a regular compositional function of the meaning of its parts. As a consequence, gestalt effects in semantics (cf. Lakoff 1977) are eliminated as a possibility.
>
> They assume *objectivist semantics,* that is, that meaning is based on truth.
>
> They assume that all noun modifiers are to be treated via conjunction. This is commonly done in objectivist semantics, though as we will see it is grossly inadequate.

In the light of the previous discussion, we can see that these assumptions are not well founded. As we have pointed out, almost all prototype and basic-level effects are inconsistent with objectivist semantics. However, the Effects = Structure Interpretation is not inconsistent with objectivist semantics. The reason is that it treats all categories as graded categories, and as we have seen, graded categorization is consistent with most of the objectivist assumptions.

If we grant all of Osherson and Smith's assumptions, their argument follows. The examples they give are well worth considering. Like classical set theory, classical fuzzy-set theory has only three ways of forming complex categories: intersection, union, and complementation. Osherson and Smith take each of these and show that they lead to incorrect results. Their first counterexample involves three drawings:

a. A line drawing of a normally shaped apple with stripes superimposed on the apple.

b. A line drawing of a normally shaped apple.

c. A line drawing of an abnormally shaped apple with only a few stripes.

They now consider three concepts: *apple, striped,* and *striped apple.* They correctly observe that within classical fuzzy-set theory there is only one way to derive the complex category *striped apple* from the categories *apple* and *striped,* namely, by intersection of fuzzy sets – which is defined by taking the minimum of the membership values in the two-component fuzzy sets. They assume the following:

(a) is a good example of a striped apple.

(a) is not a good example of an apple, since apples generally aren't striped.

(a) is not a good example of a striped thing, since apples are not among the things that are typically striped.

It follows that:

(a) will have a high value in the category *striped apple.*

(a) will have a low value in the category *apple.*

(a) will have a low value in the category *striped.*

But since the minimum of two low values is a low value, it should follow from fuzzy-set theory that (a) has a low value in the category *striped apple*. Thus fuzzy-set theory makes an incorrect prediction. It predicts that an excellent example of a striped apple will have a low value in that category because it has low values in the component categories *apple* and *striped*.

There is a general moral here:

GOOD EXAMPLES OF COMPLEX CATEGORIES ARE OFTEN BAD EXAMPLES OF COMPONENT CATEGORIES.

Osherson and Smith cite a similar example: *pet fish.* A guppy might be a good example of a pet fish, but a bad example of a pet and a bad example of a fish. Set intersection in classical fuzzy-set theory will give incorrect results in such cases.

Osherson and Smith also use some of what might be called 'logicians' examples':

P AND NOT P: an apple that is not an apple

P OR NOT P: a fruit that either is, or is not, an apple

They assume the correctness of the usual logician's intuitions about such cases: There is no apple that is not an apple, and so the first category should have no members to any degree; and all fruits either are or are not apples, so the second category should contain all fruits as full-fledged members. Such intuitions have been disputed: a carved wooden apple might be considered an apple that is not an apple. And a cross between a pear and an apple might be considered a bad example of a fruit that clearly either is, or is not, an apple. Osherson and Smith do not consider such possibilities. They correctly argue that classical fuzzy-set theory cannot account for the usual logician's intuitions in such cases.

The argument goes like this. Take an apple that is not a representative example of an apple, say a crabapple. According to classical fuzzy-set theory, this would have a value in the category *apple* somewhere in between zero and 1. Call the value *c.* Its value in the category *not an apple* would then be 1–*c,* according to the definition of set complementation in fuzzy-set theory. If *c* is in between zero and 1, 1–c will also be between zero and 1. And both the maximum and the minimum of *c* and 1–*c* will be in between zero and 1. Thus, according to fuzzy-set theory, a nonrepresentative apple, like a crabapple, would have a value greater than zero in the category *an apple that is not an apple,* and it would have a value less than 1 in the category *a fruit that either is, or is not, an apple.* This is inconsistent with the intuitions assumed to be correct by Osherson and Smith. If we accept their intuitions, their argument against fuzzy-set theory is correct.

Osherson and Smith's last major argument depends on their assumption of the Prototype = Representation Interpretation, namely, that in prototype theory, degree of membership is determined by degree of similarity to a prototypical member. They correctly produce a counterexample to this interpretation. It is based on the following use of the Prototype = Representation Interpretation. Consider grizzly bears and squirrels. Since one can find some (possibly small) similarities between grizzly bears and squirrels, it follows on the Prototype = Representation Interpretation that squirrels are members of the category *grizzly bear* to some degree greater than zero. Now consider the statement:

> All grizzly bears are inhabitants of North America.

Suppose someone were to find a squirrel on Mars. Because that squirrel is a member of the category *grizzly bear* to some extent, and because Mars is far from North America, the discovery of a squirrel on Mars would serve as disconfirmation of the claim that all grizzly bears are inhabitants of North America. But this is ridiculous. The existence of squirrels on Mars should have nothing to do with the truth or falsity of that statement. Given Osherson and Smith's assumptions, this is indeed a counterexample to the Prototype = Representation Interpretation of prototype effects.

What Osherson and Smith have correctly shown is that, given all their assumptions, the Effects = Structure and Prototype = Representation Interpretations are incorrect. Of course, each one of their assumptions is questionable. One need not use the classical version of fuzzy-set theory to mathematicize these interpretations. The assumption that noun modifiers work by conjunction is grossly incorrect. And objectivist semantics and atomism are, as we have seen above, inadequate to handle the kinds of prototype phenomena that we have discussed. But, most importantly, the Effects = Structure and Prototype = Representation Interpretations are wildly inaccurate ways of understanding prototype and basic-level effects. To show that they are wrong is to show virtually nothing about any reasonable version of prototype theory. In addition, their argument shows nothing whatever about the Cognitive Models Interpretation that we are suggesting. But Osherson and Smith seem unaware of all this, and conclude (p. 54) that they have provided arguments against *all* versions of prototype theory.

Osherson and Smith then endorse a proposal reminiscent of that suggested by Miller and Johnson-Laird (l976) for saving the classical theory while accounting for the experimental results of prototype theory. What they adopt is a hybrid theory: each concept has a *core* and an *identification procedure*. The core works according to the traditional theory; the identification procedure account for the prototype effects that show up in experiments. As they put it:

> The core is concerned with those aspects of a concept that explicate its relation to other concepts, and to thoughts, while the identification procedure specifies the kind of information used to make rapid decisions about membership… We can illustrate this with the concept *woman*. Its core might contain information about presence of a reproductive system, while its identification procedures might contain information about body' shape, hair length, and voice pitch.

The core, in other words, would be where the real work of the mind – thought – is done. The identification procedure would link the mind to the senses, but not do any real conceptual work. As they say,

> Given this distinction it is possible that some traditional theory of concepts correctly characterizes the core, whereas prototype theory characterizes an important identification procedure. This would explain why prototype theory does well in explicating the real-time process of determining category membership (a job for identification procedures), but fares badly in explicating conceptual combination and the truth conditions of thoughts (a job for concept cores).

This hybrid theory assumes that traditional theories actually work for complex concepts. The fact is that this is one of the most notorious weaknesses of traditional theories. The only traditional theories in existence are based on classical set theory. Such theories permit set-theoretical intersection, union, and complement operations, and occasionally a small number of additional operations. But on the whole they do very badly at accounting for complex categorization. We can see the problems best by looking first at the classical theory, without any additional operations. The traditional set-theoretical treatment of adjective-noun phrases is via set intersection. That is the only option the traditional theory makes available. So, in the classical theory, the complex concept striped apple would denote the intersection of the set of striped things and the set of apples.

The literature on linguistic semantics is replete with examples where simple set intersection will not work. Perhaps we should start with some that Osherson and Smith themselves mention (1981:43, fn 8; 50, fn 12).

small galaxy – not the intersection of the set of small things and the set of galaxies

good thief – not the intersection of the set of good things and the set of thieves

imitation brass – not the intersection of the set of imitations and the set of brass things

Other classic examples abound:

electrical engineer – not the intersection of the set of electrical things and the set of engineers

mere child – not the intersection of the set of mere things and the set of children

red hair – because the color is not focal red, it is not merely the intersection of the set of red things and the set of hairs

happy coincidence – not the intersection of the set of happy things and the set of coincidences

topless bar – not the intersection of the set of topless things and the set of bars

heavy price – not the intersection of the set of heavy things and the set of prices

past president – not the intersection of the set of past things and the set of presidents

Such examples can be multiplied indefinitely. There is nothing new about them, and no serious student of linguistic semantics would claim that such cases could be handled by intersection in traditional set theory. At present there is no adequate account of most kinds of complex concepts within a traditional framework, though a small number of isolated analyses using nonstandard set-theoretical apparatus have been attempted. For example, various logicians have attempted a treatment of the 'small galaxy' cases using Montague semantics, and there have been occasional attempts to account for the 'good thief' cases, and a couple of the others. But the vast number have not even been seriously studied within traditional approaches, and there is no reason whatever to think that they could be ultimately accounted for by traditional set theory, or any simple extension of it.

Let us turn now from the adequacy of the traditional set-theoretical core of the Osherson and Smith hybrid theory to the identification procedures. They do not give an indication as to what such identification procedures might be like. But what is more important is that Osherson and Smith do not consider the question of what the identification procedures for complex concepts would be like and how they would be related to the identification procedures for component concepts. Take, for example, Osherson and Smith's case of *pet fish.* As Osherson and Smith correctly observe, 'A guppy is more prototypical of *pet fish* than it is of either pet or fish.' In the hybrid theory, the identification procedure for *pet* would not pick out a guppy as prototypical, nor would the identification procedure for fish. How does the hybrid theory come up with an identification procedure for the complex concept *pet fish* that will pick out a guppy as prototypical? In short, the hybrid theory has not solved the problem of how to account for the prototypes of complex concepts. It has just given the problem a new name.

Perhaps the most inaccurate part of the hybrid theory is that it views prototype phenomena as involving no more than 'identification.' But metonymic cases of prototypes function to a large extent in the service of reasoning; in general, what Rosch calls *reference-point reasoning* has to do with drawing conclusions, and not mere identification. For example, arithmetic submodels are used for doing computations and making approximations; social stereotypes are used to make rapid judgments about people; familiar examples are used to make probability judgments; paragons are used to make comparisons, and ideals are used to make plans. Moreover, generative prototypes are not used just for identification; they are necessary to define their categories. Radial structures characterize relationships among subcategories, and permit category extension, which is an extremely important rational function. Most actual cases of prototype phenomena simply are not used in 'identification.' They are used instead in thought – making inferences, doing calculations, making approximations, planning, comparing, making judgments, and so on – as well as in defining categories, extending them, and characterizing relations among subcategories. Prototypes do a great deal of the real work of the mind, and have a wide use in rational processes.

In short, Osherson and Smith have said nothing whatever that bears on the version of prototype theory that we have given. Nor have they provided any reason to believe that their proposal for saving the classical theory will work. Indeed, the fact that prototypes are used widely in rational processes of many kinds indicates that the classical theory will not account for all those aspects of rational thought.

26 Armstrong, Gleitman, and Gleitman

The hybrid theory, despite all the arguments against it, is not likely to disappear. The classical theory that it incorporates as its 'core' has two thousand years of tradition behind it. Within the past hundred years, theories of the form *core + everything else* have appeared repeatedly as attempts preserve the classical theory of categories. A particularly interesting recent attempt to argue for some form of the Osherson and Smith core + identification procedure theory has been made by Armstrong, Gleitman, and Gleitman (1983). Armstrong *et al.* argue that the very ubiquity of prototype phenomena provides support for a classical theory over a prototype theory.

Like Osherson and Smith, Armstrong *et al.* equate prototype theory with the Effects = Structure Interpretation. That is, they assume that every version of prototype theory would have to claim that all categories are graded, and that goodness-of-example ratings correspond to degrees of membership. The form of their argument is roughly as follows:

(a) *Basic assumption:* Prototype theory assumes that whenever there are prototype effects for a category that category is graded. Goodness-of-example ratings correspond to degrees of membership. Conversely, it is assumed that prototype theory claims that ungraded categories would not yield prototype effects, since it is assumed that prototype effects only reflect degrees of membership.

(b) *Secondary,assumption:* Concepts from formal mathematics are defined in terms of the classical theory, that is, by necessary and sufficient conditions, and therefore are not graded. By assumption (a), they should not show prototype effects. 'Odd number' is an example.

(c) Armstrong et al. perform Rosch's experiments using the concept 'odd number.' They show that Rosch's prototype results appear, and that subjects give graded responses when asked if some numbers are better examples of the category 'odd number' than other numbers.

(d) From (a), they reason that prototype theory must interpret these results as indicating that the category 'odd number' is graded. But (b) shows that it is not graded.

(e) Since we know that (b) is true, prototype effects cannot show that a category is graded. Therefore, (a) must be false, and so prototype theory does not show anything about the real structure of categories.

(f) But Rosch's results must show something. The 'core + identification procedure' theory gives a plausible answer. Rosch's reproducible experiments reflect the identification procedure, but not the core, that is, the real cognitive structure of a category.

Like Osherson and Smith, Armstrong *et al.* assume the Effects = Structure Interpretation, and it is this interpretation that they, very reasonably, find wanting. They do not even consider the possibility of anything like the Cognitive Models Interpretation. But in the Cognitive Models Interpretation, their results make perfect sense.

To see why, let us first distinguish natural numbers as they are defined technically in formal arithmetic from natural numbers as ordinary people understand them. In formal arithmetic, the natural numbers are defined recursively. '0' is taken as a generator and 'successor' as an operator. '1' is a name given to the successor of 0, '2' is a name given to the successor of the successor of 0, and so on. In mathematics, it is important to distinguish numbers from their names. We have a naming systems for numbers that takes 10 as a base; that is, we have ten single-digit number names – 0, 1,...,9 – and form multiple-digit number names thereafter. There are an indefinitely large number of possible naming systems. The best-known one after the base 10 system is the binary system, which takes 2 as a base and has only two single-digit number names: 0 and 1.

Most nonmathematicians do not distinguish numbers from their names. We comprehend numbers in terms of our base 10 naming system. The single-digit numbers are all generators. Multiple-digit numbers are understood as sequences of single-digit numbers. In order to compute with numbers, we must learn the generators – 0 through 9 – plus the addition and multiplication tables, plus algorithms for adding, multiplying, dividing, and so on. Computation with large numbers is understood in terms of computation with smaller numbers – ultimately single-digit numbers. Without understanding large numbers in terms of single-digit numbers, we could not do arithmetic computations.

Thus, single-digit numbers have a privileged place among the numbers. Double-digit numbers, especially those in the multiplication and addition tables, are somewhat less privileged. Larger numbers in general are less privileged still. A model for understanding all natural numbers in terms of single-digit numbers is, by our definition, a metonymic model. We would therefore expect that all other things being equal, single-digit numbers should be judged as better examples than double-digit numbers, which should be judged as better examples than larger numbers.

However, our understanding of numbers is more complicated than that. To aid in computation, and in judging the relative size of numbers, we have learned to comprehend numbers using various submodels. The most common submodel consists of powers of ten – ten, a hundred, a thousand, and so on. Another common subsystem consists of multiples of five; the American monetary system is based on these submodels and it is helpful in doing monetary calculations. Other common submodels are multiples of two, powers of two, and so on. As we pointed out above, each such submodel produces prototype effects. Taking all such sub-models together, we would expect prototype effects of complex sorts.

On the Cognitive Models Interpretation, such prototype effects for numbers would not correspond to degrees of membership. All numbers are equal with respect to membership in the category *number*. But with respect to the various models we use to comprehend numbers, certain numbers have privileged status.

Another submodel we use with numbers is one in which numbers are divided into odd numbers and even numbers; the even numbers are those divisible by 2, while the odd numbers are those of the form $2n + 1$. The odd-even submodel has no gradations; all numbers are either odd or even.

Let us now consider all the models together: the model used to generate the numbers, the powers-of-ten-model, the multiples-of-five model, the powers-of-two model, the prime number model, the odd-even model, and any others that we happen to have. Each model, by itself, produces prototype effects, except for the odd-even and prime number models. If we superimpose the all-or-none odd-even model on all the integers, we would expect to get prototype effects within the odd numbers and other prototype effects within the even numbers. We would expect these effects to be complex, since they would be the product of all the models together.

If we then asked subjects if the odd-even distinction was all-or-none or graded, we would expect them to say it was all-or-none. If we then asked them to give goodness-of-example ratings for odd numbers and for even numbers, we would expect them to be able to perform the task readily, and to give rather complex ratings. This is exactly what Armstrong et al. did, and those were the results they got. It is exactly what prototype theory would predict – under the Cognitive Models Interpretation.

Unfortunately, Armstong et al. were using the Effects = Structure Interpretation of prototype theory, and the results they got were, not surprisingly, inconsistent with that interpretation. They assumed that, since the odd-even distinction was all-or-none, there should be no prototype effects, since there was no degree-of-membership gradation. When they found prototype effects in a nongraded category, they concluded that prototype effects occurred in all categories regardless of structure, and therefore reflected nothing about the structure of the category. Thus, the same experiment that confirms prototype theory under the Cognitive Models Interpretation disconfirms it under the Effects = Structure Interpretation.

27 Conclusion

Osherson and Smith, together with Armstrong, Gleitman, and Gleitman, have provided even more evidence that the incorrect Effects = Structure and Prototype = Representation interpretations of prototype theory are indeed incorrect. They have not shown that the core plus identification procedure theory *is* correct. In fact, the considerations we discussed above indicate that such a view is not viable for a number of reasons.

1 The classical theory of categories is hopelessly inadequate for complex concepts.

2 There is a correspondence between prototype effects and metonymically based reasoning. Such prototype effects can be accounted for by metonymic models, which are needed independently to account for what Rosch has called 'reference point reasoning.' Thus, prototype effects are not independent of reasoning.

3 There do exist direct correlations between conceptual structure and prototype effects. They are of two types: (a) cognitive models containing scales that define gradations of category membership, and (b) radial categories.

The best way to account for prototype effects in general seems to be via a theory of cognitive models.

Note

A fuller account of the issues discussed in this paper can be found in the author's book *Women, fire, and dangerous things: What categories reveal about the mind,* University of Chicago Press, 1987.

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7 Where does prototypicality come from?

Dirk Geeraerts

1 Hypotheses about the sources of prototypicality

Prototype theory is as it were part of the prototypical core of the cognitive paradigm in semantics, particularly in lexical semantics. I think it is safe to say that it is by now quite obvious that gradience and salience are among the linguistically relevant aspects of semantic structure. One need only recall the early experimental work by Rosch (1973) and Labov (1973) to appreciate the importance of graduality and vagueness for the adequate description of word meaning. But what about explanatory adequacy? Can we move beyond the descriptive level and explain why prototypicality exists at all? There are at least four different hypotheses that have been proposed to explain prototypical phenomena. Each of these hypotheses has been formulated (or at least hinted at) by Eleanor Rosch herself; this is an indication that the hypotheses might well be complementary rather than mutually contradictory. I will call these four hypotheses the physiological, the referential, the statistical, and the psychological one. Let us have a look at them.

The *physiological* hypothesis says that prototypicality is the result of the physiological structure of the perceptual apparatus (Rosch, 1973). This hypothesis has been formulated with regard to the prototypicality effects in the domain of colour terms (the first major field in which prototypicality phenomena have been observed). Particular colours are thought to be focal because the human eye is more sensitive to certain light frequencies than to others. The scope of the physiological explanation is probably fairly limited; it may only be applicable to concepts immediately referring to perceptual phenomena, or at least to bodily experiences that have a distinct physiological basis. Since this is most likely not the majority of cases, additional hypotheses will have to be invoked to explain the prototypical structure of concepts that have no immediate physiological basis.

The *referential* hypothesis states that prototypicality results from the fact that some instances of a category share more attributes with other instances of the category than certain peripheral members of the category (or share attributes with more other instances than these peripheral cases). The peripheral applications of a category share attributes with relatively few other cases, or share only a relatively small number of attributes with other, more central members of the category. This is the *family resemblance* model of prototypicality (Rosch & Mervis, 1975); in psychological terms, it states that the prototypical instances of a category maximize cue validity. I have dubbed this view 'referential' because it considers prototypicality to be an automatic consequence of the structure of the range of application of a concept. Once you know what objects, events etc. a concept can refer to, you can compute differences in salience by comparing the number of shared attributes among those things. One might even say that prototypicality is a secondary phenomenon: it is a side-effect of the mutual attribute relations among the instances in the referential range of application of the concept.

Statistical explanations of prototypicality state that the most frequently experienced member of a category is the prototype. At least, this is the simple form of the frequency model. It can also be combined with the family resemblance model; the weight of an attribute within a concept is then not only determined by its role within the family of applications constituting the category, but also by the relative frequency with which it is experienced (Rosch, 1975).

The *psychological* hypothesis is a functional one. It states that it is cognitively advantageous to maximize the conceptual richness of each category through the incorporation of closely related nuances into a single concept because this makes the conceptual system more economic. Because of the maximal conceptual density of each category, the most information can be provided with the least cognitive effort (Rosch, 1977).

In what follows, I would like to show that the functional explanation of prototypicality is more general than the other ones because it can explain cases of prototypicality that are counterexamples to the other models. I will elaborate the psychological hypothesis by indicating some more functional sources of prototypicality; I will try to make clear that prototypicality is the outcome of some deep-seated principles of cognitive functioning.

2 A case study in synonymics

Dutch has a pair of synonyms *vernielen* and *vernietigen*, which both roughly mean 'to destroy'. Though they exhibit some degree of phonetic similarity, their origin is quite diverse. *Vernielen* is the older form. It is already to be found in Middle Dutch, and it is formed by means of the common verb-forming prefix *ver*- and the adjective *niel*, only a few examples of which survive, but which probably meant 'down to the ground'. Etymologically, then, *vernielen* means 'to throw down to the ground, to tear down'. *Vernietigen*, on the other hand, makes its first appearance in the 16th century; it is formed by means of the same prefix *ver*- and the adjective *nietig*, which is itself a derivation from the negation particle *niet* (English not) and the suffix -*ig* (which corresponds with English -y). *Vernietigen* gradually replaces a third form *vernieten*, which is a straightforward derivation from *niet* with *ver*-, and which is extinct by the end of the 17th century. *Vernietigen* literally means 'to annihilate, to bring to naught'.

The best way to study both words is to turn to the *Woordenboek der Nederlandsche Taal* (hence *WNT*), the major dictionary of Dutch that covers the period from 1500 up to 1920 and that, by the way, is still uncompleted after about a century of editorial work. This dictionary is being compiled on the basis of a huge corpus of quotations; there are as yet no equally representative corpora for contemporary Dutch, so that it is rather more difficult to get an adequate picture of 20th-century usage than it is to study the semantic history of the vocabulary of Dutch. For the purpose of this paper, this is not very important: it suffices to pick out one synchronic period and to see how both words relate to each other in that period. For a number of practical reasons (among others the amount of available material), I will concentrate on the 19th century, stretching the temporal borders of that period with approximately one decade at each end. In this way, a period from 120 to 130 years can be considered, ranging from roughly 1790 to 1910. In the light of the history of culture, this seems quite justified; we more or less envisage the cultural period from the French revolution up to the First World War: the 19th century in the broadest sense.

To get a good picture of the development of *vernietigen* and *vernielen*, it would be necessary to present and discuss the entire articles that I have compiled for the *WNT*, and the complete set of quotations on which they are based. For obvious lack of space, I will only give illustrative quotations; translations of the quotations are given in the Appendix. The set of quotations in the table shows that *vernielen* and *vernietigen* can be used indiscriminately with the same range of application. Each numbered pair of quotations gives examples of one particular kind of usage. These examples should be studied from two points of view. On the one hand, the question has to be asked whether *vernielen* and *vernietigen* exhibit any syntagmatic differences, i.e. differences in their collocational properties. On the other hand, the question arises whether they are paradigmatically different, i.e. whether they exhibit purely conceptual differences. (More details on the analysis of both verbs can be found in Geeraerts, 1985a.)

Syntagmatically, we not only see that both words can be used by the same author in the same context without noticeable differences (as in (1), (2), (8) and (9)), but also that the range of application of each word can be divided into three identical major groups, which can moreover be subdivided along parallel lines. There is a set of applications in which the words are used with regard to concrete, material objects (1, 2, 3); a set in which they are used with regard to abstract objects (4, 5), and a set in which they are used with regard to persons (6, 7, 8, 9). Within the first set, frequently occurring applications relate to buildings (1), other human artifacts (2), and natural objects, in particular plants and crops (3). With regard to the abstract applications, we can distinguish between the annihilation of the existence of certain abstract objects as such (4), and applications in which the realisation or fulfilment of certain abstract notions that contain an aspect of expectation or intention with regard to the future is prevented (5). With regard to persons, (6) expresses their death as such; (7) and (8) indicate how someone's bodily or mental health, respectively, are undermined. (9) expresses how armies are beaten; this application is half-way between the abstract group (the armies cease to exist as functional entities), and the personal group (individual soldiers are killed). The existence of analogous subdivisions within each of the major groups shows that the syntagmatic equivalence of *vernielen* and *vernietigen* is not a coincidence, but that it is an essential part of their relationship.

Table 1

			VERNIELEN	VERNIETIGEN
With regard to concrete things	To demolish buildings or parts thereof	(1)	Dat huis was...evenmin als de naburige tegen de verwoestende veeten dier tijd bestand. Reeds onder den zoon en opvolger des stichters werd het ... tot den grond toe vernield (Veegens, Hist. Stud. 2, 282, 1869).	Alleen zijn de vroegere kruisvensters door vensterramen van nieuweren trant vervangen en hebben de vrijheidsmannen van 1795...het wapen des stichters in den voorgevel met ruwe hand vernietigd (Veegens, Hist. Stud. 1, 125, 1864).
	To destroy other human artifacts	(2)	Er gaat dan stroom op den daarvoor gevormden zijweg over, waarbij genoeg warmte ontwikkeld wordt om de draadwindingen in zeer korten tijd te vernielen (Van Cappelle, Electr. 214. 1908).	Zonder deze voorzorg zou het draadje door de enorme hitte van den gloeidraad vernietigd worden (Van Cappelle, Electr. 295, 1908).
	To destroy natural objects	(3)	Hoeveel het wild vernielt wordt door een Engelschman zeer goed uiteenge-zet bij gelegenheid van een aanval op de beschcrming die het wild aldaar ...geniet (Volksvlijt 1872, 175).	Bij het vernieligen van de onkruiden door het bewerken dient op hunne voortplan-ting en ontwikkeling te worden gelet (Reinders, Landb. 1, 309, 1892).
With regard to abstract things	To annihilate existing situations, characteristics etc.	(4)	Wei wat hamer ! Wordt door zulke sentimentele zotternyen niet al de inwendige kragt vernield ? (Wolff en Deken, Blank. 3, 220, 1789).	Stel mij niet zoo hoog, zei ze onthutst, ik zou daaraan niet beantwoorden; ik zou uw ideaal vernietigen (Vosmaer, Amaz. 175, 1880).
	To prevent the execution of plans, hopes, intentions etc.	(5)	De bergstroom in zijn grammen loop Verscheurt zijn zoom, verdrinkt de dalen: Alzoo vernielt Gij ‘s Menschen hoop! (Ten Kate, Job 53, 1865).	Zy is dan, van kindsbeen af, opgevoed on mynheer Daniel’s echtgenote te worden, en nu is die hoop van een geheel leven vernietigd ! (Conscience, Kwael d. T. 2, 65, 1859). Dit toeval verniedgde ons geheele plan (Haafner, Ceilon 103, 1810).

			VERNIELEN	VERNIETIGEN
With regard to persons	To kill people, to take someone's life	(6)	Mij gendenkt ook nog dat Nicolaas Gaal...mij placht te verhalen...dat de oude man om deze ontstolen eer zich zoo ontstelde en vergramde, dat het ook scheen of hij dezen dief wel had willen vernielen (Fruin, Geschr. 1,1974,1888).	Intusschen heeft de Godin de Natuur besloten nu voor altijd de Drijvende Eilanden en al hun inwoners te vernietigen (Quack, Soc. 1, 246, 1875).
	To undermine someone's physical health	(7)	De beroerte, die haar zwakke levenskrachten in een half uur tijds vernielde, had reeds in het eerste oogenblik hare spraak verlamd (Beets, CO. 206, 1840).	Hy moet rusten. Zulke driften vernietigen het sterkste gestel (Wolff en Deken, Leev. 1, 290, 1784).
	To undermine someone's psychological well-being	(8)	De vrouwen, Lus, zijn zonen, al de anderen bleven stom, vemield van ontsteltenis, op hun stoelen genageld (Buysse, Neef Perseyn 45, 1893).	Toen...antwoordde zij langzaam met een doffe stem, als vernietigd door haar eigene woorden: 'Ja, indien het nog mogelijk is' (Buysse, Mea Culpa 68, 1896).
	To defeat groups of armed men, or armies	(9)	De uitslag van den stryd was ditmael hem niet gunstig: geheel zyn leger werd vernield of uiteen geslagen (Conscience, Gesch. v. Belgie 110, 1845)	Het gansch leger der Turken was vernietigd ! (Conscience, Gesch. v. Belgie 352, 1845).

Furthermore, the examples also show that there is a paradigmatic, strictly conceptual equivalence between both: they do not only have the same collocational properties, but they also seem to express the same concepts in the same contexts. (The distinction between syntagmatic and paradigmatic meaning is used here for purposes of analysis only; it does not imply any particular view with regard to the theoretical relation between both aspects of lexical meaning and particularly with regard to the question whether selectional restrictions are always an automatic consequence of a concept's paradigmatic characteristics.) As a preliminary step, notice that the concept 'to destroy' does not only appear as the notion 'to annihilate the existence of someone or something, to cause someone or something to disappear out of existence', but that it also exhibits the weaker nuance 'to undermine someone or something with regard to some aspect of his existence' (without a complete destruction or a complete removal out of existence being implied). The distinction can easily be discovered within the personal group of applications. In (6), a person is killed, taken out of existence, while in (8) (and most likely also in the second quotation from (7)) someone's existence is undermined from one point of view or another, but not entirely annihilated. Likewise, we can see that within the abstract group, (4) signifies the suppression of the existence of some abstract things as such, whereas in (5), plans, hopes, and expectations are undermined with regard to their realisation and fulfilment: the plan as such is not removed (at least not to begin with), but it is reduced to ineffectiveness and futility. In short, both *vernielen* and *vernietigen* express the notions of complete destruction and partial damage, that is to say, the complete removal out of existence of something or someone, and the less drastic undermining in some respect, of the existence of people or objects. According to the syntagmatic context, these notions receive further specifications. For instance, with regard to persons, complete destruction means killing, but with regard to concrete things, destruction signifies material demolition, and so on. (For the sake of completeness it should be added that the equivalence of *vernielen* and *vernietigen* is less straightforward in present-day Dutch than it is in 19th-century Dutch. Some of the quotations discussed here are now felt to be rather awkward; in particular, it would be difficult to use, *vernielen* with regard to persons.)

On the basis of the foregoing observations, one might be tempted to conclude that the semantic structure of *vernielen* and *vernietigen* in 19th-century Dutch is completely identical: both syntagmatically and paradigmatically, they have the same range of application. However, a number of facts testify that both words have different prototypical structures, i.e., that they have different conceptual centres. There are two sets of facts to be considered: corpus-based facts relating to the way in which both words are used in our corpus of quotations, and introspective facts relating to the way in which the words are perceived by the speakers of the language. In general, consideration of these facts will lead to the conclusion that the abstract applications are central within the structure of *vernietigen*, and that the material applications are central in the cases of *vernielen*. As such, each verb has a different semantic structure in spite of the fact that the elements of these structures appear to be the same.

3 Usage as evidence for prototypicality

Five observations support the prototypical hypothesis. In the first place, the abstract group of applications is quantitatively more prominent within the structure of *vernietigen* than the material set of applications, while the reverse is true of *vernielen*, in which the material group is the most frequently occurring one. In both cases, the major group is represented by approximately three times the quotations of the less central group.

In the second place, the differences in centrality show up in the fact that the prominent applications exhibit specifications and particular nuances that they do not have when they are peripheral within the structure of the lexical item. Thus, the material group of *vernielen* contains a metonymical extension of the application with regard to plants and crops, towards an application in which the fields and gardens where these plants and crops grow appear as the direct object of the verb. Likewise, the application with regard to buildings receives a figurative extension towards an application with regard to an allegorical 'wall' that separates two people. These extensions are probably not impossible within the concrete set of applications of *vernietigen*, but the fact that they do not appear there is statistically interesting: it indicates that the concrete application is more productive in the case of *vernielen* than in the case of *vernietigen*. Conversely, the abstract group has nuances and additional specifications in the case of *vernietigen* that are lacking in the same group with *vernielen*, although it is quite easy to imagine that they would in fact occur there. For example, *vernietigen* has a fairly large set of applications in which social movements, institutions, activities and so on are abolished, one quotation in which it is said that railway transport destroys distances (obviously, distances do not disappear as such, they are only functionally overcome), and one quotation in which a philosopher is said to destroy the soul (again, the soul is not destroyed as such, but the idea that the soul exists is metonymically abolished by the philosopher in question). None of these extensions of the abstract use of the concept 'to destroy' can be found in the case of *vernielen*, which is indicative of the fact that the abstract use is less prominent in the latter verb than in the semantic structure of *vernietigen*.

In the third place, the salience of the material kind of usage can be derived indirectly from the nominalisations of both verbs. Both *vernietiging* and *vernieling* have the verbal sense 'the fact, the act or the process of destroying or being destroyed', but only *vernieling* exhibits the metonymical extension towards the concept expressing the result of that process or that act, i.e., the concrete damage that issues from it. (In the latter case, the word is typically used in the plural: *vernielingen* more or less equals the notion 'damage'.)

In the fourth place, the internal structure of the set of personal applications reflects the differences in prototypical structure between both verbs. To begin with, notice that the personal group contains concrete as well as abstract applications; to kill someone is clearly more concrete than to undermine someone's psychological well-being or his social position. If we then have a look at the mutual relationship between the abstract and the concrete subgroups of the application with regard to persons, we find that the abstract subgroup is proportionally dominant in the case of *vernietigen*, whereas the reverse is true in the case of *vernielen*. Also, we find that extensions of the concrete subgroup of the personal application with regard to other living beings than people or with regard to personifications, are not as strongly present in the case of *vernietigen* than in the case of *vernielen*. (It should be added that these observations have to be considered with more care than the previously mentioned points, since there is a general tendency throughout the centuries covered by the WAT-material, to remove the personal application from the structure of *vernielen*. There are relatively less personal applications in the structure of 19th-century *vernielen* than in the structure of either 19th-century *vernietigen* or 16th-century *vernielen*; as has already been mentioned, it is even more difficult to use *vernielen* with regard to persons in present-day Dutch. In any case, the

19th-century material does seem to show that the material subgroup of the personal application of *vernielen* is more resistant to the tendency in question than the abstract subgroup, as can be predicted from our centrality hypothesis.)

Finally, the importance of prototypicality can be derived from the fact that different nuances play a central role within the core of each concept, whereas those nuances are not particularly important within the corresponding group in the other concept. Thus, the destruction of buildings and other human constructions is prominent within the material use of *vernielen*, but is only rarely present within the material group of *vernietigen*. Within the structure *vernielen* as a whole, demolishing buildings is the single most frequently represented kind of usage, but within the structure of *vernietigen*, it is merely one among many equally important nuances of the material set of applications. In the same way, the central, abstract group within the structure of *vernietigen* is itself centred round applications relating to the dissolution, the cancellation, the annulment of agreements, commitments, engagements, obligations, permissions, rights, and so on, and of the laws, orders, contracts etc. in which they are contained and through which they come into existence. Whereas *vernielen* only rarely exhibits this kind of usage, it is the most frequently occurring sense within the abstract group of *vernietigen* as well as within that word as a whole.

In general, these facts of linguistic usage clearly favour the hypothesis that the abstract applications of the concept 'to destroy' are prototypical within the structure of *vernietigen*, whereas the concrete applications are prominent in the case of *vernielen*. Taking into account that each central group is itself concentrated round a dominant kind of usage, it seems plausible to say that the latter is the prototypical sense for each of the verbs in question. It should furthermore be noted that these prototypical phenomena seem to be connected with the etymology of the words. On the one hand, the abstract prototype of *vernietigen* may well be connected with the abstract character of the words *niet* 'not', and *nietig* 'null and void, insignificant', on which it is based. Moreover, the common phrase *nietig verklaren* 'to declare something to be null and void, dissolve, annul something' corresponds pretty closely with the central notion within the abstract group of *vernietigen*. On the other hand, the centrality of the application with regard to buildings in the structure of *vernielen* seems to correspond with the etymological meaning 'to tear down, to throw to the ground' that we reconstructed above as the original meaning of the verb.

4 Introspective evidence of prototypicality

Before we can deal with the introspective evidence in favour of the prototypicality hypothesis, two preliminary questions have to be answered. In the first place, how trustworthy is the introspective methodology? The paradoxical fact of the matter is that it is exactly the unreliability of introspection that makes it interesting for our purposes. If introspection were able to yield a completely adequate picture of the facts of linguistic usage (which is doubtful), it would simply reduplicate the results reached in the previous paragraphs on the basis of a direct examination of linguistic usage.

But given the presupposition that introspection yields only a partial insight into the semantic structure of the words that are investigated, we can also presuppose that it will be exactly the prototypical kinds of usage of those words, that reach the introspective consciousness of the language user. We can use the results of the introspective method as support for the prototypical hypothesis if we presuppose that prototypical kinds of usage (precisely because they are more salient than other applications) will more easily pass the threshold of conscious attention. Given this presupposition, the introspective judgements of native speakers may shed light on the question which kinds of usage are predominant within a certain concept.

In the second place, how can the introspective method be used with regard to historical material? There are no 19th-century speakers of Dutch around to be asked what they think is the meaning of particular words, so how are we going to get introspective judgements at all? The fact is that we do have information on how the 19th-century speakers of Dutch perceived the near-synonyms that we are investigating, viz. in the form of synonym dictionaries. Synonym dictionaries (at least the older ones) are notoriously unreliable as descriptions of actual patterns of usage; most of the time, the compilers of synonym dictionaries rationalise away the actual identity of words by imposing distinctions that cannot be discovered in the actual facts of usage. However, these rationalisations need not always have proceeded out of the blue: it seems quite plausible that they were guided by the introspective judgements of the compilers. So, if we like to know something of the introspective insights of the 19th-century speakers of Dutch, we can have a look at the synonym dictionaries of that time to see whether the distinctions they make between *vernielen* and *vernietigen* (however inadequate as a picture of the complete set of possible kinds of usage) do indeed reflect the differences in prototypical structure of both words.

And indeed, the 19th-century synonym dictionaries of Dutch do distinguish between *vernielen* and *vernietigen* along lines that fit into our hypothesis. On the one hand, there are those that draw the line syntagmatically, such as Weiland & Landre (1825), who state that *vernielen* can only be used with regard to '*lighamelijke dingen*' (material things), whereas *vernietigen* is more widely used, in particular also with regard to '*menschelijke instellingen*' (human institutions). De Beer (1897) expresses an analogous point of view. On the other hand, there are those that describe the distinction along paradigmatic lines, so that there would be an actual notional difference between the verbs in question, rather than merely a distinction in selectional restrictions. Whereas *vernietigen* is defined as 'to bring to naught, to annihilate', *vernielen* is defined as 'to damage, to smash to pieces, to tear down'. In this sense, *vernietigen* implies a complete annihilation whereas there may be some pieces left of the original object in the case of *vernielen*. It is easy to see that this paradigmatic point of view, which can be found among others in Pluim (1894), is connected with the previous, syntagmatic one: it is precisely because *vernielen* relates to material things that the notion of remaining debris comes to the fore. Likewise, a complete annihilation (in which the original objects disappear completely) is less likely in the material world of concrete objects, so that the restriction of *vernietigen* to abstract objects will tend to be related to the notion of complete annihilation. This is in fact done by Weiland & Landre (1825), though not all proponents of the paradigmatic distinction adhere to the syntagmatic distinction. For instance, De Flines (1810) mentions that *vernietigen* can in fact be used with regard to material objects, but that there is a difference with *vernielen* in the degree of damage achieved. By and large, these views faithfully reflect the insight into the prototypes of *vernielen* and *vernietigen* that we have gained by considering the actual facts of linguistic usage. Syntagmatically, it is recognised that the material context is more important for *vernielen*, whereas abstract objects are predominant in the case of *vernietigen*. Paradigmatically, this is reflected by the fact that *vernielen* carries overtones of material destruction and damage (think of the relationship between the prototypical usage of *vernielen* with regard to buildings, and the definitions of that word that bring to the fore the act of smashing and demolishing things), whereas *vernietigen* calls forth the idea of complete annihilation (as it were, wiping something off the face of the earth). As such, the stubborn efforts of the compilers of synonym dictionaries to find semantic differences among near-synonyms seem to be not entirely gratuitous. To the extent that they try to capture the characteristics of the most salient kinds of usage of both lexical concepts, they strengthen our own hypothesis about the differences in prototypical structure among the verbs.

5 The functional explanation of prototypicality

There are a number of interesting conclusions to be derived from the above analysis of the near-synonyms *vernielen* and *vernietigen*. First, prototypicality is an interesting new point of view in the study of synonyms. It is traditionally well-known in lexical semantics that there are relatively few true synonyms in natural languages, and the ways in which near-synonyms differ can be very diverse. Our discussion of *vernielen* and *vernietigen* shows that there is one more factor to be added to the list of differentiating factors: near-synonyms may be distinct with regard to the prototypical structure imposed on an otherwise identical range of application. Once again, the importance of prototype theory for the traditional concerns of lexical semantics becomes apparent (cf. Geeraerts, 1983, 1984, 1985b); prototype theory opens up new perspectives in the study of synonyms.

Secondly, there are some indications that introspective judgements in lexical semantics relate to the prototypically salient instances of concepts rather than to the full range of actual usage possibilities. If this can be confirmed by additional comparisons between introspective perceptions of lexical meanings and actual usage patterns, more will be known about the value of both methodologies (introspective and corpus-based) in lexical semantics. Also, if we maintain the classical view of modern linguistics that it is one of the goals of linguistic theory to account for the introspective judgements of native speakers, and if these judgements appear to be influenced by prototypical phenomena, yet one more reason presents itself for incorporating prototype theory into lexical semantics.

Thirdly, the fact that *vernielen* and *vernietigen* have the same conceptual and collocational range of application, and yet differ with regard to the core and the periphery of their categorial structure, indicates that there are at least some cases of prototypicality that cannot be explained by means of the referential model. *Vernielen* and *vernietigen* refer to the same set of acts and processes; as such, the differences in their prototypical structure cannot be the automatic consequence of their referential range, as is implied by the family resemblance hypothesis. In addition, the physiological and the statistical explanation will not be of much avail either. There is no particular organ or mechanism for the perception of processes of destruction, and even if there were, we would still need two *different* physiological structures to explain the distinction between both verbs, which is beyond all intuitive plausibility. The statistical explanation is inapplicable for the same reason as the referential hypothesis: since the range of application of both verbs is the same, the frequency of occurrence of the processes referred to is the same for both verbs. That is to say, the frequency with which the demolishing of buildings occurs *in reality*, relative to the frequency with which, say, agreements are cancelled *in reality*, has exactly the same effect on both verbs, since these refer to the same objective reality. Because they denote the same things in reality, the structure of reality (either with regard to the frequency of occurrence of its elements, or with regard to the mutual resemblances among those elements) cannot be invoked to explain the distinction in semantic structure between *vernielen* and *vernietigen*.

In short, we can reject all materialistic explanations of the prototypicality effects observed in the verbs under consideration. Indeed, the physiological, the referential, and the statistical hypotheses have this in common: that they try to explain prototypicality on the basis of materialistic data, either the material structure of the human perceptual apparatus, or the material characteristics (statistical or otherwise) of the referential range of the concepts involved. Given that we have to reject these materialistic hypotheses, we can provisionally choose, by elimination, the psychological, functional explanation of prototypicality. To support this choice, I would like to make clear that the functional hypothesis has some additional advantages, besides the fact that it avoids the problem of the materialistic hypotheses. First, however, three remarks have to be made.

To begin with, it might be claimed that a statistical explanation of the prototypicality effects in *vernielen* and *vernietigen* can indeed be given, if we take into account, e.g., that the material sense occurs much more frequently with *vernielen* than with *vernietigen*, or that the abstract specification of the notion 'to destroy' is statistically much more prominent in the latter verb than in the former. However, the frequencies that are mentioned here are linguistic frequencies, not referential frequencies, i.e., they are frequencies of occurrence of words, not of the things those words refer to. Because the frequency at stake here is linguistic rather than referential, it can hardly be invoked to explain prototypicality; as an aspect of linguistic usage, it is one of the things we have to explain, not one of the things that are themselves part of the explanation. We can use linguistic frequencies to determine what instances of a concept are prototypical (that is what we did in section 3), but explaining prototypicality on the basis of linguistic frequency is putting the cart before the horse. Some kinds of usage are not prototypical because they are more frequent; they are more frequent because they are prototypical. The apple is not a prototypical fruit because we talk more about apples than about mangoes, but because we experience apples more often than we encounter mangoes (and this fact, in turn, may be the reason why we talk more about apples). Frequency of linguistic occurrence may be a heuristic tool in the pinpointing of prototypes, but it is not the source of prototypicality as meant in the statistical hypothesis.

The second remark has to do with the fact that criticism with regard to the referential, family resemblance model of prototypicality has already been formulated elsewhere. This has been the case in the work of Pulman (1983) and – in more stringent fashion – in the well-known article by Armstrong *et al.* (1983). They argue that gradience can be observed in concepts with rigid boundaries (their examples relate to natural numbers), so that family resemblances cannot be invoked to explain the differences in salience among numbers. There are two reasons, however, why their argumentation is less relevant than they assume. First of all, they more or less equate prototype theory and the family resemblance model of the sources of prototypicality, whereas it is quite clear that the family resemblance model is merely one of a number of hypotheses concerning the sources of prototypicality: ruling out one hypothesis does not mean that one can ignore the others. And also, I do not think that Armstrong *et al.* are successful in presenting a counter-example to the family resemblance model. Even if a concept has rigidly defining characteristics, family resemblances may exist among the non-defining characteristics of the instances of that category. Since cognitive semantics is basically encyclopaedist in its approach, these non-defining, 'encyclopaedic' attributes should be incorporated into the computation of degrees of shared attributes. As Lakoff (1982) has shown, such encyclopaedic, experiential factors do indeed occur with regard to numbers, and they can be used to explain the prototypicality ratings found by Armstrong *et al.*

My third remark is this: my criticism of the materialistic hypotheses should not be overgeneralised. The fact that they do not work in the case of *vernielen* and *vernietigen* clearly does not imply that they do not work in any case, but merely makes clear that next to the physiological, the referential, and the statistical model, there will have to be at least one other source of prototypicality.

Let us now come back to the functional model of prototypicality and try to elaborate it. Remember that the psychological hypothesis involves requirements that the cognitive system is to comply with if it is to function efficiently: *prototypicality exists because it is cognitively advantageous*. As we have seen, Rosch has specified this functional advantage in terms of the economical effect of informational density; prototypical categories enable one to reach the most information with the least cognitive effort. This functional line of reasoning can be supplemented with some additional (and perhaps even more fundamental) functional reasons for having prototypical categories. We can base the discussion on one of the fundamental insights of cognitive psychology, viz. that cognition should combine structural stability with flexible adaptability. On the one hand, cognition should have a tendency towards structural stability: the categorial system can only work efficiently if it can maintain its overall organisation for some time, if it does not change fundamentally any time new information has to be incorporated. At the same time, however, it should be flexible enough to be easily adaptable to changing circumstances. To prevent it from becoming chaotic, it should have a built-in tendency towards structural stability, but this stability should not become rigidity, lest the system stops being able to adapt itself to new and unforeseen circumstances.

This necessity of flexibility is one of the aspects of lexical semantics that was recognized by the prestructuralist tradition of historical semantics, but that has been more or less lost in the meantime, as a result of the structuralist attention for fixed synchronic structures. Be that as it may, it will be clear that prototypically organised categories are particularly well suited to fulfil the double demand for flexible adaptability and structural stability. On the one hand, the fact that slightly deviant nuances can be developed within a particular category indicates that categories have the dynamic ability to cope with changing conditions and changing expressive needs. On the other hand, the same fact (that marginally deviant concepts can be incorporated into existing categories as peripheral instances of the latter) proves that these categories have a tendency to maintain themselves as holistic entities, thus maintaining the overall structure of the categorial system. Prototypical categories maintain themselves by adapting themselves to changing circumstances and new expressive needs; at the same time, they function as expectational patterns with regard to reality: new facts are interpreted in terms of information that is already at the disposal of the individual. The flexibility of the cognitive system does not only show up in the fact that it can adapt itself to new experiences, but this flexibility is supplemented with the fact that existing categories have a formative influence with regard to experience; new experiences are fitted into the expectational patterns provided by the existing categorial system.

Along these lines, prototypicality appears to be the outcome of some fundamental, deep-seated principles of cognitive functioning. The form of the conceptual system appears to be determined by a set of basic functional requirements, and prototypically structured concepts admirably meet these requirements. If this is correct, the same basic principles should also have a role to play in other cognitive disciplines. That is to say, if prototypicality is an emanation of some basic characteristics of all cognition, we should be able to find analogies of the prototypical idea in other fields of cognitive science, next to lexical semantics. I have tried to prove at length elsewhere (1985b) that this is in fact the case: the importance of interpretative schemata mediating between experience and existing knowledge is an idea that can be traced in a number of cognitive disciplines. It is very much apparent in Artificial Intelligence (Minsky's frame notion); it can be found in cognitive psychology, particularly in the work of Bruner, and to some extent in that of Piaget; it can be related to some of the views of the early, Husserlian phenomenological movement in philosophical epistemology; and it has some important similarities with the paradigmatic conception of scientific enquiry inaugurated by Thomas Kuhn.

These are exciting parallels because they suggest that the functional, psychological hypothesis concerning the sources of prototypicality can at the same time be the basis for a truly integrated cognitive science in which the insights of linguistics, Artificial Intelligence, cognitive psychology, philosophical epistemology, and the philosophy of science can be brought together under a common denominator. In this respect, the functional model of prototypicality, even if it does not rule out the possible importance of the physiological, the referential, or the statistical explanation, does seem to be more general than the latter, not just because it is based on fundamental principles of cognition, but also because similar views have been put forward in other branches of cognitive science.

6 Onomasiological and semasiological aspects of cognitive semantics

Unfortunately, the optimistic perspective of the previous paragraph does not solve everything. To round off the discussion, I would like to show that a complete explanation of all questions to be raised with regard to *vernielen* and *vernietigen* is far from available. The picture we have reconstructed so far looks like this: apparently, the linguistic community at some point in its development finds it convenient to have two distinct categories for the concepts of material and abstract destruction. Thus, a pair of etymologically distinct words becomes available, originally *vernielen* and *vernieten*, later on *vernielen* and *vernietigen*; their compound character ensures that one of them signifies material destruction, the other abstract annihilation. Gradually, the flexibility that is inherent in all human categorisation extends these concepts beyond their etymological usage; as a result, they have the same range of application in the 19th century.

But now consider the original situation in which these flexible extensions have hardly begun taking place. Is it then not irrational to use *vernielen* to express abstract annihilation, when you already have *vernietigen* or *vernielen* to do so? The question can be put in terms of global and local efficiency. As we have argued, the global efficiency of the conceptual system commands its flexible, prototypical organisation. But there is, in the case of *vernielen* and *vernietigen*, also a local efficiency principle that says that it is uneconomic to have two terms expressing the same things. We are then forced to ask: why does not the local efficiency principle stop the application of the global principle? Why is not the prototypical extension of *vernielen* towards abstract forms of destruction checked or prevented by the consideration that you already have a lexical category expressing abstract destruction? There is yet another way of formulating the problem: prototype-based flexibility is necessary because of the expressive needs of the speaker: he may want to express concepts for which no specific term is available. But why then would he use these flexible mechanisms of semantic extension if such a specific term is indeed available?

One kind of answer might simply be that the global principle is stronger than the local principle; the global principle simply supersedes the local principle to the extent that local inefficiencies are created. We are then saying that the global principle is so general that its strength overrules the local principle, and that it applies even where it is not strictly necessary. Still, this does not tell us why the local principle is weaker than the global principle. Also, it is rather awkward to explain a mechanism that is unfunctionally overproductive on the basis of functional considerations. Couldn't we therefore find a more rational explanation of the flexible extensions?

The way out, as far as I can see, is to take into account other kinds of expressivity than the purely conceptual one. Using *vernielen* to express a concept that is commonly expressed by *vernietigen* may be conceptually superfluous, but that does not mean that doing so may not serve particular expressive purposes. On the level of the linguistic form, for example, it may be quite functional to use another word than the usual one. The varieties of such a formally expressive synonymy are well-known in traditional lexical semantics; near-synonyms may exhibit connotational and emotional differences (as in euphemisms), stylistic differences (as in popular words versus poetic terms), or sociolinguistic differences (as in learned words versus common words). Perhaps we can even say that speakers have an urge for stylistic variation as such, even if the formal variants do not carry specific overtones; variation may well be governed by a straightforward desire to avoid monotony, to create new ways of expressing oneself, to experiment with unexpected innovations as a way of stressing one's own individuality. Moreover, it may well be that the importance of metaphor in natural language is determined precisely by its stylistic expressivity; metaphorical expressions would then be created primarily to add expressive weight to the message one wants to convey. (See the contribution of B. Rudzka-Ostyn 1988.)

It is quite plausible, then, that factors such as these have governed the extension of *vernielen* and *vernietigen* beyond their original meanings and into each other's etymological range of application. For instance, using *vernielen* to express a process of abstract cancellation may have been stylistically particularly expressive, because the process of material destruction normally denoted by *vernielen* carried overtones of physical violence that were less marked in the case of *vernietigen*. The extended use of *vernielen* would then have been a case of metaphorical hyperbole. It is, however, very difficult to pinpoint exactly which form of expressivity is the relevant one with regard to the two verbs that we are concerned with here; our historical material for the earliest (Middle Dutch) history of *vernielen* and *vernieten*, for instance, is very hard to interpret with regard to such questions. Still, some clear cases may in fact be found. For instance, the first quotation of (5) in Table 1 clearly carries more overtones of violence, force, and intensity than the second quotation in that pair of examples. (This is mainly made apparent by the presence of a simile, marked by *alzoo*.) This suggests that the verbs highlight slightly different aspects of the situation described, or rather, represent the situation from different points of view (determined by the prototypical core of each verb). (In Langacker's terminology, the distinction between the two verbs, when used with regard to the same process, might then be characterized as a figure/ground-distinction: *vernielen* takes the violent process as figure, and *vernietigen* the destructive result.)

This is not an altogether implausible hypothesis, but it is unfortunately hard to confirm for the simple reason that the historical texts used here do not give us enough clues to discern such subtle differences in stylistic or emotional overtones.

On the whole, then, what can we conclude from our discussion of this additional problem? On the one hand, it inspires caution with regard to our attempts to explain prototypical phenomena: the linguistic materials at our disposal do not always allow completely satisfactory answers with regard to the questions at stake to be formulated. On the other hand (and this is, I think, the more important conclusion), the discussion suggests that prototype formation may be influenced by other factors than purely conceptual ones. Stretching the meaning of a lexical item may be motivated by the desire to use another form than the one that is usual to express the idea in question; stylistic, sociolinguistic, connotational expressivity rather than purely conceptual needs may determine the flexible use of a category. In such a case, the conceptual coherence of the prototypically structured category (i.e., the fact that the new, peripheral kinds of usage have to be accessible from the prototypical core) constitutes a limit to the desire for formal variation: you can use a particular lexical item to express an idea that is usually signified by another word, but only on the condition that the idea in question is part of the prototypical potentialities of that lexical item. Basically, you stretch an item's meaning to express something conceptually new, but you can also stretch it to express something conceptually old in a formally new way. This is a very important suggestion, because it implies a warning against a tendency that is a natural characteristic of cognitive semantics: the tendency, in fact, to look for purely cognitive or conceptual explanations of the facts one encounters. Taking the cognitive, experiential, encyclopaedic nature of linguistic signs seriously should not imply looking only for strictly conceptual explanations. Language is not just content: it is also form, and its formal side has an expressivity of its own, which does seem to create lexical configurations that can hardly be explained if we only take into account the conceptual expressivity of language.

In the traditional terms of lexical semantics, this means that the explanation of prototypicality should not restrict itself to the *semasiological* perspective (in which each category is considered on its own), but that the *onomasiological* point of view (in which what is studied concerns how several items may express similar or identical concepts) should be taken into account as well. Conceptual expressivity is basically a factor connected with the semasiological explanation of prototypicality, whereas the onomasiological influences on prototype formation seem to refer to other kinds of expressivity, as was suggested by our study of *vernielen* and *vernietigen*. The incorporation of the onomasiological approach does not mean that cognitive semantics moves away from the functional perspective advocated in the previous section; non-conceptual expressivity is just as much a functional principle as purely conceptual expressivity and cognitive efficiency. Rather, the incorporation of onomasiology implies that cognitive semantics moves much closer to the rich tradition of lexical semantics, in which onomasiological mechanisms and configurations have been thoroughly studied (see Geeraerts, 1986, ch. 1). Such a link with traditional approaches can only strengthen the linguistic attractiveness of cognitive semantics.

To summarise: I have tried to argue, on the basis of a case study involving the Dutch near-synonyms *vernielen* and *vernietigen*, that the functional point of view is the most encompassing, most promising one for studying prototype formation, though it should not be restricted to purely conceptual expressivity and efficiency, but should also take into account the kinds of functional mechanisms that have traditionally been studied by the onomasiological approach to lexical semantics. The fact, however, that prototypicality may come from a number of diverse sources, also implies that an adequate explanation of conceptual structures will not be easy.

Appendix. A translation of the quotations

The references given in the table follow the standard abbreviations used in the *WNT*. Full references can be found in: C. Kruijskamp & A. Persijn, Bronnenlijst *WNT*, met aanvullingen (1943–1966; Den Haag: Nijhoff, Leiden: Sijthoff).

(1) Like the neighbouring one, this house was not able to stand up against the destructive quarrels of the age. Already under the son of the founder, it was demolished down to the ground. – Only, the earlier cross-windows have been replaced by windows in a newer style, and in 1795, the freedom fighters demolished the founder's arms in the facade with their rough hands.

(2) Electric current is then transferred to the diversion that has been construed to that end, in which case enough warmth is produced to destroy the coils of the wire in a very short time. – Without this precaution, the wire would be destroyed by the enormous heat of the filament.

(3) How much is destroyed by game is aptly expressed by a certain Englishman on the occasion of an attack on the protection these animals enjoy in his country. – During the destruction of weeds by cultivating the land, one should bear in mind their reproduction and development.

(4) By golly! Does not such sentimental foolishness destroy all our inner strength? – Do not put me on a pedestal, she said disconcertedly, I would not live up to that; I would destroy your ideal.

(5) The mountain stream in its angry course rends its banks, drowns the valleys: thus, Thou destroyest the hope of Man! – She has been raised from childhood to become Master Daniel's wife, and now this hope of a lifetime has been annihilated! – This coincidence annihilated our entire plan.

(6) I still remember that Nicolas Gaal was fond of telling me that the old man used to get so angry and upset about this stolen honour, that it seemed that he would have liked to kill that thief. – Meanwhile, the goddess Nature has decided to destroy the inhabitants of the Floating Islands once and for all.

(7) The stroke that destroyed her weak life force in half an hour, had from the first moment paralysed her speech. – He has to take a rest. Such passions undermine the strongest constitution.

(8) The women, Lus, his sons, all the others remained silent, destroyed by disconcertedness, nailed to their chairs. – Then she answered slowly, in a dull voice, as if struck down by her own words: 'Yes, if it is still possible'.

(9) This time, the result of the battle was not favourable to him: his entire army was destroyed or dispersed. – The entire army of the Turks was destroyed!

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8 Reconsidering prepositional polysemy networks: the case of *over* *

Andrea Tyler and Vyvyan Evans

1 Introduction

We focus here on the issue of semantic polysemy, the phenomenon whereby a single linguistic form is associated with a number of related but distinct meanings or *senses*. In particular, we consider how the notorious polysemy of the English preposition *over* might be accounted for in a principled, systematic manner within a cognitive linguistic framework. At base, we argue that the many senses of *over* constitute a motivated semantic network organized around an abstract, primary meaning component, termed a *protoscene*. The many distinct senses associated with *over* are accounted for by interaction of the protoscene with a constrained set of cognitive principles. Accordingly, our more general claim is that the lexicon is not an arbitrary repository of unrelated lexemes. Rather, the lexicon constitutes an elaborate network of form–meaning associations (Langacker, 1987, 1991a, 1991b), in which each form is paired with a semantic network or continuum (Brisard, 1997). This follows from two basic assumptions, widely demonstrated within the framework of cognitive linguistics. First, semantic structure derives from and mirrors conceptual structure (see, for example, Fauconnier, 1994, 1997; Heine, 1997; Jackendoff, 1983; Lakoff, 1987). Second, the kinds of bodies and neural architecture human beings have – how we experience – and the nature of the spatio-physical world we happen to live in – what we experience – determine the conceptual structure we have (Clark, 1973; Evans, 2004; Grady, 1997; Heine, 1993, 1997; Johnson, 1987; Lakoff & Johnson, 1980, 1999; Svorou, 1993; Sweetser, 1990; Talmy, 1983, 1988, 1996, 2000; Turner, 1991; Varela, Thompson & Rosch, 1991).

This model of the lexicon generally, and the model of polysemy proposed here in particular, contrasts with traditional models in a number of ways. The traditional view holds that all regularity and productivity are in the syntax, with the lexicon serving as a repository of the arbitrary. Aronoff (1994) points out that Bloomfield articulated this perspective as early as 1933. More recently, Chomsky has reasserted this stance: 'I understand the lexicon in a rather traditional sense: as a list of 'exceptions', whatever does not follow from general principles' (1995, p. 235). Models within this framework have tended to represent different word senses as distinct lexical items (Croft, 1998). Polysemous forms are simply represented as an arbitrary list of discrete words that happen to share the same phonological form.

Over the years, this stand has been criticized for failing to account for systematic ways in which numerous forms are clearly related (Jackendoff, 1997; Langacker, 1991a;

Levin, 1993; Pustejovsky, 1995). Croft (1998) notes that a number of linguists have argued for some type of derivation within the lexicon that would represent distinct senses as arising from a primary sense via a set of lexical operations. By and large, these analyses have focused on polysemy involving changes in the argument structure of verbs or alternatively in category changes, and have had little to say about the type of polysemy demonstrated by English prepositions in which syntactic category changes are often not involved.

In fact, most linguists (cognitive linguists excepted) have not paid much attention to the phenomena of polysemy. Pustejovsky notes that 'The major part of semantic research ... has been on logical form and the mapping from a sentence-level syntactic representation to a logical representation' (1995, p. 33). The lexicon has been represented as a static set of word senses, tagged with features for syntactic, morphological and semantic information, ready to be inserted into syntactic frames with appropriately matching features. Within this tradition the lexicon has been viewed as 'a finite set of [discrete] memorized units of meaning' (Jackendoff, 1997, p. 4).

Cognitive linguistics takes a significantly different perspective on the nature of the mental lexicon. Of primary importance is the notion of *embodied meaning*: the meanings associated with many individual lexemes are instantiated in memory not in terms of features, nor as abstract propositions, but rather as imagistic, schematic representations. Such *image-schemas* are held to be embodied, in the sense that they arise from *perceptual analysis* of recurring patterns in everyday physical experience (see Johnson, 1987; Mandler, 1992, 1996, for a developmental perspective).[1] Perceptual analysis creates a new, abstract level of information – information tied to the spatio-physical world we inhabit but mediated by human perception and conceptualization. The central assumption of embodied meaning stands in stark contrast to approaches to the mental lexicon that represent lexical items as bundles of semantic, syntactic and morphological features.

A second distinguishing tenet of cognitive linguistics involves the representation of lexical items as natural categories involved in networks or continuums of meaning. Research into human categorization (Rosch, 1975) strongly suggests that speakers distinguish between prototypical and peripheral members of a set, based not on criterial properties or features, but rather on how predictable a member is, based on a prototype (Lakoff, 1987). Consequently, cognitive semantic accounts of polysemy (Brugman, 1981; Brugman & Lakoff, 1988; Lakoff, 1987) have argued that lexical items constitute natural categories of related senses organized with respect to a primary sense and thus form semantic or polysemy networks. Hence, such accounts are strongly suggestive that the lexicon is much more motivated and organized than has traditionally been assumed (Dirven, 1993; Lakoff, 1987; see also Langacker, 1991a; the work in *construction grammar* argues in a related vein, e.g. Fillmore, Kay & O'Connor, 1988; Kay & Fillmore, 1999; Goldberg, 1995).

In the 1980s, Brugman conducted pioneering work in the polysemy of the English preposition *over* (1981 [1988]). This research was followed by Lakoff (1987), Brugman and Lakoff (1988), Dewell (1994) and Kreitzer (1997). Brugman and Lakoff treated prepositions as denoting a spatial relation between an element in focus (the figure), and an element not in focus (the ground).[2] The Brugman/Lakoff framework took a highly fine-grained approach to the semantics of prepositions. Accordingly, Lakoff (1987) provides a network that contains at least 24 distinct senses. More recently, work such as Evans (2004), Kreitzer (1997), Rice (1993), Ruhl (1989),[3] Sandra (1998), Sandra and Rice (1995), Tyler and Evans (2003), and Vandeloise (1990), has questioned whether such a fine-grained analysis is warranted, arguing that the Brugman/Lakoff analysis is methodologically unconstrained.

We will argue that a significant problem with previous approaches is that they fail to distinguish between what is coded by a lexical expression and the information that must be derived from context, background knowledge of the world, and spatial relations in general. That is, previous analyses fail to take account of meaning construction as a process which relies upon conceptual integration of linguistic and nonlinguistic prompts, guided by various global cognitive principles. Hence, we follow recent work in cognitive linguistics (Fauconnier, 1994, 1997; Fauconnier & Turner, 1998; Turner, 1991, 1996), which posits that formal linguistic expression underspecifies for meaning. We will further argue that this failure stems in large part from the fact that previous approaches have not developed well-motivated criteria for (i) distinguishing between distinct senses within a network versus interpretations produced on-line and (ii) determining the primary sense associated with a preposition.

Our first objective in the present article is to outline what we term a 'principled polysemy framework'. This will anchor the semantic network of *over* to a foundational conceptual representation (our protoscene), deriving directly from uniquely human perceptions of and experience with the spatiophysical world. The protoscene we posit is a highly abstract representation of a recurring spatial configuration between two (or more) objects. Hence, details of the physical attributes of the objects involved in a particular spatial scene will be shown not to involve distinct senses (contra Brugman/Lakoff). We will argue that many of the distinct senses posited in previous approaches are produced on-line, as a result of a highly constrained process of integrating linguistic prompts at the conceptual level. Key to distinguishing our framework from previous ones will be outlining a clear, motivated methodology for determining the protoscene associated with a preposition and distinguishing between senses that are instantiated in memory versus interpretations produced on-line. Our second objective is to demonstrate the usefulness of the framework by providing a complete account of the polysemy exhibited by *over*.

2 Previous approaches

2.1 The full-specification approach

The full-specification approach (e.g. Lakoff, 1987) characterizes the polysemy network for *over* as subsuming distinct but related topographical structures at a fine-grained level. Each sense is represented by a distinct image-schema; each image-schema is related through various formal links and transformations. To see the level of granularity in this model, consider (1) and (2).

(1) *The helicopter hovered over the ocean.*

(2) *The hummingbird hovered over the flower.*

Following Langacker's *cognitive grammar* (Langacker, 1987, 1991a, 1991b), figure–ground relations denoted by prepositions were described in terms of a *trajector* (TR) and a *landmark* (LM). Lakoff observed that in a sentence such as (1) *over* describes a relation between a TR, *the helicopter*, and a LM that is extended, *the ocean*, while in (2) the relationship is between a TR, *the hummingbird*, and a LM that is not extended, *the flower*. Lakoff argued that such differences in dimensionality of the LM should be represented as distinct senses in the semantic network associated with *over*. He termed this approach *full specification* (see Lakoff, 1987 for full details and copious examples). From this view it follows that for a word such as *over*, there would be a vast number of distinct senses explicitly specified in the semantic network, including many of the metric characteristics of the variety of TRs and LMs, that can be mediated by the spatial relation designated by *over*.

While not in principle inconceivable,[4] in practice, as Kreitzer observed, the fine-grained distinctions between instances of *over* as in (1) and (2), along with the proposed links and transformations, provide a semantic network so unconstrained that 'the model ... [allows] ... *across*, *through* and *above* all to be related to the polysemy network of *over*' (1997, p. 292). Sandra and Rice (1995), on the basis of their experimental findings, question whether the actual polysemy networks of language users are as fine-grained as suggested by models of the sort proposed by Lakoff. This view is echoed forthrightly in Vandeloise (1990).

Moreover, a Lakoff-type analysis fails to consider that detailed metric properties of LMs and TRs are often not specified by the lexical forms used by speakers in their utterances. For instance, the lexical form *flower* does not specify whether the entity should be construed as [+ vertical], as a tulip or calla lily might be, or [– vertical], as a lobelia or a water lily might be. Thus, in a sentence such as (2), *The hummingbird hovered over the flower*, it appears that verticality is not explicitly specified by the semantics of the LM. This indicates that there must be a sense of *over* in which the TR is higher than the nonextended LM and the verticality of the LM is not specified. Thus, Lakoff's account results in the highly questionable consequence of positing three senses of *over* in which the TR is located higher than a nonextended LM – one which specifies for a vertical LM, one which specifies for a nonvertical LM, and one which does not specify for verticality and hence subsumes the first two senses. Similarly, Lakoff's model would posit three additional senses involving a LM which is extended, one which specifies for verticality (e.g. *a mountain range*), one which specifies for nonverticality (e.g. *an ocean*), and one which does not specify for verticality (e.g. *the area*) and hence subsumes the first two.[5]

In essence, by building too much redundancy into the lexical representation, Lakoff's model vastly inflates the number of proposed distinct meanings associated with a preposition such as *over*. An implicit consequence of this representation is that real-world knowledge as well as discourse and sentential context, which are used in the conceptual processes of inferencing and meaning construction, are reduced in importance, as much of the information arising from inferencing and meaning construction is actually built into the lexical representation.

2.2 The partial-specification approach

Kreitzer's approach (1997), which we term *partial specification*, offers a notable refinement of the Brugman/Lakoff approach because Kreitzer is able to constrain the number of senses within a polysemy network, in a consistent, motivated way. Building on work by Talmy (1983), Kreitzer posits that there are three distinct levels of schematization inherent in the conceptualization of a spatial scene: the component level, the relational level, and the integrative level. The component level constitutes conceptual primitives, notions such as LM, TR, PATH, contact between TR and LM, lack of contact, whether the LM is extended, vertical, and so on. These combine giving the relational level. Crucially, for Kreitzer 'the relational level schema is taken as the basic level of 'granularity' representing a sense of a preposition' (1997, p. 295). Whereas for Lakoff each additional topographical component constituted a distinct sense, Kreitzer claims that these individual components apply compositionally at the relational level. As such, image-schema transformations (which allow new components to be added to the image-schemas) are no longer taken as providing a new sense. Rather, image-schema transformations simply serve to widen the applicability of a particular sense. Examples (3) and (4) illustrate this point.

(3) *The boy climbed over the wall.*

(4) *The tennis ball flew over the wall.*

In (3) there is contact between the TR, *the boy*, and the LM, *the wall*, whereas in (4) there is not. For Lakoff, this distinction warranted two distinct senses. Kreitzer, by claiming that the sense provided by an image-schema is defined at the relational level (rather than at the component level), is able to argue that both usages represent only one sense of *over*. His insight is that the basic spatial relation between the TR and LM remains unchanged in (3) and (4), even though the components of the spatial scene may vary contextually. For Kreitzer, topographical features, such as contact and extendedness of the LM, are situated at the component level, and consequently do not delineate distinct senses or image-schemas.

Consequently, Kreitzer argues that the plethora of separate image-schemas posited by Lakoff can be represented by three image-schemas at the relational level. The primary sense, which he terms *over1*, is static, *over2* is dynamic, and *over3* is what Kreitzer terms the occluding sense. Examples of these are:

(5) *The picture is over the sofa* [*over1*, static sense].

(6) *Sam walked over the hill* [*over2*, dynamic sense].[6]

(7) *The clouds are over the sun* [*over3*, occluding sense].

Although Kreitzer is successful in constraining Lakoff's analysis, his account faces a significant problem because his three basic senses of *over* are arbitrarily connected; they do not share a common TR–LM configuration. As Lakoff's model with a system of links and transformations has been abandoned, *over* now denotes three distinct relations, and it is difficult to see how Kreitzer's occluding sense of *over3* could be related to *over1* or *over2*. In order to appreciate the difficulty, consider (7) in relation to (5) and (6). In (7), *over* denotes a relationship in which the TR, *the clouds*, is beneath the LM, *the sun*. In (6), *over* denotes a dynamic relationship in which the TR is above the LM only at the midpoint of the TR, but in (5) the TR is stationed above the LM. It would seem that his claim to polysemy is undermined by three schemas so distinct as to have little in common. Moreover, he makes no attempt to account for how *over1* could give rise to *over2* and *over3* respectively.

Secondly, as with Lakoff's full-specification approach, Kreitzer's model fails to fully address the issue of the contributions of sentential context and background knowledge. Consider (8) for instance.

(8) *The clouds moved over the city.*

Kreitzer posits that (8) has two construals as a result of his assumption that *over* has both a static and a dynamic relational schema. Construal 1 stipulates that the clouds moved above and across the city, such that they originated in a position not above the city, moved over the city, and came to be in a position beyond the city. Construal 2 stipulates that the clouds moved from a position in which they were not over the city, to a position such that they came to be directly over the city. These construals are diagrammed in Figures 1 and 2.

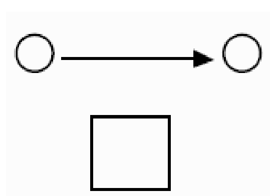

Figure 1 The clouds moved over the city: construal 1 (after Kreitzer 1997: 305).

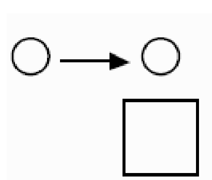

Figure 2 The clouds moved over the city: construal 2 (after Kreitzer 1997: 305).

Kreitzer argues that construal 1 is the result of *over2*, while construal 2 represents an integration of *move*, which contains a path schema as one of its components, and *over1*. On this view, the whole meaning of the sentence depends on which image-schema for *over* is taken.

In addition to these two construals posited by Kreitzer, however, there is a third construal in which the clouds move around but remain above the city. This is represented in Figure 3.

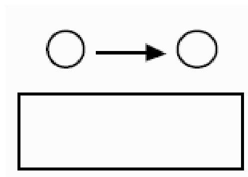

Figure 3 The clouds moved over the city: construal 3.

Based on Kreitzer's account, we would expect construal 3 to result from integration of *move* with *over1*, as the TR is always 'above' the city. However, the problem for Kreitzer's account is that we have two construals, 2 and 3, which would thus not be distinguished image-schematically. How do we obtain distinct construals without such being coded?

Kreitzer's account is problematic because he is assuming that distinct construals either result from such being coded by a preposition at the relational level or arise at the integrative level. But the integrative level simply 'conflates' the two linguistic codes. That is, the path schema of *move* is added to the static schema of *over1*, resulting in a dynamic construal. Since we are able to distinguish construal 3 from construal 2, there must be a further level of integration at which linguistic codes are elaborated, such that linguistic underspecification is filled in, providing a variety of construals, limited only by our perceptual abilities and what is possible in the world. This is the level of integration we refer to as the conceptual level. Hence, a fundamental problem with Kreitzer's account (as well as with Lakoff's) is that it assumes that the rich understanding we obtain about spatial scenes is derived entirely from what is coded by formal linguistic expression. This represents a commitment to the view that conceptualization must always derive from linguistic antecedents. We argue that the ambiguity (given that there are three construals) arises precisely because *move* codes a path schema whereas *over* does not, and because of what we know about cities and clouds (cities, unlike walls, for instance, occupy an extended area). Accordingly, the elements can be integrated in at least three different ways, as indicated by the three construals. This is testimony to the highly elaborate and rich process of conceptual integration. The linguistic prompts themselves do not provide distinct interpretations; these come from our knowledge of what is possible in the world and our ability to integrate minimal cues to construct a complex and dynamic conceptualization of a spatial scene. Sentence (9) illustrates this point.

(9) *The clouds moved over the wall.*

In (9) construals 1 (Fig. 1) and 3 (Fig. 3) are ruled out, not because *over* has both a dynamic and a static sense, but because walls are not extended landmarks (as noted in Lakoff's analysis), whereas cities are, and *moved* codes a path schema. Thus, when the sentential elements are integrated, the TR follows a path, as designated by *moved*, such that the TR occupies a position relative to the LM, as specified by the mental representation for *over*. The clouds move, neither away from the wall, nor in a vertical manner without crossing the wall, but from a position prior to the wall to a position beyond the wall. That this should be so follows from conceptual integration of the cues prompted by the linguistic elements in the sentence. Accordingly, we argue that a polysemy network needs to allow for the distributed contribution of meaning played by all sentential elements, as well as the constraints imposed by our experience of the world and our ability to construct a rich and highly dynamic conceptualization based on minimal linguistic cues.

Another problem with Kreitzer's account is that in attempting to constrain Lakoff's analysis he has significantly understated the amount of polysemy appropriately associated with *over*. For instance, many senses touched on by Lakoff are simply ignored by Kreitzer. We will provide a detailed examination of the semantic network for *over* in Section 4. Finally, neither Kreitzer nor Lakoff attempts a serious account of how he determined which sense of *over* should be considered the primary sense. We address this issue in detail in Section 3.2.

The spirit of our model is coherent with a number of previous analyses that have addressed the multiple meanings associated both with prepositions (Herskovits, 1986; Vandeloise, 1991, 1994) and with other linguistic forms (Cushing, 1990, 1991). While these scholars differ from each other and from us in several key assumptions (e.g. the nature of lexical representation), they do entertain the possibility that the polysemy exhibited might be best modelled in terms of a central (or ideal) sense.[7]

3 Principled polysemy: the basic framework

3.1 Methodology for determining distinct senses

One of the problems with previous polysemy networks, as noted by Sandra and Rice (1995), is that there appear to be as many different approaches to how best to model a semantic network as there are semantic network theorists. While we accept that all linguistic analysis is to some extent subjective, we propose here to introduce methodology to minimize the subjective nature of our analysis. We do so in the hope that other scholars can employ our methodology and test the predictions made by our model. We aim to provide the basis for replicability of findings, a prerequisite for any theoretically rigorous study.

We suggest two criteria for determining whether a particular instance of a preposition counts as a distinct sense. Firstly, accepting the standard assumption that the primary sense coded for by prepositions is a particular spatial relation between a TR and a LM (although we will nuance what 'spatial' means), for a sense to count as distinct, it must involve a meaning that is not purely spatial in nature and/or in which the spatial configuration between the TR and LM is changed *vis-à-vis* the other senses associated with a particular preposition.[8] Secondly, there must be instances of the sense that are context-independent, instances in which the distinct sense could not be inferred from another sense and the context in which it occurs. To see how this would work let us reconsider the sentences in (1) and (2). In (1), *over* designates a spatial relation in which the TR, coded by *the helicopter*, is located higher than the LM. In (2), *over* also designates a spatial relationship in which the TR, *the hummingbird*, is located higher than the LM, coded by *the flower*. Neither instance of *over* constitutes a nonspatial interpretation, hence neither use adds additional meaning with respect to the other. By virtue of our proposed methodology, these instances of *over* cannot be treated as two distinct senses.

In contrast, examples (10) and (11) do appear to constitute a distinct sense.

(10) *Joan nailed a board over the hole in the ceiling.*

(11) *Joan nailed a board over the hole in the wall.*

In these sentences the spatial configuration between the TR and LM designated by *over* is not consistent with the 'above' meaning designated in examples (1) and (2). In addition, a nonspatial meaning appears to be part of the interpretation. That is, the meaning associated with *over* appears to be that of covering, such that *the hole*, the LM, is obscured from view by the TR. Clearly, this notion of covering and obscuring represents an additional meaning not apparent in examples such as (1) and (2). The fact that the usage in (10) and (11) brings additional meaning meets the first assessment criterion for whether this instance counts as a distinct sense.

In terms of the second criterion, we must establish whether the covering or obscuring meaning can be derived from context. If it can be, then this instance would fail the second assessment criterion and so could not, on the basis of the present methodology, be deemed a distinct sense. Assuming that the primary sense of *over* involves a spatial configuration between a TR and LM and that this configuration involves some sense of the TR being higher than the LM,[9] we see no way in which the covering meaning component associated with *over* in (10) and (11) can be derived from context. To see why this is so, contrast this instance with (12), in which the covering meaning is derivable from context.

(12) *The tablecloth is over the table.*

The TR, the *tablecloth*, is higher than (and in contact with) the LM, *the table*. As tablecloths are typically larger than tables, and the usual vantage point from which such a spatial scene would be viewed is a point higher than the table, the result would be that a substantial part of the table would be covered and so obscured from view. The interpretation that the table is covered/obscured could be inferred from the fact that the tablecloth is *over* and hence higher than the table, in conjunction with our knowledge that tablecloths are larger than tables and that we typically view tables from above the top of the table. Such an inference is not possible in (10) as the spatial relation holding between the TR and the LM is one that would normally be coded by *below* (i.e. *the board is below the hole in the ceiling*), rather than by *over*, given the typical vantage point. Similarly, in (11) the spatial configuration between the TR and LM would normally be coded by something like *next to*. In short, unless we already know that *over* has a covering/ obscuring meaning associated with it, there is no ready contextual means of deriving this meaning in sentences such as (10) and (11). From this, we conclude that the covering/obscuring meaning associated with *over* in (10) and (11) constitutes a distinct sense.

The two assessment criteria being proposed are rigorous and, in the light of future empirical research, may be shown to exclude senses that are legitimately instantiated in the language user's mental lexicon and hence would have to be adjusted. Nonetheless, without prejudging future findings, we suggest that this methodology predicts many findings that have already come to light, and so represents a reasonable approximation for assessing where we should draw the line between what counts as a distinct sense conventionalized in semantic memory, and a contextual inference produced on-line for the purpose of local understanding. The appeal of such methodology is that it provides a rigorous and relatively consistent way of making judgements about whether a sense is distinct, and provides methodology that can be used in an intersubjective way.

3.2 Methodology for determining the primary sense

An equally thorny problem is the question of what counts as the primary sense associated with a polysemy network. In previous studies of semantic networks, researchers have assumed that there is a single primary sense associated with a preposition and that the other senses are derived from this primary sense in a principled way. We share this assumption. Scholars, however, have often disagreed about which sense should be taken as primary (or central). Lakoff (1987) following Brugman (1981), argued that the primary sense for *over* is 'above and across', and included a path along which the TR moves, as represented by sentences such as *The plane flew over the city*. Kreitzer (1997) disagreed, suggesting that the primary sense (*over1*) is something akin to an 'above' sense, as in *The hummingbird hovered over the flower*. These decisions were primarily asserted rather than being argued for. Because linguists have simply asserted what constitutes the primary sense for a particular lexical category, appealing to intuitions and assumptions they often fail to explicitly articulate, we are in the unfortunate position that Lakoff (1987) and Kreitzer (1997) can offer equally plausible yet conflicting views of what the primary sense of *over* should be.

Sandra and Rice (1995) observed that given the current state of theoretical development, any analysis of a polysemy network, including what constitutes its primary sense, is relatively arbitrary, reflecting each analyst's own preferences (or indeed imagination). Langacker, however, has argued persuasively that there are various kinds of evidence to help us discover and verify the structure of a complex category (1987, p. 376). Building on his suggestions we advance a set of criteria that we believe provides a more principled, intersubjective method of determining the appropriate primary sense for individual prepositions. As with our criteria for determining distinct senses, we see these criteria as the beginning of a plausible methodology leading to replicability of findings. We hypothesize that some of these criteria may also be useful for other classes of words. But because of the particular nature of prepositions – that they code for spatial relations that may not have changed over many thousands of years (that is, the way humans perceive space seems not to have changed), and that they are a closed class – the nature of the primary senses associated with lexical forms is likely to be at least somewhat distinct from the primary senses associated with word classes such as nouns, adjectives, and verbs.

We suggest that there are at least four types of linguistic evidence that can be used to narrow the arbitrariness of the selection of a primary sense. We posit that no one piece of evidence is criterial but, taken together, they form a substantial body of evidence pointing to one sense among the many distinct senses being what Langacker (1987, p. 157) terms the *sanctioning sense*, from which other senses may have been extended. The evidence includes (i) earliest attested meaning; (ii) predominance in the semantic network; (iii) relations to other prepositions; and (iv) grammatical predictions (Langacker, 1987). Given the very stable nature of the conceptualization of spatial relations within a language, one likely candidate for the primary sense is the historically earliest sense. Having examined more than 15 English prepositions (see Tyler & Evans, 2003), we found that the historical evidence indicates the earliest attested uses coded a spatial configuration holding between the TR and the LM (as opposed to a nonspatial configuration as in *The movie is over* [= complete]). Since English has historically drawn from several languages, not all prepositions entered the language at the same time and there are instances of competing, near synonyms, for instance, *beneath*, *below*, and *under*. In such cases, over a period of time the semantic territory has been divided among such competing prepositions, but even so, they retain a core meaning that directly involves the original TR–LM configuration. Unlike words from many other word classes, the earliest attested sense for many prepositions is still a major, active component of the synchronic semantic network of each particle. *Over* is related to the Sanskrit *upan* 'higher' as well as the Old Teutonic comparative form *ufa* 'above', that is, a spatial configuration in which the TR is higher than the LM (OED).

Turning to the notion of predominance within a semantic network, by this we mean that the sense most likely to be primary will be the one whose meaning components are most frequent in other distinct senses. We have identified 14 distinct senses associated with *over*. Of these, eight directly involve the TR being located higher than the LM; four involve a TR located on the other side of the LM *vis-à-vis* the vantage point; and three – covering, reflexive, and repetition – involve multiple TR–LM configurations. Thus, the criterion of predominance suggests that the primary sense for *over* involves a TR being located higher than the LM.

Within the entire group of English prepositions, certain clusters of prepositions appear to form compositional sets that divide up various spatial dimensions. *Above*, *over*, *under*, and *below* appear to form a compositional set that divides the vertical dimension into four related subspaces (see Tyler & Evans, 2003). Other compositional sets include *in* and *out*, *on* and *off*, *up* and *down*. The linguistically coded division of space and spatial relations is relativistic in nature, depending largely on construal of the particular scene being prompted for (Langacker, 1987; Talmy, 1988, 2000). To a large extent, the label assigned to denote a particular TR–LM configuration is determined in relation to other labels in the composite set. So, for instance, what we label as *up* is partially determined by what we label as *down*. In this sense, the meaning of a preposition that participates in a compositional set is partially determined by how it contrasts with other members of the set. The particular sense used in the formation of such a compositional set would thus seem to be a likely candidate as a primary sense. For *over*, the sense that distinguishes this preposition from *above*, *under*, and *below* involves the notion of a TR being located higher than but potentially within reach of the LM. We expand on this argument in the next section.

The choice of a primary sense gives rise to testable grammatical predictions. So, for instance, if we recognize that what are now distinct senses were at one time derived from and related to a pre-existing sense and became part of the semantic network through routinization and entrenchment of meaning, we would predict that a number of the senses should be directly derivable from the primary sense. This is consistent with Langacker's (1987) discussion of a *sanctioning sense* giving rise to additional senses through extension. Any senses not directly derivable from the primary sense itself should be traceable to a sense that was derived from the primary sense. This view of polysemy explicitly acknowledges that language is an evolving, usage-based system. Grammatically, for any distinct sense that is represented as directly related to the primary sense, we should be able to find sentences whose context provides the implicature that gives rise to the additional meaning associated with the distinct sense. We have already discussed this notion briefly (Section 3.1) when we considered the additional meaning of covering/obscuring associated with *over* in (10)–(12). We argued that the use of *over* in (10) and (11) revealed additional meaning that could not be derived from sentential context, while the additional meaning of covering/ obscuring could be derived from context in (12). By the criterion of grammatical prediction, (12) constitutes evidence that a likely candidate for the primary sense associated with *over* involves the TR being located higher than the LM, as the distinct covering/obscuring sense can be derived from this primary sense and certain sentential contexts. Of course, the covering/ obscuring sense is only one of 14; all other senses would have to be tested against this same criterion.

3.3 The protoscene

As we said earlier, we assume that English prepositions form polysemy networks organized around a primary sense. At the conceptual level, the primary sense is represented in terms of abstracting away from specific spatial scenes, that is, real-world scenarios such as described by (13a) and (13b), resulting in an idealized spatio-functional configuration.

(13) a. *The picture is over the mantel.*
b. *The bee is hovering over the flower.*

We call this abstracted mental representation of the primary sense the *protoscene*. It consists of a schematic trajector (TR), which is the locand (the element located, and in focus), and is typically smaller and movable; a schematic landmark (LM), which is the locator (the element with respect to which the TR is located, and in background), and is typically larger and immovable, and a conceptual configurational–functional relation which mediates the TR and the LM. In the case of *over*, the TR is conceptualized as being proximate to the LM, so that under certain circumstances, the TR could come into contact with the LM. The functional aspect resulting from this particular spatial configuration is that the LM (or the TR) is conceptualized as being within the sphere of influence of the TR (or the LM) (see Dewell, 1994, and Vandeloise, 1991, 1994, for a discussion of other prepositions).

In our label *protoscene*, the term *proto* captures the idealized aspect of the conceptual relation, which lacks the rich detail apparent in individual spatial scenes, while the use of *scene* emphasizes visual awareness of a spatial scene, although the information included in the image can contain information from other sense-perceptions. Because protoscenes are abstractions ultimately arising from recurring real-world spatial scenarios, we will diagram them.[10] In our diagrammatic representation of the protoscene posited for *over* (Fig. 4), the TR is portrayed as a dark sphere, the LM as a bold line.

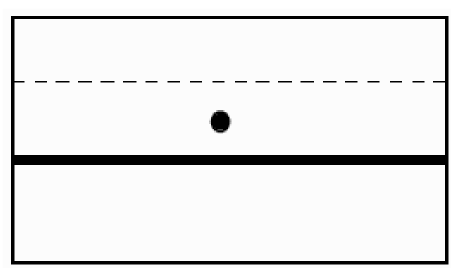

Figure 4 The protoscene for *over*.

The dashed line signals a distinction between the part of the spatial scene conceptualized as being proximal to the LM (i.e. within potential contact with the LM) and that which is conceptualized as being distal. The vantage point for construing the spatial scene is offstage, and external to the spatial scene. Crucially, the linguistic form *over* prompts for the conceptual spatial relation captured by the protoscene.

Two claims warrant more thorough investigation. The first is that the spatial configuration holding between the TR–LM is correctly expressed by the description that *over* lexicalizes the protoscene depicted in Figure 4, namely that the TR is above but within a region of potential contact with the LM. This contrasts with the English preposition *above*, which we argue prompts for a conceptual spatial relation in which the TR is higher than but not within reach of the LM. The second claim warranting further scrutiny is that the TR and LM are within each other's sphere of influence.

Dealing with the first claim, using the criterion of relationship to other prepositions which form a compositional set, consider the instances of *over* and *above* in sentences such as (14).

(14) a. *She walked over the bridge.*
b. *he walked above the bridge.*

The sentences in (14) are characteristic of the distinction in English between *over* and *above*. While in (14a) the conventional reading is one in which the TR, *she*, is above but within reach (in this particular case, the TR is in contact with the bridge), most native speakers of English would exclude possible contact from their reading of (14b). The TR, *she*, might constitute a ghostly presence capable of levitation, or the TR might be on a second bridge higher than the first, but generally English speakers would not interpret the bridge as the surface being walked upon. These examples strongly suggest that we are right in positing that *over* does designate a spatial configuration in which the TR is in potential contact with the LM.

We turn now to the functional aspect of the protoscene in Figure 4, namely the claim that the TR and LM are within each other's sphere of influence. A consequence of being within potential reach of the LM is that the TR can affect the LM in some way and *vice versa*. For instance, because of an independently motivated experiential correlation (Grady, 1997), we conventionally understand power and control being associated with an entity who is higher than the entity being controlled (we will discuss this in more detail when we deal with the control sense for *over*). In physical terms we can only control someone or something, and hence ensure compliance, if we are physically proximal to the entity we seek to control. If, then, in recurring human experience, control, and hence the ability to physically influence someone or something, is dependent upon being higher than and physically close to the entity we seek to control, we would expect that these notions can be designated by *over* but not *above*. While both *over* and *above* designate spatial relations which are higher than, only *over* also designates the functional relation of influence, precisely because part of its spatial configuration involves the notion of potential contact between the TR and LM. Consider (15).

(15) a. *She has a strange power over me.* (Lakoff, 1987)
b. ?*She has a strange power above me.*

In terms of a control reading, while *over* in (15a) is perfectly acceptable, *above* in (15b) is decidedly odd. This suggests that the protoscene for *over* does indeed have a functional element of influence between the TR and LM, as a consequence of its spatial configuration designating potential contact between the TR and LM (see Vandeloise, 1994, for a discussion of the functional nature of prepositions).

This relation places certain maximal constraints on what can count as *over*: a spatial relation should be prompted for using the preposition *over* only if the spatial relation ranges from a configuration in which there is TR– LM contact to one in which there is no contact but the TR can be construed as within potential reach of the LM. While there is strong evidence for defining *over* in this way, a review of the many interpretations regularly assigned to *over* by speakers of English shows that this representation alone is inadequate. Hence, there is a need to posit a set of cognitive principles of meaning construction and meaning extension that will account for the many additional senses associated with *over*.

3.4 Cognitive principles

3.4.1 Perceptual analysis and reconceptualization

Mandler (1988, 1992, 1996) argues that a basic aspect of human cognition is the ability to submit salient (i.e. recurring) real-world scenarios and spatial scenes to perceptual analysis that gives rise to a new level of conceptualized information which is stored imagistically in the form of an abstract schematization, termed an *image-schema*.[11] Once stored, the image-schema is available for integration with other conceptualizations, further analysis, and reconceptualization.

Earlier, we used the term *conceptualization* in a nontechnical way. In order to distinguish our nontechnical usage from a more sharpened operationalization, we here introduce the term *complex conceptualization*. A complex conceptualization is a constructed representation,[12] typically (but not inevitably) produced on-line. A complex conceptualization represents our projection of reality (in the sense of Jackendoff, 1983), and can represent static and relatively simple phenomena, e.g. *The cloud is over the sun*, or dynamic and relatively complex phenomena, e.g. *The cat ran over the hill and ended up several miles away*. Our claim is that the integration of linguistic forms with other cognitive knowledge prompts for the construction of a complex conceptualization.

In our model, the image-schemas representing the spatial configurations associated with prepositions are termed protoscenes.[13] The primary scene (i.e. the protoscene) associated with a preposition can be used, in conjunction with other linguistic prompts (i.e. within an utterance), to prompt for recurring spatial scenes and real-world scenarios.

Figure 5 represents the complex conceptualization which would be constructed in the interpretation of the recurring scenario prompted by sentences such as (16) and (17).

(16) *The rabbit hopped over the fence.*

(17) *The boy stepped over the pile of leaves.*

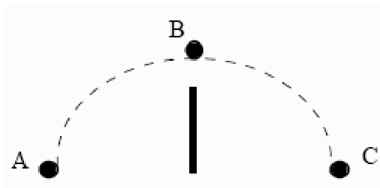

Figure 5 Schematization of sentences of the type ***The cat jumped over the wall***.

At some point, such recurring complex conceptualizations become subject to reanalysis and hence reconceptualization.[14] We posit that distinct senses arise as a result of the reanalysis of a particular aspect of such a recurring complex conceptualization. In other words, the recurring complex conceptualization from which a distinct sense originally arises is derivable from the protoscene and thus the distinct sense is related to the protoscene in a principled manner.

On our analysis, while prepositions themselves do not prompt for dynamism, prepositions do participate in prompting for complex conceptualizations, which often are dynamic (in the sense that they include motion phenomena). Minimally varying static spatial scenes can be integrated at the conceptual level to provide a dynamic sequence. This is analogous to the way in which movie stills (static images) are flashed onto a screen in sequence to create the illusion of a moving image, a movie. Hence, we are arguing that prepositions prompt for nondynamic conceptual spatial relations, while maintaining that such relations can be integrated with other prompts, to create (dynamic) complex conceptualizations. In sum, we hold that while human conceptualization of spatial scenes is rich and dynamic, the available linguistic prompts underspecify such richness. Meaning is the result of integration of linguistic prompts at the conceptual level. Thus, the protoscene for *over* is integrated in the most felicitous way, given the sentential context, and given what we know about what is possible in the world.

3.4.2 Ways of viewing spatial scenes

The notion of a vantage point mentioned in the discussion of the protoscene suggests that how a particular spatial scene is viewed will in large part determine the functional nature of a particular spatial scene, and thus in what way it is meaningful. Four distinct issues affect the functional nature of a particular spatial scene, based on the different ways in which such scenes can be construed (i.e. 'viewed').

(i) Every spatial scene is conceptualized from a particular vantage point. The conceptualizer represents the default vantage point. Accordingly, the same scene can be construed from many different vantage points (Langacker (1987) divides this phenomenon into two aspects, *perspective* and *vantage point*).

(ii) Certain parts of the spatial scene can be profiled (Langacker, 1987, 1992). Thus, in the sentence *The cat is sitting in the middle of the circle*, the TR, *the cat*, is conceptualized as being surrounded by the LM, described by the circle; here the LM is being conceptualized as a container, and the space encompassed by the LM is being profiled. In contrast, in the sentence *Okay everybody, get in a circle*, the outer edge, or shape of the LM, is being profiled.[15]

(iii) Related to (ii) is the fact that the same scene can be construed in a different way. For instance, in a spatial scene in which a large cloth is positioned in relation to a table such that the cloth covers the top of the table, the scene can be construed by focusing on contact between the cloth and the table. In this case, the scene is likely to be coded in English by the sentence *The tablecloth is on the table*. Alternatively, the relationship between the cloth and the table can be viewed as the cloth occluding the table from the observer's vantage point. In this case, the scene might be coded as *The cloth is over the table*. A less typical, but perfectly acceptable construal would be to place the table in focus, in which case the coding would be something like *The table is under the tablecloth*.

(iv) The exact properties of the entities which are conceptualized as TR and LM can vary. In the sentence *The hot air balloon floated over New York City*, the LM is conceptualized as vertical and extended; whereas in the sentence *The plane flew over the ocean*, the LM is nonvertical and extended.

3.4.3 Atemporality

In advancing the model of word meaning on which we will base our analysis of *over* in Section 4, we note, following Langacker (1987, 1991a, 1991b, 1992; see also Talmy, 1988, 2000) that prepositions profile (i.e. designate) a spatio-functional relation that is scanned (i.e. apprehended) in summary fashion.[16] That is, they do not profile a relation that evolves through time, as is the case for example with verbs. Verbs profile processes that are scanned in serial fashion. For instance, in the sentence *The boy runs home from school*, the process profiled by *run* constitutes a process that integrates all the points occupied by the TR, *The boy*, which intervene between *school* and *home*, hence the process evolves through time by integrating these sequential components. The result is a sequential process. This contrasts with the relation described by a preposition, which does not evolve through time. Prepositions represent a conceptualized relation holding between two entities (a TR and a LM), independent of sequentially evolving interdependencies. In this sense, prepositions can be considered to profile atemporal relations.

3.4.4 Inferencing strategies

We have argued that not all meanings assigned to a preposition, which arise from interpreting the particle within an utterance, are stored as distinct senses, and that previous models have often failed to recognize the contribution of encyclopaedic knowledge and inferencing involved in natural language processing. In deriving on-line interpretations we employ a number of inferencing strategies. Because of space constraints we will mention just three of the most important. In Section 4 we provide a detailed illustration of how these strategies enable us to produce meaning on-line.

(i) Best fit. Only a tiny fraction of all possible spatial relations are coded by discrete lexical items. In linguistic terms, prepositions represent a closed class, that is, English speakers have a limited set of linguistic choices to represent a virtually unlimited set of conceptual spatial relations. Speakers choose the preposition that offers the best fit between the conceptual spatial relation and the speaker's communicative needs. The notion of best fit represents a crucial means for allowing us to fill in information about a particular spatial scene. To our knowledge, no other linguist has specifically discussed this notion, but it seems to be a logical extension of the notion of relevance (Grice, 1975; Sperber & Wilson, 1986).

(ii) Knowledge of real-world force dynamics. Although a spatial scene is conceptual in nature, in the creation and interpretation of an utterance the speaker and hearer will assume that all elements in a spatial scene are subject to real-world force dynamics.[17] For instance, in the interpretation of a sentence such as *The cat jumped over the wall*, it is assumed the interlocutors will apply their knowledge of the world, which includes the information that entities cannot float in mid-air unless they possess the means or ability to do so. General knowledge of cats includes the information that they cannot hover above walls and that they are subject to gravity. Hence, any responsible account of the conceptual system and meaning extension must recognize the large body of real-world knowledge we bring to bear (often unconsciously) when constructing meaning. Vandeloise (1991) discusses this in terms of a naïve theory of physics that applies to how humans conceptualize spatial relations and use language to express those conceptualizations.

(iii) Topological extension. This strategy involves the notion that the principles of Euclidean geometry do not hold at the level of conceptual structure (Talmy, 1988, 2000). Conceptualized space and spatial relations are not held to be metric notions of fixed distance, amount, size, contour, angle, and so on. Rather, conceptualized space and spatial relations are topological in nature, that is they 'involve relativistic relationships rather than absolutely fixed quantities' (2000, p. 170). Thus, a TR–LM configuration can be distorted conceptually, as long as the relation denoted by the protoscene remains constant. In applying this principle to prepositions, we argue that *over* denotes a relation in which the TR is above but within reach of the LM. This functional relationship has sometimes been referred to as the TR/LM being conceptualized as in each other's *sphere of influence* (Dewell 1994). The principle of topological extension allows us to account for examples in which, on first analysis at least, this relation does not appear to hold, e.g. *The plane flew over the city* (the plane is a considerable distance above the city, yet is being conceptualized as within potential reach).

3.5 On-line meaning construction

How might on-line meaning construction apply to the protoscene (or indeed any distinct sense) to produce a contextualized interpretation of a preposition? To illustrate this process, we will consider the path sense posited by Lakoff (1987) and Kreitzer (1997). Lakoff termed this the above-across sense, while Kreitzer called it *over2*. Both Lakoff and Kreitzer sought to capture the intuition that *over* could be employed to designate a trajectory followed by a TR in which it moves from a position on one side of a LM so that it comes to be on the other side, as in (18).

(18) *The cat jumped over the wall.*

Crucially, they suggested that *over* codes the trajectory or path as a distinct sense instantiated in semantic memory. Following the methodology previously suggested for determining whether a sense is distinct or not, we posit that in sentences such as (18) the interpretation that the TR follows a particular trajectory described by 'above and across' can be inferred from context. Based on this methodology, *over* does not have a distinct above-across path sense associated with it.

The case for attributing an above-across sense to *over* in examples such as (18) relies on implied reasoning which runs as follows: (i) a spatial scene is conceptualized in which a cat starts from a position on one side of the wall and comes to be in a position on the other side; (ii) there is nothing in the sentence, other than *over*, which indicates the trajectory followed by the cat; (iii) therefore, *over* must prompt for an above-and-across trajectory. But this conclusion is a *non sequitur*. Simply because a trajectory is not prompted for by specific linguistic forms (formal expression) does not entail that such information is absent. To reach this conclusion is to assume that the lack of formal expression coding trajectory information implicates a lack of trajectory information *per se*. On this view, all elements that are salient in the interpretation of a scene must be coded linguistically.

We offer an alternative account that argues that the meaning assigned to any utterance is radically underdetermined by the lexical items and the grammatical structures in which they occur. That is, sentential interpretation is largely the result of various cognitive/inferential processes and accessing appropriate world knowledge. Consider the conceptualizations prompted for by the sentence in (18) and contrast this with (19).

(19) *The tree branch extended over the wall.*

Lakoff's full-specification account for *over* would argue that (18) and (19) represent two different senses of *over*. For (19) he assumes that *over* has a meaning that can be paraphrased as 'above' while in (18) *over* has a meaning, as already intimated, of 'above and across'. The implied reasoning for adducing that *over* in (19) is associated with a static 'higher than' sense runs as follows: in the interpretation prompted for by (19), (i) no motion is involved hence there is no trajectory; (ii) the branch is located above the wall; and (iii) the only element that indicates the location of the branch in relation to the wall is the word *over;* hence, (iv) *over* must have an above sense.

We suggest that it is wrong to conclude that examples (18) and (19) represent two distinct senses. Rather than representing prepositions as carrying detailed information about each scene being described, we argue that they prompt for schematic conceptualizations (a protoscene and other distinct senses instantiated in semantic memory) that are interpreted within the particular contexts in which they occur. Under our analysis, a path (or its absence) is typically prompted for by the verb as it relates to other words in the sentence.[18]

In (18), the verb *jumped* does prompt for a conceptualization involving motion, which entails a trajectory. Hence, the interpretation of the above-across trajectory of the movement in (18) is not prompted for by *over* (i.e. the concept of the TR in motion is not a semantic attribute of the protoscene), nor for any of the other distinct senses associated with *over*, but rather arises from the integration of linguistic prompts at the conceptual level. Most of the information required to integrate the linguistic prompts and construct a mental conceptualization of the spatial scene is filled in by inferencing and real-world or encyclopaedic knowledge. In turn, this knowledge constrains the possible interpretations that *over* can have in this particular sentence. In the interpretation of (18), encyclopaedic knowledge (as adduced in part by the inferencing strategy pertaining to real-world force dynamics) includes (at the very least): (i) our understanding of the action of jumping, and in particular our knowledge of the kind of jumping cats are likely to engage in (that is, not straight up in the air as on a trampoline and not from a bungee cord suspended from a tree branch extending above the wall); (ii) our knowledge of cats (for instance, that they cannot physically hover in the air the way a hummingbird can); (iii) our knowledge of the nature of walls (that they provide vertical, impenetrable obstacles to forward motion along a path); and (iv) our knowledge of force dynamics such as gravity (which tells us that a cat cannot remain in mid-air indefinitely and that if the cat jumped from the ground such that the trajectory of its path at point B matches the relation described by *over the wall*, then it would have to come to rest beyond the wall, providing an arc trajectory). Thus, we argue that the interpretation regarding the above-across interpretation of the trajectory in sentence (18) is not prompted for by *over*, but rather arises from the integration of linguistic prompts at the conceptual level, in a way that is maximally coherent with and contingent on our real-world interactions.

We further suggest that part of the general understanding of this particular sentence involves the interpretation of *the wall* as an obstacle which *the cat* is attempting to overcome. There is an important conceptual connection between the TR, *the cat*, and the LM, *the wall*, that is, *the cat* and *the wall* are within each other's sphere of influence. Given this particular context and the functional element we have assigned the protoscene, the salient point is that the cat jumped high enough to overcome the obstacle. The exact metric details of a spatial relation in a specific spatial scene are filled in by application of inferencing strategies. These allow us to construct a likely interpretation, based largely on knowledge gained from recurring daily interactions with our environment. To make this point more concrete, reconsider Figure 5, which offers an approximate depiction of the complex conceptualization constructed in the interpretation of (18).

In Figure 5, the various positions occupied by the TR, *the cat*, along its trajectory are represented by the three spheres labelled A, B, and C. Notice that only point B – the point at which the cat is higher than but in potential reach of the wall – is explicitly mentioned in the sentence (i.e. this point in the trajectory is explicitly prompted for by the occurrence of *over*. Points A and C are inferred from what we know about jumping, cats and walls. The verb *jumped* codes self-propelled motion using a solid surface to push off from; thus, point A is implied as the initial point of the trajectory. The prompts are integrated in such a way that the trajectory initiated by the verb *jump* intersects with point B. Our knowledge of real-world force dynamics fills in position C. Put another way, if a cat begins at point A and passes through point B, then given our knowledge of gravity and the kind of jumping cats are able to do, point C is entailed.

Many spatial relationships exist between the TR and the LM in the complex conceptualization represented diagrammatically in Figure 5; thus, the speaker has many choices of which relationship between the TR and LM to mention. For instance, at both points A and C, the cat is beside the wall. The cat could also be described as jumping near the wall. But, none of these choices provides a sufficient cue for the construction of the relevant conceptualization that the cat jumped such that at one point in its trajectory it was higher than, but crucially within the sphere of influence of, the wall. Alternative prepositions fail to prompt for the key spatial configuration that prompts the listener to construct the complex conceptualization represented in Figure 5. Given the conceptualization the speaker wishes to convey, the speaker chooses from the closed class of English prepositions the one that best fits the relevant conceptual spatial relation between the TR and LM at one point in the cat's trajectory, which will, in turn, prompt the appropriate entailments or inferences. This inferencing strategy is the notion of best fit. Accordingly, we reiterate that a serious flaw in both the full- and partial-specification approaches is that neither fully distinguishes between formal expression in language, which represents certain information, and patterns of conceptualization, which integrate information prompted for by other linguistic elements of the sentence. *Over* does not itself prompt for an above-across sense, that is, for a path. We hypothesize that all path or trajectory information in the examples discussed results from conceptual integration of linguistic and other prompts, following the notion of best fit, which determines that the relation designated by the protoscene (and indeed other distinct senses) will not precisely capture a dynamic real-world spatial relation, which is constantly changing, but will provide a sufficient cue for conceptualization.

In order to illustrate the strategy of topological extension, we offer example (20).

(20) *There are a few stray marks just above the line.*

Example (20) provides, on first inspection at least, a counterexample to the spatial configuration we proposed for the protoscene associated with *over* when it designates a spatial relation in which the TR is above but crucially within potential contact with the LM. On this view then, we would expect *over*, and not *above* to be employed in sentences such as (20), as this example is describing a spatial scene in which the TR, *a few stray marks*, is physically proximal to the LM, *the line*.

However, the inferencing strategy of topological extension places less significance on the absolute metric distance between the TR and LM than on the functional element associated with a particular sense. That is, the metric distance between the TR and LM can be extended or contracted if the functional element holds; in the case of *over* the TR and LM are understood as being within each other's sphere of influence. Although the *few stray marks*, the TR, are metrically proximal to *the line*, the LM, there is no contact and no potential for contact between them. The stray marks are distinct from the line and the LM is not within the sphere of influence of the TR. On the basis of sentences such as *She walked above the bridge*, in which no contact between the TR and LM is possible, we hypothesize that the functional element of the protoscene for *above* places the focus on the notion of non-bridgeable distance between the LM and TR. Thus, the relation in (14b) is best designated by *above*. This analysis is supported if we attempt to use *over* in place of *above*, as in *There are a few stray marks over the line*, which presents the ambiguous interpretation that the marks are in contact with the line and potentially obscuring parts of it. This interpretation arises from the covering sense, which we will address later.

Grice (1975) noted with his *maxim of manner* that in everyday conversation speakers generally try to avoid ambiguity, unless there is a purpose for the ambiguity. To avoid possible ambiguity, the inferencing strategy of attempting best fit in the choice of lexical item suggests that the speaker will choose the protoscene (or particular sense) that best facilitates conceptualization of the scene he or she intends the listener to construct. In light of the strategies of topological extension and best fit, we argue that *above* is the most felicitous choice to prompt for the complex conceptualization that involves a LM (a *line*), and a TR *(stray marks*) that is higher than and not in contact with the LM, as attested by (20).[19]

3.6 Pragmatic strengthening

Earlier we presented a method for establishing when a sense is distinct and hence putatively instantiated in semantic memory. Given our assumption that the distinct senses associated with a particular preposition are related to one another in a principled way, one of our purposes is to understand both how and why new senses associated with a particular preposition came to be derived. Since what are now conventionalized senses at one time did not exist, we seek to explain how they are related to the protoscene. Our hypothesis is that all the senses associated with the preposition *over* were at one time derived from the protoscene or from a sense that can be traced back to the protoscene for each individual preposition.[20]

Grady (1997) has shown in detail that tight correlations in experience can lead to conceptual associations between two quite distinct and otherwise unrelated concepts. For instance, on a daily basis we experience recurring correlations between quantity and vertical elevation. When a liquid is added to a container or when more objects are added to a pile, an increase in quantity correlates with an increase in height. Grady has suggested that correlations of this kind result in lexical items relating to vertical elevation developing a conventional reading in which they denote quantity, as in sentences such as *The prices have gone up*, where *gone up* refers not literally to an increase in vertical elevation, but rather to a quantificational increase.

A number of scholars who have investigated the meaning extension of lexical items have observed that inferences deriving from experience (analogous to the situation just discussed) can, through continued usage, come to be conventionally associated with the lexical form identified with the implicature (see e.g. Bybee, Perkins & Pagliuca, 1994; Evans, 2004; Fleischman, 1999; Hopper & Traugott, 1993; Svorou, 1993; Traugott, 1989). Following Traugott, we term this process *pragmatic strengthening*. It results in the association of a new meaning component with a particular lexical form through the continued use of the form in particular contexts in which the implicature results. New senses derive from the conventionalization of implicatures through routinization and the entrenchment of usage patterns.

Recurring implicatures that come to be conventionalized can result either from independently motivated experiential correlations (as with quantity and vertical elevation) or from construing a spatial scene in a certain way, that is, from a new vantage point. Examples of each of these will be presented in Section 4.

Prepositions can also be employed to express figure–ground relations between nonphysical elements. In a sentence such as *A feeling of dread hung over the crowd*, the TR, *dread*, is an emotion rather than a physical entity. We argue that this use is possible because *over* conveys a specific relationship between an emotion, the TR, and the crowd, the LM; one in which the crowd is being affected by, or within the sphere of influence of, the feeling of dread. Being within the sphere of influence of a physical TR means the LM can potentially be affected by the TR, as in *Rain clouds hung over the city all week*. In *A feeling of dread hung over the crowd*, the TR is not physically located higher than the LM, but because *over* has the functional notion of a sphere of influence associated with it, *over* can be employed to designate relations between nonphysical entities.

3.7 The conceptual significance of syntax

Our model takes the view that formal aspects of language, such as syntactic configurations, have conceptual significance. As syntax is meaningful, in principle in the same way as lexical items, it follows that differences in syntactic form reflect a distinction in meaning (Lakoff, 1987; Langacker, 1987, 1991a, 1991b; Sweetser, 1990; Talmy, 1988, 2000). We are using the generic term 'preposition' to describe the linguistic forms we are studying. But this term subsumes a number of formal distinctions characterized by prepositions, verb–particle constructions (or phrasal verbs), adpreps (which are adverbial in nature, and do not overtly code a LM, e.g. *the race is over*; they are discussed in Section 4), and particle prefixes (bound spatial particles as in *overflow*, *overhead*, and so on).[21]

4 Beyond the protoscene: additional senses in the semantic network

Our methodology for determining distinct senses points to the conclusion that in addition to the protoscene a number of senses must be instantiated in semantic memory (contra Ruhl's (1989) monosemy framework).[22] For instance, we see no direct way of deriving the interpretation of completion normally assigned to *over* in the sentence *The movie is over* (= finished), suggesting that such an interpretation is due to a distinct completion sense associated with *over* being stored in long-term memory. We now turn to a consideration of the distinct senses, other than the protoscene conventionally associated with the preposition *over*.

Figure 6 is a preview of the remainder of this paper; it represents our proposed semantic network for *over*, subsuming a total of 14 distinct senses, including the protoscene.

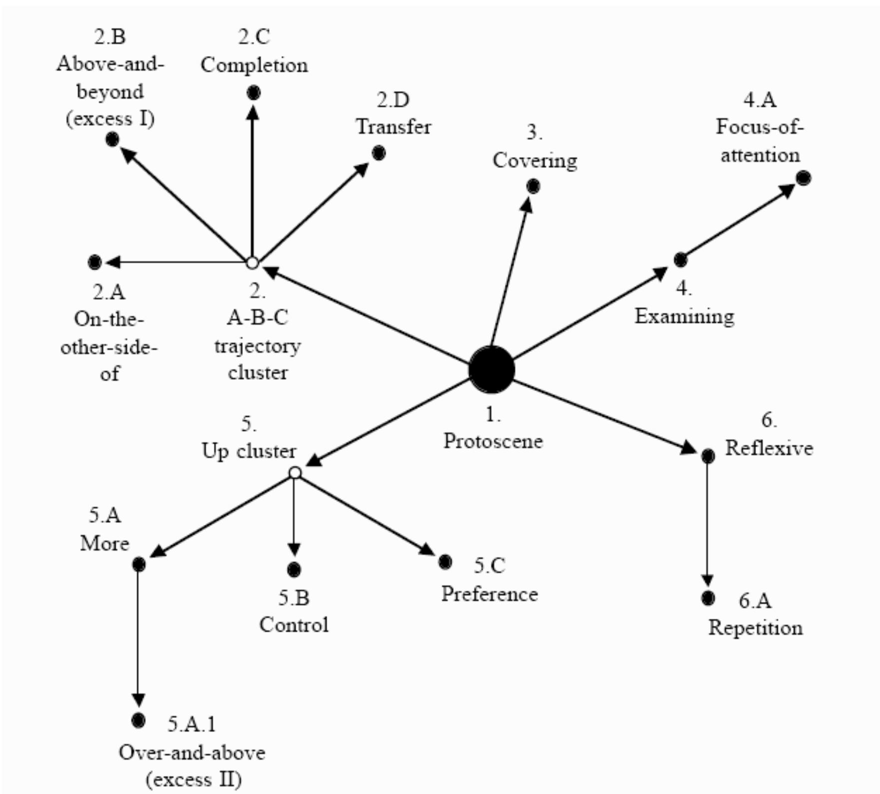

Figure 6 The semantic network for *over*.

Each distinct sense is shown as a dark sphere, which represents a node in the network; the protoscene occupies a central position indicating its status as the primary sense. In some instances our representation of the semantic network depicts a distinct, conventionalized sense arising from the conceptualization prompted for by another conventionalized sense, rather than directly from the protoscene. For instance, in the network represented in Figure 6, the 'excess' sense is represented as arising from the conceptualization associated with the 'more' sense rather than arising directly from a conceptualization in which the protoscene of over occurs. Figure 6 represents the claim that reanalysis of conceptualizations is potentially recursive and that a distinct sense can be the result of multiple instances of reanalysis. Moreover, we believe that a complex conceptualization, such as the one represented in Figure 5, can be submitted to multiple reanalyses and thus give rise to several distinct senses. When a complex conceptualization gives rise to multiple senses, we term the set of senses a 'cluster of senses'. A cluster of senses is denoted in our representation of a semantic network by an open circle. A single distinct sense is represented by a dark sphere.

4.1 The A-B-C trajectory cluster

The four distinct senses in the A-B-C trajectory cluster (on-the-other-side-of, above-and-beyond (excess I), completion, and transfer) all derive from reanalyses of the complex conceptualization depicted in Figure 5, in which the verb designates point A as a starting/push-off point. All involve TRs that cannot hover and must return to ground; involve LMs construed as impediments to forward motion; and use *over* to designate the key spatial/functional configuration (i.e. the TR being higher than the LM and both being within each other's spheres of influence). This complex conceptualization, although profiling a sequentially evolving process, is subject during reanalysis to conceptualization in summary format. That is, although points B and C never exist simultaneously in the world (because a TR such as a cat could not occupy two such positions simultaneously), when such a spatial scene is conceptualized in summary format, point C can be related to point B, and hence the lexical form that prompts for point B can come, through entrenchment, to be employed to reference senses related to point C.

4.1.1 The on-the-other-side-of sense (2.A)

An unavoidable consequence of the unique trajectory prompted by sentences analogous to (18) is that when the motion is complete the TR is located on the other side of the LM relative to the starting point of the trajectory. Although point C in Figure 5 and its relation to point A are not part of the protoscene for *over* (and cannot be derived from the protoscene absent the particular properties of the verb and TR discussed above), the on-the-other-side-of sense has come to be associated with certain uses of *over* that are not derivable from context. Consider (21).

(21) *Arlington is over the Potomac River from Georgetown.*

Notice in this sentence that the verb, *is*, fails to indicate any sense of motion. In our model, the verb typically codes for motion and hence prompts for a trajectory. Thus, the lack of motion coded by *is*, in turn, results in failure to prompt for a trajectory. If there is no trajectory, there is no beginning or endpoint, hence no principled way of deriving an on-the-other-side-of sense from this sentential context. Native speakers nevertheless will normally interpret this utterance such that Arlington is understood to be located on the other side of the Potomac River from Georgetown. Consequently, *over* must have a context-independent on-the-other-side-of sense associated with it. Accordingly, the two criteria for establishing that a sense is distinct have been met. The on-the-other-side-of sense adds meaning not apparent in the protoscene and the use in (21) is context-independent.

We hypothesize that this distinct sense came to be instantiated in memory as a result of reanalysis of the complex conceptualization represented in Figure 5, specifically, the privileging of the consequence of the jump – that the TR ends up on the other side of the LM. In addition, this conceptualization involves a shift in vantage point from being offstage (Langacker 1992) to being in the vicinity of point A. The default vantage point specified in the protoscene for *over*, Figure 4, is offstage. Previously, we noted that spatial scenes could be viewed from a number of possible vantage points, and these different vantage points could give rise to different construals of the same scene.

The on-the-other-side-of sense is illustrated in Figure 7. The eye icon on the left represents the vantage point, the vertical line the impediment and the dark sphere the TR.

Figure 7 The on-the-other-side-of-sense.

Further evidence for this sense comes from examples like (22).

(22) *Arlington is just over the river.*

The sentence in (22) is felicitous only if the construer (the vantage point) is located in the vicinity of point A (in Fig. 5) and Arlington is construed as point C. Thus, the reanalysis of *over* which results in the on-the-other-side-of sense involves two changes *vis-à-vis* the protoscene – the privileging of point C and interpreting it as the point at which the TR is located, and a shift in vantage point such that the construer is located in the vicinity of point A. While the on-the-other-side-of component (point C in Fig. 5) is correlated in experiential terms with arc-shaped trajectories and jumping *over* (i.e. higher than) obstacles by TRs such as cats, without the shift in vantage point this experiential correlation cannot be construed. We hypothesize that through the use of *over* in contexts where on-the-other-side-of is implicated, this meaning has come to be conventionally associated with *over* as a distinct sense, a process we term pragmatic strengthening.

The on-the-other-side-of sense is highly productive in English, as attested by the examples below. Notice that in neither of the following do we conventionally obtain the reading in which the TR is physically higher than the LM or that jumping or moving is involved.[23]

(23) *The old town lies over the bridge.*

(24) *John lives over the hill.*

Moreover, examples such as (24), which have been described as having *endpoint focus*, are reminiscent of the examples offered in Lakoff's (1987, p. 423) analysis for *over*, as evidence for an above-across sense.[24] We suggest that misanalysis of the on-the-other-side-of sense contributed to a path above-across sense being posited by earlier analyses.[25]

4.1.2 The above-and-beyond (excess I) sense (2.B)

In (25) and (26) *over* is used as predicted by the protoscene but with the additional implicatures that the LM represents an intended goal or target and that the TR moved beyond the intended or desired point.

(25) *The arrow flew over the target and landed in the woods.*

(26) *Lissa just tapped the golf ball, but it still rolled over the cup.*

Given general knowledge of shooting arrows and targets, most speakers would assume that whoever shot the arrow intended to hit the target but aimed too high. The movement of the arrow, the TR, was above and beyond the LM, or in excess of what the agent intended. Similarly, given general knowledge of the game of golf and the goals of people who engage in the game, most speakers would assume that the agent (*Lissa*) intended that the movement of the *ball* (the TR), which she initiated with a tap, would result in the ball going into the *cup*, the LM. Thus the movement of the ball was above and beyond, or in excess of, what the agent intended.

The basic spatial configuration and trajectory followed by the TR is identical to that associated with the protoscene in the context of a verb depicting forward motion. But in sentences such as *The cat jumped over the wall*, the TR's movement beyond the LM is presumed to be intentional, while in sentences such as (25) and (26) the LM is construed as the target or goal and the presumed intention is to have the TR come into contact with the target. When the TR misses the target, it goes above and beyond the LM. Going above and beyond the target is conceptualized as going too far or involving too much. The implicatures of (i) the LM being construed as the target/goal and (ii) the TR passing *over* the LM as going beyond the target/ goal have been reanalysed, resulting in a distinct sense being added to the semantic network. Evidence for this sense being distinct comes from sentences such as (27), in which the sense cannot be derived from context.

(27) *Your article is over the page limit.*

In this sentence, *over* cannot felicitously be interpreted as physically higher than, or even on-the-other-side-of. Rather, the interpretation seems to be that there is an established or 'targeted' number of pages for the article and that the actual number of pages 'went beyond' that target.

Figure 8 diagrams the above-and-beyond (excess I) sense, representing the LM as a bull's-eye target and highlighting the salient 'beyond' portion of the trajectory. (Our analysis provides for a second source of an excess sense associated with *over*. This sense and its implication for the model are discussed later.)

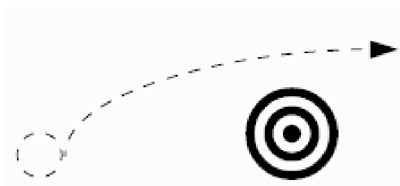

Figure 8 The above-and-beyond (excess I) sense.

We emphasize that we are not claiming that the semantic network contains criterial senses: that is, we are not suggesting that all uses of *over* will absolutely reflect one sense or another. Often, specific uses of a preposition will contain flavours of more than one sense, imbuing a particular reading with complex nuances of meaning and providing both intra- and inter-hearer differences in interpretation. Equally, we are not suggesting that application of the model outlined in Section 3 will mechanistically provide a single, unique derivation for each distinct sense, based ultimately on the protoscene. We do not want to posit a simplicity rubric which claims that there is one correct analysis and deny that there may be many means of instantiating a distinct sense in memory. We find no strong evidence that human conceptualization and cognition is constrained by such a dictum (contra the widespread view adopted in formalist approaches to meaning in the generative tradition; for a critique of such views see Langacker (1991a, Chapter 10), and the discussion of the generality fallacy in Croft (1998)).

At this point we see no principled reason to rule out the possibility that an excess interpretation might arise through an alternative route, as represented in the network by the over-and-above (excess II) sense (5.A.1). We in fact hypothesize that some speakers might derive an excess interpretation through one route while others arrive at it through the other. Still others may use both routes; the two resultant senses would then serve to inform each other in various ways. We further argue that it is inappropriate to treat this flexibility (or redundancy) as evidence that our model is flawed. Nor should an alternative analysis of the derivation of a particular sense be taken to constitute a counterexample to the overall model being posited. We see this flexibility (and redundancy) as an appropriate reflection of the richness of human cognition and the way in which experience is meaningful to us as human beings.

4.1.3 The completion sense (2.C)

When *over* is integrated into a complex conceptualization, such as described by Figure 5, the inferred shape of the trajectory has an endpoint C. The endpoint of any trajectory (which represents the process of moving) is commonly understood as representing the completion of the process.

We suggest that the completion sense associated with *over* has arisen as a result of the implicature of completion being reanalysed as distinct from the complex conceptualization represented in Figure 5. Once reanalysis has taken place, the final location resulting from motion correlates with the completion of motion, the distinct sense comes to be associated with the form *over* in the semantic network via pragmatic strengthening.

(28) *The cat's jump is over* [= finished/complete].

We suggest that the meaning component of completion results from reanalysis of the spatial location of the TR as standing for an aspect of a process. In (28), for example, the endpoint of the motion through space over an impediment (i.e. the location at which the TR comes to rest) is interpreted as the completion of the movement. In this instance the completion sense is not describing a spatial relation but rather an aspect of a process. This is reflected syntactically by the fact that the completion sense does not mediate a TR– LM configuration in which the preposition is sequenced between the TR and the LM, as illustrated by example (28). The completion sense, in formal terms, is represented not by a preposition but rather by what we are terming an 'adprep' (Bolinger, 1971; O'Dowd, 1998).[26]

The completion sense differs crucially from the on-the-other-side-of sense in that the latter focuses on the spatial location of the TR when the process is completed (see Fig. 9) while the former focuses on interpreting point C as the end of the motion or process. We tentatively hypothesize that an adprep will always arise when the reanalysis involves interpreting the location of the TR as an aspect of a process.

Figure 9 diagrams the completion sense. The dark sphere on the left represents the location of the TR at the beginning of the process. The large sphere on the right, which is in focus, represents the endpoint or completion.

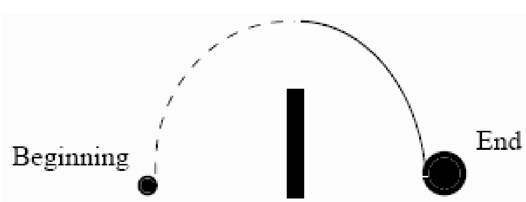

Figure 9 The completion sense.

4.1.4 The transfer sense (2.D)

A consequence of the conceptualization represented in Figure 5 gives rise to the transfer sense. Consider the following examples.

(29) *Sally turned the keys to the office over to the janitor.*

(30) *The teller handed the money over to the investigating officer.*

In these sentences, the conceptualization constructed is of a TR moving from one point to another. This follows from the conceptualization schematized in Figure 5, in which an implicature of transfer arises, a consequence of understanding the scene as one involving the transfer of a TR from one location, point A, to a new location, point C (see Fig. 10). We suggest that change in location of an entity is experientially correlated with transfer of the entity; change in position often gives rise to the implicature that transfer has taken place. Via pragmatic strengthening, this implicature is conventionalized as a distinct meaning component and instantiated in the semantic network associated with *over* as a distinct sense. As with the completion sense, the transfer sense involves the reanalysis of the trajectory or process. Again, in formal terms, *over* is represented not by a preposition but by an adprep. In Figure 10, the TR has been transferred from the left side of the impediment to the right side, as represented by the dark sphere, which is in focus.[27]

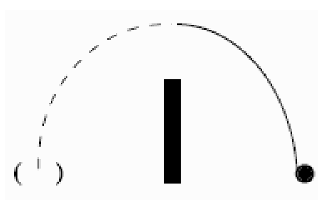

Figure 10 The transfer sense.

4.2 The covering sense (3.)

In our basic definition of TR and LM we noted that the typical situation is for the TR to be smaller than the LM, when the TR and LM are physical entities (although as we have seen, it is not inevitable that such is the case). All the senses and interpretations examined thus far have assumed that the TR is smaller than the LM. This default ascription is also represented in the protoscene we posited for *over*. However, there are instances in the real world in which the object that is in focus (the TR) is larger or perceived to be larger than the locating object (the LM). Such a situation is described by the sentence in (31).

(31) *Frank quickly put the tablecloth over the table.*

Given our normal interactions with tables and tablecloths – we sit at tables or walk past them such that both the table and the tablecloth are lower than our line of vision – it follows that our typical vantage point is such that when a tablecloth is over the table we perceive it as covering the table. This being so, the vantage point is not that depicted in the default representation of the protoscene, in which the viewer/construer is offstage. Rather the vantage point has shifted so that the TR is between the LM and the construer or viewer. The perceptual effect of having the TR physically intervene between the viewer and the LM is that the TR will often appear to cover the LM or some significant portion of it.[28]

In accordance with the position outlined previously – that spatial scenes can be viewed from different vantage points – the covering interpretation results from having a particular vantage point from which the situation is construed. When a shift in vantage point occurs, the conceptualization constructed is likely to involve an additional implicature not part of the interpretation when the default vantage of the protoscene is assumed. In sum, we are arguing that the conceptualization constructed in the normal interpretation of (31) involves two changes from the default representation of the protoscene: first, the TR is perceived as being larger than the LM and second, the vantage point has shifted from offstage to higher than the TR.[29]

The covering implicature has been reanalysed as distinct from the spatial configuration designated by the protoscene (see Fig. 11). As noted with examples (10) and (11), when *over* prompts for a covering sense, the TR need not be construed as being located higher than the LM; hence, the covering sense must exist independently in semantic memory.[30]

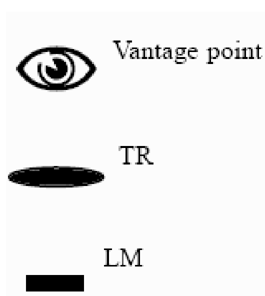

Figure 11 The covering sense.

4.3 Above and proximal

4.3.1 The examining sense (4.)

As noted earlier, any spatial scene can be viewed from a variety of vantage points. The construal that gives rise to the examining sense is the result of a shift from the default (i.e. offstage) vantage point. In particular, we argue that in the scene associated with the examining sense, the vantage point is that of the TR, and further that the TR's line of vision is directed at the LM.

How might this construal arise? Consider the following sentence.

(32) *Phyllis is standing over the entrance to the underground chamber.*

Here *over* is being used as designated in the protoscene and is mediating a spatial relation between the TR, *Phyllis*, and the LM, *the entrance to the underground chamber*, in which the TR is higher than but proximal to the LM. A consequence of Phyllis's being in this physical relation to the entrance is that she is in a position to carefully observe the entrance. An important way of experiencing and therefore understanding the act of examining is in terms of the examiner being physically higher than but proximal to the object being examined. Many recurring everyday examples of looking carefully at objects involve the human eyes being higher than the object being scrutinized, for example, examining tools, jewellery, a written text, or wounds on the body. Further, if an object is not proximal to the viewer, it is generally not possible to see the object clearly and therefore not possible to examine the object thoroughly. The experiential correlation between proximity and potential thoroughness is reflected in sentences such as (33) and (34).

(33) *I'll give the document a close examination.*

(34) *I'll give the manuscript a close read.*

Two experiential correlates of examining are the viewer being located above the LM and in proximity to the LM. Further, the functional aspect associated with the protoscene is that there is a conceptual connectedness between the TR and LM, i.e. the notion of sphere of influence. In this case, the connection is construed as that between the examiner and the examined. Because the protoscene for *over* contains these elements – a TR higher than a LM, proximity between the TR and LM, and a conceptual connectedness between the TR and LM – which match the physical correlates necessary for examination, *over* is a likely candidate for developing an examining sense. But this is not the entire story. Notice that the use of *over* in (32) does not prompt for the interpretation that Phyllis is examining the entrance, only that she is located such that she could examine it. For the examining sense to arise, the scene must contextually imply examination. Put another way, examination must be an implicature deriving from the particular linguistic prompts in a given sentence. Consider (35).

(35) *Mary looked over the manuscript quite carefully.*

The normal interpretation of this sentence is something like 'Mary examined the manuscript'. In this sentence, the TR, *Mary*, is physically higher than and in proximity to the LM, *the manuscript*. Thus, the TR and the LM are in the spatial configuration associated with the protoscene for *over*. In addition, the TR is construed as directing attention toward the manuscript. (This construal arises from our knowledge of the act of looking (it involves looking at something) and our knowledge of humans (often when they are looking, it is for some purpose).

This additional meaning element of directing attention towards the LM is essential to the examining sense (see Fig. 12). Now consider sentence (36).

(36) *The mechanic looked over the train's undercarriage.*

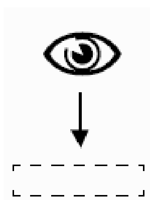

Figure 12 The examining sense.

The normal reading is that the mechanic examined the train's undercarriage, but for such examination to occur, *the mechanic*, the TR, must be physically underneath the train. In other words, in this conceptualization, the TR is under the LM. Clearly, in this situation, there is no way of predicting that *over* has associated with it an examination reading, given that the TR– LM spatial configuration does not correspond with that normally associated with *over*, the very configuration that motivated the implicature of examination in the first place. This is good evidence, therefore, that the contextual implicature of examination has been instantiated as a distinct sense in the network via pragmatic strengthening. Hence, examination results from construing a scene in a particular way. This being so, speakers are free to use this examination-meaning component in the absence of the TR–LM configuration which gave rise to the implicature of examination initially.

4.3.2 The focus-of-attention sense (4.A)

Sentences (37) and (38) illustrate what we call the focus-of-attention sense. Notice that in (37) *over* can be paraphrased by *about*.

(37) *The little boy cried over his broken toy.*
(Cf. *The little boy cried about his broken toy.*)

(38) *The senator presided over the opening ceremonies.*

In (37) and (38) the LM is the focus of attention. This sense is closely related to the examining sense from which it derives. In the examining sense, the vantage point is that of the TR, while the LM is physically below and proximal to the TR. We further posited that the TR must be construed as directing attention toward the LM. A natural consequence of the examining sense is that the object being examined, the LM, is the focus of the TR's attention. This natural consequence of examining has been privileged and reanalysed as distinct from the spatial scene in which it originally occurred (see Fig. 13), and via pragmatic strengthening, conventionalized as a distinct sense. (Fig. 13 differs minimally from Fig. 12; here the LM is in focus.) Once this sense has been instantiated in memory, nonphysical TRs and LMs can be mediated by this sense.

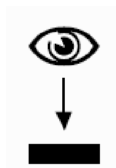

Figure 13 The focus-of-attention sense.

(39) *The committee agonized over the decision.*

(40) *The committee chair watched over the decision-making process.*

4.4 The vertical elevation or 'up' cluster (5.)

Four distinct senses fall under this cluster, as can be seen in Figure 6. Each arises from construing a TR located physically higher than the LM as being vertically elevated, or up, relative to the LM. Being up entails a particular construal of the scene in which upward orientation is assigned to the TR (see Fig. 14).

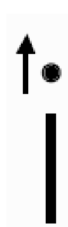

Figure 14 The up cluster.

This construal arises frequently in real-world experiences associated with the conceptual spatial relation *over*. For instance, in order to move over and beyond many LMs, movement from a physically lower location to a physically higher location is often necessary, i.e. vertical elevation of the TR occurs. Furthermore, an upward orientation is not typically construed in a neutral way. As Clark (1973) and Lakoff and Johnson (1980) have observed, an upward orientation is meaningful in human experience. An element in a vertically elevated position is often experienced as being positive or superior to an element in a physically lower position. Notice that there is nothing in the protoscene of *over*, i.e. of a TR being higher than the LM, that entails this construal: in the scene described by *The picture is over the mantel*, the picture is not construed as being in a better or superior position *vis-à-vis* the mantel.

4.4.1 The more sense (5.A)

As noted in the discussion of experiential correlation, vertical elevation and quantity are correlated in our experience. When there is an addition to the original amount of a physical entity, the height or level of that entity often rises. Because *over* can be construed as relating to a TR which is physically up with respect to a LM, and vertical elevation correlates in experiential terms with greater quantity, an implicature associated with having more of some entity is associated with being *over*. This implicature is conventionalized (via pragmatic strengthening), as attested by example (41).

(41) *Jerome found over 40 kinds of shells on the beach.*

The normal interpretation of *over* in this context is 'more than'. The LM, *40 kinds of shells*, is interpreted as a kind of standard or measurement. The TR is not actually mentioned; in interpreting the sentence, we infer that the TR is shell types 41 and greater. If *over* were interpreted in terms of the protoscene in this sentence, we would obtain a semantically anomalous reading in which the additional shells would be understood as somehow being physically higher than the 40 kinds actually mentioned in the sentence. Again, we see no direct way in which this interpretation can be constructed from the protoscene and the sentential context alone. Moreover, there is no direct correlation between the concept of more types and vertical elevation. The concept here is more variety not greater quantity of shells. We argue that the 'more' sense associated with *over* has arisen because of the independently motivated experiential correlation between greater quantity and greater elevation. Because of this experiential correlation, the implicature of greater quantity comes to be conventionally associated with *over* (which in terms of the designation prompted by the protoscene, has a greater height meaning, and hence also implicates greater quantity).

The implicature of greater quantity or more comes to be reanalysed as distinct from the conceptualization of the physical configuration that originally gave rise to it (see Fig. 15). Once reanalysis has taken place, the distinct sense comes to be associated with the form *over*, in the semantic network.

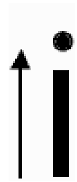

Figure 15 The more sense.

4.4.2 The over-and-above (excess II) sense (5.A.1)

The over-and-above (excess II) sense is closely related to the more sense. It adds an interpretation of 'too much' to the 'more' construal. We believe that a likely origin for this sense is the reanalysis of scenes involving containment, such as those described in (42) and (43).

(42) *The heavy rains caused the river to flow over its banks.*

(43) *Lou kept pouring the cereal into the bowl until it spilled over and onto the counter.*

In these scenarios the LMs are containers and the TRs are understood as entities held by the container. When the level of liquid or cereal (or whatever) that has been placed in the container is higher than but within reach of the top of the LM, then the amount constitutes more than the container can hold. A consequence of the capacity of a container being exceeded is that more of the TR becomes an excess of the TR, which results in spillage. In sum, more of the TR, *the water*, equals a higher level of water. Too much more of the TR results in a mess (see Fig. 16).

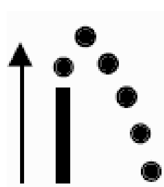

Figure 16 The over-and-above (excess II) sense.

This node in the semantic network represents a second potential source for the general notion of excess associated with certain uses of *over*. We see subtle but distinguishable differences between the excess I sense, which seems to us to be more closely tied to motion along a path and the interpretation of going beyond a designated point, and the excess II sense, which seems to be more closely related to exceeding the capacity of containers and exceeding what is normal. For instance, in a compound such as *overtired*, it may be that the conceptualization involved is not that an expected level of tiredness is a goal that is missed, but rather, an expected or normal capacity for tiredness has been exceeded. Consider (44).

(44) *The child was overtired and thus had difficulty falling asleep.*

In our interpretation of this sentence the child is conceptualized as having a certain capacity for activity; the child is conceptualized as a container and her or his activities are conceptualized as filling the container. When the activity level reaches that capacity, the child is tired and the normal response to that tiredness is to fall asleep. If the activity level exceeds the normal capacity, the child becomes too tired, which results in irritability and difficulty going to sleep.[31] In this example we might construct a 'more' conceptualization for *over*, or we might construct an 'excess' interpretation (which provides not just a more meaning, but the additional too-much-more meaning) for *over*.

4.4.3 The control sense (5.B)

A third experiential correlate associated with vertical elevation is the phenomenon of control or power. This meaning component associated with *over* is illustrated by (45) (from Lakoff, 1987).

(45) *She has a strange power over me.*

Clearly, this sentence does not mean that the TR, *she*, is higher than but within reach of *me*, the LM. Rather, the conventional interpretation derived from such an example is that the TR exerts influence, or control over the LM (as observed earlier). This meaning could not be derived from context, and is therefore suggestive, given our methodology, that this constitutes a distinct control sense instantiated in semantic memory. How then did the control sense derive from the semantic network associated with *over*? We suggest that this sense is due to an implicature becoming conventionally associated with *over*, from an independently motivated experiential correlation between control and vertical elevation. For most of human history, when one person has been in physical control of another person, control has been experienced as the controller being physically higher. In physical combat, the victor, or controller, is often the one who finishes standing, in the up position; the loser finishes on the ground, physically lower than the controller. Hence an important element of how we actually experience control (and presumably from where the concept itself is derived) is that of being physically higher than that which is controlled.

(46) *The fight ended with John standing over Mac, his fist raised.*

Further, within the physical domain, the physically bigger, up, often controls the physically smaller, down. Within the animal kingdom, a widespread signal of the acknowledgment of power or status is for the submissive animal to adopt a position in which its head is physically lower than the head of the dominant animal. In experiential terms then, control and vertical elevation are correlated. We suggest that because of an independently motivated experiential association between control and being vertically elevated, there is an implicature of control associated with *over*.

Nonetheless, if control were understood only in terms of vertical elevation, we would expect that the English preposition *above* should also implicate control. But as (47) demonstrates, this is not the case.

(47) ?*She has a strange power above me* [control reading].

To exert control in order to affect the subject's actions and thus guarantee compliance, one must be physically proximal to the subject. In experiential terms, there are two elements associated with the concept control; the first is up, and the second is physical proximity. As we have argued throughout this article, while the protoscene for *over* designates a TR being physically higher and proximal to the LM, there is good evidence for supposing that *above* designates that the TR will be physically higher but precludes physical proximity. In linguistic terms, we would expect *over* to develop a control reading. The linguistic usage, then, accords with how we actually experience (see Fig. 17: the spiral shape denotes that the TR [sphere] controls the LM [vertical line]).

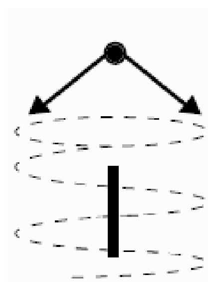

Figure 17 The control sense.

As we have been arguing, distinct senses, once instantiated in semantic memory, can be employed in situations that did not originally motivate them, as a consequence of being instantiated as distinct within the semantic network. Accordingly, the control sense can be employed to mediate relations between nonphysical TRs and LMs. In examples (48) and (49), either or both the TR/ LM are nonphysical entities.

(48) *Camilia has authority over purchasing* [= the act of deciding what will be purchased].

(49) *Personality has more influence over who we marry than physical appearance.*

4.4.4 The preference sense (5.C)

In the preference sense, that which is higher is conventionally understood as being preferred to that which is lower.

(50) *I would prefer tea over coffee.*

(51) *I like Beethoven over Mozart.*

We suggest that the preference sense derives in the following way: being physically up in experiential terms can implicate greater quantity, which generally is preferred to a lesser quantity. In another experiential pattern being physically up is associated with positive states such as happiness (*He's feeling up today*), while being physically down is associated with being unhappy (*I'm feeling down today*) (see Lakoff & Johnson, 1980). Given that happiness is normally preferred to unhappiness, this experiential correlation results in states associated with positions of vertical elevation being preferred to those associated with a lower position. Hence, being *over* implicates a preferred state (see Fig. 18: the TR, which is higher, is to be preferred to the LM, which is hence not in focus).

Figure 18 The preference sense.

This implicature of preference is conventionalized, allowing a preference interpretation (rather than a higher-than reading) in examples (50) and (51).

4.5 Reflexivity

4.5.1 The reflexive sense (6.)

Spatial reflexivity (first noted by Lindner, 1981) is the phenomenon whereby a single entity which occupies multiple positions is conceptualized such that two salient positions occupied by the entity are integrated into a TR–LM spatial configuration. A preposition such as *over* is then used to mediate a spatial relation between the two positions, even though the same entity cannot simultaneously occupy two distinct spatial positions in the world. The dynamic character of experience is reanalysed as a static spatial configuration. Langacker (1987) discusses this gestalt-like static conceptualization of a dynamic process as summary scanning. Consider (52).

(52) *The fence fell over.*

In (52), the TR – the initial (upright) position of the fence – is distinguished from the final position, in which the fence is lying horizontally on the ground. We see the fence fall through a 90-degree arc and from this experience a conceptual spatial relation is abstracted (via summary scanning), mediating the two temporally situated locations into a single spatial configuration. In the world, no such spatial configuration exists; after all, the same fence cannot be in two locations at the same time, but by conceptualizing the fence reflexively, the same entity can be both the TR and the LM (see Fig. 19).

Figure 19 The reflexive sense.

Additional examples of the reflexive sense are given in (53) and (54).

(53) *He turned the page over.*

(54) *The log rolled over.*

This sense arises from reanalysis of a process. As noted previously, when *over* is used to profile a process, it is coded as an adprep.

4.5.2 The repetition sense (6.A)

The repetition sense adds an iterative meaning component to the use of *over*, a meaning component that could not be predicted from the protoscene alone (or from any other sense considered so far). In examples (55) and (56), *over* can be paraphrased by *again* or *anew*.

(55) *After the false start, they started the race over.*

(Cf. *After the false start, they started the race again/anew*.)

(56) *This keeps happening over and over.*

Many native speakers have informed us that sentences such as (56) prompt for a conceptualization of a wheel or cycle, which seems to be evoked by the notion of repetition. We hypothesize that the repetition-meaning component associated with *over* may be the result of iterative application of the reflexive sense (i.e. the 90-degree arc is repeated such that the TR passes through 360 degrees returning to its original starting point).

Such an analysis is consistent with the intuition that repetition is conceptualized as cyclical in nature (Fig. 20).

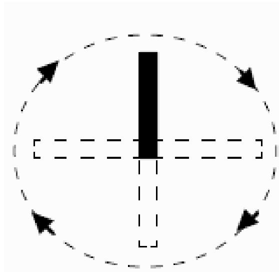

Figure 20 The repetition sense.

An alternative derivation may be due to an iterative application of the A-B-C trajectory, such that when the endpoint or completion of the trajectory is reached the process begins again.[32] A third possibility may be that the notions of completion and reflexivity are conceptually integrated forming a conceptual blend (in the sense of Fauconnier & Turner, 1994, 1998, 2002). We remain agnostic about which of these routes led to the instantiation of the repetition sense in the semantic network for *over*.

5 Conclusion

Previous polysemy accounts of *over* offer analyses that are too fine-grained. These accounts fail to distinguish between coding in formal expression and a level of conceptualization that integrates linguistic prompts in a way maximally coherent with sentential context and real-world knowledge. The selection of a linguistic prompt is, we argued, motivated by a principle of best fit. That is, given that prepositions represent a closed class they cannot possibly code the infinite array of all conceptual spatial relations. The speaker selects the preposition which, given the scene being described, is closest to accurately describing the key spatial relation. Conceptual integration results from such underspecified cues being used to construct a complex conceptualization, which elaborates the relatively impoverished linguistic input. A sentence such as *The cat jumped over the wall* results in a dynamic complex conceptualization in which the cat moves above and across the wall, not because this trajectory is coded for linguistically but because this is the most coherent and reasonable conceptualization, given the particular prompts, and given what we know about cats and walls.

In addition, we distinguish between constructed meanings and senses. The former are constructed on-line in the course of constructing a conceptualization of a specific scene prompted by a particular utterance, whereas senses are instantiated in memory, and can be recruited for the process of conceptual integration. While complex conceptualizations result from the process of conceptual integration taking account of motion and hence temporal frames, it does not follow that prepositions themselves code dynamism. Accordingly, we maintain the general assumption that prepositions code atemporal relations.

Within the polysemy network for *over* set forth here, the primary sense is termed the protoscene, and represents a highly idealized abstraction from our rich recurring experience of spatial scenes. We set forth a set of explicit criteria for determining the primary sense. Other distinct senses instantiated in the polysemy network for *over* result from pragmatic strengthening, i.e. reanalysis and encoding. We recognize a use as distinct only if its interpretation involves a change in the spatial configuration between the TR and LM and/or additional nonspatial information is involved. The polysemy network for *over* contains 14 distinct senses. Other interpretations derive from conceptual integration constrained by the cognitive principles discussed in Section 3.

The results of our study provide a means for distinguishing between distinct senses and the process of on-line meaning construction, which is primarily conceptual in nature. Clearly, a recognition of this distinction is imperative for future research into the nature of semantic networks, and provides additional insight into (i) the fundamentally non-arbitrary quality of the mental lexicon; (ii) the highly creative nature of the human conceptual system; and (iii) the fact that the way we experience renders spatio-physical interactions meaningful, which in turn gives rise to emergent conceptual structure.

Acknowledgements

Our thinking has benefited greatly from conversations with a number of colleagues. We would particularly like to thank Joseph Grady, Elizabeth Lemon and the members of the Georgetown Metaphor Group. We also thank Mark Aronoff, Steven Cushing, and two anonymous *Language* referees for their detailed comments and suggestions. We are grateful to Angela Evans for her assistance with the diagrams throughout, and for supplying us with many of our linguistic examples. Andrea Tyler would like to acknowledge the many insights and persistent questions raised by the students in her classes on pedagogical grammar and applying cognitive linguistics. Vyvyan Evans has benefited from detailed discussions with Craig Hamilton, and owes special thanks to Mark Turner for his insight and encouragement.

Notes

* This is a revised version of an article that was first published in *Language*, Volume 77, Number 4 (2001), 724–765. It is reprinted with the permission of ©*LSA* and *Language*.

1 Johnson's (1987) pioneering work argues that image-schemas are representations of recurring aspects of bodily sensory–motor experience, such as verticality, containment, and so on, which are stored in long-term memory. Hence, they are not 'mental pictures', but rather abstractions from rich experience. See also Cienki (1998) for an analysis of a single image-schema: STRAIGHT.

2 The figure–ground notions were developed by the cognitive linguist Leonard Talmy (e.g. 1978), and are derived from Gestalt psychology.

3 Ruhl (1989) has elegantly argued against a polysemy position, championing instead a monosemy framework. Monosemy holds that each lexical item is associated with a single highly abstract sense. On this view, the sense is so abstract that its precise

meaning is filled in by context in conjunction with pragmatic knowledge. We will demonstrate (Section 4) that some senses cannot be predicted by context alone, a strong argument against a monosemy position.

4 Future empirical analysis might find that speakers make such fine-grained distinctions, but the evidence to date does not bear this out. Although we cannot definitively prove Lakoff's full-specification model is wrong, it does result in questionable consequences, both in terms of its linguistic representations and in terms of the little experimental evidence that is available.

5 The variations among just the two attributes of + / – or unspecified extended, and + / – or unspecified vertical, result in nine distinct senses. Each time another attribute is added to the model, the list of distinct senses multiplies accordingly – consider Table 1. The predictions become even more questionable when one considers that five of the nine senses involve attributes being unspecified.

Analogous arguments can be made for specification of the exact, metric relationship between the TR and LM in terms of the presence or absence of contact, as Kreitzer (1997) underscores with the example *Sam went over the wall*, in which the precise manner of passing over the wall, either jumping or crawling, is unspecified, therefore the presence or absence of contact is unspecified.

Table 1. Topographical features (after Lakoff, 1987).

	+ Vertical	**– Vertical**	**Unspecified**
+ Extended	S	S	U
– Extended	S	S	U
Unspecified	U	U	U

S = specified; U = unspecified.

6 In order to motivate the distinction between *over1* and *over2*, Kreitzer appeals to Langacker's notion of *summary scanning* (Langacker, 1987, 1991a). Langacker posits that summary scanning provides a means of integrating points occupied by a TR along a path into a construal of motion along a path. The path is reified at the conceptual level, even though it never actually exists in the world. Kreitzer argues that the dynamic *over2* describes a relation between a TR and a LM in which it is the path that is the TR.

7 The term *ideal meaning* is from Herskovits, 1986, Chapter 4.

8 It is important to note that some central (= most basic, to be explicated) senses associated with prepositions will crucially involve a coordinate system along the vertical or horizontal axes, while others will not. We will argue that the primary sense associated with *over* does involve such a system in which the spatial relation of the TR being located higher than the LM is essential. But this should not be interpreted as a claim that all prepositions prompt for such a system. While the English prepositions *over* and *under* regularly code respectively for the TR being in a higher-than or lower-than position relative to the LM, the preposition *out* appears to be insensitive to this dimension. Thus, we find sentences like *The rain poured out of the sky* (in which the TR is lower than the LM) and *The water bubbled out of the hot springs* (in which the TR is higher than the LM) which do not affect the basic interpretation associated with *out*. Whether a

particular preposition is sensitive to the horizontal or vertical dimensions is part of its basic lexical entry.

9 Although there has been disagreement about the appropriate representation of the primary sense associated with *over*, all published analyses accept these two basic assumptions. Synchronically, evidence that the basic spatial configuration prompted for by *over* is something like a TR in a higher-than position relative to the LM comes from sentences with clearly contrasting interpretations: *Nicole decided to walk over the bridge* versus *Nicole decided to walk under the bridge*. Having argued that the primary sense for *over* involves a spatial configuration in which the TR is higher than the LM, we readily acknowledge that in many instances this spatial configuration is not prompted for by *over*. Our analysis attempts to model how these non-canonical spatial configurations have come to be associated with the form *over*.

10 It should be noted that our diagrammatic representations of protoscenes are made for ease of explication. They should not be interpreted as making any serious claim about the neurological nature of imagistic representation.

11 An image-schema, as Mandler uses the term, constitutes a representation distinct from purely perceptual information. As such, it constitutes a rudimentary 'theory' as to the nature of a particular object or relation between objects. The image-schema relating to containment, for instance, is a concept as opposed to a perceived entity, insofar as it constitutes a means of understanding the functional aspects of a particular spatial configuration.

12 This is akin to what Jackendoff (1983, p. 29) refers to as the *projected world*, and is constructed at what Fauconnier (1997, p. 36) terms the *cognitive level* or *level C*.

13 In terms of specifics our claim is as follows: a particular spatial scene is a rich real-world scenario, mediating two objects (TR and LM) via a conceptual spatial relation. Recurring spatial scenes perceived as resembling each other are stored as an abstract protoscene. The aspect of the protoscene coded by a preposition is the spatial relation mediating the TR and LM, and not the whole protoscene. From this, it follows that a preposition presupposes a TR and a LM (as the conceptual spatial relation holds by virtue of mediating a relation between a TR and a LM). In minimal terms, a preposition prompts for a TR and LM, which are typically supplied linguistically, e.g. *The picture* [TR] *is over the mantel* [LM].

14 The reanalysis of an aspect of a particular complex conceptualization results in privileging a different aspect or perspective on the complex conceptualization. Yet, because the pertinent complex conceptualization is first prompted for by the use of *over*, as in Figure 5, the derived sense is coded by the same linguistic form, namely *over*.

15 Cruse (1986) discusses this in terms of modulation of a lexical item. For instance, various parts of *the car* are highlighted in the following sentences: *The car needs to be washed* (where *car* is interpreted as the exterior body of the car) versus *The car needs to be serviced* (where *car* is interpreted as the engine) versus *The car needs vacuuming* (where *car* is interpreted as the interior). This constitutes modulation or highlighting different parts and backgrounding others.

16 Langacker (1992) discusses the atemporal nature of prepositions in terms of the relationships they profile. 'With *before* and *after*, time functions as the domain in which the profiled relationship is manifested. Its role is consequently analogous to that of space in the basic sense of *in*, *on* or *near*. A verb, on the other hand, is said to be temporal in a very different way ... the profiled relationship is conceived as evolving through time and

is scanned sequentially along this temporal axis. It is by incorporating this further level of conceptual organization that *precede* and *follow* differ from the prepositions *before* and *after* ... [Verbs] specifically track [a process] through time ... A preposition can thus be characterized as profiling an atemporal relation that incorporates a salient landmark' (1992, p. 292).

17 Unless the world being discussed is explicitly designated as science fiction.

18 In sentence (19) the lack of motion is the result of integrating what is coded by the verb *extended* with our knowledge of trees. In particular, the interpretation of lack of motion depicted by (19) is the result of the interpretation of *extended* as it relates to a tree branch. We understand trees to be slow-growing plants such that humans do not perceive the growth of a branch as involving motion. Thus, we interpret *extended* to depict a state. Notice that the stative interpretation of *extended* is contingent upon the precise sentential context in which it occurs. *Extended* can also be interpreted to convey motion as in *He extended his arm towards the door*. Since there is no sense of motion prompted for by the verb in the sentential context provided in (19), no path or trajectory is projected for the TR.

19 We hasten to acknowledge that there are contexts in which two prepositions appear to be interchangeable and virtually synonymous: *Susan hung the picture over the mantel* versus *Susan hung the picture above the mantel*. We hypothesize that such substitutability arises because the semantic networks associated with each preposition represent continuums and at certain points the interpretations of two continuums can overlap. In addition, for *over* and *above* we find a close diachronic relationship, with *over* initially being used as the comparative form of *above*. The diachronic link may surface in these overlapping uses.

20 In terms of synchronic polysemy networks, the empirical work by Sandra, Rice, and their colleagues suggests that it may not be the case that a particular lexical form has a single primary sense from which language users perceive all other senses being derived. Their empirical work raises questions about the view that we can define polysemy as a strictly synchronic phenomenon in which speakers are consciously aware of a relationship holding between distinct senses of a particular lexical form. This is an empirical question for which we do not yet have sufficient evidence to determine the answer. If extensive experimental evidence shows that language users systematically and consistently fail to perceive some senses as being related, then we must question whether what we term polysemy constitutes a phenomenon that is wholly synchronic in nature. While we believe all the senses in a particular semantic network are diachronically (and perhaps developmentally) related, in terms of the adult lexicon, there may be differences in the perceived relatedness between distinct sets of senses, due to routinization and entrenchment, obscuring the original motivation for the derivation of senses from pre-existing senses such as the protoscenes for language users (see in particular Rice, Sandra, & Vanrespaille, 1999).

21 In formal terms, the particle in a verb–particle construction (VPC) is a more grammaticized preposition in that the LM is linguistically covert, that is, it is contextually understood without being linguistically coded (Lindner, 1981; O'Dowd, 1998). Such particles form part of a verb–particle construction with a verbal element, and each unit (the particle and the verb) contributes to the meaning of the whole unit (see Goldberg, 1995, for a construction grammar approach, Morgan, 1997, for a study of verb–particle constructions). We introduce the term adprep to describe a spatial particle which has adverbial meaning, that is, certain usages of the form *over* are adverbial in nature,

describing an aspect of a conceptual process, as in *The movie is over* (= finished). Each formal component – preposition, particle (in a VPC), particle prefix, or adprep – contributes different kinds of meaning.

22 Recall that we are using the term 'sense' for distinct meanings instantiated in memory (i.e. in the semantic network associated with each preposition).

23 It is worth pointing out that sentences such as (21)–(25) offer strong evidence against a monosemy theory of word meaning. Monosemy (see Ruhl, 1989), as noted previously, posits that all interpretations of a linguistic form, such as a preposition, are contextually derivable from a highly abstract primary sense. However, as can be seen from the on-the-other-side-of sense, neither of the original aspects of the spatial configuration hold – the TR is not above the LM and the TR is not proximal to the LM. The nature of a primary sense that would derive both these senses simply from contextual cues would need to be extremely abstract. We cannot see how a representation so abstract would also be constrained enough to distinguish among many other English prepositions.

24 Lakoff (1987, pp. 422–423) represents sentences such as *Sam lives over the hill* as an example of schema 1.VX.C.E. (above-across, with a vertical, extended LM, contact between the TR and LM, and endpoint focus).

25 There is arguably a distinct sense which is derived from the on-the-other-side-of sense. In examples such as

(57) *The festival will take place over the weekend*;

(58) *The friendship remained strong over the years*;

(59) *Let's take a look at changes over time*;

over mediates a temporal relation of concurrence between a process or activity and the times during which the process or activity elapses. This sense is likely to have developed from the on-the-other-side-of sense, when the physical LM is extended, as, for example, in *The boy walked over the hill*, *The cable runs over the yard*, and *The bridge stretches over the river*. In such situations the activity is concurrent with the duration required for the activity. Because of pragmatic strengthening, a duration sense may have become associated with *over*.

26 This is consistent with Langacker (e.g. 1987) who argues that grammatical class is determined by virtue of what is profiled. For instance, the relationship profiled by adverbs crucially differs from the relationship profiled by prepositions in that an adverb takes a relationship as its TR and does not have a salient LM. In contrast, a preposition takes an entity as its TR and elaborates a relational LM.

27 Nonphysical entities can be identified as TRs or LMs, if they are construed as focal and backgrounded respectively, and if a relation holds between them. As *over* has a conventionalized transfer sense associated with it, the relation between nonphysical TRs and LMs cannot be spatio-configurational, but as in *The government handed its power over to the newly elected officials*, it can involve the notion of transfer. This further illustrates that transfer must be a distinct sense: it could not be derived from context in such sentences. There is a conventional reading in which the members of the government transfer their authority, i.e. their mandate to govern, to a new set of officials. In literal terms, nothing is physically transferred, as the TR, *power*, is a nonphysical entity.

Nonetheless, to say that power is a nonphysical entity is not to say that the concept 'power' is without foundation in real-world experiences. In fact, the concept of power derives from a variety of very real experiences: physical forces, socially constructed relationships and hierarchies, and social interactions such as taking, issuing and following orders, commands, edicts, and so on. In this sense, we each experience power in a real way, although the variety of experiences subsumed by the concept of power does not have physical substance or spatial dimensionality in the same way that a chair or a table has. Accordingly, it makes sense that power can be transferred, thus licensing the use of the transfer sense.

28 Again, following our argument that metric properties concerning the relationship between the TR and LM are filled in on-line, *over* can be used to prompt for this covering interpretation when there is contact between the LM and TR, as in (31), or when there is no contact between the TR and the LM, as in *The fibreglass protector was put over the drained swimming pool for the winter*.

29 These two changes are closely intertwined in everyday experience. We are often involved in real-world scenarios where the TR is physically larger than the LM and we normally view the TR–LM from above, as in *The cloth is over the table*. In this real-world scene, if the TR were smaller than the LM, the preposition of choice (best fit) would be likely to change.

(60) ?*The small handkerchief was spread out over the table.*

(61) *The small handkerchief was spread out on the table.*

However, there are also many real-world scenarios in which the TR is actually smaller than the LM but because of the construer's vantage point (the TR intervenes between the viewer and the LM), the TR appears larger than the LM. For instance, in *The dark clouds moved over the sun*, the clouds are not physically larger than the sun, but they appear larger to the earthbound viewer.

30 Lakoff (1987, p. 429) accounted for cases of the covering reading in which the TR is not higher than the LM by positing a *rotation transformation*. The covering schemas all have variants in which the TR need not be above (that is, higher than) the LM. In all cases, however, there must be an understood viewpoint from which the TR is blocking accessibility of vision to at least some part of the LM. We will refer to these as *rotated* (RO) schemas, though with no suggestion that there is actual mental rotation degree-by-degree involved. This is an extremely powerful transformation, potentially affecting all prepositions whose primary sense involves either a vertical or horizontal orientation. In a number of instances, the protoscenes for *over*, *wider*, *before*, and *after* would be essentially indistinguishable. And this analysis offers no explanation for why TR–LM configurations that do not match the protoscene would develop this reading.

A common consequence of the LM being covered by the TR is that the LM is occluded from the construer's view. Typically the scene described in (31) is that the tablecloth occludes the tabletop from the observer. As we see in examples such as the following, occlusion is not an inevitable consequence of covering.

(62) *The mask is over her face.*

(63) *She wore a transparent veil over her face.*

(64) *The dark, heavy clouds are over the sun.*

(65) *There are a few wispy clouds over the sun.*

In sentences (62) and (64) a consequence of the LM being covered by the TR is that the LM is no longer visible. In (63) and (65), however, covering does not obscure the object. We have not been able to find any instances of occluding which involve the use of *over1* that do not include a covering sense. Further, in the examples in which we can tease apart covering from occluding, the physical attribute of transparency/opacity of the TR must he specified. If the TR is not specified as transparent (65) the normal reading is that covering entails occlusion. Thus, we have concluded that the occlusion interpretation is a contextual implicature of the covering sense and real-world knowledge of the properties of objects such as tablecloths and blankets. Given the absence of contextually independent examples of occlusion – linguistic examples of *over* in which occlusion is not an implicature deriving from covering – our methodological procedure suggests that an occluding reading is an on-line interpretation.

31 In some cases, we see no clear way to determine which source is more appropriate. As we noted in our discussion of the excess I sense, specific uses of *over* (or any preposition) seem to contain 'flavours' of more than one sense, which imbues a reading with complex nuances of meaning. For instance, consider the following.

(66) *Hey! Why are you bringing in so many cases of motor oil? There must be a dozen cases here. That's well over the two cases I ordered.*

In this example we might construct a 'more' conceptualization for *over*, or we might construct an 'excess' interpretation (which provides not just a more meaning, but the additional too-much-more meaning) for *over*. In this latter case, the example could be derived from either the above-and-beyond (excess I) sense or the over-and-above (excess II) sense. On the one hand, *two cases* could be conceptualized as the target the customer was aiming for, and bringing in ten additional cases could be construed as going beyond the designated target. On the other hand, *two cases* could be conceptualized as the expected amount or level of goods, and the additional ten cases could be construed as going above the expected amount or level.

Alternatively, the hearer may construct a complex conceptualization in which all three senses are influencing the interpretation. This reflects our claim that there is a semantic network linking distinct senses, and that conceptualizations may be due to a semantic network constituting a meaning continuum, as discussed earlier. Accordingly, our network should be thought of as a semantic continuum, in which complex conceptualizations can draw on meanings from distinct nodes as well as the range of points between nodes, which provide nuanced semantic values. In addition, an important consequence of our claims

(i) that the principles of meaning construction in conjunction with a distinct sense such as the protoscene (or any other distinct mental representation or sense), can be used to construct a wide range of conceptualizations;

(ii) that any one conceptualization is subject to multiple construals (through, for instance, privileging a particular aspect of the scene or shifting the vantage point from which the scene is viewed);

(iii) that distinct senses can be extended to include nonphysical entities when such are perceived as focal (TRs) and backgrounded reference points (LMs);

(iv) that semantic networks form an interrelated continuum of interpretations (rather than just a series of absolutely discrete points of meaning);

is that the model predicts that a particular sense may arise from more than one source. In forms such as *overachieve*, *overkill*, *overdo*, and *overdress* we do not see a clear basis for arguing for the superiority of the above-and-beyond interpretation versus the over-and-above interpretation. As noted earlier, we do not consider this a flaw in our model; rather we see it as testimony to the richness and complexity of conceptualization. We also hypothesize that native speakers are likely to vary in their intuitions about these cases.

32 Lindstromberg (1997) offers a very similar explanation.

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9 Frame semantics

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1 Introduction

With the term 'frame semantics' I have in mind a research program in empirical semantics and a descriptive framework for presenting the results of such research. Frame semantics offers a particular way of looking at word meanings, as well as a way of characterizing principles for creating new words and phrases, for adding new meanings to words, and for assembling the meanings of elements in a text into the total meaning of the text. By the term 'frame' I have in mind any system of concepts related in such a way that to understand any one of them you have to understand the whole structure in which it fits; when one of the things in such a structure is introduced into a text, or into a conversation, all of the others are automatically made available. I intend the word 'frame' as used here to be a general cover term for the set of concepts variously known, in the literature on natural language understanding, as 'schema', 'script', 'scenario', 'ideational scaffolding', 'cognitive model', or 'folk theory'.[1]

Frame semantics comes out of traditions of empirical semantics rather than formal semantics. It is most akin to ethnographic semantics, the work of the anthropologist who moves into an alien culture and asks such questions as, 'What categories of experience are encoded by the members of this speech community through the linguistic choices that they make when they talk?' A frame semantics outlook is not (or is not necessarily) incompatible with work and results in formal semantics; but it differs importantly from formal semantics in emphasizing the continuities, rather than the discontinuities, between language and experience. The ideas I will be presenting in this paper represent not so much a genuine theory of empirical semantics as a set of warnings about the kinds of problems such a theory will have to deal with. If we wish, we can think of the remarks I make as 'pre-formal' rather than 'non-formalist'; I claim to be listing, and as well as I can to be describing, phenomena which must be well understood and carefully described before serious formal theorizing about them can become possible.

In the view I am presenting, words represent categorizations of experience, and each of these categories is underlain by a motivating situation occurring against a background of knowledge and experience. With respect to word meanings, frame semantic research can be thought of as the effort to understand what reason a speech community might have found for creating the category represented by the word, and to explain the word's meaning by presenting and clarifying that reason.

An analogy that I find helpful in distinguishing the operation and the goals of frame semantics from those of standard views of compositional semantics is between a grammar and a set of tools – tools like hammers and knives, but also like clocks and shoes and pencils. To know about tools is to know what they look like and what they are made of – the phonology and morphology, so to speak – but it is also to know what people use them for, why people are interested in doing the things that they use them for, and maybe even what kinds of people use them. In this analogy, it is possible to think of a linguistic text, not as a record of 'small meanings' which give the interpreter the job of assembling these into a 'big meaning' (the meaning of the containing text), but rather as a record of the tools that somebody used in carrying out a particular activity. The job of interpreting a text, then, is analogous to the job of figuring out what activity the people had to be engaged in who used these tools in this order.

2 A private history of the concept 'frame'

I trace my own interest in semantic frames through my career-long interest in lexical structure and lexical semantics. As a graduate student (at the University of Michigan in the late fifties) I spent a lot of time exploring the co-occurrence privileges of words, and I tried to develop distribution classes of English words using strings of words or strings of word classes as the 'frames' within which I could discover appropriate classes of mutually substitutable elements. This way of working, standard for a long time in phonological and morphological investigations, had been developed with particular rigor for purposes of syntactic description by Charles Fries (Fries 1952) and played an important role in the development of 'tagmemic formulas' in the work of Kenneth Pike (Pike 1967), the scholars who most directly influenced my thinking during this period. Substitutability within the same 'slot' in such a 'frame' was subject to certain (poorly articulated) conditions of meaning-preservation or structure-preservation, or sometimes merely meaningfulness-preservation. In this conception, the 'frame' (with its single open 'slot') was considered capable of leading to the discovery of important functioning word classes or grammatical categories. As an example of the workings of such a procedure, we can take the frame consisting of two complete clauses and a gap between them, as in 'John is Mary's husband he doesn't live with her.' The substitution in this frame of BUT and YET suggests that these two words have (by this diagnostic at least) very similar functions; insertion of MOREOVER or HOWEVER suggest the existence of conjunctions functioning semantically similarly to BUT and YET but requiring sentence boundaries. The conjunctions AND and OR can meaningfully be inserted into the frame, but in each case (and in each case with different effect) the logical or rhetorical 'point' of the whole utterance differs importantly from that brought about by BUT or YET. In each of these cases, what one came to know about these words was the kind of structures with which they could occur and what function they had within those structures.

In the early sixties, together with William S-Y. Wang and eventually D. Terence Langendoen and a number of other colleagues, I was associated with the Project on Linguistic Analysis at the Ohio State University. My work on that project was largely devoted to the classification of English verbs, but now not only according to the surface-syntactic frames which were hospitable to them, but also according to their grammatical 'behavior', thought of in terms of the sensitivity of structures containing them to particular grammatical 'transformations.' This project was whole-heartedly transformationalist, basing its operations at first on the earliest work on English transformational grammar by Chomsky (1957) and Lees (1961), and in its later stages on advances within the theory suggested by the work of Peter Rosenbaum (Rosenbaum 1967) and the book which established the standard, working paradigm for transformationalist studies of English, Chomsky (1965). What animated this work was the belief that discoveries in the 'behavior' of particular classes of words led to discoveries in the structure of the grammar of English. This was so because it was believed that the distributional properties of individual words discovered by this research could only be accommodated if the grammar of the language operated under particular working principles. My own work from this period included a small monograph on indirect object verbs (Fillmore 1961) and a paper which pointed to the eventual recognition of the transformational cycle as an operating principle in a formal grammar of English (Fillmore 1963).

The project's work on verbs was at first completely syntactic, in the sense that what was sought was, for each verb, a full account (expressed in terms of subcategorization features) of the deep structure syntactic frames which were hospitable to it, and a full account (expressed in terms of rule features) of the various paths or 'transformational histories' by which sentences containing them could be transformed into surface sentences. The kind of work I have in mind was carried on with much greater thoroughness by Fred Householder and his colleagues at Indiana University (Householder *et al.* 1964), and with extreme care and sophistication by Maurice Gross and his team in Paris on the verbs and adjectives of French (Gross 1975).

In the late sixties I began to believe that certain kinds of groupings of verbs and classifications of clause types could be stated more meaningfully if the structures with which verbs were initially associated were described in terms of the semantic roles of their associated arguments. I had become aware of certain American and European work on dependency grammar and valence theory, and it seemed clear to me that what was really important about a verb was its 'semantic valence' (as one might call it), a description of the semantic role of its arguments. Valence theory and dependency grammar did not assign the same classificatory role to the 'predicate' (or 'VP') that one found in transformationalist work (see, e.g., Tesnière 1959); the kind of semantic classifications that I needed could be made more complete and sensible, I believed, if, instead of relying on theoretically separate kinds of distributional statements such as 'strict subcategorization features' and 'selectional features,' one could take into account the semantic roles of all arguments of a predication, that of the 'subject' being simply one of them. Questioning, ultimately, the relevance of the assumed basic immediate-constituency cut between subject and predicate, I proposed that verbs could be seen as basically having two kinds of features relevant to their distribution in sentences: the first a deep-structure valence description expressed in terms of what I called 'case frames', the second a description in terms of rule features. What I called 'case frames' amounted to descriptions of predicating words that communicated such information as the following: 'Such-and-such a verb occurs in expressions containing three nominals, one designating an actor who performs the act designated by the verb, one designating an object on which the actor's act has a state-changing influence, and one designating an object through the manipulation of which the actor brings about the mentioned state change.' In symbols this statement could be represented as [– API], the letters standing for 'Agent', 'Patient' and 'Instrument'. Actually, the kind of description I sought distinguished 'case frames' as the structures in actual individual sentences in which the verbs could appear from 'case frame features' as representations of the class of 'case frames' into which particular verbs could be inserted. In the description of 'case frame features' it was possible to notice which of the 'cases' were obligatory, which were optional, what selectional dependencies obtained among them, and so on (see Fillmore 1968).

We were developing a kind of mixed syntactic-semantic valence description of verbs, and we noticed that the separate valence patterns seemed to characterize semantic types of verbs, such as verbs of perception, causation, movement, etc. Within these syntactic valence types, however, it seemed that some semantic generalizations were lost. There seemed to be important differences between GIVE IT TO JOHN and SEND IT TO CHICAGO that could not be illuminated merely by showing what syntactic rules separate GIVE from SEND, just as there seemed to be semantic commonalities between ROB and STEAL, BUY and SELL, ENJOY and AMUSE, etc., which were lost in the syntactic class separation of these verbs.

My ultimate goal in this work in 'case grammar' (as the framework came to be called) was the development of a 'valence dictionary' which was to differ importantly from the kinds of valence dictionaries appearing in Europe (e.g., Helbig and Schenkel 1973) by having its semantic valence taken as basic and by having as much as possible of its syntactic valence accounted for by general rules. (Thus, it was not thought to be necessary to explain, in individual lexical entries, which of the arguments in a [VAPI] predication of the type described above was to be the subject and which was to be the object, since such matters were automatically predicted by the grammar with reference to a set of general principles concerning the mapping from configurations of semantic cases into configurations of grammatical relations.)

Although the concept of 'frame' in various fields within cognitive psychology appears to have origins quite independent of linguistics, its use in case grammar was continuous, in my own thinking, with the use to which I have put it in 'frame semantics'; In particular, I thought of each case frame as characterizing a small abstract 'scene' or 'situation', so that to understand the semantic structure of the verb it was necessary to understand the properties of such schematized scenes.

The scene schemata definable by the system of semantic cases (a system of semantic role notions which I held to be maximally general and defining a minimal and possibly universal repertory) was sufficient, I believed, for understanding those aspects of the semantic structure of a verb which were linked to the verb's basic syntactic properties and to an understanding of the ways in which different languages differently shaped their minimal clauses, but they were clearly not adequate for describing with any completeness the semantic structure of the clauses containing individual verbs.

This theory of semantic roles fell short of providing the detail needed for semantic description; it came more and more to seem that another independent level of role structure was needed for the semantic description of verbs in particular limited domains.

One possible way of devising a fuller account of lexical semantics is to associate some mechanism for deriving sets of truth conditions for a clause from semantic information individually attached to given predicates; but it seemed to me more profitable to believe that there are larger cognitive structures capable of providing a new layer of semantic role notions in terms of which whole domains of vocabulary could be semantically characterized.

My first attempt to describe one such cognitive structure was in a paper on 'Verbs of judging' (Fillmore 1971) – verbs like BLAME, ACCUSE, CRITICIZE – for which I needed to be able to imagine a kind of 'scene schematization' that was essentially different from the sort associated with 'case frames'. In devising a framework for describing the elements in this class of verbs, I found it useful to distinguish a person who formed or expressed some sort of judgment on the worth or behavior of some situation or individual (and I called such a person the Judge); a person concerning whose behavior or character it was relevant for the Judge to make a judgment (I called this person the Defendant); and some situation concerning which it seemed relevant for the Judge to be making a Judgment (and this I called simply the Situation). In terms of this framework, then, I chose to describe ACCUSE as a verb usable for asserting that the Judge, presupposing the badness of the Situation, claimed that the Defendant was responsible for the Situation; I described CRITICIZE as usable for asserting that the Judge, presupposing the Defendant's responsibility for the Situation, presented arguments for believing that the Situation was in some way blameworthy. The details of my description have been 'criticized' (see esp. McCawley 1975), but the point remains that we have here not just a group of individual words, but a 'domain' of vocabulary whose elements somehow presuppose a schematization of human judgment and behavior involving notions of worth, responsibility, judgment, etc., such that one would want to say that nobody can really understand the meanings of the words in that domain who does not understand the social institutions or the structures of experience which they presuppose.

A second domain in which I attempted to characterize a cognitive 'scene' with the same function was that of the 'commercial event' (see Fillmore 1977b). In particular, I tried to show that a large and important set of English verbs could be seen as semantically related to each other by virtue of the different ways in which they 'indexed' or 'evoked' the same general 'scene'. The elements of this schematic scene included a person interested in exchanging money for goods (the Buyer), a person interested in exchanging goods for money (the Seller), the goods which the Buyer did or could acquire (the Goods), and the money acquired (or sought) by the seller (the Money). Using the terms of this framework, it was then possible to say that the verb BUY focuses on the actions of the Buyer with respect to the Goods, backgrounding the Seller and the Money; that the verb SELL focuses on the actions of the Seller with respect to the Goods, backgrounding the Buyer and the Money; that the verb PAY focuses on the actions of the Buyer with respect to both the Money and the Seller, backgrounding the Goods, and so on, with such verbs as SPEND, COST, CHARGE, and a number of others somewhat more peripheral to these. Again, the point of the description was to argue that nobody could be said to know the meanings of these verbs who did not know the details of the kind of scene which provided the background and motivation for the categories which these words represent. Using the word 'frame' for the structured way in which the scene is presented or remembered, we can say that the frame structures the word-meanings, and that the word 'evokes' the frame.

The structures I have mentioned so far can be thought of as motivating the categories speakers wish to bring into play when describing situations that might be independent of the actual speech situation, the conversational context. A second and equally important kind of framing is the framing of the actual communication situation. When we understand a piece of language, we bring to the task both our ability to assign schematizations of the phases or components of the 'world' that the text somehow characterizes, and our ability to schematize the situation in which this piece of language is being produced. We have both 'cognitive frames' and 'interactional frames', the latter having to do with how we conceptualize what is going on between the speaker and the hearer, or between the author and the reader. By the early seventies I had become influenced by work on speech acts, performativity, and pragmatics in general, and had begun contributing to this field in the form of a number of writings on presuppositions and deixis (see, e.g., Fillmore 1975). Knowledge of deictic categories requires an understanding of the ways in which tenses, person marking morphemes, demonstrative categories, etc., schematize the communicating situation; knowledge of illocutionary points, principles of conversational cooperation, and routinized speech events, contribute to the full understanding of most conversational exchanges. Further, knowing that a text is, say, an obituary, a proposal of marriage, a business contract, or a folktale, provides knowledge about how to interpret particular passages in it, how to expect the text to develop, and how to know when it is finished. It is frequently the case that such expectations combine with the actual material of the text to lead to the text's correct interpretation. And once again this is accomplished by having in mind an abstract structure of expectations which brings with it roles, purposes, natural or conventionalized sequences of event types, and all the rest of the apparatus that we wish to associate with the notion of 'frame'.

In the mid-seventies I came into contact with the work of Eleanor Rosch (Rosch 1973) and that of Brent Berlin and Paul Kay (Berlin and Kay 1969) and began to see the importance of the notion of 'prototype' in understanding the nature of human categorization. Through the work of Karl Zimmer (Zimmer 1971) and Pamela Downing (Downing 1977) on the relevance of categorizing contexts to principles of word-formation and, in work that reflects fruitful collaboration with Paul Kay and George Lakoff, I began to propose descriptions of word meanings that made use of the prototype notion. One generalization that seemed valid was that very often the frame or background against which the meaning of a word is defined and understood is a fairly large slice of the surrounding culture, and this background understanding is best understood as a 'prototype' rather than as a genuine body of assumptions about what the world is like. It is frequently useful, when trying to state truth conditions for the appropriateness of predicating the word of something, to construct a simple definition of the word, allowing the complexity of fit between uses of the word and real world situations to be attributed to the details of the prototype background frame rather than to the details of the word's meaning. Thus we could define an ORPHAN as a child whose parents are no longer living, and then understand the category as motivated against a background of a particular kind: in this assumed background world, children depend on their parents for care and guidance and parents accept the responsibility of providing this care and guidance without question; a person without parents has a special status, for society, only up to a particular age, because during this period a society needs to provide some special way of providing care and instruction. The category ORPHAN does not have 'built into it' any specification of the age after which it is no longer relevant to speak of somebody as an orphan, because that understanding is a part of the background prototype; a boy in his twenties is generally regarded as being able to take care of himself and to have passed the age where the main guidance is expected to come from his family. It is that background information which determines the fact that the word ORPHAN would not be appropriately used of such a boy, rather than information that is to be separately built into a description of the word's meaning. In the prototype situation, an orphan is seen as somebody deserving of pity and concern; hence the point of the joke about the young man on trial for the murder of his parents who asked the court for mercy on the grounds that he was an orphan: the prototype scene against which society has a reason to categorize some children as orphans does not take into account the case in which a child orphans himself.

As a second example of a category that has to be fitted onto a background of institutions and practices we can consider the word BREAKFAST. To understand this word is to understand the practice in our culture of having three meals a day, at more or less conventionally established times of the day, and for one of these meals to be the one which is eaten early in the day, after a period of sleep, and for it to consist of a somewhat unique menu (the details of which can vary from community to community). What is interesting about the word BREAKFAST is that each of the three conditions most typically associated with it can be independently absent still allowing native speakers to use the word. The fact that someone can work through the night without sleep, and then at sun-up have a meal of eggs, toast, coffee and orange juice, and call that meal 'breakfast', shows clearly that the 'post-sleep' character of the category is not criterial; the fact that someone can sleep through the morning, wake up at three o'clock in the afternoon, and sit down to a meal of eggs, toast, coffee and orange juice, and call that meal 'breakfast', shows that the 'early morning' character of the category is also not criterial; and lastly, the fact that a person can sleep through the night, wake up in the morning, have cabbage soup and chocolate pie 'for breakfast', shows that the 'breakfast menu' character of the concept is also not criterial. (This in spite of the fact that an American restaurant that advertises its willingness to serve breakfast at any time is referring precisely to the stereotyped breakfast ingredients.) What we want to say, when we observe usage phenomena like that, is not that we have so far failed to capture the true core of the word's meaning, but rather that the word gives us a category which can be used in many different contexts, this range of contexts determined by the multiple aspects of its prototypic use – the use it has when the conditions of the background situation more or less exactly match the defining prototype.

The descriptive framework which is in the process of evolving out of all of the above considerations is one in which words and other linguistic forms and categories are seen as indexing semantic or cognitive categories which are themselves recognized as participating in larger conceptual structures of some sort, all of this made intelligible by knowing something about the kinds of settings or contexts in which a community found a need to make such categories available to its participants, the background of experiences and practices within which such contexts could arise, the categories, the contexts, and the backgrounds themselves all understood in terms of prototypes.

3 Further illustrations and some terminological proposals

A 'frame', as the notion plays a role in the description of linguistic meanings, is a system of categories structured in accordance with some motivating context. Some words exist in order to provide access to knowledge of such frames to the participants in the communication process, and simultaneously serve to perform a categorization which takes such framing for granted.

The motivating context is some body of understandings, some pattern of practices, or some history of social institutions, against which we find intelligible the creation of a particular category in the history of the language community. The word WEEKEND conveys what it conveys both because of the calendric seven-day cycle and because of a particular practice of devoting a relatively larger continuous block of days within such a cycle to public work and two continuous days to one's private life. If we had only one 'day of rest' there would be no need for the word 'weekend'; one could simply use the name of that day. If we had three days of work and four days of rest, then too it seems unlikely that the name for the period devoted to one's private life would have been given that name. (If the work week is gradually shortened, the word 'weekend' might stay; but it is unlikely that the category could have developed naturally if from the start the number of days devoted to work were shorter than the number of the remaining days. An acquaintance of mine who works only on Wednesdays, pleased at being able to enjoy 'a long weekend', recognizes that the word is here being used facetiously.)

The word VEGETARIAN means what it means, when used of people in our culture, because the category of 'someone who eats only vegetables' is a relevant and interesting category only against the background of a community many or most of whose members regularly eat meat. Notice that the word designates, not just someone who eats plant food, but someone who eats only plant food. Furthermore, it is used most appropriately for situations in which the individual so designated avoids meat deliberately and for a purpose. The purpose might be one of beliefs about nutrition, or it may be one of concerns for animal life; but the word is not used (in a sentence like 'John is a vegetarian.') to describe people whose diet does not include meat because they are unable to find any, or because they cannot afford to buy it.

Occasionally one comes upon a term whose motivating context is very specific. One such is the compound FLIP STRENGTH, used, I am told, in the pornographic literature business. Some publishers of pornographic novels instruct their authors to include a certain quota of high interest words on every page, so that a potential customer, in a bookstore, while 'flipping' the pages of the book, will, no matter where he opens the book, find evidence that the book is filled with wonderful and exciting goings-on. A book which has a high ratio of nasty words per page has high flip strength; a book which has these words more widely distributed has low flip strength. As I understand the word, an editor of such a publication venture might reject a manuscript, requesting that it be returned only after its flip strength has been raised.

With this last example, it is extremely clear that the background context is absolutely essential to understanding the category. It is not that the conditions for using the word cannot be stated without this background understanding (relative flip strength of novels could easily be determined by a computer), but that the word's meaning cannot be truly understood by someone who is unaware of those human concerns and problems which provide the reason for the category's existence.

We can say that, in the process of using a language, a speaker 'applies' a frame to a situation, and shows that he intends this frame to be applied by using words recognized as grounded in such a frame. What is going on here seems to correspond, within the ordinary vocabulary of a language, to lexical material in scientific discourse that is describable as 'theory laden': the word 'phlogiston' is 'theory-laden'; the reason it is no longer used in serious discourse is that nobody accepts the theory within which it is a concept. That is, nobody schematizes the physical world in a way that would give a reason to speak of part of it as 'phlogiston'.

To illustrate the point with items from everyday language, we can consider the words LAND and GROUND (which I have described elsewhere but cannot forego mentioning here). The difference between these two words appears to be best expressed by saying that LAND designates the dry surface of the earth as it is distinct from the SEA, where as GROUND designates the dry surface of the earth as it is distinct from the AIR above it. The words 'land' and 'ground', then, differ not so much in what it is that they can be used to identify, but in how they situate that thing in a larger frame. It is by our recognition of this frame contrast that we are able to understand that a bird that 'spends its life on the land' is being described negatively as a bird that does not spend any time in water; a bird that 'spends its life on the ground' is being described negatively as a bird that does not fly.

Though the details are a bit tricky, the two English words SHORE and COAST (not differently translatable in many languages) seem to differ from each other in that while the SHORE is the boundary between land and water from the water's point of view, the COAST is the boundary between land and water from the land's point of view. A trip that took four hours 'from shore to shore' is a trip across a body of water; a trip that took four hours 'from coast to coast' is a trip across a land mass. 'We will soon reach the coast' is a natural way to say something about a journey on land; 'we will soon reach the shore' is a natural way to say something about a sea journey. Our perception of these nuances derives from our recognition of the different ways in which the two words schematize the world.

The Japanese adjective NURUI is another example of a framing word. Although not all Japanese-speaking informants support this judgment, enough do to make the example worth giving. In the usage that supports my point, NURUI, used to describe the temperature of a liquid; it means 'at room temperature', but it is said mainly of liquids that are ideally hot. 'Kono ocha ga nurui' (this tea is lukewarm) is an acceptable sentence in the idiolects that support my point, but 'kono biiru ga nurui' (this beer is lukewarm) is not. It will be noticed that the English word LUKEWARM does not 'frame' its object in the same way. A cold liquid and a hot liquid can both become lukewarm when left standing long enough; but only the liquid that was supposed to be hot can be described as 'nurui'.

A large number of framing words appear only in highly specialized contexts, such as the term FLIP STRENGTH discussed earlier. The legal term DECEDENT gives us another example of such context specialization. According to my legal informants (and my available law dictionaries) the word DECEDENT is used to identify a dead person in the context of a discussion of the inheritance of that person's property. (The word DECEASED, as in the phrase 'the deceased', is also limited to legal or journalistic contexts, but it is not limited to any particular subdomain within the law.) Another example is MUFTI. Mufti, in the sense it once had in the military service, refers to ordinary clothing when worn by somebody who regularly wears a military uniform. If we see two men wearing identical suits, we can, referring to their clothing, saying that one of them is 'in mufti' if that one is a military officer. The property of being 'in mufti' is obviously a property that has relevance only in the context of a military community.

Given all these examples of clear cases of terms linked to highly specific cognitive frames, we can see that the process of understanding a text involves retrieving or perceiving the frames evoked by the text's lexical content and assembling this kind of schematic knowledge (in some way which cannot be easily formalized) into some sort of 'envisionment' of the 'world' of the text. If I tell you (to be somewhat ridiculous) that the decedent while on land and in mufti last weekend ate a typical breakfast and read a novel high in flip strength, you know that I am talking about a now-dead naval officer who during the period including last Saturday and Sunday read a pornographic novel; and you know a few other things about the man, about how he spent his time, and about the setting in which this report of his activities is given. The sentence did not give you this information directly; you had to 'compute' some of it by constructing, in your imagination, a complex context within which each of the lexically signaled framings was motivated. We see in this way that there is a very tight connection between lexical semantics and text semantics, or, to speak more carefully, between lexical semantics and the process of text comprehension. The framing words in a text reveal the multiple ways in which the speaker or author schematizes the situation and induce the hearer to construct that envisionment of the text world which would motivate or explain the categorization acts expressed by the lexical choices observed in the text.

The interpreter's envisionment of the text world assigns that world both a perspective and a history. A report of somebody buying something evokes the frame of the commercial event, but sees that event, for the moment at least, from the point of view of one of its participants. Describing somebody as being ON LAND locates the scene in the history of a sea voyage, by noticing that it is relevant to describe the location in this way only if this period is seen as an interruption of a period of sea travel. Saying that somebody is AT BAT locates an event as one part of a particular baseball game. Describing coffee, in Japanese, as NURUI recognizes that it was once hot and has been allowed to 'cool'. One knows that the coffee is currently at room temperature, but also that it did not get that way by starting out as iced coffee.

Sometimes the perspective which a word assigns is not a perspective on the current scene – something that might be visible in a pictorial representation of the scene – but is that of a much larger framework. Thus, the description of someone as a HERETIC presupposes an established religion, or a religious community which has a well-defined notion of doctrinal correctness. In a community lacking such beliefs or practices, the word has no purpose. Sometimes a word situates an event in a history wider than the history of the ongoing narrative. In speaking of locations within North America, the expressions OUT WEST and BACK EAST are frequently used. The terms have the form they do because for a large portion of American families the settlement history of the country traced its way from the east coast to the west coast. European immigrants first landed on the east coast; some of them, or some of their descendants, gradually migrated westward. The eastern part of the country, where these immigrants or their ancestors once were, was BACK EAST; the western part of the country, not yet reached, was OUT WEST. The expressions are used today by people whose families did not share in this general westward movement themselves, but the terms recall the historical basis of their creation.

Earlier I spoke of the notion of deep cases as offering an account of the semantic aspects of single-clause predications which figured in the basic grammatical structure of clauses. A broader view of the semantics of grammar, one which owes a great deal to the work of Leonard Talmy (see Talmy 1980) and Ronald Langacker (Langacker 1987), sees lexical framing providing the 'content' upon which grammatical structure performs a 'configuring' function. Thinking in this way, we can see that any grammatical category or pattern imposes its own 'frame' on the material it structures. For example, the English pluperfect can be described as having as its role, in structuring the 'history' of the text world, that of characterizing the situation at a particular time (the narrative time) as being partly explained by the occurrence of an event or situation that occurred or existed earlier on. The progressive aspect, in its turn, schematizes a situation as one which is continuing or iterating across a span of time. Thus, a sentence in a narrative of the form 'She had been running,' a form which combines the progressive and the pluperfect forms, can have the function of explaining why, at the narrative time point, 'she' was panting, or sweating, or tired. Thus we see that the cognitive frames which inform and shape our understanding of language can differ greatly in respect to their generality or specificity: a lexical verb like RUN can give us a specific kind of physical activity image, while the pluperfect and the progressive combine, each in a general and abstract way, to shape the image of running in a way that fits the current situation and to situate the event of running both temporally and in 'relevance' into the ongoing history of the text world.

It is necessary to distinguish two importantly different ways in which the cognitive frames we call on to help us interpret linguistic texts get introduced into the interpretation process. On the one hand, we have cases in which the lexical and grammatical material observable in the text 'evokes' the relevant frames in the mind of the interpreter by virtue of the fact that these lexical forms or these grammatical structures or categories exist as indices of these frames; on the other hand, we have cases in which the interpreter assigns coherence to a text by 'invoking' a particular interpretive frame. An extremely important difference between frames that are evoked by material in the text and frames that are invoked by the interpreter is that in the latter case an 'outsider' has no reason to suspect, beyond a general sense of irrelevance or pointlessness in the text, that anything is missing. To repeat an example that I have used elsewhere, a Japanese personal letter in the traditional style is supposed to begin with a comment on the current season. Somebody who knows this tradition is able to sense the relevance of an opening sentence in a letter which speaks of the garden floor covered with leaves. The kind of understanding which allows such an interpretation comes from outside of the text itself.

Invoked frames can come from general knowledge, knowledge that exists independently of the text at hand, or from the ongoing text itself.

4 Frame-semantic formulations of empirical semantic observations

In this section I examine a number of observations about lexical meaning or text interpretation which permit formulations in terms of notions from frame semantics. In the following section I examine a number of traditional topics in standard semantic theorizing and raise questions about the importance they would be given in an account of linguistic meaning of the sort we have been exploring.

4.1 Polysemy arising from alternative framings of the same lexical item

For many instances of polysemy it is possible to say that a given lexical item properly fits either of two different cognitive frames. One possibility is that a word has a general use in the everyday language but has been given a separate use in technical language. For example, we might wish to say that the English word ANGLE is understood in connection with a perceptual frame as a figure made by two lines joined at a point in a way suggested by a bent stick. Presented in terms of a competing procedural frame, an angle is thought of in terms of the rotation of a line about a point, the angle itself visually represented as the line before and after its rotation. In the procedural frame the notion of a 180 degree angle is intelligible, as is the notion of a 360 degree angle. Within the perceptual frame such notions do not fit. (The example is from Arnheim 1969, p. 182f.)

4.2 Alternate framings of a single situation

From a frame semantics point of view, it is frequently possible to show that the same 'facts' can be presented within different framings, framings which make them out as different 'facts'. Somebody who shows an unwillingness to give out money in a particular situation might be described by one person as STINGY (in which case the behavior is contrasted with being GENEROUS), and by another as THRIFTY (in which case a contrast is made with being WASTEFUL). The speaker who applies the STINGY: GENEROUS contrast to a way of behaving assumes that it is to be evaluated with respect to the behaver's treatment of fellow humans; whereas the speaker who evaluates the behavior by applying to it a THRIFTY:WASTEFUL contrast assumes that what is most important is a measure of the skill or wisdom displayed in the use of money or other resources.

4.3 'Contrast within frames' versus 'contrast across frames'

The fact that a single situation can be 'framed' in contrasting ways makes possible two ways of presenting a negation or an opposition. Using the contrasts introduced in the last paragraph, if I say of somebody, 'He's not stingy – he's really generous', I have accepted the scale by which you choose to measure him, and I inform you that in my opinion your application of this scale was in error. If on the other hand I say 'He's not stingy – he's thrifty', what I am doing is proposing that the behavior in question is not to be evaluated along the STINGY:GENEROUS dimension but along the THRIFTY: WASTEFUL dimension. In the first case I have argued for a particular standard in the application of an accepted scale; in the second case my utterance argues for the irrelevance of one scale and the appropriateness of another.

4.4 Word sense creation by frame borrowing

When a speaker wishes to talk about something for which an appropriate cognitive frame has not been established, or for which he wishes to introduce a novel schematization, he can sometimes accomplish this by transferring the linguistic material associated with a frame which makes the distinctions he's interested in onto the new situation, relying on the interpreter to see the appropriateness of the transfer. Certain new senses of words can be best understood as having originated in this way; we might expect that such was the case in the importation of the term BACHELOR into the terminology appropriate to fur seal society, to use the example made common in lexical semantics discussion from the reminder, in Katz and Fodor (1963), of the use of the word BACHELOR to designate 'a male fur seal without a mate during the mating season'. Lakoff and Johnson (1980) have made us aware of the value of metaphor in conceptualization and communication, making the persuasive case that in a great many domains of experience metaphors provide us with the only way of communicating about those experiences.

4.5 Reframing a lexical set

Various kinds of semantic change can be illuminated by considering the phenomena in frame semantic terms. One important type of change consists in reconstituting the motivating circumstances while preserving the lexical item and its basic fit with the associated scene. People observing certain usages of English with an eye to feminist concerns have noticed tendencies on the part of many speakers to have certain asymmetries in the sets of conditions for using the words in the proportion BOY:MAN::GIRL:WOMAN. In particular, in the usage pattern that I have in mind, males appeared to be classified as MEN at an earlier age than that at which females are classified as WOMEN. A number of people sensed that this usage pattern revealed attitudes toward females (or a history of attitudes toward females reflected in current conventional usage possibly in independence of the user's own attitudes) which ought to be corrected. A number of speakers have succeeded in modifying their usage in a way which established the age boundary between the BOY to MAN transition at the same place as that between the GIRL to WOMAN transition. The semantic change in this case is a real one, which needs to be explained. But it would not be satisfying to see the explanation solely in changes of the meaning of the words GIRL and WOMAN; the full explanation must assign the change to the underlying schematization on the part of the language user. The realities (of people of both sexes getting older) have not changed, nor have the available choices of linguistic material; what has changed (in some speakers) is the underlying schematization, the circumstances motivating the category contrasts.

4.6 Relexicalizing unchanged frames

A second kind of semantic change, which oddly can be illustrated with the same words, is one in which the links between words and their frames are changed, but the underlying schematization remains unchanged. The effort to respond to society's new sensitivity to the connections between language and attitudes is perhaps easiest to manage in the short run if it does not require something as deeply cognitive as a reschematization of the domain. A superficial rule-of-thumb for bringing about the appearance of a raised consciousness in the realm of language and sexism is a mechanical principle like 'Where I am inclined to say GIRL I should instead say WOMAN'. A person who adopts this rule may find that in most cases it performs very well; but one sometimes finds oneself trapped – as in the experience of an acquaintance of mine – when talking about very young females; my friend found himself, several times, using the word WOMAN when talking about an eight-year-old girl. The fact that this friend would never accidentally use the word MAN when talking about an eight-year-old boy shows that the change in question is not of the reschematization type discussed in the previous paragraph. An equally clear example of the same phenomenon (as I have discussed elsewhere – Fillmore 1972) is in the use of the word SUSPECT where the speaker or writer might have been inclined to use such a word as BURGLAR, MURDERER, ARSONIST, or more generally, CULPRIT. Conscious of the legal doctrine that a person is to be considered innocent until proven guilty, and conscious too of the danger of committing libel, journalists and police officers have learned to identify persons accused of crimes but not (yet) legally held to be guilty of them as SUSPECTS. A change in usage which would clearly reflect the adoption of the legal doctrine mentioned above about guilt and innocence as the underlying cognitive frame would not result in some of the frequent mistakes people make in the use of the word SUSPECT. The word SUSPECT is supposed to be used of a person who is suspected of committing the crime in question; for it to be used appropriately, there has to be some specific person of whom it can be said that that person is suspected by someone of committing the crime. The current journalistic use of SUSPECT even when nobody has been accused of the crime shows that the change is of the superficial kind, following the application of a rule of thumb that says, 'Wherever I am inclined to say CULPRIT (etc.), I should instead say SUSPECT.' I have in mind such usages as can be found in reports like 'Police investigating the murder have found no clues as to the identity of the suspect.'

4.7 Miscommunication by frame conflict

The law provides many contexts in which specific new framings need to be constructed for familiar words. The notion INNOCENT mentioned above is an example. In both everyday language and legal language there is a contradictory opposition between INNOCENT and GUILTY. In everyday language, the difference depends on whether the individual in question did or did not commit the crime in question. In legal language, by contrast, the difference depends on whether the individual in question has or has not been declared guilty by the court as a result of legal action within the criminal justice system. This disparity of schematization is responsible for frequent misunderstandings in the use of these words. An example of such misunderstandings (which I have discussed in Fillmore 1978) was in a conversation between a prospective juror and lawyers in a *voir dire* hearing in a municipal court in Berkeley. The attorney for the defense asked the prospective juror 'Do you accept the American legal doctrine that a man is innocent until proven guilty?' The citizen answered that a person should be treated as innocent until proven guilty, but that it would be strange to say that he was actually innocent. The attorney asked again, saying, 'I'm talking about the doctrine that a man IS innocent until proven guilty. Do you or do you not accept that doctrine?' The citizen answered that if the man IS innocent, then there is no need for a trial. (This rude answer excused the man from jury duty.) This little bit of miscommunicating could easily have been avoided. The citizen was not really being asked whether or not he accepted a particular legal doctrine, but whether or not he was willing to adopt for the purpose of discussion in the trial which was about to start the framing of the words INNOCENT and GUILTY provided by the criminal justice institutions in place of the everyday use of these same words.

4.8 Reformulations in technical language

Legal contexts give us further ways of seeing changes between general and special-purpose framings of words. In many cases this is because the everyday sense of a word does not cover all cases in which it should be appropriate to use the word. In the prototype case of events fitting the word MURDER, one person (A), intending to kill a second person (B), acts in such a way as to cause that person to die. This prototype does not cover a case in which A, intending to kill B, aims his gun at B, and kills C (who is standing next to B) instead. Some of the properties of MURDER relate A and B; others relate A to C. The question somebody needs to answer, of course, is whether, for the purposes of the law, it is proper to say that A murdered C. The law does this, not by modifying the definition of MURDER so that it will cover this 'wrong-target' case, but by adding to the system of legal semantics a statutory interpretation principle called 'Transfer of Intent' according to which A's intent to kill B is fictitiously transferred to C so that the definition of MURDER can fully fit what A did to C. With respect to judgments of reprehensibility and legal provisions for punishment, A's killing of C should be treated in the same way as A's successful killing of B would have been. The Transfer of Intent principle makes it possible for the non-prototypic case to fall under the same definition.

Other such reinterpretations in the law are equally founded on intentions associated with the prototypical case. The concept of FORCIBLE ENTRY involves one person gaining entry to another person's property by overcoming the resistance of persons trying to prevent that person's entry. The usual definition of FORCIBLE ENTRY, however, includes not only the situation in which the intruder physically overpowers the other, but also the situation in which, as it is usually put, 'resistance would be unavailing'. If you, being twice my size and strength, insist on being admitted to my apartment, and I meekly let you enter (on the reasonable grounds that if we had a fight, I would lose), then you too can be charged with FORCIBLE ENTRY. A third example is ORAL AGREEMENT. Basically an ORAL AGREEMENT is a contract or agreement which two parties entered into orally, that is, without putting the agreement in a written form and without signing our names to it. The importance of the notion ORAL AGREEMENT in the law is that the conditions of its authenticity and its bindingness distinguish it from agreements that are fully written out and signed. The critical difference, for the given legal purposes, is the presence or absence of the signatures of the principals. The important part of the contrast, then, is that between being signed and not being signed. Accordingly, provisions made in the law for ORAL AGREEMENTS also apply to written agreements which happen not to be signed. The prototype background in which the notion ORAL AGREEMENT is motivated, is one in which agreements are either made by word of mouth or by means of documents which are written and signed. In situations which depart from the prototype the law has needed to determine which aspect of the prototype contrast is legally the most salient (the presence or absence of the signatures supporting a written document) and let that be the criterion which specifies the contrast.

4.9 Frames for evaluation

One important area in which semantic interpretation depends crucially on lexical framing is that of attributions of value. Evaluative adjectives can contain in their meanings reference to the dimensions, scales, or standards according to which something is evaluated, as with adjectives like FRAGRANT, TASTY, EFFICIENT, INTELLIGENT, etc. In many cases, however, an adjective is abstractly evaluative (as with the English words GOOD and BAD) and interpretations of their attributive use depend on knowledge of the ideational frames to which they are indexed. The fact that speakers of English are able to interpret such phrases as A GOOD PENCIL, GOOD COFFEE, A GOOD MOTHER, A GOOD PILOT, etc., shows that they are able to call into their consciousness for this purpose the fact that a pencil is used for writing and can be evaluated for how easy or efficient it is to write with it, or how clearly its traces appear on the paper, the fact that coffee is a drink and can be evaluated for its taste, its contribution to the drinker's alertness, etc., that mothers and pilots do what they professionally and conventionally do and can be evaluated for how easily, how effectively, and how efficiently they do it. The point was made earlier that cognitive frames called on to assist in text interpretation may derive from general background knowledge or may be brought into play by the textual context. This is particularly true in the case of the interpretation of evaluative adjectives, since some nouns have frames associated with them whose evaluative dimensions are provided in advance, while others designate things that could be evaluated only if the context provided some basis for the evaluation. When we come across the phrase A GOOD STICK we expect to find in the context some explanation of a situation within which one stick could function better than another (for propping a window open, for repelling a raccoon, for skewering marshmallows, etc.). A general concept of 'framing' involves contextualizing or situating events in the broadest sense possible; within linguistic semantics proper the concern is with patterns of framing that are already established and which are specifically associated with given lexical items or grammatical categories.

4.10 Script evocation

I said earlier about cognitive frames that to speak of one of its elements is to speak of the others at the same time. More carefully put, to speak of one part of a frame is to bring to consciousness, or to raise into question, its other components. This effect is particularly striking in connection with the kinds of frames known as 'scripts', frames whose elements are sequenced types of events. Text understanding that makes use of scriptal knowledge (on which see Schank and Abelson, 1977) involves the activation of whole-scale scripting of events on the presentation of an event that can be seen to be part of such a script. Thus, in a textlet like 'He pushed against the door. The room was empty.' we make the two sentences cohere by assuming that the goal somebody might have in pushing against a door is to get that door open, and that if one succeeded in getting the door open by such an act, one could then be in a position to notice whether the room was empty. Reading between the lines, we expand the text to mean: 'He pushed against the door. THE DOOR OPENED. HE LOOKED INSIDE. HE SAW THAT The room was empty.'

4.11 Frames for texts

Discussion of text structure on the part of Robert Longacre and others shows that languages or cultures can differ with respect to the ways in which texts with particular communicative goals can have particular conventionalized forms. Recipes in English make consistent use of imperatives. In Hungarian recipes, first person plural descriptions are the norm. And Longacre has described (in conversation) a language lacking in procedural discourse uses narrative form for such purposes. Here it would be difficult to believe that languages differ from each other in the presence of material usable for particular kinds of discourse, it seems rather to be the case that traditions of language use within the culture develop in different ways in texts with different communicative goals.

5 Frame-semantic formulations of issues in technical semantics

In this section I examine a small number of topics that one traditionally finds in standard treatises on technical semantics: proportionality, paradigms, taxonomies, syncategorematicity, the supposed contrast between 'dictionary' and 'encyclopedia', the goal of descriptive simplicity and redundancy elimination, and, lastly, the troubled notion of 'lexical presupposition'.

5.1 Proportionality

One of the most frequently used heuristic devices for discovering and demonstrating the existence of semantic features in the vocabulary of a language is that of setting up a proportionality involving four words and asking for intuitive agreement about the identity of pairwise differences among them. Believing that man is to woman as boy is to girl, we set up the ratio MAN:WOMAN :: BOY:GIRL. Others frequently used are COME:GO :: BRING:TAKE, LOOK:SEE :: GLANCE:GLIMPSE, INHALE:EXHALE :: SNIFF:SNORT, and MAN:WOMAN :: BACHELOR:SPINSTER. The approach which sees the basic semantic relations as holding among words taken in isolation fails to help us become aware of the possibly quite separate ways in which individual members of these proportions are fitted onto, or frame, their reality. I have already pointed out that in many people's speech the differentiating criterion for BOY vs. MAN might be importantly different from that for GIRL vs. WOMAN; BRING is separate enough in its semantics from COME for it to have acquired quite separate patterns of dialect variation; and the motivation for the categories BACHELOR and SPINSTER appear to be considerably different, in spite of one's inclination, as a systematizer, to put the two words together. One might wish to propose that the abstract structural patterns underlying these word groups are simple and straightforward, in the ways suggested by the proportions, even though certain facts about the world make the domain look less orderly. I think such a proposal is not helpful, because it is not one which asks the analyst to look for the background and motivating situations which separately give reasons for the existence of the individual categories, one by one.

5.2 Paradigms

A prime example of semantic structure among lexical items is the 'paradigm'; and the best example of a lexical-semantic paradigm is the kind of display of livestock terms represented by Table 1.

Table 1

cattle	sheep	horse	swine
cow	ewe	mare	sow
bull	ram	stallion	boar
steer	wether	gelding	barrow

Here the proposal that we have a closed system of terms tied together by such features as General, Female, Male, and Neuter, cross-cut by features identifying species (Bovine, Ovine, Equine, Porcine), seems very attractive. Unfortunately the display disguises many facts about both these words and the domain which they appear to cover. CATTLE and SWINE are plurals; SHEEP and HORSE are not. The words WETHER and BARROW are known only to specialists. In the case of CATTLE, COW and BULL appear to have the status of 'basic level objects' (in the sense of Rosch 1973), whereas the general terms have that function in the case of SHEEP and HORSE. In the case of SWINE, a word not in the table, namely PIG, is the best candidate for 'basic level object' status.

In short, the regularities apparent in the paradigm (and this set of terms – together with terms for young, newborn, etc. – make up what is generally accepted as the best example of a semantic paradigm) are misleading. To which we ought to add the Neuter category of the words in the bottom row is not just a 'neutral' category operating in the same line of business as the categories Female and Male. The category is differently motivated in the different species, which is another way of saying that one has different reasons for castrating a bull and a horse, one might do it at different (relative) ages, etc.

5.3 Taxonomies

The next most common kind of lexical semantic formal structure is the 'semantic taxonomy', a semantic network founded on the relation 'is a kind of'. Scientific taxonomies have obvious uses in scientific discourse, and research that has led to the uncovering of folk taxonomies has been among the most important empirical semantic research yet done. But there are two aspects of taxonomic structures that argue against regarding them as representing merely a formal system of relationships founded on a single clear semantic relation. The first is that at different levels in a taxonomy the community might have had different reasons for introducing the categories; the second is that the usual tree-form display of the elements of a taxonomy does not show how it is that particular elements in the taxonomy are 'cognitively privileged categories' in important ways. Both of these points can be illustrated with a 'path' in a taxonomy of zoological terms in English, namely:

ANIMAL
VERTEBRATE
MAMMAL
DOG
RETRIEVER

Of this set of words, DOG and ANIMAL seem to be the cognitively privileged categories, privileged in the sense that they are the words that would most ordinarily be used when in everyday natural talk one is describing one's experiences. VERTEBRATE and MAMMAL are terms whose employment fits a particular kind of interactional or contextual schema (that of scientific discourse), while RETRIEVER as a category occurs most naturally as an answer to a question about what kind of a dog one has. Suppose that you, hearing a splash in my back yard, were to ask me what that noise was, and suppose the fact is that my pet retriever fell in the family swimming pool. As a way of explaining the source of the noise, it would be natural for me to say 'An animal fell in the pool' or 'A dog fell in the pool', but it would be very unnatural for me to say 'A vertebrate fell in the pool' or 'A mammal fell in the pool', and unnatural in a different way for me to say 'A retriever fell in the pool'. The latter three terms seem to appear more natural in utterances used in acts of classifying, but seem unnatural when used in acts of referring. This functional difference is not revealed within the logic of a standard taxonomic tree.

5.4 Syncategorematic terms

It has frequently been discussed (e.g., Austin 1964, Lecture VII) that a word like IMITATION does not semantically modify a word it grammatically modifies in the standard 'set intersection' way. Rather, it combines with the meaning of its partner to form a fairly complex concept. Something correctly described as IMITATION COFFEE looks like coffee and tastes like coffee, and it looks and tastes like coffee not by accident, but because somebody manufactured it so that it would have these properties; but, whatever it is, it is not made of coffee beans. Understanding the category, in fact, requires understanding the role of coffee in our lives and (perhaps) the reasons someone might have for making a coffee substitute.

By contrast a word like REAL appears to contribute nothing at all to the noun to which it is attached as a modifier. To describe something as REAL COFFEE is to do nothing more than to assert that something is coffee, against the background of (the possibility of) somebody's suspicion that it is imitation coffee. As with IMITATION, a part of a full understanding of an expression with REAL is knowing the reasons one might have for providing substitutes for the thing in question. The notion REAL

COFFEE makes sense to us because we know that in some settings coffee is scarce, and we know that some people find coffee damaging to their health or held offensive by their religion. We can understand a category like REAL GOLD or REAL DIAMOND because we can imagine a reason why somebody might choose to produce fake gold or fake diamonds, and we can imagine why someone might have doubts about the authenticity of particular samples. By contrast, a notion like REAL PANTS is unintelligible, because it is impossible to imagine something looking like pants and functioning like pants which do not, by virtue of those properties alone, count as being genuine pants.

5.5 Redundancy elimination

A common goal in structural semantics is the elimination or minimization of redundant information in the semantic description of lexical items. Frequently a semantic theorist will declare that the goal of a 'semantic dictionary' is that of saying just enough about each word in the language to guarantee that it is semantically in contrast with each other word in the language (Bendix 1966). It is a goal which presupposes the analyst's ability to have an overview of the entire lexical repertory of the language. Such a goal is completely antithetical to the goals of frame semantics, since frame semantics aims at discovering what categorizing functions the word serves in the contexts in which its use is motivated. This kind of knowledge is in principle attainable independently of knowledge about other words in the language, except for those relatively few cases in which the 'mosaic' image is appropriate, the image by which the meaning given to any one word is dependent on the meanings of its neighboring words (as in Trier 1931).

5.6 Dictionary vs. Encyclopedia

The various structuralist approaches that find a goal of redundancy elimination relevant, also find it intelligible to draw a clear distinction between 'dictionaries' and 'encyclopedias'. In particular, certain scholars insist on a distinction between purely semantic information about words and encyclopedic information about the designata of words. Somebody holding this view might expect to be able to justify certain characteristics of carpenters (or the concept CARPENTER) as belonging to the semantic category of the noun, other distinct characteristics of carpenters as simply being true of the individuals who satisfy the criteria associated with the category. A frame-semantic approach would rather say that communities of men contain individuals who by trade make things out of wood, using particular kinds of tools, etc., etc., and would note that these people are called CARPENTERS. The possibility of separating some features of a full description of what carpenters do as related to the concept and others as related to the people does not seem important. There is a distinction to be made between knowledge about words and knowledge about things, but it is not to be made in a way that serves the interests of the semanticists I have just been describing. True 'encyclopedic' information about carpenters as people might say something about wages, union affiliations, job related diseases, etc.; such information is not a matter of dispute.

5.7 Simplicity of description

While in respect to redundancy elimination it has appeared that standard approaches value simplicity and frame-semantic approaches do not, there is another sense in which simplicity of description is enhanced by the frame semantics approach. A recent lively discussion between Paul Kay and Linda Coleman on the one hand (Coleman and Kay 1981) and Eve Sweetser on the other hand (Sweetser 1981) concerns the possibility of a prototype background of assumptions (or, as Sweetser calls it, a 'folk theory') as providing the grounding for a simplified definition of the noun LIE. On the Kay/Coleman account, a LIE is something which is (1) false in fact, (2) believed by the speaker to be false, and (3) said in order to deceive. Sweetser's suggestion is that if we can characterize a folk theory of human communication involving cooperation, expressing what one believes, etc., then it is possible to describe a LIE as simply a 'false statement', those other understandings we have about the concept falling out through an understanding of why one would bother to produce a false statement.

5.8 Presupposition

Claims about 'presuppositional' information being associated with individual lexical items have not received a good press. I find that within frame semantics, the concept of lexical presupposition does not seem unjustified. Consider the case of a verb like English CHASE, a verb for which a lexical presuppositionist might be inclined to say that when it is used of two beings moving in the same course, the movement of the one in front is presupposed, independently of whether the movement of the individual designated by the subject of the verb is asserted, denied, questioned, or supposed. In a setting in which one person is running, especially where it is understood that that person is fleeing, it is relevant to consider whether some other person is or is not going to try to prevent that first person from getting away. (My illustration is with people, but that's not an important condition.) The verb CHASE exists as a category by recognition of such relevance. If I ask, 'Did anybody chase him?', or if I say 'We didn't chase him', our reason for understanding that 'he' was running (fleeing) is that we know the kind of situation against which the category CHASE has a reason for being. It is in that sense, it seems to me, that one can talk about lexical presuppostions.

6 Concluding remarks

In this paper I have argued for a view of the description of meaning-bearing elements in a language according to which words (etc.) come into being only for a reason, that reason being anchored in human experiences and human institutions. In this view, the only way in which people can truly be said to understand the use to which these meaning-bearing elements are being put in actual utterances is to understand those experiences and institutions and to know why such experiences and institutions gave people reasons to create the categories expressed by the words. The semanticist's job is to tease out the precise nature of the relationship between the word and the category, and the precise nature of the relationships between the category and the background. I believe that some of the examples I have offered have shown the advantages of looking at language in this way.

Note

1 For a recent attempt to differentiate these terms, see Beaugrande 1981, p. 303.

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Section IV
Introduction

Metaphor, metonymy and blending

Jörg Zinken

In this section we turn to a subfield of cognitive semantics, namely the study of figurative language, in particular metaphor and metonymy. Two influential theoretical frameworks have emerged from this field: Conceptual Metaphor Theory, initiated by Lakoff and Johnson (1980) (see Lakoff 1993/this volume), and Blending Theory (Fauconnier & Turner 1998/this volume).

Although a subfield of cognitive semantics, the cognitive linguistic study of figurative language has been one of the most influential areas of research in early cognitive linguistics. A conference series, *Researching and Applying Metaphor* (*RaAM*), has been established that is dedicated to (cognitive) linguistic approaches to figurative language. Sessions on figurative language, especially metaphor, and, more recently, blending, retain a high profile at cognitive linguistics conferences.

The continuing development of Conceptual Metaphor Theory (hereafter CMT) can, with some simplification, be divided into two phases: the 'classical' version and the 'primary metaphor' version. The classical version has its beginning in Lakoff and Johnson (1980) and has been presented most explicitly and with the greatest technical detail in Lakoff (1993/this volume). In its classical version, CMT is a prime example of the Generalisation Commitment in cognitive linguistics: Lakoff and Johnson (1980) observed that many conventional expressions in English which, upon reflection, are apparently not used in their literal meanings, seem to form thematic clusters. For example, utterances such as '*look how far we've come*', '*we should go our separate ways*' or '*our relationship is on the rocks*' all seem to express ideas about relationships in terms of travelling. The main claim of CMT is that such patterns in language exist precisely because people do think about relationships in terms of journeys, i.e., a conceptual metaphor LOVE IS A JOURNEY is stored in long-term memory. Such conceptual metaphors are not linguistic entities, they are a type of conceptual structure. Linguistic expressions such as '*we should go our separate ways*' are symptoms, as it were, of conceptual metaphors.

Lakoff (1993/this volume) discusses three kinds of generalisations that lead to the identification of conceptual metaphors: Generalisations over polysemous words, generalisations over the patterns of inference of such polysemous words in their different contexts, and generalisations over conventional and novel metaphors.

The 'primary metaphor' version was developed by Grady (1997; 1999/this volume; Lakoff & Johnson 1999) when he investigated reasons for the restricted productivity of some conceptual metaphors that had been proposed earlier (see also Clausner & Croft 1997). It is, for example, quite usual to read about the '*basis*' or the '*foundations*' of a theory. However, talk of the '*windows*' of a theory would require considerable context to be interpretable. It seems, therefore, that it is not all of our rich knowledge of houses that is relevant in our thinking about theories. Based on this observation, Grady (1997) suggests that the conceptual metaphors that ground linguistic meaning are indeed much more schematic, and relate to knowledge about patterns of early non-verbal experience. Correlations in everyday experience, such as the correlation between the sensori-motor experience of physical structure and the subjective experience of the organisation of an object result in so-called 'primary metaphors': ORGANISATION IS PHYSICAL STRUCTURE. These 'primary' conceptual metaphors are unlimited in their productivity, and they guide meaning constructions in many more specific domains, e.g., talk about the *weak foundations* of a *collapsing* theory. Grady's work on 'primary metaphor' illustrates the focus on the idea of 'embodied cognition' (see Evans, Bergen & Zinken, this volume) in some cognitive semantic theories, especially CMT: 'primary metaphors' are thought to be universally acquired prior to language as a natural function of the way the human body interacts with the material environment (see the new afterword in Lakoff & Johnson 2003). In his article on a typology of motivation for metaphor, Grady (1999/this volume) compares such 'correlation metaphors' with a more traditional kind of metaphor, which he calls 'resemblance metaphors', an example of which is '*Achilles is a lion*'. 'Resemblance metaphors' are understood on the basis of stereotypical impressions about the source concept, not unlike Black's (1993 [1979]) notion of systems of associated commonplaces involved in the interpretation of metaphor.

Critics of CMT have pointed to the problem of circularity: conceptual metaphors are inferred from linguistic metaphors and these are then 'explained' by appealing to the conceptual metaphors. A current concern relates to research that would provide independent evidence for the existence of conceptual metaphors. At present, it is contentious whether these exist, or whether patterns in figurative language are relics of semantic history. Some psycholinguistic research finds positive evidence for a role of conceptual metaphors in the interpretation of idioms (e.g., Gibbs, 1994). Other psycholinguistic research suggests that conceptual metaphors are not necessary for people to understand conventional figurative expressions (Gentner et al. 2001; Glucksberg & McGlone 1999; Keysar & Bly 1999; see also Gibbs, this volume).

Irrespective of this debate, CMT is a prime example of an innovative aspect of cognitive linguistics that is also characteristic of other areas of research such as Blending Theory or Construction Grammar(s). This is the attention that is being paid to aspects of language that had previously been marginalised as irregular. In traditional rule-based approaches to meaning, committed more to the concerns of formal logic than to psychological realism, 'rules' for meaning construction were formulated on the basis of certain forms of (usually written) language use. Supposedly 'higher' forms of language use were interpreted as breaching those rules (see Searle 1993 [1979], for such an approach to metaphor). In cognitive linguistics, it is common to take the opposite approach: 'interesting' (unusual, seemingly irregular) forms of language use are taken as the point of departure. Explanations developed on that basis are then applied to an account of seemingly more 'ordinary' forms of language use. CMT was one of the earliest theories in cognitive linguistics to adopt such a perspective.

In *Metaphors We Live By*, Lakoff and Johnson (1980) reframed both metaphor and metonymy as primarily conceptual, rather than linguistic, phenomena. However, as in that book, the study of metonymy has so far been less prominent in cognitive linguistics than the study of metaphor. Nevertheless, a group of researchers (see Barcelona 2000) has developed a distinctive cognitive linguistic approach to metonymy over the past two decades. The article by Radden and Kövecses included in this volume gives one synthesis of these research efforts. By providing an extensive typology of metonymic relationships, the authors show the pervasiveness of metonymy in everyday language.

Blending Theory (hereafter BT) takes the interest in Cognitive Semantics in 'imaginative' language and thought one step further. BT developed out of Fauconnier's research on mental spaces (e.g., Fauconnier 1985) and Turner's research on figurative language (e.g., Turner 1991, see also Coulson & Oakley 2000). Initially, BT was primarily interested in the surprising effects that some forms of language use, such as figurative language, but also, e.g., counterfactuals, often have. Developing BT further, Fauconnier and Turner (1998/this volume; 2002) noted that the complexities involved in conceptual integration might apply not only to spectacular and novel forms of language use, but also to perfectly 'ordinary' language use, such as category attribution, as well as non-linguistic symbolic activity. In a way, this development is a reverse mirror of the study of figurative language in psycholinguistics. In that field, Glucksberg has built his theory of metaphor comprehension in part on the finding that figurative language comprehension does not take significantly longer than literal language comprehension (Glucksberg, 2001). He interpreted this finding as showing that figurative language comprehension involves processes that are not much more complex than those involved in literal category attribution. One way to put the perspective of BT in a nutshell would be to say that literal category attribution is not much *less* complex than figurative meaning construction. The paper by Fauconnier and Turner included in this volume, *Conceptual Integration Networks*, is the most complete technical exposition of BT to date (but see also their book-length treatment in Fauconnier & Turner, 2002, which has a more popular-scientific orientation).

Finally, Grady, Oakley and Coulson (1999/this volume) discuss the possibilities of integrating the perspectives of Conceptual Metaphor Theory and Blending Theory. While CMT can describe regularities in figurative language use, BT might be better suited to account for the novel insights emerging from figurative language comprehension. Consider the metaphorical expression 'this surgeon is a butcher'. The evaluation of incompetence that is expressed here is not part of what we know about the vehicle, 'butchers'. Butchers are perfectly competent for their job, just as surgeons are for theirs. The evaluation of incompetence seems to arise from 'blending' the two in a new mental space. BT suggests that such forms of language use cannot be explained as a mapping of knowledge from one domain to another. Rather, several 'input spaces' seem to provide fragments of knowledge that become integrated in the 'blended space'. As Grady et al. argue, BT complements CMT, as it accounts for data that are not easily accommodated in a two-domain framework.

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10 The contemporary theory of metaphor

George Lakoff

Do not go gentle into that good night. – Dylan Thomas
Death is the mother of beauty. – Wallace Stevens, 'Sunday Morning'

1 Introduction

These famous lines by Thomas and Stevens are examples of what classical theorists, at least since Aristotle, have referred to as metaphor: instances of novel poetic language in which words like *mother*, *go*, and *night* are not used in their normal everyday senses. In classical theories of language, metaphor was seen as a matter of language not thought. Metaphorical expressions were assumed to be mutually exclusive with the realm of ordinary everyday language: everyday language had no metaphor, and metaphor used mechanisms outside the realm of everyday conventional language.

The classical theory was taken so much for granted over the centuries that many people didn't realize that it was just a theory. The theory was not merely taken to be true, but came to be taken as definitional. The word metaphor was defined as a novel or poetic linguistic expression where one or more words for a concept are used outside of its normal conventional meaning to express a similar concept.

But such issues are not matters for definitions; they are empirical questions. As a cognitive scientist and a linguist, one asks: What are the generalizations governing the linguistic expressions referred to classically as poetic metaphors? When this question is answered rigorously, the classical theory turns out to be false. The generalizations governing poetic metaphorical expressions are not in language, but in thought: They are general mappings across conceptual domains. Moreover, these general principles which take the form of conceptual mappings, apply not just to novel poetic expressions, but to much of ordinary everyday language.

In short, the locus of metaphor is not in language at all, but in the way we conceptualize one mental domain in terms of another. The general theory of metaphor is given by characterizing such cross-domain mappings. And in the process, everyday abstract concepts like time, states, change, causation, and purpose also turn out to be metaphorical.

The result is that metaphor (that is, cross-domain mapping) is absolutely central to ordinary natural language semantics, and that the study of literary metaphor is an extension of the study of everyday metaphor. Everyday metaphor is characterized by a huge system of thousands of cross-domain mappings, and this system is made use of in novel metaphor.

Because of these empirical results, the word metaphor has come to be used differently in contemporary metaphor research. The word metaphor has come to mean a cross-domain mapping in the conceptual system. The term metaphorical expression refers to a linguistic expression (a word, phrase, or sentence) that is the surface realization of such a cross- domain mapping (this is what the word metaphor referred to in the old theory). I will adopt the contemporary usage throughout this chapter.

Experimental results demonstrating the cognitive reality of the extensive system of metaphorical mappings are discussed by Gibbs (1993). Mark Turner's 1987 book, *Death is the mother of beauty*, whose title comes from Stevens' great line, demonstrates in detail how that line uses the ordinary system of everyday mappings. For further examples of how literary metaphor makes use of the ordinary metaphor system, see *More Than Cool Reason: A Field Guide to Poetic Metaphor*, by Lakoff and Turner (1989) and *Reading Minds: The Study of English in the Age of Cognitive Science*, by Turner (1991).

Since the everyday metaphor system is central to the understanding of poetic metaphor, we will begin with the everyday system and then turn to poetic examples.

1.1 Homage to Reddy

The contemporary theory that metaphor is primarily conceptual, conventional, and part of the ordinary system of thought and language can be traced to Michael Reddy's ([1979] 1993) now classic paper, The Conduit Metaphor. Reddy did far more in that paper than he modestly suggested. With a single, thoroughly analyzed example, he allowed us to see, albeit in a restricted domain, that ordinary everyday English is largely metaphorical, dispelling once and for all the traditional view that metaphor is primarily in the realm of poetic or figurative language. Reddy showed, for a single very significant case, that the locus of metaphor is thought, not language, that metaphor is a major and indispensable part of our ordinary, conventional way of conceptualizing the world, and that our everyday behavior reflects our metaphorical understanding of experience. Though other theorists had noticed some of these characteristics of metaphor, Reddy was the first to demonstrate it by rigorous linguistic analysis, stating generalizations over voluminous examples.

Reddy's chapter on how we conceptualize the concept of communication by metaphor gave us a tiny glimpse of an enormous system of conceptual metaphor. Since its appearance, an entire branch of linguistics and cognitive science has developed to study systems of metaphorical thought that we use to reason, that we base our actions on, and that underlie a great deal of the structure of language.

The bulk of the chapters in this book [*Metaphor and Thought*, [1979] 1993 ed. A. Ortony] were written before the development of the contemporary field of metaphor research. My chapter will therefore contradict much that appears in the others, many of which make certain assumptions that were widely taken for granted in 1977. A major assumption that is challenged by contemporary research is the traditional division between literal and figurative language, with metaphor as a kind of figurative language. This entails, by definition, that: What is literal is not metaphorical. In fact, the word literal has traditionally been used with one or more of a set of assumptions that have since proved to be false:

1.2 Traditional false assumptions

- All everyday conventional language is literal, and none is metaphorical.
- All subject matter can be comprehended literally, without metaphor.
- Only literal language can be contingently true or false.
- All definitions given in the lexicon of a language are literal, not metaphorical.
- The concepts used in the grammar of a language are all literal; none are metaphorical.

The big difference between the contemporary theory and views of metaphor prior to Reddy's work lies in this set of assumptions. The reason for the difference is that, in the intervening years, a huge system of everyday, conventional, conceptual metaphors has been discovered. It is a system of metaphor that structures our everyday conceptual system, including most abstract concepts, and that lies behind much of everyday language. The discovery of this enormous metaphor system has destroyed the traditional literal-figurative distinction, since the term literal, as used in defining the traditional distinction, carries with it all those false assumptions.

A major difference between the contemporary theory and the classical one is based on the old literal-figurative distinction. Given that distinction, one might think that one arrives at a metaphorical interpretation of a sentence by starting with the literal meaning and applying some algorithmic process to it (see Searle, 1993). Though there do exist cases where something like this happens, this is not in general how metaphor works, as we shall see shortly.

1.3 What is not metaphorical

Although the old literal-metaphorical distinction was based on assumptions that have proved to be false, one can make a different sort of literal-metaphorical distinction: those concepts that are not comprehended via conceptual metaphor might be called literal. Thus, while I will argue that a great many common concepts like causation and purpose are metaphorical, there is nonetheless an extensive range of nonmetaphorical concepts. Thus, a sentence like *The balloon went up* is not metaphorical, nor is the old philosopher's favorite *The cat is on the mat*. But as soon as one gets away from concrete physical experience and start talking about abstractions or emotions, metaphorical understanding is the norm.

2 The contemporary theory: some examples

Let us now turn to some examples that are illustrative of contemporary metaphor research. They will mostly come from the domain of everyday conventional metaphor, since that has been the main focus of the research. I will turn to the discussion of poetic metaphor only after I have discussed the conventional system, since knowledge of the conventional system is needed to make sense of most of the poetic cases.

The evidence for the existence of a system of conventional conceptual metaphors is of five types:

- Generalizations governing polysemy, that is, the use of words with a number of related meanings.
- Generalizations governing inference patterns, that is, cases where a pattern of inferences from one conceptual domain is used in another domain.
- Generalizations governing novel metaphorical language (see, Lakoff & Turner, 1989).
- Generalizations governing patterns of semantic change (see, Sweetser, 1990).
- Psycholinguistic experiments (see, Gibbs, 1990, 1993).

We will primarily be discussing the first three of these sources of evidence, since they are the most robust.

2.1 Conceptual metaphor

Imagine a love relationship described as follows: *Our relationship has hit a dead-end street*. Here love is being conceptualized as a journey, with the implication that the relationship is *stalled*, that the lovers cannot *keep going the way they've been going*, that they must *turn back*, or abandon the relationship altogether. This is not an isolated case. English has many everyday expressions that are based on a conceptualization of love as a journey, and they are used not just for talking about love, but for reasoning about it as well. Some are necessarily about love; others can be understood that way: Look *how far we've come.* It's been *a long, bumpy road.* We can't *turn back now.* We're at a *crossroads.* We may have to *go our separate ways.* The relationship isn't *going anywhere.* We're *spinning our wheels.* Our relationship is *off the track.* The marriage is *on the rocks.* We may have to *bail out of this relationship*.

These are ordinary, everyday English expressions. They are not poetic, nor are they necessarily used for special rhetorical effect. Those like *look how far we've come*, which aren't necessarily about love, can readily be understood as being about love.

As a linguist and a cognitive scientist, I ask two commonplace questions:

- Is there a general principle governing how these linguistic expressions about journeys are used to characterize love?
- Is there a general principle governing how our patterns of inference about journeys are used to reason about love when expressions such as these are used?

The answer to both is yes. Indeed, there is a single general principle that answers both questions. But it is a general principle that is neither part of the grammar of English, nor the English lexicon. Rather, it is part of the conceptual system underlying English: It is a principle for understanding the domain of love in terms of the domain of journeys. The principle can be stated informally as a metaphorical scenario:

> The lovers are travelers on a journey together, with their common life goals seen as destinations to be reached. The relationship is their vehicle, and it allows them to pursue those common goals together. The relationship is seen as fulfilling its purpose as long as it allows them to make progress toward their common goals. The journey isn't easy. There are impediments, and there are places (crossroads) where a decision has to be made about which direction to go in and whether to keep traveling together.

The metaphor involves understanding one domain of experience, love, in terms of a very different domain of experience, journeys. More technically, the metaphor can be understood as a mapping (in the mathematical sense) from a source domain (in this case, journeys) to a target domain (in this case, love). The mapping is tightly structured. There are ontological correspondences, according to which entities in the domain of love (e.g., the lovers, their common goals, their difficulties, the love relationship, etc.) correspond systematically to entities in the domain of a journey (the travelers, the vehicle, destinations, etc.).

To make it easier to remember what mappings there are in the conceptual system, Johnson and I (Lakoff and Johnson, 1980) adopted a strategy for naming such mappings, using mnemonics which suggest the mapping. Mnemonic names typically (though not always) have the form: TARGET-DOMAIN IS SOURCE-DOMAIN, or alternatively, TARGET-DOMAIN AS SOURCE- DOMAIN. In this case, the name of the mapping is LOVE IS A JOURNEY. When I speak of the LOVE IS A JOURNEY metaphor, I am using a mnemonic for a set of ontological correspondences that characterize a mapping, namely:

THE LOVE-AS-JOURNEY MAPPING

- The lovers correspond to travelers.
- The love relationship corresponds to the vehicle.
- The lovers' common goals correspond to their common destinations on the journey.
- Difficulties in the relationship correspond to impediments to travel.

It is a common mistake to confuse the name of the mapping, LOVE IS A JOURNEY, for the mapping itself. The mapping is the set of correspondences. Thus, whenever I refer to a metaphor by a mnemonic like LOVE IS A JOURNEY, I will be referring to such a set of correspondences.

If mappings are confused with names of mappings, another misunderstanding can arise. Names of mappings commonly have a propositional form, for example, LOVE IS A JOURNEY. But the mappings themselves are not propositions. If mappings are confused with names for mappings, one might mistakenly think that, in this theory, metaphors are propositional. They are, of course, anything but that: metaphors are mappings, that is, sets of conceptual correspondences.

The LOVE-AS-JOURNEY mapping is a set of ontological correspondences that characterize epistemic correspondences by mapping knowledge about journeys onto knowledge about love. Such correspondences permit us to reason about love using the knowledge we use to reason about journeys. Let us take an example. Consider the expression, *We're stuck*, said by one lover to another about their relationship. How is this expression about travel to be understood as being about their relationship?

We're stuck can be used of travel, and when it is, it evokes knowledge about travel. The exact knowledge may vary from person to person, but here is a typical example of the kind of knowledge evoked. The capitalized expressions represent entities in the ontology of travel, that is, in the source domain of the LOVE IS A JOURNEY mapping given above.

> Two TRAVELLERS are in a VEHICLE, TRAVELING WITH COMMON DESTINATIONS. The VEHICLE encounters some IMPEDIMENT and gets stuck, that is, becomes nonfunctional. If they do nothing, they will not REACH THEIR DESTINATIONS. There are a limited number of alternatives for action:

- They can try to get it moving again, either by fixing it or getting it past the IMPEDIMENT that stopped it.
- They can remain in the nonfunctional VEHICLE and give up on REACHING THEIR DESTINATIONS.
- They can abandon the VEHICLE.
- The alternative of remaining in the nonfunctional VEHICLE takes the least effort, but does not satisfy the desire to REACH THEIR DESTINATIONS.

The ontological correspondences that constitute the LOVE IS A JOURNEY metaphor map the ontology of travel onto the ontology of love. In doing so, they map this scenario about travel onto a corresponding love scenario in which the corresponding alternatives for action are seen. Here is the corresponding love scenario that results from applying the correspondences to this knowledge structure. The target domain entities that are mapped by the correspondences are capitalized:

> Two LOVERS are in a LOVE RELATIONSHIP, PURSUING COMMON LIFE GOALS. The RELATIONSHIP encounters some DIFFICULTY, which makes it nonfunctional. If they do nothing, they will not be able to ACHIEVE THEIR LIFE GOALS. There are a limited number of alternatives for action:

- They can try to get it moving again, either by fixing it or getting it past the DIFFICULTY.
- They can remain in the nonfunctional RELATIONSHIP, and give up on ACHIEVING THEIR LIFE GOALS.
- They can abandon the RELATIONSHIP.

The alternative of remaining in the nonfunctional RELATIONSHIP takes the least effort, but does not satisfy the desire to ACHIEVE LIFE GOALS.

This is an example of an inference pattern that is mapped from one domain to another. It is via such mappings that we apply knowledge about travel to love relationships.

2.2 Metaphors are not mere words

What constitutes the LOVE IS A JOURNEY metaphor is not any particular word or expression. It is the ontological mapping across conceptual domains, from the source domain of journeys to the target domain of love. The metaphor is not just a matter of language, but of thought and reason. The language is secondary. The mapping is primary, in that it sanctions the use of source domain language and inference patterns for target domain concepts. The mapping is conventional, that is, it is a fixed part of our conceptual system, one of our conventional ways of conceptualizing love relationships.

This view of metaphor is thoroughly at odds with the view that metaphors are just linguistic expressions. If metaphors were merely linguistic expressions, we would expect different linguistic expressions to be different metaphors. Thus, 'We've hit a dead-end street' would constitute one metaphor. 'We can't turn back now' would constitute another, entirely different metaphor. 'Their marriage is on the rocks' would involve still a different metaphor. And so on for dozens of examples. Yet we don't seem to have dozens of different metaphors here. We have one metaphor, in which love is conceptualized as a journey. The mapping tells us precisely how love is being conceptualized as a journey. And this unified way of *conceptualizing* love metaphorically is realized in many different *linguistic* expressions.

It should be noted that contemporary metaphor theorists commonly use the term 'metaphor' to refer to the conceptual mapping, and the term metaphorical expression to refer to an individual linguistic expression (like *dead-end street*) that is sanctioned by a mapping. We have adopted this terminology for the following reason: Metaphor, as a phenomenon, involves both conceptual mappings and individual linguistic expressions. It is important to keep them distinct. Since it is the mappings that are primary and that state the generalizations that are our principal concern, we have reserved the term metaphor for the mappings, rather than for the linguistic expressions.

In the literature of the field, small capitals like LOVE IS A JOURNEY are used as mnemonics to name mappings. Thus, when we refer to the LOVE IS A JOURNEY metaphor, we are referring to the set of correspondences discussed above. The English sentence *Love is a journey*, on the other hand, is a metaphorical expression that is understood via that set of correspondences.

2.3 Generalizations

The LOVE IS A JOURNEY metaphor is a conceptual mapping that characterizes a generalization of two kinds:

- Polysemy generalization: A generalization over related senses of linguistic expressions, e.g., dead-end street, crossroads, stuck, spinning one's wheels, not going anywhere, and so on.
- Inferential generalization: A generalization over inferences across different conceptual domains.

That is, the existence of the mapping provides a general answer to two questions:

- Why are words for travel used to describe love relationships?
- Why are inference patterns used to reason about travel also used to reason about love relationships?

Correspondingly, from the perspective of the linguistic analyst, the existence of such cross-domain pairings of words and of inference patterns provides evidence for the existence of such mappings.

2.4 Novel extensions of conventional metaphors

The fact that the LOVE IS A JOURNEY mapping is a fixed part of our conceptual system explains why new and imaginative uses of the mapping can be understood instantly, given the ontological correspondences and other knowledge about journeys. Take the song lyric, *We're driving in the fast lane on the freeway of love*. The traveling knowledge called upon is this: When you drive in the fast lane, you go a long way in a short time and it can be exciting and dangerous. The general metaphorical mapping maps this knowledge about driving into knowledge about love relationships. The danger may be to the vehicle (the relationship may not last) or the passengers (the lovers may be hurt, emotionally). The excitement of the love-journey is sexual. Our understanding of the song lyric is a consequence of the pre-existing metaphorical correspondences of the LOVE AS A JOURNEY metaphor. The song lyric is instantly comprehensible to speakers of English because those metaphorical correspondences are already part of our conceptual system.

The LOVE IS A JOURNEY metaphor and Reddy's Conduit Metaphor were the two examples that first convinced me that metaphor was not a figure of speech, but a mode of thought, defined by a systematic mapping from a source to a target domain. What convinced me were the three characteristics of metaphor that I have just discussed:

1 The systematicity in the linguistic correspondences.

2 The use of metaphor to govern reasoning and behavior based on that reasoning.

3 The possibility for understanding novel extensions in terms of the conventional correspondences.

2.5 Motivation

Each conventional metaphor, that is, each mapping, is a fixed pattern of conceptual correspondences across conceptual domains. As such, each mapping defines an open-ended class of potential correspondences across inference patterns. When activated, a mapping may apply to a novel source domain knowledge structure and characterize a corresponding target domain knowledge structure.

Mappings should not be thought of as processes, or as algorithms that mechanically take source domain inputs and produce target domain outputs. Each mapping should be seen instead as a fixed pattern of ontological correspondences across domains that may, or may not, be applied to a source domain knowledge structure or a source domain lexical item. Thus, lexical items that are conventional in the source domain are not always conventional in the target domain. Instead, each source domain lexical item may or may not make use of the static mapping pattern. If it does, it has an extended lexicalized sense in the target domain, where that sense is characterized by the mapping. If not, the source domain lexical item will not have a conventional sense in the target domain, but may still be actively mapped in the case of novel metaphor. Thus, the words *freeway* and *fast lane* are not conventionally used of love, but the knowledge structures associated with them are mapped by the LOVE IS A JOURNEY metaphor in the case of *We're driving in the fast lane on the freeway of love*.

2.6 Imageable idioms

Many of the metaphorical expressions discussed in the literature on conventional metaphor are idioms. On classical views, idioms have arbitrary meanings. But within cognitive linguistics, the possibility exists that they are not arbitrary, but rather motivated. That is, they do arise automatically by productive rules, but they fit one or more patterns present in the conceptual system. Let us look a little more closely at idioms.

An idiom like *spinning one's wheels* comes with a conventional mental image, that of the wheels of a car stuck in some substance – either in mud, sand, snow, or on ice – so that the car cannot move when the motor is engaged and the wheels turn. Part of our knowledge about that image is that a lot of energy is being used up (in spinning the wheels) without any progress being made, that the situation will not readily change of its own accord, that it will take a lot of effort on the part of the occupants to get the vehicle moving again –and that may not even be possible.

The LOVE IS A JOURNEY metaphor applies to this knowledge about the image. It maps this knowledge onto knowledge about love relationships: a lot of energy is being spent without any progress toward fulfilling common goals, the situation will not change of its own accord, it will take a lot of effort on the part of the lovers to make more progress, and so on. In short, when idioms have associated conventional images, it is common for an independently-motivated conceptual metaphor to map that knowledge from the source to the target domain. For a survey of experiments verifying the existence of such images and such mappings, see Gibbs (1990, 1993).

2.7 Mappings are at the superordinate level

In the LOVE IS A JOURNEY mapping, a love relationship corresponds to a vehicle. A vehicle is a superordinate category that includes such basic-level categories as car, train, boat, and plane. Indeed, the examples of vehicles are typically drawn from this range of basic level categories: car (*long bumpy road, spinning our wheels*), train (*off the track*), boat (*on the rocks, foundering*), plane (*just taking off, bailing out*). This is not an accident: in general, we have found that mappings are at the superordinate rather than the basic level. Thus, we do not find fully general submappings like A LOVE RELATIONSHIP IS A CAR; when we find a love relationship conceptualized as a car, we also tend to find it conceptualized as a boat, a train, a plane, etc. It is the superordinate category VEHICLE not the basic level category CAR that is in the general mapping.

It should be no surprise that the generalization is at the superordinate level, while the special cases are at the basic level. After all, the basic level is the level of rich mental images and rich knowledge structure. (For a discussion of the properties of basic-level categories, see Lakoff, 1987, pp. 31–50.) A mapping at the superordinate level maximizes the possibilities for mapping rich conceptual structure in the source domain onto the target domain, since it permits many basic-level instances, each of which is information rich.

Thus, a prediction is made about conventional mappings: the categories mapped will tend to be at the superordinate rather than basic level. Thus, one tends not to find mappings like A LOVE RELATIONSHIP IS A CAR or A LOVE RELATIONSHIP IS A BOAT. Instead, one tends to find both basic-level cases (e.g., both cars and boats), which indicates that the generalization is one level higher, at the superordinate level of the vehicle. In the hundreds of cases of conventional mappings studied so far, this prediction has been borne out: it is superordinate categories that are used in mappings.

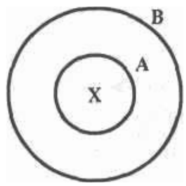
3 Basic semantic concepts that are metaphorical

Most people are not too surprised to discover that emotional concepts like love and anger are understood metaphorically. What is more interesting, and I think more exciting, is the realization that many of the most basic concepts in our conceptual systems are also comprehended normally via metaphor – concepts like time, quantity, state, change, action, cause, purpose, means, modality and even the concept of a category. These are concepts that enter normally into the grammars of languages, and if they are indeed metaphorical in nature, then metaphor becomes central to grammar.

I would like to suggest that the same kinds of considerations that lead to our acceptance of the LOVE-AS-JOURNEY metaphor lead inevitably to the conclusion that such basic concepts are often, and perhaps always, understood via metaphor.

3.1 Categories

Classical categories are understood metaphorically in terms of bounded regions, or 'containers.' Thus, something can be in or out of a category, it can be put into a category or removed from a category, etc. The logic of classical categories is the logic of containers (see Figure 1).



X is in A
A is in B
∴X is in B

Figure 1

If X is in container A and container A is in container B, then X is in container B.

This is true not by virtue of any logical deduction, but by virtue of the topological properties of containers. Under the CLASSICAL CATEGORIES ARE CONTAINERS metaphor, the logical properties of categories are inherited from the logical properties of containers. One of the principal logical properties of classical categories is that the classical syllogism holds for them. The classical syllogism,

Socrates is a man.
All men are mortal. Therefore, Socrates is mortal.
is of the form:
If X is in category A and category A is in category B, then X is in category B.

Thus, the logical properties of classical categories can be seen as following from the topological properties of containers plus the metaphorical mapping from containers to categories. As long as the topological properties of containers are preserved by the mapping, this result will be true.

In other words, there is a generalization to be stated here. The language of containers applies to classical categories and the logic of containers is true of classical categories. A single metaphorical mapping ought to characterize both the linguistic and logical generalizations at once. This can be done provided that the topological properties of containers are preserved in the mapping.

The joint linguistic-and-inferential relation between containers and classical categories is not an isolated case. Let us take another example.

3.2 Quantity and linear scales

The concept of quantities involves at least two metaphors. The first is the well-known MORE IS UP, LESS IS DOWN metaphor as shown by a myriad of expressions like *Prices rose, Stocks skyrocketed, The market plummeted*, and so on. A second is that LINEAR SCALES ARE PATHS. We can see this in expressions like:

> John is *far* more intelligent than Bill.
> John's intelligence *goes way beyond* Bill's.
> John is *way ahead of* Bill in intelligence.

The metaphor maps the starting point of the path onto the bottom of the scale and maps distance traveled onto quantity in general. What is particularly interesting is that the logic of paths maps onto the logic of linear scales (see Figure 2).

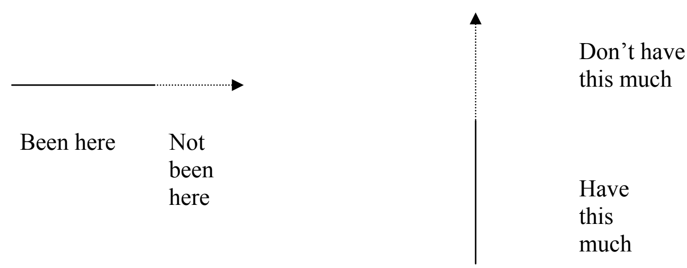


Figure 2

> Path inference: if you are going from A to C, and you are now at in intermediate point B, then you have been at all points between A and B and not at any points between B and C.

Example: if you are going from San Francisco to N.Y. along route 80, and you are now at Chicago, then you have been to Denver but not to Pittsburgh.

> Linear scale inference: if you have exactly $50 in your bank account, then you have $40, $30, and so on, but not $60, $70, or any larger amount.

The form of these inferences is the same. The path inference is a consequence of the cognitive topology of paths. It will be true of any path image-schema. Again, there is a linguistic-and-inferential generalization to be stated. It would be stated by the metaphor LINEAR SCALES ARE PATHS, provided that metaphors in general preserve the cognitive topology (that is, the image-schematic structure) of the source domain.

Looking at the inferential structure alone, one might suggest a nonmetaphorical alternative in which *both* linear scales and paths are instances of a more general abstract schema. But when both the inferential and lexical data are considered, it becomes clear that a metaphorical solution is required. An expression like 'ahead of' is from the spatial domain, not the linear scale domain: 'ahead' in its core sense is defined with respect to one's head – it is the direction in which one is facing. To say that there is no metaphorical mapping from paths to scales is to say that 'ahead of' is not fundamentally spatial and characterized with respect to heads; it is to claim rather that 'ahead' is very abstract, neutral between space and linear scales, and has nothing to do with heads. This would be a bizarre analysis. Similarly, for sentences like: 'John's intelligence goes beyond Bill's', the nonmetaphorical analysis would claim that 'go' is not fundamentally a verb of motion at all, but is somehow neutral between motion and a linear relation. This would also be bizarre. In short, if one grants that 'ahead of' and 'go' are fundamentally spatial, then the fact that they can also be used of linear scales suggests a metaphor solution. Indeed, there could be no such neutral sense of 'go' for these cases, since 'go beyond' in the spatial sense involves motion, while in the linear scale sense, there is no motion or change, but just a point on a scale. Here the neutral case solution is not even available.

3.3 The invariance principle

In the examples we have just considered, the image-schemas characterizing the source domains (containers, paths) are mapped onto the target domains (categories, linear scales). This observation leads to the following hypothesis, called 'The Invariance Principle':

> Metaphorical mappings preserve the cognitive topology (that is, the image-schema structure) of the source domain, in a way consistent with the inherent structure of the target domain.

What the Invariance Principle does is guarantee that, for container-schemas, interiors will be mapped onto interiors, exteriors onto exteriors, and boundaries onto boundaries; for path-schemas, sources will be mapped onto sources, goals onto goals, trajectories onto trajectories, and so on.

To understand the Invariance Principle properly, it is important not to think of mappings as algorithmic processes that start with source domain structure and wind up with target domain structure. Such a mistaken understanding of mappings would lead to a mistaken understanding of the Invariance Principle, namely, that one first picks all the image-schematic structure of the source domain, then one copies it onto the target domain unless the target domain interferes.

One should instead think of the Invariance Principle in terms of constraints on fixed correspondences: if one looks at the existing correspondences, one will see that the Invariance Principle holds: source domain interiors correspond to target domain interiors; source domain exteriors correspond to target domain exteriors, etc. As a consequence it will turn out that the image-schematic structure of the target domain cannot be violated: One cannot find cases where a source domain interior is mapped onto a target domain exterior, or where a source domain exterior is mapped onto a target domain path. This simply does not happen.

3.4 Target domain overrides

A corollary of the Invariance Principle is that image-schema structure inherent in the target domain cannot be violated, and that inherent target domain structure limits the possibilities for mappings automatically. This general principle explains a large number of previously mysterious limitations on metaphorical mappings. For example, it explains why you can give someone a kick, even if they don't have it afterwards, and why you can give someone information, even if you don't lose it. This is just a consequence of the fact that inherent target domain structure automatically limits what can be mapped. For example, consider that part of your inherent knowledge of actions that says that actions do not continue to exist after they occur. Now consider the ACTIONS ARE TRANSFERS metaphor, in which actions are conceptualized as objects transferred from an agent to a patient, as when one gives someone a kick or a punch. We know (as part of target domain knowledge) that an action does not exist after it occurs. In the source domain, where there is a giving, the recipient possesses the object given after the giving. But this cannot be mapped onto the target domain since the inherent structure of the target domain says that no such object exists after the action is over. The target domain override in the Invariance Principle explains why you can give someone a kick without his having it afterward.

3.5 Abstract inferences as metaphorical spatial inferences

Spatial inferences are characterized by the topological structure of image-schemas. We have seen cases such as CATEGORIES ARE CONTAINERS and LINEAR SCALES ARE PATHS where image-schema structure is preserved by metaphor and where abstract inferences about categories and linear scales are metaphorical versions of spatial inferences about containers and paths.

The Invariance Principle hypothesizes that image-schema structure is always preserved by metaphor. The Invariance Principle raises the possibility that a great many, if not all, abstract inferences are actually metaphorical versions of spatial inferences that are inherent in the topological structure of image-schemas. What I will do now is turn to other cases of basic, but abstract, concepts to see what evidence there is for the claim that such concepts are fundamentally characterized by metaphor.

3.6 Time

It has often been noted that time in English is conceptualized in terms of space. The details are rather interesting.

Ontology: Time is understood in terms of things (i.e., entities and locations) and motion.

Background condition: The present time is at the same location as a canonical observer.

Mapping:
- Times are things.
- The passing of time is motion.
- Future times are in front of the observer; past times are behind the observer.
- One thing is moving, the other is stationary; the stationary entity is the deictic center.

Entailment:
- Since motion is continuous and one-dimensional, the passage of time is continuous and one-dimensional.

Special case 1:
- The observer is fixed; times are entities moving with respect to the observer.
- Times are oriented with their fronts in their direction of motion.

Entailments:
- If time 2 follows time 1, then time 2 is in the future relative to time 1. The time passing the observer is the present time.Time has a velocity relative to the observer.

Special case 2:
- Times are fixed locations; the observer is moving with respect to time.

Entailment:
- Time has extension, and can be measured.
- An extended time, like a spatial area, may be conceived of as a bounded region.

This metaphor, TIME PASSING IS MOTION, with its two special cases, embodies a generalization that accounts for a wide range of cases where a spatial expression can also be used for time. Special case 1, TIME PASSING IS MOTION OF AN OBJECT, accounts for both the linguistic form and the semantic entailments of expressions like:

> The time will come when... The time has long since gone when. The time for action has arrived. That time is here. In the weeks following next Tuesday.... On the preceding day, ... I'm looking ahead to Christmas. Thanksgiving is coming up on us. Let's put all that behind us. I can't face the future. Time is flying by. The time has passed when ...

Thus, special case 1 characterizes the general principle behind the temporal use of words like *come, go, here, follow, precede, ahead, behind, fly, pass*, accounting not only for why they are used for both space and time, but why they mean what they mean.

Special case 2, TIME PASSING IS MOTION OVER A LANDSCAPE, accounts for a different range of cases, expressions like:

> There's going to be trouble down the road. He stayed there for ten years. He stayed there a long time. His stay in Russia extended over many years. He passed the time happily. He arrived on time. We're coming up on Christmas. We're getting close to Christmas. He'll have his degree within two years. I'll be there in a minute.

Special case 2 maps location expressions like *down the road*, *for + location, long, over, come, close to, within, in, pass*, onto corresponding temporal expressions with their corresponding meanings. Again, special case 2 states a general principle relating spatial terms and inference patterns to temporal terms and inference patterns.

The details of the two special cases are rather different; indeed, they are inconsistent with one another. The existence of such special cases has an especially interesting theoretical consequence: words mapped by both special cases will have inconsistent readings. Take, for example, the come of *Christmas is coming* (special case 1) and *We're coming up on Christmas* (special case 2). Both instances of come are temporal, but one takes a moving time as first argument and the other takes a moving observer as first argument. The same is true of *pass* in *The time has passed* (special case 1) and in *He passed the time* (special case 2).

These differences in the details of the mappings show that one cannot just say blithely that spatial expressions can be used to speak of time, without specifying details, as though there were only one correspondence between time and space. When we are explicit about stating the mappings, we discover that there are two different – and inconsistent – subcases.

The fact that time is understood metaphorically in terms of motion, entities, and locations accords with our biological knowledge. In our visual systems, we have detectors for motion and detectors for objects/locations. We do not have detectors for time (whatever that could mean). Thus, it makes good biological sense that time should be understood in terms of things and motion.

3.7 Duality

The two special cases (location and object) of the TIME PASSING IS MOTION metaphor is not merely an accidental feature of our understanding of time. As we shall see below, there are other metaphors that come in such location/object pairs. Such pairs are called 'duals', and the general phenomenon in which metaphors come in location-object pairs is referred to as 'duality'.

3.8 Simultaneous mappings

It is important to recall that metaphorical mappings are fixed correspondences that can be activated, rather than algorithmic processes that take inputs and give outputs. Thus, it is not the case that sentences containing conventional metaphors are the products of a real-time process of conversion from literal to metaphorical readings. A sentence like *The time for action has arrived* is not understood by first trying to give a literal reading to *arrive*, and then, upon failing, trying to give it a temporal reading. Instead, the metaphor TIME PASSING IS MOTION is a fixed structure of existing correspondences between the space and time domains, and *arrive* has a conventional extended meaning that makes use of that fixed structure of correspondences.

Thus, it is possible for two different parts of a sentence to make use of two distinct metaphorical mappings at once. Consider a phrase like, *Within the coming weeks*. Here, *within* makes uses of the metaphor of time as a stationary landscape which has extension and bounded regions, while *coming* makes use of the metaphor of TIMES AS MOVING OBJECTS. This is possible because the two metaphors for time pick out different aspects of the target domain. The coming weeks conceptualizes those weeks as a whole, in motion relative to the observer. *Within* looks inside that whole, conceptualizing it as a bounded region with an interior. Each mapping is used partially. Thus, while the mappings-as-wholes are inconsistent, there are cases where parts of the mappings may be consistently superimposed. The Invariance Principle allows such parts of the mappings to be picked out and used to characterize reasoning about different aspects of the target domain.

Simultaneous mappings are very common in poetry. Take, for example the Dylan Thomas line *Do not go gentle into that good night*. Here *go* reflects DEATH IS DEPARTURE, *gentle* reflects LIFE IS A STRUGGLE, with death as defeat. *Night* reflects A LIFETIME IS A DAY, with death as night. This one line has three different, metaphors for death, each mapped onto different parts of the sentence. This is possible since mappings are fixed correspondences.

There is an important lesson to be learned from this example. In mathematics, mappings are static correspondences. In computer science, it is common to represent mathematical mappings by algorithmic processes that take place in real time. Researchers in information processing psychology and cognitive science also commonly represent mappings as real-time algorithmic procedures. Some researchers from these fields have mistakenly supposed that the metaphorical mappings we are discussing should also be represented as real-time, sequential algorithmic procedures, where the input to each metaphor is a literal meaning. Any attempt to do this will fail for the simultaneous mapping cases just discussed.

4 Event structure

I now want to turn to some research by myself and some of my students (especially Sharon Fischler, Karin Myhre, and Jane Espenson) on the metaphorical understanding of event structure in English. What we have found is that various aspects of event structure, including notions like states, changes, processes, actions, causes, purposes, and means, are characterized cognitively via metaphor in terms of space, motion, and force.

The general mapping we have found goes as follows:

The Event Structure Metaphor
- States are locations (bounded regions in space).
- Changes are movements (into or out of bounded regions).
- Causes are forces.
- Actions are self-propelled movements.
- Purposes are destinations.
- Means are paths (to destinations).
- Difficulties are impediments to motion.
- Expected progress is a travel schedule; a schedule is a virtual traveler, who reaches pre-arranged destinations at pre-arranged times.
- External events are large, moving objects.
- Long term, purposeful activities are journeys.

This mapping generalizes over an extremely wide range of expressions for one or more aspects of event structure. For example, take states and changes. We speak of being *in* or *out* of a state, of *going into* or *out of* it, of *entering* or *leaving* it, of getting *to* a state or *emerging* from it.

This is a rich and complex metaphor whose parts interact in complex ways. To get an idea of how it works, consider the submapping 'Difficulties are impediments to motion'. In the metaphor, purposive action is self-propelled motion toward a destination. A difficulty is something that impedes motion to such a destination. Metaphorical difficulties of this sort come in five types: blockages; features of the terrain; burdens; counterforces; lack of an energy source. Here are examples of each:

Blockages:

He got over his divorce. He's trying to get around the regulations. He went through the trial. We ran into a brick wall. We've got him boxed into a corner. Features of the terrain: He's between a rock and a hard place. It's been uphill all the way. We've been bogged down. We've been hacking our way through a jungle of regulations.

Burdens:

He's carrying quite a load. He's weighed down by lots of assignments. He's been trying to shoulder all the responsibility. Get off my back!

Counterforces:

Quit pushing me around. She's leading him around by the nose. She's holding him back.

Lack of an energy source:

I'm out of gas. We're running out of steam.

To see just how rich The Event Structure Metaphor is, consider some of its basic entailments:

- Manner of action is manner of motion.
- A different means for achieving a purpose is a different path.
- Forces affecting action are forces affecting motion.
- The inability to act is the inability to move.
- Progress made is distance traveled or distance from goal.

We will consider examples of each of these one by one, including a number of special cases.

Aids to Action are Aids to Motion

It is smooth sailing from here on in.
It's all downhill from here.
There's nothing in our way.

A Different Means of Achieving a Result is a Different Path.

Do it this way.
She did it the other way.
Do it any way you can.
However you want to go about it is fine with me.

Manner of Action is Manner of Motion

We are moving/running/skipping right along.
We slogged through it.
He is flailing around.
He is falling all over himself.
We are leaping over hurdles.
He is out of step.
He is in step.

Careful Action is Careful Motion

I'm walking on eggshells.
He is treading on thin ice.
He is walking a fine line.

Speed of Action is Speed of Movement

He flew through his work.
He is running around.
It is going swimmingly.
Keep things moving at a good clip.
Things have slowed to a crawl.
She is going by leaps and bounds.
I am moving at a snail's pace.

Purposeful Action is Self-propelled Motion To a Destination
This has the following special cases:
Making Progress Is Forward Movement
We are moving ahead.
Let's forge ahead.
Let's keep moving forward.
We made lots of forward movement.

Amount of Progress is Distance Moved
We've come a long way.
We've covered lots of ground.
We've made it this far.

Undoing Progress is Backward Movement
We are sliding backward.
We are backsliding.
We need to backtrack.
It is time to turn around and retrace our steps.

Expected Progress is a Travel Schedule; A Schedule is a Virtual Traveler, who reaches pre-arranged destinations at pre-arranged times.
We're behind schedule on the project.
We got a head start on the project.
I'm trying to catch up.
I finally got a little ahead.

Starting an Action is Starting out on a Path
We are just starting out.
We have taken the first step.

Success Is Reaching The End of the Path
We've reached the end.
We are seeing the light at the end of the tunnel.
We only have a short way to go.
The end is in sight.
The end is a long way off.

Lack of Purpose is Lack of Direction
He is just floating around.
He is drifting aimlessly.
He needs some direction.

Lack of Progress is Lack of Movement
We are at a standstill.
We aren't getting any place.
We aren't going anywhere.
We are going nowhere with this.

External Events Are Large Moving Objects
Special Case 1: **Things**
How're things going?
Things are going with me.
Things are going against me these days.
Things took a turn for the worse.
Things are going my way.

Special Case 2: **Fluids**
You gotta go with the flow.
I'm just trying to keep my head above water.
The tide of events... The winds of change.... The flow of history...
I'm trying to get my bearings.
He's up a creek without a paddle.
We're all in the same boat.

Special Case 3: **Horses**
Try to keep a tight rein on the situation.
Keep a grip on the situation.
Don't let things get out of hand.
Wild horses couldn't make me go.
Whoa! (said when things start to get out of hand)

Such examples provide overwhelming empirical support for the existence of the Event Structure metaphor. And the existence of that metaphor shows that the most common abstract concepts–TIME, STATE, CHANGE, CAUSATION, ACTION, PURPOSE and MEANS– are conceptualized via metaphor. Since such concepts are at the very center of our conceptual systems, the fact that they are conceptualized metaphorically shows that metaphorical mappings do not occur isolated from one another.

4.1 Inheritance hierarchies

They are sometimes organized in hierarchical structures, in which 'lower' mappings in the hierarchy inherit the structures of the 'higher' mappings. Let us consider an example of a hierarchy with three levels:

- Level 1: The Event Structure Metaphor
- Level 2: A PURPOSEFUL LIFE IS JOURNEY
- Level 3: LOVE IS A JOURNEY; A CAREER IS A JOURNEY

To refresh your memory, recall:
The Event Structure Metaphor
Target Domain: Events Source Domain: Space

- States are locations (bounded regions in space).
- Changes are movements (into or out of bounded regions).
- Causes are forces.
- Actions are self-propelled movements.
- Purposes are destinations.
- Means are paths to destinations.
- Difficulties are impediments to motion.
- Expected progress is a travel schedule; a schedule is a virtual traveler, who reaches pre-arranged destinations at pre-arranged times.
- External events are large, moving objects.
- Long-term, purposeful activities are journeys.

In our culture, life is assumed to be purposeful, that is, we are expected to have goals in life. In the Event Structure Metaphor, purposes are destinations and purposeful action is self-propelled motion toward a destination. A purposeful life is a long-term, purposeful activity, and hence a journey. Goals in life are destinations on the journey. The actions one takes in life are self-propelled movements, and the totality of one's actions form a path one moves along. Choosing a means to achieve a goal is choosing a path to a destination. Difficulties in life are impediments to motion. External events are large moving objects that can impede motion toward one's life goals. One's expected progress through life is charted in terms of a life schedule, which is conceptualized as a virtual traveler that one is expected to keep up with.

In short, the metaphor A PURPOSEFUL LIFE IS A JOURNEY makes use of all the structure of the Event Structure Metaphor, since events in a life conceptualized as purposeful are subcases of events in general.

A PURPOSEFUL LIFE IS A JOURNEY
Target Domain: Life Source Domain: Space
The person leading a life is a traveler.
Inherits Event Structure Metaphor, with:
Events = Significant Life Events
Purposes = Life Goals

Thus we have expressions like:

He got a head start in life. He's without direction in his life. I'm where I want to be in life. I'm at a crossroads in my life. He'll go places in life. He's never let anyone get in his way. He's gone through a lot in life.

Just as significant life events are special cases of events, so events in a love relationship are special cases of life events. Thus, the LOVE IS A JOURNEY metaphor inherits the structure of the LIFE IS A JOURNEY metaphor. What is special about the LOVE IS A JOURNEY metaphor is that there are two lovers, who are travelers, and that the love relationship is a vehicle. The rest of the mapping is a consequence of inheriting the LIFE IS A JOURNEY metaphor. Because the lovers are in the same vehicle, they have common destinations, that is, common life goals. Relationship difficulties are impediments to travel.

LOVE IS A JOURNEY
Target Domain: Love Source Domain: Space
The lovers are travelers.
The love relationship is a vehicle.
Inherits the LIFE IS A JOURNEY metaphor.

A career is another aspect of life that can be conceptualized as a journey. Here, because STATUS IS UP, a career is actually a journey upward. Career goals are special cases of life goals.

A CAREER IS A JOURNEY
Target Domain: Career Source Domain: Space
A careerist is a traveler.
Status is up.

Inherits LIFE IS A JOURNEY, with:
Life goals = Career Goals
Ideal: To go as high, far, and fast as possible.

Examples include:

He clawed his way to the top. He's over the hill. She's on the fast track. He's climbing the corporate ladder. She's moving up in the ranks quickly.

This inheritance hierarchy accounts for a range of generalizations. First, there are generalizations about lexical items. Take the word *crossroads*. It's central meaning is in the domain of space. But it can be used in a metaphorical sense to speak of any extended activity, of one's life, of a love relationship, or of a career.

> I'm at a crossroads on this project. I'm at a crossroads in life. We're at a crossroads in our relationship. I'm at a crossroads in my career.

The hierarchy allows one to state a general principal: *crossroads* is extended lexically via the submetaphor of the Event Structure Metaphor that LONG-TERM PURPOSEFUL ACTIVITIES ARE JOURNEYS. All its other uses are automatically generated via the inheritance hierarchy. Thus, separate senses for each level of the hierarchy are not needed.

The second generalization is inferential in character. Thus the understanding of difficulties as impediments to travel occurs not only in events in general, but also in a purposeful life, in a love relationship, and in a career. The inheritance hierarchy guarantees that this understanding of difficulties in life, love, and careers is a consequence of such an understanding of difficulties in events in general.

The hierarchy also allows us to characterize lexical items whose meanings are more restricted: thus, *climbing the ladder* refers only to careers, not to love relationships or to life in general.

Such hierarchical organization is a very prominent feature of the metaphor system of English and other languages. So far we have found that the metaphors higher up in the hierarchy tend to be more widespread than those mappings at lower levels. Thus, the Event Structure Metaphor is very widespread (and may even be universal), while the metaphors for life, love, and careers are much more restricted culturally.

4.2 Duality in the event structure system

In our discussion of time metaphors, we noted the existence of an object-location duality. There were two related time metaphors. In both, the passage of time was understood in terms of relative motion between an observer and a time. In the object-dual, the observer is fixed and times are moving objects. In the location-dual, the opposite is true. The observer moves and times are fixed locations in a landscape.

The event structure system that we have seen so far is based wholly on location. But there is another event structure system that is the dual of the one we have just discussed – a system based on objects rather than locations. In both systems, CHANGE IS MOTION and CAUSES ARE FORCES that control motion. The difference is this:

- In the location system, change is the motion of the thing-changing to a new location or from an old one.
- In the object system, the thing-changing doesn't necessarily move. Change is instead the motion of an object to, or way from, the thing changing.

In addition, the object in motion is conceptualized as a possession and the thing-changing as a possessor. Change is thus seen as the acquisition or loss of an object. Causation is seen as giving or taking. Here are some examples:

I have a headache. [The headache is a possession.]
I got a headache. [Change is acquisition – motion to]
My headache went away. [Change is loss – motion from]
The noise gave me a headache. [Causation is giving – motion to]
The aspirin took away my headache. [Causation is taking – motion from]

We can see the duality somewhat more clearly with a word like *trouble*:

I'm in trouble. [Trouble is a location]
I have trouble. [Trouble is an object that is possessed]

In both cases, trouble is being attributed to me, and in both cases, trouble is metaphorically conceptualized as being in the same place as me (co-location) – in one case, because I possess the trouble-object and in the other case, because I am in the trouble-location. That is, attribution in both cases is conceptualized metaphorically as co-location. In 'I'm in trouble', trouble is a state. A state is an attribute that that is conceptualized as a location. Attributes (or properties) are like states, except that they are conceptualized as possessable objects.

Thus, STATES ARE LOCATIONS and ATTRIBUTES ARE POSSESSIONS are duals, since possession and location are special cases of the same thing – co-location – and since states and attributes are also special cases of the same thing – what can be attributed to someone.

Given this, we can see that there is an object-version of the Event Structure Metaphor:

- Attributes are possessions
- Changes are movements (of possessions, namely, acquisitions or losses)
- Causes are forces (controlling the movement of possessions, namely, giving or taking away) These are the duals of:
- States are locations
- Changes are movements (to or from locations)
- Causes are forces (controlling movement to or from locations)

Similarly, ACTIONS ARE SELF-PROPELLED MOVEMENTS (to or from locations) has as its object-dual ACTIONS ARE SELF-CONTROLLED ACQUISITIONS OR LOSSES. Thus, there is a reason why one can 'take' certain actions – you can take a shower, or take a shot at someone, or take a chance.

The submapping PURPOSES ARE DESTINATIONS also has a dual. Destinations are desired locations, and so the submapping can be rephrased as PURPOSES ARE DESIRED LOCATIONS, and ACHIEVING A PURPOSE IS REACHING A DESIRED LOCATION. Replacing 'location' by 'object', we get the dual PURPOSES ARE DESIRED

OBJECTS, and ACHIEVING A PURPOSE IS ACQUIRING A DESIRED OBJECT (or ridding oneself of an undesirable one). Here are some examples:

> ACHIEVING A PURPOSE IS ACQUIRING A DESIRED OBJECT
> They just handed him the job. It's within my grasp. It eluded me. Go for it. It escaped me. It slipped through my hands. He is pursuing a goal. Reach for /grab all the gusto you can get. Latch onto a good job. Seize the opportunity. He found success.

There is also a hierarchical structure in the object version of the Event Structure Metaphor. A special case of getting an object is getting an object to eat. Hence:

> ACHIEVING A PURPOSE IS GETTING SOMETHING TO EAT
> He savored the victory. All the good jobs have been gobbled up. He's hungry for success. The opportunity has me drooling. This is a mouth-watering opportunity.

Traditional methods of getting things to eat are hunting, fishing, and agriculture. Each of these special cases can be used metaphorically to conceptualize achieving (or attempting to achieve) a purpose.

> TRYING TO ACHIEVE A PURPOSE IS HUNTING
> I'm hunting for a job. I bagged a promotion. The pennant is in the bag.
> The typical way to hunt is to use projectiles (bullets, arrows, etc.)
> I'm shooting for a promotion. I'm aiming for a career in the movies. I'm afraid I missed my chance.

> TRYING TO ACHIEVE A PURPOSE IS FISHING
> He's fishing for compliments. I landed a promotion. She netted a good job. I've got a line out on a good used car. It's time to fish or cut bait.

> TRYING TO ACHIEVE A PURPOSE IS AGRICULTURE
> It's time I reaped some rewards. That job is a plum. Those are the fruits of his labor. The contract is ripe for the picking.

I will not try to survey all the dualities in the English metaphor system, but it is worth mentioning a few to see how subtle and pervasive dualities are. Take, for example, the LIFE IS A JOURNEY metaphor, in which goals in life are destinations, that is, desired locations to be reached. Since the dual of PURPOSES ARE DESTINATIONS is PURPOSES ARE DESIRED OBJECTS, the dual of LIFE IS A JOURNEY is a metaphor in which life is an activity through which one acquires desired objects. In this culture, the principle activity of this sort is business, and hence, LIFE IS A BUSINESS is the dual of LIFE IS A JOURNEY.

A PURPOSEFUL LIFE IS A BUSINESS
He has a rich life. It's an enriching experience. I want to get a lot out of life. He's going about the business of everyday life. It's time to take stock of my life.

Recall that LOVE IS A JOURNEY is an extension of A PURPOSEFUL LIFE IS A JOURNEY. It happens that LOVE IS A JOURNEY has a dual that is an extension of the dual of A PURPOSEFUL LIFE IS A JOURNEY, which is A PURPOSEFUL LIFE IS A BUSINESS. The dual of LOVE IS JOURNEY is LOVE IS A PARTNERSHIP, that is, a two-person business. Thus, we speak of lovers as partners; there are marriage contracts, and in a long-term love relationship the partners are expected to do their jobs and to share in both responsibilities (what they contribute to the relationship) and benefits (what they get out of it). Long-term love relationships fail under the same conditions as businesses fail – when what the partners get out of the relationship is not worth what they put into it.

Duality is a newly-discovered phenomenon. The person who first discovered it in the event structure system was Jane Espenson, a graduate student at Berkeley who stumbled upon it in the course of her research on causation metaphors. Since Espenson's discovery, other extensive dualities have been found in the English metaphor system. However, at present, it is not known just how extensive dualities are in English, or even whether they are all of the location/object type.

At this point, I will leave off discussing the metaphor system of English, even though hundreds of other mappings have been described to date. The major point to take away from this discussion is that metaphor resides for the most part in this huge, highly structured, fixed system. This system is anything but dead. Because it is conventional, it is used constantly and automatically, with neither effort nor awareness. Novel metaphor uses this system, and builds on it, but only rarely occurs independently of it. But, most interestingly, this system of metaphor seems to give rise to abstract reasoning, which appears to be based on spatial reasoning.

4.3 Invariance again

The metaphors I have discussed primarily map three kinds of image-schemas: containers, paths, and force-images. Because of the complexity of the sub-cases and interactions, the details are intricate, to say the least. However, the Invariance Principle does make claims in each case as to what image-schemas get mapped onto target domains. I will not go through most of the details here, but so far as I can see, the claims made about inferential structure are reasonable ones.

For example, the logic of force dynamics does seem to map, via the submapping CAUSES ARE FORCES, onto the logic of causation. The following are inferences from the logic of forces inherent in force dynamics:

- A stationary object will move only when force is applied to it; without force, it will not move.

- The application of force requires contact; thus, the applier of the force must be in spatial contiguity with the thing it moves.
- The application of force temporally precedes motion, since inertia must be overcome before motion can take place.

These are among the classic inferential conditions on causation: spatial contiguity, temporal precedence, and that A caused B only if B wouldn't have happened without A.

At this point, I would like to take up the question of what else the Invariance Principle would buy us. I will consider two cases that arose while Mark Turner and I were writing *More Than Cool Reason* (Lakoff & Turner, 1989). The first concerns image-metaphors and the second, generic-level metaphors. But before I move on to those topics, I should point an important consequence of invariance.

Johnson and I argued in *Metaphors We Live By* (Lakoff & Johnson, 1980) that a complex propositional structure could be mapped by metaphor onto another domain. The main example we gave was ARGUMENT IS WAR. Kövecses and I, in our analysis of anger metaphors (Lakoff, 1987, case study 1, Kövecses, 1990), also argued that metaphors could map complex propositional structures. The Invariance Principle does not deny this, but it puts those claims in a very different light. Complex propositional structures involve concepts like time, states, changes, causes, purposes, quantity scales, and categories. If all of these abstract concepts are characterized metaphorically, then the Invariance Principle claims that what we had called propositional structure is really image-schematic structure. In other words:

> So-called propositional inferences arise from the inherent topological structure of the image-schemas mapped by metaphor onto concepts like time, states, changes, actions, causes, purposes, means, quantity, and categories.

I have taken the trouble to discuss all those abstract concepts to demonstrate this consequence of the Invariance Principle; namely, that what have been seen in the past as propositional inferences are really image-based inferences. If the Invariance Principle is correct, it has a remarkable consequence:

> Abstract reasoning is a special case of imaged-based reasoning.

Image-based reasoning is fundamental and abstract reasoning is image-based reasoning under metaphorical projections to abstract domains.

To look for independent confirmation of the Invariance Principle, let us turn to image-metaphors.

5 Novel metaphors

5.1 Image metaphors

There is a class of metaphors that function to map one conventional mental image onto another. These contrast with the metaphors I have discussed so far, each of which maps one conceptual domain onto another, often with many concepts in the source domain mapped onto many corresponding concepts in the target domain. Image-metaphors, by contrast, are 'one-shot' metaphors: they map only one image onto one other image.

Consider, for example, this poem from the Indian tradition:

> Now women-rivers
> belted with silver fish
> move unhurried as women in love
> at dawn after a night with their lovers
> (Merwin & Masson, 1981, p. 71)

Here the image of the slow, sinuous walk of an Indian woman is mapped onto the image of the slow, sinuous, shimmering flow of a river. The shimmering of a school of fish is imagined as the shimmering of the belt.

Metaphoric image-mappings work in just the same way as all other metaphoric mappings: by mapping the structure of one domain onto the structure of another. But here, the domains are conventional mental images. Take, for example, this line from André Breton:

> My wife . . . whose waist is an hourglass.

This is a superimposition of the image of an hourglass onto the image of a woman's waist by virtue of their common shape. As before, the metaphor is conceptual; it is not in the words themselves, but in the mental images. Here, we have a mental image of an hourglass and of a woman, and we map the middle of the hourglass onto the waist of the woman. Note that the words do not tell us which part of the hourglass to map onto the waist, or even that it is only part of the hourglass shape that corresponds to the waist. The words are prompts for us to map from one conventional image to another. Similarly, consider:

> His toes were like the keyboard of a spinet.
> (Rabelais, 'The Descriptions of King Lent,' trans. J. M. Cohen)

Here too, the words do not tell us that an individual toe corresponds to an individual key on the keyboard. Again, the words are prompts for us to perform a conceptual mapping between conventional mental images. In particular, we map aspects of the part-whole structure of one image onto aspects of the part-whole structure of another.

Just as individual keys are parts of the whole keyboard, so individual toes are parts of the whole foot.

Image-mapping can involve more than mapping physical part-whole relationships. For example, the water line of a river may drop slowly and that slowness is part of the dynamic image, which may be mapped onto the slow removal of clothing:

> Slowly slowly rivers in autumn show
> sand banks
> bashful in first love woman
> showing thighs
> (Merwin & Masson, 1981, p. 69)

Other attributes are also mapped: the color of the sand bank onto the color of flesh, the quality of light on a wet sand bank onto the reflectiveness of skin, the light grazing of the water's touch receding down the bank onto the light grazing of the clothing along the skin. Notice that the words do not tell us that any clothing is involved. We get that from a conventional mental image. Part-whole structure is also mapped in this example. The water covers the hidden part of the bank just as the clothing covers the hidden part of the body. The proliferation of detail in the images limits image-mappings to highly specific cases. That is what makes them one-shot mappings.

Such mappings of one image onto another can lead us to map knowledge about the first image onto knowledge about the second. Consider the following example from the Navaho:

> My horse with a mane made of short rainbows.
> ('War God's Horse Song I' Words by Tall Kiaahni. Interpreted by Louis Watchman.)

The structure of a rainbow, its band of curved lines for example, is mapped onto an arc of curved hair, and many rainbows onto many such arcs on the horse's mane. Such image-mapping allows us to map our evaluation of the source domain onto the target. We know that rainbows are beautiful, special, inspiring, larger than life, almost mystic, and that seeing them makes us happy and awe-inspired. This knowledge is mapped onto what we know of the horse: it too is awe-inspiring, beautiful, larger than life, almost mystic. This line comes from a poem containing a series of such image-mappings:

> My horse with a hoof like a striped agate,
> with his fetlock like a fine eagle plume:
> my horse whose legs are like quick lightning
> whose body is an eagle-plumed arrow:
> my horse whose tail is like a trailing black cloud.

Image-metaphors raise two major issues for the general theory of metaphor:

- How do they work? What constrains the mappings? What kind of internal structures do mental images have that permit some mappings to work readily, others only with effort, and others not at all?
- What is the general theory of metaphor that unifies image-metaphors with all the conventional metaphors that map the propositional structure of one domain onto the propositional structure of another domain?

Turner and I (Lakoff & Turner, 1989) have suggested that the Invariance Principle could be an answer to both questions. We suggest that conventional mental images are structured by image-schemas and that image-metaphors preserve image-schematic structure, mapping parts onto parts and wholes onto wholes, containers onto containers, paths onto paths, and so on. The generalization would be that all metaphors are invariant with respect to their cognitive topology, that is, each metaphorical mapping preserves image-schema structure.

5.2 Generic-level metaphors

When Turner and I were writing *More Than Cool Reason*, we hypothesized the existence of what we called 'generic-level metaphors' to deal with two problems that we faced – first, the problem of personification and second, the problem of proverbs, which requires an understanding of analogy. I shall discuss each in turn.

Personification. In studying a wide variety of poems about death in English, we found that, in poem after poem, death was personified in a relatively small number of ways: drivers, coachmen, footmen; reapers, devourers and destroyers; or opponents in a struggle or game (say, a knight or a chess opponent). The question we asked was: why these? Why isn't death personified as a teacher or a carpenter or an ice cream salesman? Somehow, the ones that occur repeatedly seem appropriate. Why?

In studying personifications in general, we found that the overwhelming number seem to fit a single pattern: events (like death) are understood in terms of actions by some agent (like reaping). It is that agent that is personified. We thus hypothesized a very general metaphor, EVENTS ARE ACTIONS, which combines with other, independently existing metaphors for life and death. Consider, for example, the DEATH IS DEPARTURE metaphor. Departure is an event. If we understand this event as an action on the part of some causal agent-someone who brings about, or helps to bring about, departure-then we can account for figures like drivers, coachmen, footmen, etc. Or take the PEOPLE ARE PLANTS metaphor. In the natural course of things, plants wither and die. But if we see that event as a causal action on the part of some agent, then that agent is a reaper. So far, so good. But why destroyers and devourers? And what about the impossible cases?

Destruction and devouring are actions in which an entity ceases to exist. The same is true of death. The overall 'shape' of the event of death is similar in this respect to the overall 'shapes' of the events of destruction and devouring. Moreover, there is a causal aspect to death: the passage of time will eventually result in death. Thus, the overall shape of the event of death has an entity that over time ceases to exist as the result of some cause. Devouring and destruction have the same overall 'event-shape'. That is, it is the same with respect to causal structure and the persistence of entities over time.

Turner (1987) had noticed a similar case in *Death Is The Mother Of Beauty*, his classic work on kinship metaphor. In expressions like *Necessity is the mother of invention*, or *Edward Teller was the father of the H-bomb*, causation is understood in terms of giving birth or fathering-what Turner called the CAUSATION IS PROGENERATION metaphor. But, as he observed (pp. 145–148), this metaphor could not be used for just any instance of causation. It could only be used for cases that had the overall event-shape of progeneration: something must be created out of nothing, and the thing created must persist for a long time (as if it had a life).

Thus, for example, we can speak of Saussure as the father of modern synchronic linguistics, or of New Orleans as giving birth to jazz. But we cannot use this metaphor for a single causal action with a short-lived effect. Thus, we could not speak of Jose Canseco as the father of the home run he just hit, or of that home run as giving birth to the Oakland A's victory in the game. Though, of course, we could speak of Babe Ruth as the father of modern home-run hitting, and of the home runs giving birth to the era of baseball players as superstars. The overall event shape of the target domain limits the applicability of the metaphor.

Recalling Turner's observation about CAUSATION IS PROGENERATION, we therefore hypothesized that EVENTS ARE ACTIONS is constrained in the following way: the action must have the same overall event-shape as the event. What is preserved across the mapping is the causal structure, the aspectual structure, and the persistence of entities. We referred to this as 'generic-level structure'.

The preservation of generic-level structure explained why death is not metaphorized in terms of teaching, or filling the bathtub, or sitting on the sofa. They simply do not have the same causal and overall event structure, that is, they do not share 'generic-level structure.'

Proverbs. In Asian figures – proverbs in the form of short poems – the question arises as to what are the limitations on the interpretation of a proverb. Some interpretations are natural; others seem impossible. Why? Consider the following example from *Asian Figures*, translated by William Merwin.

> Blind
> blames the ditch

To get some sense of the possible range of interpretations for such a proverb, consider the following application of the proverb:

> Suppose a presidential candidate knowingly commits some personal impropriety (though not illegal and not related to political issues) and his candidacy is destroyed by the press's reporting of the impropriety. He blames the press for reporting it, rather than himself for committing it. We think he should have recognized the realities of political press coverage when he chose to commit the impropriety. We express our judgment by saying, 'Blind / blames the ditch.'

Turner and I (1989) observed that the knowledge structure used in comprehending the case of the candidate's impropriety shared certain things with the knowledge structure used in comprehending the literal interpretation of 'Blind / blames the ditch'. That knowledge structure is the following:

- There is a person with an incapacity, namely, blindness.
- He encounters a situation, namely a ditch, in which his incapacity, namely his inability to see the ditch, results in a negative consequence, namely, his falling into the ditch.
- He blames the situation, rather than his own incapacity.
- He should have held himself responsible, not the situation.

This specific knowledge schema about the blind man and the ditch is an instance of a general knowledge schema, in which specific information about the blindness and ditch are absent. Let us refer to it as the 'generic-level schema' that structures our knowledge of the proverb. That generic-level knowledge schema is:

- There is a person with an incapacity.
- He encounters a situation in which his incapacity results in a negative consequence.
- He blames the situation rather than his own incapacity.
- He should have held himself responsible, not the situation.

This is a very general schema characterizing an open-ended category of situations. We can think of it as a variable template that can be filled in in many ways. As it happened, Turner and I were studying this at the time of the Gary Hart scandal, when Hart, a presidential candidate, committed certain sexual improprieties during a campaign, had his candidacy dashed, and then blamed the press for his downfall. Blind / blames the ditch fits this situation. Here's how:

- The person is the presidential candidate.
- His incapacity is his inability to understand the consequences of his personal improprieties.
- The context he encounters is his knowingly committing an impropriety and the press's reporting it.
- The consequence is having his candidacy dashed.
- He blames the press.
- We judge him as being foolish for blaming the press instead of himself.

If we view the generic-level schema as mediating between the proverb 'Blind / blames the ditch' and the story of the candidate's impropriety, we get the following correspondence:

- The blind person corresponds to the presidential candidate.

- His blindness corresponds to his inability to understand the consequences of his personal improprieties.
- Falling into the ditch corresponds to his committing the impropriety and having it reported.
- Being in the ditch corresponds to being out of the running as a candidate.
- Blaming the ditch corresponds to blaming the press coverage.
- Judging the blind man as foolish for blaming the ditch corresponds to judging the candidate as foolish for blaming the press coverage.

This correspondence defines the metaphorical interpretation of the proverb as applied to the candidate's impropriety. Moreover, the class of possible ways of filling in the generic-level schema of the proverb corresponds to the class of possible interpretations of the proverb. Thus, we can explain why 'Blind / blames the ditch' does not mean 'I took a bath' or 'My aunt is sitting on the sofa' or any of the myriad of things the proverb cannot mean.

All the proverbs that Turner and I studied turned out to involve this sort of generic-level schema. And the kinds of things that turned up in such schemas seemed to be pretty much the same in case after case. They include:

- Causal structure.
- Temporal structure.
- Event shape; that is, instantaneous or repeated, completed or open-ended, single or repeating, having fixed stages or not, preserving the existence of entities or not, and so on.
- Purpose structure.
- Modal structure.
- Linear scales.

This is not an exhaustive list. But what it includes are most of the major elements of generic-level structure that we discovered. What is striking to us about this list is that everything on it is, under the Invariance Principle, an aspect of image- schematic structure. In short, if the Invariance Principle is correct, the way to arrive at a generic-level schema for some knowledge structure is to extract its image-schematic structure.

The metaphoric interpretation of such discourse forms as proverbs, fables, allegories, and so on seems to depend on our ability to extract generic-level structure. Turner and I have called the relation between a specific knowledge structure and its generic-level structure the GENERIC IS SPECIFIC metaphor. It is an extremely common mechanism for comprehending the general in terms of the specific.

If the Invariance Principle is correct, then the GENERIC IS SPECIFIC metaphor is a minimal metaphor that maps what the Invariance Principle requires it to and nothing more. Should it turn out to be the case that generic-level structure is exactly image-schematic structure, then the Invariance Principle would have enormous explanatory value. It would obviate the need for a separate characterization of generic-level structure. Instead, it would itself characterize generic-level structure-explaining possible personifications and the possible interpretations for proverbs.

5.3 Analogy

The GENERIC IS SPECIFIC metaphor is used for more than just the interpretation of proverbs. Turner (1991) has suggested that it is also the general mechanism at work in analogic reasoning, and that the Invariance Principle characterizes the class of possible analogies. We can see how this works with the Gary Hart example cited above. We can convert that example into an analogy with the following sentence: Gary Hart was like a blind man who fell into a ditch and blamed the ditch. The mechanism for understanding this analogy makes use of:

- A knowledge schema for the blind man and the ditch
- A knowledge schema concerning Gary Hart
- The GENERIC IS SPECIFIC metaphor

The GENERIC IS SPECIFIC metaphor maps the knowledge schema for the blind man and the ditch into its generic-level schema. The generic-level schema defines an open-ended category of knowledge schemas. The Gary Hart schema is a member of that category, since it fits the generic-level schema given the correspondences stated above.

It appears at present that such analogies use this metaphorical mechanism. But it is common for analogies to use other metaphorical mechanisms as well, for instance, the Great Chain Metaphor and the full range of conventional mappings in the conceptual system. Sentences like *John is a wolf* or *Harry is a pig* use the Great Chain metaphor (see Lakoff & Turner, 1989, ch. 4).

A good example of how the rest of the metaphor system interacts with GENERIC IS SPECIFIC is the well-known example of Glucksberg and Keysar (1993), *My job is a jail*. First, the knowledge schema for a jail includes the knowledge that a jail imposes extreme physical constraints on a prisoner's movements. The GENERIC IS SPECIFIC metaphor preserves the image-schematic structure of the knowledge schema, factoring out the specific details of the prisoner and the jail: X imposes extreme physical constraints on Y's movements. But now two additional conventional metaphors apply to this generic-level schema: the Event Structure Metaphor, with the submetaphor ACTIONS ARE SELF-PROPELLED MOVEMENTS, and PSYCHOLOGICAL FORCE IS PHYSICAL FORCE. These metaphors map 'X imposes extreme physical constraints on Y's movements' into 'X imposes extreme psychological constraints on Y's actions'. The statement *My job is a jail* imposes an interpretation in which X = my job and Y = me, and hence yields the knowledge that 'my job imposes extreme psychological constraints on my actions'. Thus, the mechanism for understanding My job is a jail uses very common, independently existing metaphors: GENERIC IS SPECIFIC, PSYCHOLOGICAL FORCE IS PHYSICAL FORCE, and The Event Structure Metaphor.

5.4 The Glucksberg-Keysar claim

I mention this example because of the claim by Glucksberg and Keysar (1993) that metaphor is simply a matter of categorization. However, in personal correspondence Glucksberg has written, 'We assume that people can judge and can also infer that certain basic level entities, such as 'jails' typify or are emblematic of a metaphoric attributive category such as situations that are confining, unpleasant, etc.'. Glucksberg and Keysar give no theory of how it is possible to have such a metaphoric attributive category – that is, how it is possible for one kind of thing (a general situation) to be metaphorically categorized in terms of a fundamentally spatial notion like 'confining'. Since Glucksberg is not in the business of describing the nature of conceptual systems, he does not see it as his job to give such an account. I have argued in this paper that the general principle governing such cases is the Event Structure Metaphor. If such a metaphor exists in our conceptual system, then Glucksberg's 'jail' example is accounted for automatically and his categorization theory is not needed. Indeed, the category he needs – 'situations that are confining, unpleasant, etc.' – is a 'metaphoric attributive category'. That is, to get the appropriate categories in their categorization theory of metaphor he needs an account of metaphor. But given such an account of metaphor, their metaphor-as-categorization theory becomes unnecessary.

Even worse for the Glucksberg-Keysar theory, it cannot account for either everyday conceptual metaphor of the sort we have been discussing or for really rich poetic metaphor, such as one finds in the works of, say, Dylan Thomas, or for image-metaphor of the sort common in the examples cited above from the Sanskrit, Navaho and surrealist traditions. Since it does not even attempt to deal with most of the data covered by the contemporary theory of metaphor, it cannot account for 'how metaphor works'.

5.5 More on novel metaphor

At the time most of the papers in this volume were written (the late 1970's), 'metaphor' was taken to mean 'novel metaphor', since the huge system of conventional metaphor had barely been noticed. For that reason, the authors never took up the question of how the system of conventional metaphor functions in the interpretation of novel metaphor. We have just seen one such example. Let us consider some others.

As common as novel metaphor is, its occurrence is rare by comparison with conventional metaphor, which occurs in most of the sentences we utter. Our everyday metaphor system, which we use to understand concepts as commonplace as TIME, STATE, CHANGE, CAUSATION, PURPOSE, etc. is constantly active, and is used maximally in interpreting novel metaphorical uses of language. The problem with all the older research on novel metaphor is that it completely missed the major contribution played by the conventional system.

As Turner and I discussed in detail (Lakoff & Turner, 1989), there are three basic mechanisms for interpreting linguistic expressions as novel metaphors: extensions of conventional metaphors, generic-level metaphors and image-metaphors. Most interesting poetic metaphor uses all of these superimposed on one another. Let us begin with examples of extensions of conventional metaphors. Dante begins the *Divine Comedy*:

> In the middle of life's road
> I found myself in a dark wood.

'Life's road' evokes the domain of life and the domain of travel, and hence the conventional LIFE IS A JOURNEY metaphor that links them. 'I found myself in a dark wood' evokes the knowledge that if it's dark you cannot see which way to go. This evokes the domain of seeing, and thus the conventional metaphor that KNOWING IS SEEING, as in expressions like 'I see what you're getting at', 'His claims aren't clear', 'The passage is opaque', etc. This entails that the speaker doesn't know which way to go. Since the LIFE IS A JOURNEY metaphor specifies destinations are life goals, it is entailed that the speaker does not know what life goals to pursue, that is, he is without direction in his life. All of this uses nothing but the system of conventional metaphor, ordinary knowledge structure evoked by the conventional meaning of the sentence, and metaphorical inferences based on that knowledge structure.

Another equally simple case of the use of the conventional system is Robert Frost's:

> Two roads diverged in a wood, and I –
> I took the one less traveled by,
> And that has made all the difference.

Since Frost's language often does not overtly signal that the poem is to be taken metaphorically, incompetent English teachers occasionally teach Frost as if he were a nature poet, simply describing scenes. (I have actually had students whose high school teachers taught them that!) Thus, this passage could be read nonmetaphorically as being just about a trip on which one encounters a crossroads. There is nothing in the sentences themselves that forces one to a metaphorical interpretation. But, since it is about travel and encountering crossroads, it evokes a knowledge of journeys. This activates the system of conventional metaphor we have just discussed, in which long-term, purposeful activities are understood as journeys, and further, how life and careers can also be understood as one-person journeys (love relationships, involving two travelers, are ruled out here). The poem is typically taken as being about life and a choice of life goals, though it might also be interpreted as being about careers and career paths, or about some long-term, purposeful activity. All that is needed to get the requisite range of interpretations is the structure of conventional metaphors discussed above, and the knowledge structure evoked by the poem. The conventional mapping will apply to the knowledge structure yielding the appropriate inferences. No special mechanisms are needed.

5.6 Searle's theory

At this point I will leave off discussion of other more complex poetic examples, since they require lengthy discussion and since such discussion can be found in Lakoff and Turner (1989), Turner (1987), and Turner (1991). Instead, I will confine myself to discussing three examples from John Searle's chapter (1993). Consider first Disraeli's remark, 'I have climbed to the top of the greasy pole'.

This could be taken nonmetaphorically, but its most likely metaphorical interpretation is via the CAREER IS A JOURNEY metaphor. This metaphor is evoked jointly by source domain knowledge about pole-climbing (which is effortful, self-propelled, destination-oriented motion upward) and knowledge that the metaphor involves effortful, self-propelled, destination-oriented motion upward. Part of the knowledge evoked is that the speaker is as high as he can get on that particular pole, that the pole was difficult to climb, that the climb probably involved backwards motion, that it is difficult for someone to stay at the top of a greasy pole, and that he will most likely slide down again. The CAREER IS A JOURNEY metaphor maps this knowledge onto corresponding knowledge about the speaker's career: the speaker has as much status as he or she can get in that particular career, that it was difficult to get to that point in the career, that it probably involved some temporary loss of status along the way, that it is difficult to maintain this position, and that he or she will probably lose status before long. All this follows with nothing more than the conventional career-as-journey mapping, which we all share as part of our metaphorical systems, plus knowledge about climbing greasy poles.

The second example of Searle's I will consider is 'Sally is a block of ice'. Here there is a conventional metaphor that AFFECTION IS WARMTH, as in ordinary sentences like 'She's a warm person', 'He was cool to me', etc. 'A block of ice' evokes the domain of temperature, and, since it is predicated of a person, it also evokes knowledge of what a person can be. Jointly, both kinds of knowledge activate AFFECTION IS WARMTH. Since 'a block of ice' is something that is very cold and not able to become warm quickly or easily, this knowledge is mapped onto Sally as being unaffectionate and not being able to become affectionate quickly or easily. Again, common knowledge and a conventional metaphor that we all have is all that is needed.

Finally, Searle discusses 'The hours crept by as we waited for the plane'. Here we have a verb of motion predicated of a time expression; the former activates the knowledge about motion through space and the latter activates the time domain. Jointly, they activate the time-as-moving-object mapping. Again the meaning of the sentence follows only from everyday knowledge and the everyday system of metaphorical mappings.

Searle accounts for such cases by his Principle 4, which says that 'we just do perceive a connection' which is the basis of the interpretation. This is vague and doesn't say what the perceived connection is or why we 'just do' perceive it. When we spell out the details of all such 'perceived connections', they turn out to be the system of conceptual metaphors that I have been describing. But given that system, Searle's theory and his principles become unnecessary.

In addition, Searle's account of literal meaning makes most of the usual false assumptions that accompany that term. Searle assumes that all everyday, conventional language is literal and not metaphorical. He would thus rule out every example of conventional metaphor that is described not only in this paper, but in the whole literature of the field.

The study of the metaphorical subsystem of our conceptual system is a central part of synchronic linguistics. The reason is that much of our semantic system, that is, our system of concepts, is metaphorical, as we saw above. It is because this huge system went unnoticed prior to 1980 that authors like Searle, Sadock, and Morgan could claim that metaphor was outside of synchronic linguistics and in the domain of principles of language use.

6 The experiential basis of metaphor

The conceptual system underlying a language contains thousands of conceptual metaphors – conventional mappings from one domain to another, such as the Event Structure Metaphor. The novel metaphors of a language are, except for image metaphors, extensions of this large conventional system.

Perhaps the deepest question that any theory of metaphor must answer is this: why do we have the conventional metaphors that we have? Or alternatively: is there any reason why conceptual systems contain one set of metaphorical mappings rather than another? There do appear to be answers to these questions for many of the mappings found so far, though they are in the realm of plausible accounts, rather than in the realm of scientific results.

Take a simple case: the MORE IS UP metaphor, as seen in expressions like: *Prices rose. His income went down. Unemployment is up. Exports are down. The number of homeless people is very high.*

There are other languages in which MORE IS UP and LESS IS DOWN, but none in which the reverse is true, where MORE IS DOWN and LESS IS UP. Why not? Contemporary theory postulates that the MORE IS UP metaphor is *grounded in experience* – in the common experiences of pouring more fluid into a container and seeing the level go up, or adding more things to a pile and seeing the pile get higher. These are thoroughly pervasive experiences; we experience them every day of our lives. They have structure – a correspondence between the conceptual domain of quantity and the conceptual domain of verticality: MORE corresponds in such experiences to UP and LESS corresponds to DOWN. These correspondences in real experience form the basis for the correspondence in the metaphorical cases, which go beyond the cases in real experience: in *Prices rose* there is no correspondence in real experience between quantity and verticality, but understanding quantity in terms of verticality makes sense because of the existence of a regular correspondence in so many other cases.

Consider another case. What is the basis of the widespread KNOWING IS SEEING metaphor, as in expressions like: *I see what your saying. His answer was clear. This paragraph is murky. He was so blinded by ambition that he never noticed his limitations*?

The experiential basis in this case is the fact that most of what we know comes through vision, and that in the overwhelming majority of cases, if we see something, then we know it is true.

Consider still another case: why, in the Event Structure Metaphor, is achieving a purpose understood as reaching a destination (in the location subsystem) and as acquiring a desired object (in the object subsystem)? The answer again seems to be correspondences in everyday experience. To achieve most of our everyday purposes, we either have to move to some destination or acquire some object. If you want a drink of water, you've got to go to the water fountain. If you want to be in the sunshine, you have to move to where the sunshine is. And if you want to write down a note, you've got to get a pen or pencil. The correspondences between achieving purposes and either reaching destinations or acquiring objects is so utterly common in our everyday existence, that the resulting metaphor is completely natural.

But what about the experiential basis of A PURPOSEFUL LIFE IS A JOURNEY? Recall that the mapping is in an inheritance hierarchy, where life goals are special cases of purposes, which are destinations in the event structure metaphor. Thus, A PURPOSEFUL LIFE IS A JOURNEY inherits the experiential basis of PURPOSES ARE DESTINATIONS. Thus, inheritance hierarchies provide *indirect experiential bases*, in that a metaphorical mapping lower in a hierarchy can inherit its experiential basis indirectly from a mapping higher in the hierarchy.

Experiential bases motivate metaphors, they do not predict them. Thus, not every language has a MORE IS UP metaphor, though all human beings experience a correspondence between MORE and UP. What this experiential basis does predict is that no language will have the opposite metaphor LESS IS UP. It also predicts that a speaker of language that does not have that metaphor will be able to learn that metaphor much more easily than its reverse.

6.1 Realizations of metaphor

Consider objects like thermometers and stock market graphs, where increases in temperature and prices are represented as being up and decreases as being down. These are objects created by humans to accord with the MORE IS UP metaphor. They exhibit a correlation between MORE and UP and are much easier to read and understand than if they contradicted the metaphor, if, say, increases were represented as down and decreases as up. Such objects are ways in which metaphors impose a structure on real life, through the creation of new correspondences in experience. And once created in one generation, they serve as an experiential basis for that metaphor in the next generation.

There are a great many ways in which conventional metaphors can be made real. Metaphors can be realized in obvious imaginative products such as cartoons, literary works, dreams, visions, and myths. But metaphors can be made real in less obvious ways as well, in physical symptoms, social institutions, social practices, laws, and even foreign policy and forms of discourse and of history.

Let us consider some examples.

Cartoons. Conventional metaphors are made real in cartoons. A common example is the realization of the ANGER IS A HOT FLUID IN A CONTAINER metaphor, in which one can be 'boiling mad' or 'letting off steam'. In cartoons, anger is commonly depicted by having steam coming out the character's ears. Social clumsiness is indicated by having a cartoon character 'fall on his face'.

Literary works. It is common for the plot of novel to be a realization of the PURPOSEFUL LIFE IS A JOURNEY metaphor, where the course of a life takes the form of an actual journey. *The Pilgrim's Progress* is a classical example.

Rituals. Consider the cultural ritual in which a newborn baby is carried upstairs to ensure his or her success. The metaphor realized in this ritual is STATUS IS UP, exemplified by sentences such as: *He clawed his way to the top. He climbed the ladder of success. You'll rise in the world*.

Dream Interpretation. Conceptual metaphors constitute the vocabulary of dream interpretation. The collection of our everyday conceptual metaphors make dream interpretations possible. Consider one of the most celebrated of all dream interpretations, Joseph's interpretation of Pharaoh's dream from Genesis. In Pharaoh's dream, he is standing on the river bank, when seven fat cows come out of the river, followed by seven lean cows that eat the seven fat ones and still remain lean. Then Pharaoh dreams again. This time he sees seven 'full and good' ears of corn growing, and then seven withered ears growing after them. The withered ears devour the good ears. Joseph interprets the two dreams as a single dream. The seven fat cows and full ears are good years and the seven lean cows and withered ears are famine years that follow the good years. The famine years devour what the good years produce. This interpretation makes sense to us because of a collection of conceptual metaphors in our conceptual system – metaphors that have been with us since Biblical times. The first metaphor used is: TIMES ARE MOVING ENTITIES. A river is a common metaphor for the flow of time; the cows are individual entities (years) emerging from the flow of time and moving past the observer; the ears of corn are also entities that come into the scene. The second metaphor used is ACHIEVING A PURPOSE IS EATING, where being fat indicates success, being lean indicates failure. This metaphor is combined with the most common of metonymies: A PART STANDS FOR THE WHOLE. Since cows and corn were typical of meat and grain eaten, each single cow stands for all the cows raised in a year and each ear of corn for all the corn grown in a year. The final metaphor used is: RESOURCES ARE FOOD, where using up resources is eating food. The devouring of the good years by the famine years is interpreted as indicating that all the surplus resources of the good years will be used up by the famine years. The interpretation of the whole dream is thus a composition of three conventional metaphors and one metonymy. The metaphoric and metonymic sources are combined to form the reality of the dream.

Myths. In the Event Structure metaphor, there is a submapping EXTERNAL EVENTS ARE LARGE, MOVING OBJECTS that can exerted a force upon you and thereby effect whether you achieve your goals. In English the special cases of such objects are things, fluids, and horses. Pamela Morgan (in unpublished work) has observed that in Greek Mythology, Poseidon is the god of the sea, earthquakes, horses and bulls. The list might seem arbitrary, but Morgan observes that these are all large moving objects that can exert a force on you. Morgan surmises that this is not an obvious list. The sea, earthquakes, horses, and bulls are all large moving objects that can exert a significant force. Poseidon, she surmises, should really be seen as the god of external events.

Physical symptoms. The unconscious mind makes use our unconscious system of conventional metaphor, sometimes to express psychological states in terms of physical symptoms. For example, in the Event Structure metaphor, there is a submapping DIFFICULTIES ARE IMPEDIMENTS TO MOTION which has, as a special case, DIFFICULTIES ARE BURDENS. It is fairly common for someone encountering difficulties to walk with his shoulders stooped, as if 'carrying a heavy weight' that is 'burdening' him.

Social institutions. We have a TIME IS MONEY metaphor, shown by expressions like *He's wasting time; I have to budget my time; This will save you time; I' ve invested a lot of time in that; He doesn't use his time profitably*. This metaphor came into English about the time of the industrial revolution, when people started to be paid for work by the amount of time they put in. Thus, the factory led to the institutional pairing of periods of time with amounts of money, which formed the experiential basis of this metaphor. Since then, the metaphor has been realized in many other ways. The budgeting of time has spread throughout American culture.

Social practices. There is conceptual metaphor that SEEING IS TOUCHING, where the eyes are limbs and vision is achieved when the object seen is 'touched'.

Examples are: *My eyes picked out every detail of the pattern. He ran his eyes over the walls. He couldn't take his eyes off of her. Their eyes met. His eyes are glued to the TV*. The metaphor is made real in the social practice of avoiding eye 'contact' on the street, and in the social prohibition against 'undressing someone with your eyes'.

Laws. Law is a major area where metaphor is made real. For example, CORPORATIONS ARE PERSONS is a tenet of American law, which not only enables corporations to be harmed and assigned responsibility so that they can be sued when liable, but also gives corporations certain First Amendment rights.

Foreign policy. A STATE IS A PERSON is one of the major metaphors underlying foreign policy concepts. Thus, there are 'friendly' states, 'hostile' states, etc. Health for a state is economic health and strength is military strength. Thus a threat to economic 'health' can be seen as a death threat, as when Iraq was seen to have a 'stranglehold' on the economic lifeline of the U.S. Strong states are seen as male, and weak states as female, so that an attack by a strong state on a weak state can be seen as a 'rape', as in the rape of Kuwait by Iraq. A 'just war' is conceptualized as a fairy tale with villain, victim, and hero, where the villain attacks the victim and the hero rescues the victim. Thus, the United States and allies in the Gulf War were portrayed as having 'rescued' Kuwait. As President Bush said in his address to Congress, 'The issues couldn't have been clearer: Iraq was the villain and Kuwait, the victim'.

Forms of discourse. Common metaphors are often made real in discourse forms. Consider three common academic discourse forms: the Guided Tour, the Heroic Battle, and the Heroic Quest. The Guided Tour is based on the metaphor that THOUGHT IS MOTION, where ideas are locations and one reasons 'step-by-step', 'reaches conclusions', or you fail to reach a conclusion if you are engaged in 'circular reasoning'.

Communication in this metaphor is giving someone a guided tour of some rational argument or of some 'intellectual terrain'. This essay is an example of such a guided tour, where I, the author, am the tour guide who is assumed to be thoroughly familiar with the terrain, and where the terrain surveyed is taken as objectively real. The discourse form of the Heroic Battle is based on the metaphor that ARGUMENT IS WAR. The author's theory is the hero, the opposing theory is the villain, and words are weapons. The battle is in the form of an argument defending the hero's position and demolishing that of the villain. The Heroic Quest discourse form is based on the metaphor that knowledge is a valuable but elusive object that can be 'discovered' if one perseveres. The scientist is the hero on a quest for knowledge, and the discourse form is an account of his difficult journey of discovery. What is 'discovered' is, of course, a real entity.

What makes all of these cases realizations of metaphors is that in each case there is something real structured by conventional metaphor, and thereby made comprehensible, or even natural. What is real differs in each case: an object like a thermometer or graph, an experience like a dream, an action like a ritual, a form of discourse, and so forth. These examples reveal that much of what is real in a society or in the experience of an individual is structured and made sense of via conventional metaphor.

Experiential bases and realizations of metaphors are two sides of the same coin: they are both correlations in real experience that have the same structure as the correlations in metaphors. The difference is that experiential bases precede, ground, and make sense of conventional metaphorical mappings, whereas realizations follow, and are made sense of, via the conventional metaphors. And as we noted above, one generation's realizations of a metaphor can become part of the next generation's experiential basis for that metaphor.

7 Summary of results

As we have seen, the contemporary theory of metaphor is revolutionary in many respects. To give you some idea of how revolutionary, here is a list of the basic results that differ from most previous accounts.

7.1 The nature of metaphor

- Metaphor is the main mechanism through which we comprehend abstract concepts and perform abstract reasoning.
- Much subject matter, from the most mundane to the most abstruse scientific theories, can only be comprehended via metaphor.
- Metaphor is fundamentally conceptual, not linguistic, in nature.
- Metaphorical language is a surface manifestation of conceptual metaphor.
- Though much of our conceptual system is metaphorical, a significant part of it is nonmetaphorical. Metaphorical understanding is grounded in nonmetaphorical understanding.

- Metaphor allows us to understand a relatively abstract or inherently unstructured subject matter in terms of a more concrete, or at least a more highly structured subject matter.

7.2 The structure of metaphor

- Metaphors are mappings across conceptual domains.
- Such mappings are asymmetric and partial.
- Each mapping is a fixed set of ontological correspondences between entities in a source domain and entities in a target domain.
- When those fixed correspondences are activated, mappings can project source domain inference patterns onto target domain inference patterns.
- Metaphorical mappings obey the Invariance Principle: The image-schema structure of the source domain is projected onto the target domain in a way that is consistent with inherent target domain structure.
- Mappings are not arbitrary, but grounded in the body and in everyday experience and knowledge.
- A conceptual system contains thousands of conventional metaphorical mappings, which form a highly structured subsystem of the conceptual system.
- There are two types of mappings: conceptual mappings and image-mappings; both obey the Invariance Principle.

7.3 Some aspects of metaphor

- The system of conventional conceptual metaphor is mostly unconscious, automatic, and is used with no noticeable effort, just like our linguistic system and the rest of our conceptual system.
- Our system of conventional metaphor is alive in the same sense that our system of grammatical and phonological rules is alive; namely, it is constantly in use, automatically and below the level of consciousness.
- Our metaphor system is central to our understanding of experience and to the way we act on that understanding.
- Conventional mappings are static correspondences, and are not, in themselves, algorithmic in nature. However, this by no means rules out the possibility that such static correspondences might be used in language processing that involves sequential steps.
- Metaphor is mostly based on correspondences in our experiences, rather than on similarity.
- The metaphor system plays a major role in both the grammar and lexicon of a language.
- Metaphorical mappings vary in universality; some seem to be universal, others are widespread, and some seem to be culture-specific.

- Poetic metaphor is, for the most part, an extension of our everyday, conventional system of metaphorical thought.

These are the conclusions that best fit the empirical studies of metaphor conducted over the past decade or so. Though much of it is inconsistent with traditional views, it is by no means all new, and some ideas –for example, that abstract concepts are comprehended in terms of concrete concepts – have a long history.

8 Concluding remarks

The evidence supporting the contemporary theory of metaphor is voluminous and grows larger each year as more research in the field is done. The evidence, as we saw above, comes from five domains:

Generalizations over polysemy
Generalization over inference patterns
Generalizations over extensions to poetic cases
Generalizations over semantic change
Psycholinguistic experiments

I have discussed only a handful of examples of the first three of these, enough, I hope, to make the reader curious about the field.

Evidence is convincing, however, only if it can count as evidence. When does evidence fail to be evidence? Unfortunately, all too often. It is commonly the case that certain fields of inquiry are defined by assumptions that rule out the possibility of counterevidence. When a defining assumption of a field comes up against evidence, the evidence usually loses: the practitioners of the field must ignore the evidence if they want to keep the assumptions that define the field they are committed to.

Part of what makes the contemporary theory of metaphor so interesting is that the evidence for it contradicts the defining assumptions of so many academic disciplines. In my opinion, this should make one doubt the defining assumptions of all those disciplines. The reason is this: the defining assumptions of the contemporary theory of metaphor are minimal. There are only two.

1 The generalization commitment: to seek generalizations in all areas of language, including polysemy, patterns of inference, novel metaphor, and semantic change.

2 The cognitive commitment: to take experimental evidence seriously.

But these are nothing more than commitments to the scientific study of language and the mind. No initial commitment is made as to the form of an answer to the question of what is metaphor.

The defining assumptions of other fields do, however, often entail a commitment about the form of an answer to that question. It is useful, in an interdisciplinary volume of this sort, to spell out exactly what those defining assumptions are, since they will often explain why different authors reach such different conclusions about the nature of metaphor.

8.1 Literal meaning commitments

I started this chapter with a list of the false assumptions about literal meaning that are commonly made. These assumptions are 'false' only relative to the kinds of evidence that supports the contemporary theory of metaphor. If one ignores all such evidence, the assumptions can be maintained without contradiction.

Assumptions about literality are the locus of many of the contradictions between the contemporary theory of metaphor and various academic disciplines. Let us review those assumptions. In the discussion of literal meaning given above, I observed that it is taken as definitional that what is literal is not metaphorical. The 'false assumptions and conclusions' that usually accompany the word 'literal' are:

- All everyday conventional language is literal, and none is metaphorical.
- All subject matter can be comprehended literally, without metaphor.
- Only literal language can be contingently true or false.
- All definitions given in the lexicon of a language are literal, not metaphorical.
- The concepts used in the grammar of a language are all literal; none are metaphorical.

We will begin with the philosophy of language. The Generalization Commitment and the Cognitive Commitment are not definitional to the philosophy of language. Indeed, most philosophers of language would feel no need to abide by them, for a very good reason. The philosophy of language is typically not seen as an empirical discipline, constrained by empirical results, such as those that arise by the application of the Generalization and Cognitive Commitments. Instead, the philosophy of language is usually seen as an a priori discipline, one which can be pursued using the tools of philosophical analysis alone, rather than the tools of empirical research. Therefore, all the evidence that has been brought forth for the contemporary theory of metaphor simply will not matter for most philosophers of language.

In addition, the philosophy of language comes with its own set of defining assumptions, which entail many of the false assumptions usually associated with the word 'literal'. Most practitioners of the philosophy of language usually make one or more of the following assumptions.

- The correspondence theory of truth.
- Meaning is defined in terms of reference and truth.
- Natural language semantics is to be characterized by the mechanisms of mathematical logic, including model theory.

The very field of philosophy of language comes with defining assumptions that contradict the main conclusions of the contemporary theory of metaphor. Consequently, we can see why most philosophers of language have the range of views on metaphor that they have: they accept the traditional literal-figurative distinction. They may, like Davidson (1981), say that there is no metaphorical meaning, and that most metaphorical utterances are either trivially true or trivially false. Or, like Grice (1989, p. 34) and Searle (1993), they will assume that metaphor is in the realm of pragmatics, that is, that a metaphorical meaning is no more than the literal meaning of some other sentence which can be arrived at by some pragmatic principle. This is required, since the only real meaning for them is literal meaning, and pragmatic principles are those principles that allow one to say one thing (with a literal meaning) and mean something else (with a different, but nonetheless literal, meaning).

Much of generative linguistics accepts one or more of these assumptions from the philosophy of language. The field of formal semantics accepts them all, and thus formal semantics, by its defining assumptions, is at odds with the contemporary theory of metaphor. Formal semantics simply does not see it as its job to account for the generalizations discussed in this paper. From the perspective of formal semantics, the phenomena that the contemporary theory of metaphor is concerned with are either nonexistent or uninteresting, since they lie outside the purview of the discipline. Thus Jerrold Sadock (1993) claims that metaphor lies outside of synchronic linguistics. Since he accepts mathematical logic as the correct approach to natural language semantics, Sadock must see metaphor as being outside of semantics proper. He must, therefore, also reject the entire enterprise of the contemporary theory of metaphor. And Morgan (1993), also accepting those defining assumptions of the philosophy of language, agrees with Grice and Searle that metaphor is a matter of pragmatics.

Chomsky's (1981) theory of government and binding also accepts crucial assumptions from the philosophy of language that are inconsistent with the contemporary theory of metaphor. Government and binding, following my early theory of generative semantics, assumes that semantics is to be represented in terms of logical form. Government and binding, like generative semantics, thus rules out the very possibility that metaphor might be part of natural language semantics as it enters into grammar. Because of this defining assumption, I would not expect government and binding theorists to become concerned with the phenomena covered by the contemporary theory of metaphor.

It is interesting that much of continental philosophy and deconstructionism is also characterized by defining assumptions that are at odds with the contemporary theory of metaphor. Nietzsche (see, Johnson, 1981) held that all language is metaphorical, which is at odds with those results that indicate that a significant amount of everyday language is not metaphorical. Much of continental philosophy, observing that conceptual systems change through time, assumes that conceptual systems are purely historically contingent, that there are no conceptual universals. Though conceptual systems do change through time, there do, however, appear to be universal, or at least very widespread, conceptual metaphors. The event structure metaphor is my present candidate for a metaphorical universal.

Continental philosophy also comes with a distinction between the study of the physical world, which can be scientific, and the study of human beings, which it says cannot be scientific. This is very much at odds with the conceptual theory of metaphor, which is very much a scientific enterprise.

Finally, the contemporary theory of metaphor is at odds with certain traditions in symbolic artificial intelligence and information processing psychology. Those fields assume that thought is a matter of algorithmic symbol manipulation, of the sort done by a traditional computer program. This defining assumption is inconsistent with the contemporary theory of metaphor in two respects.

First, the contemporary theory has an image-schematic basis. The Invariance Principle both applies to image metaphors and characterizes constraints on novel metaphor. Since symbol manipulation systems cannot handle image-schemas, they cannot deal with image metaphors or imageable idioms.

Second, those traditions must characterize metaphorical mapping as an algorithmic process, which typically takes literal meanings as input and gives a metaphorical reading as output. This is at odds with cases where there are multiple, overlapping metaphors in a single sentence, and which require the simultaneous activation of a number of metaphorical mappings.

The contemporary theory of metaphor is thus not only interesting for its own sake. It is especially interesting for the challenge it presents to other disciplines. If the results of the contemporary theory are accepted, the defining assumptions of whole disciplines are brought into question.

Note

This research was supported in part by grants from the Sloan Foundation and the National Science Foundation (IRI-8703202) to the University of California at Berkeley.

The following colleagues and students helped with this paper in a variety of ways, from useful comments to allowing me to cite their research: Ken Baldwin, Claudia Brugman, Jane Espenson, Sharon Fischler, Ray Gibbs, Adele Goldberg, Mark Johnson, Karin Myhre, Eve Sweetser, and Mark Turner.

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11 A typology of motivation for conceptual metaphor: correlation vs. resemblance

Joseph E. Grady

1 Conceptual metaphors and experiential motivation

One of the most basic principles of the theory of metaphor outlined by Lakoff and Johnson in *Metaphors we live by* (1980) is that there are conventional metaphoric associations, or mappings, between some concepts, but not between others. For instance, emotional unresponsiveness is mapped onto coldness in the domain of temperatures, but not onto warmth, and not onto any number of properties in other domains, such as width, monetary value, or innateness.

So, for instance, we say that an unsympathetic person has a *cold* and unfeeling demeanor, but not a *wide* and unfeeling demeanor or a *precious* and unfeeling demeanor.

(1) a. He has a very cold and unfeeling demeanor.
b. ? He has a very warm and unfeeling demeanor.
c. ? He has a very wide and unfeeling demeanor.
d. ? He has a very precious and unfeeling demeanor.

Unlike 1a, examples 1b-d are difficult to interpret as statements about an individual's temperament. Speaking more generally, it is often the case that a given pairing of concepts invokes no conventional or easily determined metaphoric mapping. The following example from Mark Turner's *Reading Minds* (1991, p. 154) illustrates this point.

(2) ? The moon is a monkey wrench.

Although we could probably find a way to impose meaning on this statement (as Turner does), the interpretation would hardly be predictable, and would demand a good deal of creativity.

If there is one set of figurative correspondences which is conventional, and is manifested in numerous linguistic expressions, and another set of pairings which do not have this status, then cognitive linguists should be concerned with finding the principles which cause some metaphors to be in the conceptual repertoire, and others not to be. Unless this distinction is arbitrary, it should be possible to account for it.

Table 1 lists some examples of conventional metaphors, which underlie various linguistic examples, and also some unconventional pairings of concepts, which are difficult to make sense of.

Table 1 Conventional and unconventional metaphoric pairings

Conventional	**Unconventional**
NORMAL IS STRAIGHT	NORMAL IS LARGE
SIGNIFICANT IS LARGE	SIGNIFICANT IS TASTY
PLEASING IS TASTY	PLEASING IS HEAVY
DIFFICULT IS HEAVY	DIFFICULT IS STRAIGHT

There are various kinds of evidence which show that the distinction is not entirely arbitrary – that is, not simply a matter of historical accident. For instance, the recurrence of the same metaphoric patterns across broad samples of unrelated languages argues against the view that the conventionality of particular metaphors is arbitrary. The examples in 3 illustrate one such pattern:

(3) Zulu –*khulu* «big; important»
Hawaiian *nui* 'big; important'
Turkish *büyük* 'big; important'
Malay *besar* 'big; important'
Russian *krupnij* 'big; important'

In each of these languages, a term which literally refers to physical size may also refer metaphorically to degree of importance. This is a conceptualization with very wide crosslinguistic distribution.

If there is a principle behind the conventionalization of certain metaphors, that principle must logically be due to either something about the human organism – for instance, the metaphoric correspondences are innate and hardwired into our cerebral structure – or the patterns must arise from something about our experiences, or possibly both. Presumably, even a cause which lies in the realm of our experiences must relate in some way to the structures of our brains and bodies, since these structures constrain our experiences so definitively. The recurrence of particular metaphorical patterns across cultures is so striking that any experiences which could give rise to these metaphors must be fundamental to human life in general, rather than based on any particular, local, culturally bound types of experience.

Metaphor researchers such as Lakoff, Johnson, Sweetser, Turner, Gibbs and Brugman have been unanimous in invoking the principle of 'experiential motivation' rather than arguing that metaphors are arbitrary or innate. This position contrasts sharply with other theories of metaphor. A striking statement of an opposing viewpoint is Searle's argument that coldness 'just is' associated with being unemotional:

(4) I think the only answer to the question, 'what is the relation between cold things and unemotional people that would justify the use of 'cold' as a metaphor for lack of emotion?' is simply that as a matter of perceptions, sensibilities, and linguistic practices, people find the notion of coldness associated in their minds with lack of emotion. The notion of being cold just is associated with being unemotional. (Searle, 1979, p. 267)

Searle appears to dismiss the enterprise of trying to find motivations for metaphors, and even the idea that there is any principled reason why some metaphorical conceptualizations arise and make sense to us while others do not.

By contrast, I cite the following passage from Lakoff and Johnson (1980) as a concise statement of the position on experiential motivation within the theory of conceptual metaphor: 'We feel that no metaphor can ever be comprehended or even adequately represented independently of its experiential basis....' (Lakoff & Johnson, 1980, p. 19). The typical example of experiential motivation referred to in conceptual metaphor literature is the grounding for MORE IS UP (e.g., 'Drunk driving arrests are *up* this year'). In this case, the motivation is a straightforward correlation between the two concepts: as objects or substances accumulate in greater quantities, their level often rises – consider for instance the top of a stack or the level of fluid in a container.

2 Death is a thief

Many other metaphors cited in the literature, however, are much harder to account for in terms of such simple correlations as the one between quantity and vertical elevation. This observation has been one of the motivations for the development of the theory of 'primary metaphors', which holds that certain basic, low-level metaphorical correspondences have a privileged status, and are the bases for other metaphorical expressions and conceptualizations (Grady et al., 1996; Grady, 1997a, etc.).[1] These basic conceptual associations, which are excellent predictors of how and whether linguistic data may be interpreted, are also the metaphors which are most clearly grounded in aspects of our experience (Grady, 1997b).

As an example of a metaphor which is not primary in this sense, consider DEATH IS A THIEF, discussed by Mark Turner in *Reading Minds*.

(5) [D]eath robbed him of his life. (Turner, 1991, p. 174)

This metaphor, unlike MORE IS UP, is not based on any common aspect of our experience. There is certainly no recurring scene we all experience involving both death and a thief. In fact, many of us who understand the metaphor may have no direct experience whatsoever with thieves, and even our indirect experience of them, e.g. in books and films, would not motivate a tight association between thieves and death – they are most closely associated with stealing, not murder.

An additional fact which will be relevant to us about this metaphor is that the sentences and expressions which it appears to motivate are extremely similar to expressions about target concepts other than death. In fact, anything which we greatly appreciate – such as our own experiences of hope, happiness, comfort, etc. – can be metaphorically 'robbed' from us, just as life can. Whatever causes us to metaphorically lose these valued elements of our experience can be cast as a thief:

(6) a. All hope and comfort have been robbed from me in this awful place.
b. He broke her heart and stole her happiness.

In each of these cases it seems that the thief as an entire person is not relevant – instead it is merely the thief as the entity responsible for our loss that figures in the mapping. For this reason, expressions like the following are very difficult to interpret.

(7) a. ? Worry has robbed me of my peace of mind, and he [i.e. Worry] is tall.
b. ? A lifetime of poverty has robbed her of her hopes and dreams, and it [i.e. the lifetime of poverty] is fatigued.

Clearly, the metaphorical conceptualization of these situations which allows us to speak of 'thieves' and 'robbing' does not involve a rich understanding of the thief as an individual with physical characteristics, feelings, and so forth. Of course we are capable of enriching our figurative image of Death-as-Thief with any degree of detail, including his physical appearance; but the conventional mapping does not include such elements.[2]

In the simpler, conventional mapping the thief is merely the agent of loss. Note that primary metaphors like DIFFICULT IS HEAVY and PLEASING IS TASTY do *not* involve this sort of very partial projection. In these cases virtually any lexical item which refers to the source concept can refer metaphorically to the target concept, yielding an expression which is interpretable according to the given conceptual pattern even if it is lexically unconventional – a *delicious* idea, a *succulent* idea, a *weighty* task, a *ten-ton* task. That is, while these mappings are very schematic, they are relatively exhaustive within their limited range. As 7 illustrates, the same cannot be said of DEATH IS A THIEF. Since the mapping between thieves and agents of unwanted change is so selective, or to put it more strongly, so narrowly restricted, we are better justified in stating the mapping at the level of the projections which actually occur.

From the considerations above we can conclude that possession is the key metaphorical concept here – abstract entities which we value are understood as prized possessions, and whatever causes us to lose those things fits into this conceptualization as a thief, or other individual who takes away from us what we hold dear. The expressions mapping valued experiences onto possessions need not refer to thieves, however, as we see in 8:

(8) a. My most *precious possession* is my health.

b. I still *treasure* those memories.

Thus the linguistic evidence suggests that a metaphor along the lines of VALUED ASPECTS OF EXPERIENCE ARE PRECIOUS POSSESSIONS lies behind the conceptualization of death as a thief. This less specific mapping is also much easier to account for than DEATH IS A THIEF in terms of a plausible, direct association between the source and target concepts. There are strong, recurrent correlations between physical and emotional aspects of our experience as we interact with objects. For instance, we may feel a strong sense of pleasure when we acquire certain objects, satisfaction as we hold them, and loss or grief when they are taken away. As long as life, hope, happiness, and the love of others are appreciated on an emotional level they can be construed as metaphorical treasures, vulnerable to theft by metaphorical thieves.

Contrast this more schematic metaphor with DEATH IS A THIEF: It would be unsatisfying (and, as we have seen, unnecessary) to invoke our few experiences with actual thieves as motivations for the metaphor, especially since so little of those experiences is relevant to the expressions. Fear, for instance, might be a typical reaction to an encounter with a thief, but does not figure in expressions like 6 and 7. The recurring experience types mentioned above, however, are plausible motivations for the VALUED OBJECTS METAPHOR, and instances of what have been termed 'primary scenes'. (See Grady, 1997, and Grady & Johnson, To appear).

The types of interactions with objects which ultimately motivate the conceptualization of death as a thief occur in all sorts of settings and transcend particular experiential frames such as restaurant dining or highway driving – the precious object could be a wedding ring, a pen we like to write with, a favorite book, a photograph, a seashell, a toy, etc. And, like other types of experience which appear to underlie conventional metaphoric mappings, our experiences with valued objects correlate some aspect of our perception of or interaction with the world with some aspect of our cognitive response to the world. Other such experience types include *lifting a heavy object and experiencing strain*, *tasting a sweet object and experiencing pleasure*, *judging an object to be flawed due to irregularities in its shape*, and *paying particular attention to a larger object* (because of its potentially greater significance as an obstacle, threat, reward, etc.). These are recurring experiences which plausibly motivate the conventional metaphors listed in Table 1.

Experiences with valued objects constitute plausible bases for a metaphor like VALUED ASPECTS OF EXPERIENCE ARE PRECIOUS POSSESSIONS since they involve tight, recurring correlations between the emotional and physical dimensions of our interactions with possessions.

(9) Experience types which motivate VALUED ASPECTS OF EXPERIENCE ARE PRECIOUS POSSESSIONS
a. Gaining a possession and feeling happy
b. Holding a possession and feeling content
c. Losing a possession and feeling sad

This basic metaphor, in turn, licenses more particular conceptualizations such as DEATH IS A THIEF.

The reason I have taken the time to discuss this particular case is that it illustrates the more general principle that specific or complex metaphors, or ones which have been elaborated with rich detail, often owe their existence to mappings at a more fundamental level, and this is where we should look for experiential motivation.

3 Experiential correlation as a motivation for primary metaphors

When we investigate the apparent experiential bases of a number of primary metaphors we find that the experiences which could plausibly give rise to them are similar in scale and structure to the experience types just discussed. Namely, a recurring 'primary scene', which can be characterized at a very local and schematic level, involves a tight correlation between two dimensions of experience – typically with one more directly related to sensory input than the other. Typical of these scenes is that they are elements of universal human experience – basic sensori-motor, emotional and cognitive experiences which do not depend on the particulars of culture.

Some other metaphors at the primary level include:

(10) [CAUSAL] ORGANIZATION IS PHYSICAL [PART-WHOLE] STRUCTURE
STRONG DESIRE IS HUNGER
ACHIEVING A PURPOSE IS REACHING A DESTINATION

ORGANIZATION IS PHYSICAL STRUCTURE (e.g., 'Our monitoring system has *unraveled* over the past week'), which involves a mapping between physical part-whole structure and the logical and causal relationships which we refer to very generally as *organization*, is plausibly accounted for in terms of a correlation between physical interaction with complex objects and the formation of cognitive representations of their causal structure. For instance, our experience of table legs includes both perceptual information about shape and conceptual information, informed by our understanding of gravity, regarding their causal role in supporting tabletops. As motivation for STRONG DESIRE IS HUNGER – e.g., 'Our team is very *hungry* for a victory' – we can point to the correlation between the physical sensation of hunger and the focused conscious desire (for food) which accompanies it. Finally, ACHIEVING A PURPOSE IS REACHING A DESTINATION appears to be based on the correlation between arriving at physical landmarks and achieving purposes (See Johnson, 1987, for a discussion of this metaphor and its basis in experience.)

The kinds of motivations I have just mentioned sound strikingly like metonymic relationships between aspects of experienced scenes (which could be represented in schema theory by close network links between schemas embedded within larger scenarios). In fact primary metaphors and their motivations should be especially fertile material for research on the relationship between metaphor and metonymy. A number of researchers (e.g., Goossens, 1995), have explored this relationship and pointed out that the two often appear to be closely related, or even hard to distinguish, both in the kinds of conceptual relationships they comprise and especially in the kinds of situational relationships that motivate them. While it is clearly metaphoric to cast difficulty as heaviness in cases where no physical burdens or physical weights are relevant, the origins of the conceptual association between the physical assessment of weight and the affective experience of exertion certainly bear comparison to the type of frame-internal relations typical of metonymy.

Chris Johnson and I have argued (Grady & Johnson, 1998; Grady & Johnson, To appear) that the characterization of the primary scenes which underlie primary metaphors can also help account for other aspects of language, including the organization of basic semantic fields and patterns in children's acquisition of semantic and grammatical forms. For instance, there is evidence to suggest that children acquire the Instrumental sense of *with* later than other senses, and that this pattern is due to the relative complexity of the semantics of Instrumentality. In particular, Instrumentality cannot be defined with respect to an individual primary scene – unlike the Accompaniment sense of *with*, for instance, which may refer simply to co-location with another person (as in, 'He's *with* Paul'). Instead, Instrumentality must involve at least possession plus the performance of a particular action. The possible role of primary scenes in motivating acquisition patterns is a fascinating topic in itself, but not one we can explore here.

The title of this paper refers to a typology of motivations for conceptual metaphors, and the cases we have considered so far fall into a category which I will call 'correlation metaphors'. As we have seen, each case, when examined at the appropriate level of locality and specificity, involves a correlation between distinct dimensions of experience. Metaphors at this level, which arise from primary scenes, are characterized by a number of interesting features; in the present context I will mention only one of these. Much of the recent literature on conceptual metaphor has suggested that target concepts are abstract in the sense of being sophisticated or complex intellectual constructs – e.g., 'Conceptual metaphors arise when we try to understand difficult, complex, abstract, or less delineated concepts, such as love, in terms of familiar ideas, such as different kinds of nutrients' (Gibbs, 1994, p. 6). I have found instead that the target concepts of primary metaphors refer to basic cognitive processes, and are typically no more sophisticated or distant from our direct experience than corresponding source concepts.

For instance, the metaphor MORE IS UP has as its target the concept of quantity, which we judge instantaneously in many situations. If quantity is judged instantly and perceived as a simple, scalar parameter, then it is not a complex concept (whatever the complexities of the neural mechanisms needed to calculate it, or of giving it a satisfactory definition). The primary metaphor DESIRE IS HUNGER maps hunger onto desire, a basic cognitive-emotional state which again we do not conceive as having a complex internal structure, and which we need no help to recognize or understand. In a similar manner the other primary metaphors mentioned in (10) refer to fundamental sorts of cognitive experience, such as the (in many cases automatic and unconscious) inference that some events are causally connected with others, and the immediate feeling of satisfaction (probably the result of hormonal activity) when we have achieved a simple goal.

If there is an advantage to be gained from entertaining metaphorical conceptualizations of some of the simplest elements of conscious experience, one possibility is that we are more efficient at the conscious manipulation of images – i.e. mental representations of sensori-motor experience, not necessarily visual – than at dealing with such notions as Quantity or Desire per se. Even though the ability to attend to and judge quantity and the tendency to experience desire seem to be fundamental aspects of cognitive function, these functions may take place at a level of cognition whose operation is not directly accessible to consciousness. In order to manipulate them at the conscious level it may be necessary to tie these elements of mental experience to specific sensory images. This idea fits well with findings about basic level categorization, for instance – the types of concepts which people find easiest to store, describe, and name.

4 Resemblance metaphors

Despite the value of experiential correlation in accounting for many basic metaphors, not all metaphors are plausibly motivated in this way.

4.1 'Achilles is a lion'

Consider a statement like 'Achilles is a lion,' a classic example of a type cited regularly in philosophical and psychological studies of metaphor. It is difficult to imagine how the conceptualization underlying this statement could arise from recurring correlations in experience. Most obviously, many of us who might use and understand such an expression have no personal experience with lions. But even if we allow for the importance of indirect experience in forming schemas, e.g. learning about lions by reading about them, it is still problematic to identify correlation as a motivating factor for the metaphor.

For a start, it would be difficult to name any concepts that are correlated here, in a way that could give rise to the metaphor. Is bravery correlated with 'lionhood'? If so, what content does the concept of lionhood contain? Presumably, it includes all the information in our shared schema for lions (cf. Lakoff & Turner, 1989, p. 195), including their appearance, the fact that they live in prides, the fact that they sleep much of the day, and so forth. None of these features, however, is relevant to the metaphorical lionization of Achilles (or any other courageous person). For this reason, not to mention the fact that courageousness is part of the lion schema itself, it is awkward to speak of a correlation between courage and 'lionhood,' or between courage and any other particular features of the lion schema, which could be the motivation for the metaphor BRAVE PEOPLE ARE LIONS.

To understand even more clearly that correlation is not a direct motivation for this metaphor, let's review the kinds of correlation which form the basis for metaphors like MORE IS UP and PURPOSES ARE DESTINATIONS. In each of these cases, two quite distinct concepts are cognitively linked because they are tightly correlated in certain recurring types of experience. Vertical elevation varies directly with quantity in many situations, though our means of judging these two parameters are very different. (We can judge quantity in the absence of vertical elevation, and vice versa.) We often experience a sense of gratification as a consequence of arriving at a particular spatial location, but our means of determining location and our emotional capacity for feeling gratification are distinct, too, of course. Notice, by the way, that there are many times when we move through space to a new location but do not feel this same sense. For instance, on some occasions I might accidentally move to the wrong location, or I might be pushed to a place I had no intention of going. In these cases, the distinction between arriving at a spatial location and achieving a purpose is plain.

There is no way to analyze the conceptual correspondence underlying 'Achilles is a lion' as an association of this sort, between fundamentally distinct concepts which are correlated in some type of experience. Consider 'Brave people are lions,' 'Acting courageously is acting like a lion,' 'Courage is the instinctive fearlessness of a lion,' etc. No matter how we phrase the metaphor, it seems, the cues that prompt us to attribute bravery (and which relate to some aspect of perceived behavior) are the same for the people and the lions. The simplest explanation for the metaphor is that, in some sense, brave people and lions are perceived to resemble one another.

4.2 The 'similarity theory' vs. The 'resemblance hypothesis'

In their discussion of 'Achilles is a lion' Lakoff and Turner note that the courage of a lion is itself a metaphorical projection from a human character trait onto an aspect of the lion's instinctive behavior. If so, does this observation defeat the suggestion that lions and brave people bear a perceived resemblance? Not at all. Lakoff and Turner's discussion of the 'Great Chain Metaphor' offers important insights into why the statement is taken as referring to Achilles' character, rather than his hair color or gait, for instance, but does not address the question of why the association between people and lions would arise in the first place, which is the issue we are considering here. Why do we project human bravery onto aspects of lions' instinctive behavior, and vice versa, rather than associating brave people with chickens or goldfish, for instance? The most plausible explanation is that we perceive something in common between stereotypical lions, whatever the basis for this schema, and brave people. Lions and courageous people both (appear to) confront dangerous opponents without fear.

For centuries, various scholars who have treated the phenomenon of metaphor – including Aristotle, in the *Poetics* – have suggested that metaphors are basically expressions of the similarity between two concepts. Recent researchers in the cognitive linguistic tradition have argued compellingly against this 'similarity theory' of metaphor (e.g. Lakoff & Turner, 1989, p. 198). Simply put, there is often no literal similarity to point to between concepts which are associated by metaphor. For instance, it is difficult to see how a metaphor like HAPPY IS UP (Lakoff & Johnson, 1980), as in 'She is in *high* spirits,' could be based on an objective similarity between mood and vertical elevation. Nor is coldness 'similar' to lack of emotion, as Searle acknowledged. Yet these concepts are metaphorically equated. In short, the similarity theory fails for a number of important cases (and in particular, for metaphors based on correlation).

Because of this controversy, I emphasize that I am not advocating the discredited similarity theory, which may at this point be a straw man in any case. My proposal does not depend on any literal similarity between brave people and lions. It seems inevitable, though, to conclude that the metaphorical association between them – involving projection in whichever direction – is most plausibly based on the perception of common aspects in their behavior. I will call this proposition the 'resemblance hypothesis,' in order to distinguish it from the similarity theory, and to highlight the role of our perceptions and representational schemas, as opposed to facts about the world.

There is some precedent within conceptual metaphor theory for allowing that there can be a sort of metaphorical association based on (the perception of) shared features. Lakoff and Turner (1989) described the phenomenon of 'image metaphors', offering as an example the mapping of a woman's waist onto an hourglass, made possible 'by virtue of their common shape' (p. 90). In Lakoff and Turner's view, this kind of metaphor has a special status, since conceptual structure and inferences are not mapped from one domain to another. Instead the source and target of the metaphor share some feature in a single perceptual domain, such as color or shape. Since features of lions other than their alleged courage are not projected onto brave people – e.g., there is nothing about a brave person which corresponds to the lion's tawny coat, or to its habit of sleeping most of the day – we might point out that here too there is a very limited correspondence, which we might even hesitate to call a mapping. 'Achilles is a lion' is obviously not an image metaphor, since it makes no claims about Achilles' physical form, but it may reflect a type of very limited conceptual projection, in the same way that image metaphors do.

As we have seen, the correlation metaphors considered in previous sections are best accounted for in terms of co-occurrence, rather than resemblance. For instance, achieving an objective and arriving at a location do not share a feature which makes them suitable as a source-target pair; neither do quantity and elevation. (In both cases we might say that there actually is a shared feature: punctual aspect in the first case and scalar structure in the second, but while these aspects of 'superschematic' shared structure are probably necessary for the formation of metaphoric connections, they are not sufficient motivations for the respective pairings. If they were, then any punctual experience, such as breaking a dish or blowing out a candle, should stand metaphorically for achieving an objective, and any scalar phenomenon, such as the blueness of the sky or pitch of an acoustic signal, should serve as a source concept for quantity.) Resemblance is not the basis for the sorts of entrenched mappings which prompted the development of conceptual metaphor theory. If it is the basis for the conceptualization underlying 'Achilles is a lion,' then this is a reason to consider this metaphor different in kind from those which are derived from recurring correlations in experience.

4.3 A network model

There is a simple network model which helps illustrate the difference between resemblance and correlation metaphors. If we think of metaphors as patterns of association within activation networks then primary metaphors could be characterized as links between distinct concepts, perhaps based on numerous experiences where the concepts are tightly correlated and therefore simultaneously activated. This pattern is schematized in Figure 1.

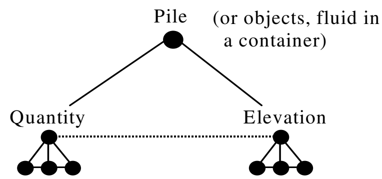

Figure 1 Schematic network representation of a correlation-based metaphor

The concepts PILE, QUANTITY and ELEVATION are used as examples. Lower nodes represent features of objects at higher nodes. The node at the top of the figure represents the concept of a pile – a conceptualization in which quantity and vertical dimension are correlated. The dashed line represents the association which is the basis of the metaphor MORE IS UP.[3]

A metaphor like 'Achilles is a lion,' on the other hand, would have a different kind of representation. In Figure 2 the circled section represents overlapping activation – in this case, activation of the notion of courage. The dashed line represents the association between lions and brave people, based on the feature shared by their respective schemas.

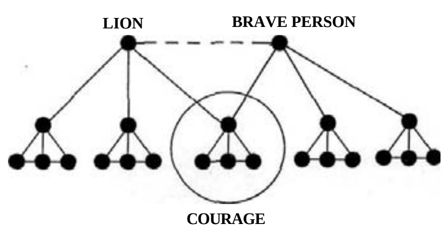

Figure 2 Schematic representation of a simple resemblance metaphor

We can draw no such diagram for MORE IS UP or ACHIEVING AN OBJECTIVE IS ARRIVING. These concepts do not share a feature which motivates the mapping between them; they are instead linked by co-occurrence (as in Figure 1). If a certain configuration can represent one metaphor but not another, this suggests that there is a substantive difference between the two metaphor types.

5 'Generic-is-specific' metaphors

There is one more type of relationship between concepts, besides correlation and resemblance, which might motivate a metaphoric association between them. In *More than cool reason*, Lakoff and Turner (1989, p. 162) state that, 'There exists a single generic-level metaphor, GENERIC IS SPECIFIC, which maps a single specific-level schema onto an indefinitely large number of parallel specific-level schemas that all have the same generic-level structure as the source domain schema.' They illustrate the pattern with discussions of several Asian proverbs, including 'Blind blames the ditch.' The situation depicted in the proverb, they propose, instantiates a more general schema, in which a person blames his own mistakes on circumstances he should have anticipated. We understand the meaning of the proverb by recognizing the relationship between the particular scenario and the more generic schema. (The metaphorical correspondence between vision and understanding is also evident here, of course, and Lakoff and Turner point out that these proverbs often rely on conventional mappings as well as the GENERIC-IS-SPECIFIC structure.)

We probably do not want to treat GENERIC IS SPECIFIC as a metaphor per se, if we would like to reserve the term for particular figurative pairings of concepts. Nonetheless, it is worth considering whether this type of metaphorical pattern might add to the typology we have developed so far: There may be metaphors based on the 'is a' relationship, instantiation. Other cases where the source concept appears to be a specific instance of the more generic target concept include RISK-TAKING IS GAMBLING ('A career change is a *high-stakes gamble*') and CO-OPERATIVE ACTIVITY IS MUSICAL HARMONIZING ('There's been *harmony* in the family lately, thank goodness').

Any discussion of categories and instantiations in the context of a metaphor study must call to mind Glucksberg and Keysar's position (e.g. 1993, p.408) that 'metaphors are class inclusion assertions.' Glucksberg and Keysar's analysis of statements like 'my job is a *jail*' holds, in part, that the source term (or *vehicle*) refers to a broad category of objects – in this case, any 'involuntary, unpleasant, confining, punishing, unrewarding situation' (1993, p.414). Glucksberg, Keysar, Lakoff and Turner would probably all agree that the specific concept *jail* may stand (metaphorically) for the generic category of involuntary etc. situations, that *ditch* may stand for threatening circumstances, and, more generally, that prototypical cases often stand metaphorically for generic categories.[4]

Returning to the question of whether we must add a new category to our typology, note first that it is difficult to make a clear distinction between GENERIC-IS-SPECIFIC metaphors and metaphors of the resemblance type. For example, if 'Achilles is a lion' is motivated by perceived resemblance between the behavior of a brave man called Achilles and the stereotypical behavior of a lion, then we might argue that the lion stands for the more generic category of brave things – i.e. that Achilles and the lion share a generic-level representation, along the lines of 'COURAGEOUS BEINGS.' (Equivalently, one could argue that the behavior of courageous people and lions are instances of a more general schema for courageous behavior.)

On either analysis a particular entity is mapped onto another entity with which it shares salient perceived features, and therefore, an identical representation at a higher level of generality. Figure 3 sketches this situation. (Here, lower nodes represent instances of categories at higher nodes.)

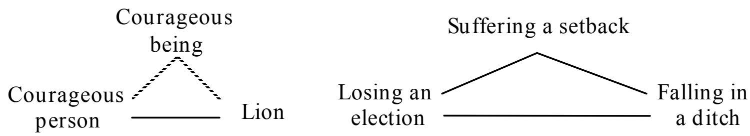

Figure 3 Resemblance vs. Generic-is-specific

The lines represent association between concepts and show that this association can be traced along either of two routes in both cases – either a direct association or an association by way of a shared underspecified, or generic, representation. In essence, then, the existence of Lakoff and Turner's GENERIC-IS-SPECIFIC pattern is evidence against a strong 'anti-abstractionist' position: The generic scenario is an abstraction over a range of more particular cases, which are easy to map onto one another precisely because of this shared structure. (This structure also foreshadows the 'generic space' in Fauconnier and Turner's theory of 'conceptual blending'.) While the correlation cases do not appear to involve abstraction – and have provided compelling evidence against a strong abstractionist position – the resemblance cases and GENERIC-IS-SPECIFIC cases arguably do.

The cases considered so far suggest a fairly neat distinction between correlation metaphors on one hand and resemblance or GENERIC-IS-SPECIFIC metaphors on the other. The distinction seems to be challenged, though, when we consider that supporting a heavy burden is an instance of enduring a difficult situation, arriving at a destination is an instance of achieving a purpose, being hungry is an instance of experiencing desire, and so forth. In other words, the primary, correlation-based metaphors discussed in earlier sections might somehow be analyzable as GENERIC-IS-SPECIFIC metaphors. And since we have seen that GENERIC-IS-SPECIFIC metaphors can be construed as resemblance metaphors, perhaps the primary metaphors should after all be accounted for based on shared aspects of schemas. For instance, enduring a family crisis resembles supporting a heavy weight in that both provoke feelings of stress and displeasure. An important day resembles a large object in that both tend to command our attention. Does the typology actually collapse to a single category?

No, there is still a basis for preserving the distinctions. First, we will briefly review the relationship between GENERIC-IS-SPECIFIC and resemblance metaphors. Once again, simple diagrams help clarify the argument. In each case the arrow points from source to target.

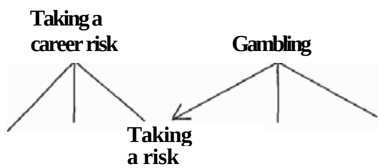

Figure 4a Risk-taking is gambling (generic-is-specific)

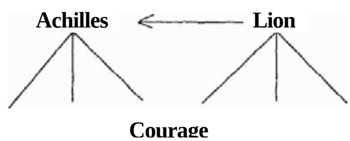

Figure 4b Achilles is a lion (resemblance)

In Figure 4a, the GENERIC-IS-SPECIFIC case (RISK-TAKING IS GAMBLING), the source is a specific instance of the target, a generic schema.[5] The resemblance metaphor structure represented in Figure 4b ('Achilles is a lion') is very similar except that here the target is taken to be a specific instance of the generic schema; a different instance serves as the source. Cases a and b are fundamentally similar, and differ only with respect to which levels of specificity are highlighted. We can show that they are variants by considering hypothetical metaphors like 'COURAGEOUS BEINGS ARE LIONS' and 'MAKING A RISKY CAREER MOVE IS GAMBLING,' which would look like GENERIC IS SPECIFIC and resemblance metaphors, respectively.

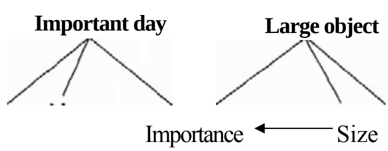

Figure 4c Size is importance (correlation)

A correlation metaphor (IMPORTANCE IS SIZE), as represented in Figure 4c, looks somewhat different. Here there is a particular feature of the source concept, not itself the basis for a resemblance link, which is relevant to the metaphorical mapping. In cases a and b there is no particular feature of the source image which is conventionally associated with the target concept. We have seen, for instance, that lions' appearance and sleep habits are not conventionally mapped onto courageous people. While we could try to treat case (c) the same way as 'Achilles is a lion' – i.e. by identifying the metaphor as 'An important day is a large object' and arguing that it is based on the shared feature *important* (i.e. 'commands our attention'), as in Figure 4d.

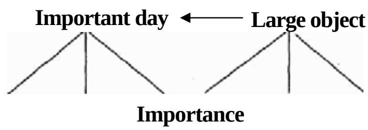

Figure 4d 'An important day is a large object'

We would be missing an important observation: There is more than one aspect of our understanding of large objects that is relevant to this conceptualization, and in fact the relationship between two of these aspects – physical size and subjective importance – constitutes a pairing with special significance, one that enters our conceptual repertoire as a projection pattern that may serve as the basis for more elaborate mappings.

In sum, 'GENERIC-IS-SPECIFIC' and 'resemblance' do appear to be alternative ways of construing what is essentially the same conceptual relationship, differentiated from each other only with respect to which link is profiled, to borrow a term from Cognitive Grammar. Correlation metaphors, on the other hand, involve salient relationships between aspects of single concepts, of a kind not evident in the other sorts of metaphor. These relationships derive from correlations within the recurring experience types that give content to those concepts.

6 Comparison between the types of metaphor

Considering the evidence, we now have two distinct classes of metaphors – the resemblance class, including GENERIC-IS-SPECIFIC metaphors, on one hand and the correlation-based metaphors, including primary metaphors, on the other. This is not an elaborate typology, but it is one which involves some critical distinctions. In addition to what has been said above, there are a number of other significant ways in which these two classes of metaphors appear to differ.

6.1 Directionality

Some resemblance metaphors appear to violate the principle of unidirectionality that is usually attributed to conceptual metaphors. For instance, consider the hypothetical statements, 'Einstein is the modern Pythagoras' and 'Pythagoras was the Einstein of his age,' intended as comments about comparable intellectual achievement.[6] Another metaphor which appears to be based on resemblance is DEATH IS SLEEP, as in Hamlet's 'to sleep perchance to dream.' (We could argue, by the way, that this correspondence is based on a shared generic-level schema involving inactivity.) This metaphor, too, works in reverse, as in the expression '*dead* to the world,' said of someone who is asleep or unconscious.

Metaphors of the GENERIC-IS-SPECIFIC type also seem to be symmetrical, allowing projection in either direction, as we would expect from Lakoff and Turner's description.

We might respond 'Blind blames the ditch' when a hasty person blames an injury on a hammer instead of his own carelessness, and we can also imagine using a hypothetical proverb like 'Hasty blames the hammer' when a person falls into a ditch. Either instance may serve as source to the other's target. In this important respect, then, both resemblance and GENERIC-IS-SPECIFIC metaphors are like image metaphors, which work equally well in either direction: a woman's waist can be an 'hourglass;' an hourglass can have a slender 'waist.'

Of course all these cases involve the projection of subtly different conceptual material depending on direction – e.g., an hourglass may be 'feminized' when its narrow portion is called a *waist* – but for our purposes it is sufficient to note that a salient shared feature leads to the possibility of projection in either direction, which is not the case where metaphors based on correlation are concerned. Difficulty may *not* stand metaphorically for simple physical weight, and so forth.

6.2 Ontology

Correlation metaphors and resemblance metaphors make different demands on the objects which serve as source and target. Resemblance metaphors may involve correspondences between concepts of the same type, whereas correlation metaphors link concepts of different types. For instance, weight and difficulty are two concepts linked in the primary metaphor DIFFICULTIES ARE BURDENS (e.g., 'Caring for an elderly relative places a *heavy burden* on a family'). The phenomenon of physical weight is recognized and judged by cognitive faculties very distinct from those which underlie the notion of difficulty – i.e. exertion, discomfort, stress, etc. The same principle applies to the correspondences between quantity and vertical elevation, between similarity and proximity, between logical organization and physical part-whole structure, etc. In each of these cases, the linked concepts are fundamentally distinct in the way they are perceived and understood. In fact, it is typical of the source and target concepts of primary metaphors that they are characterized by very distinct properties. For instance, source concepts tend to involve sensory content whereas target concepts involve our cognitive responses to sensory input. (See Grady, 1997.) Resemblance metaphors, on the other hand, may involve objects of identical or nearly identical types, as we have seen. One state of inactivity is mapped onto another; one type of physical mishap is mapped onto another, one intelligent person is mapped onto another, etc.

6.3 Conventionality

Because the human imagination is boundless in its capacity to impose resemblance on disparate objects, resemblance metaphors would appear to be nearly unconstrained. The moon and a monkey wrench surely do have something in common, at least in the way we perceive them. (As Turner, 1991, p. 154, points out, both 'can expand and contract'.) Our ability to perceive resemblance, of course, is constrained by the cognitive mechanisms of perception, possibly including the structuring role of the 'image schema' (see, e.g., Johnson, 1987; Lakoff, 1987; Turner, 1991). Nonetheless, this constraint still leaves open a nearly infinite range of potential pairings of concepts and images which somehow remind us of each other. The same is true of GENERIC-IS-SPECIFIC metaphors, which may involve links between, as Lakoff and Turner put it, 'an indefinitely large number of parallel specific-level schemas.'

Correlation-based metaphors, on the other hand reflect specific, recurring experience types, and are therefore much more constrained. This is especially clear when we look at primary metaphors, which have direct experiential motivation. Similarity, for instance, corresponds metaphorically to Proximity, and not to other sorts of spatial relations. The same associations arise in language after language – apparently because the experience types which motivate them are so basic that they characterize human life in all times and places – and these associations fall into well-defined sets of patterns.

7 Conclusion

Debate about the nature of metaphor has been sharp and long-running in several different scholarly traditions. Part of the reason may be that researchers have pointed to objects of different kinds in support of their own preferred definitions. If we make a distinction between these types many of the controversial issues about metaphor might be resolved. Supporters of versions of the similarity theory, i.e. researchers who refer to shared features and structural analogy as the basis for metaphor, would have to acknowledge that there are metaphors which are not based on resemblance or perceived resemblance – the correlation metaphors. Conceptual metaphor theorists, who are used to arguing that similarity is not the basis for metaphors, might allow that there is a class of linguistic and conceptual phenomena which is motivated by the perception of a resemblance between distinct objects, a resemblance which would, of course, have to be described in terms of cognitive mechanisms of perception and categorization.

Other claims about metaphors – besides the extent to which similarity plays a role in motivating them – also fall out from the two positions, and might be resolved by recognizing a taxonomy. For instance, the traditional understanding of metaphor as an exceptional, creative product of imagination may have resulted from a focus on metaphors of a particular type. Many of the metaphors which have appeared in traditional philosophical discussions of metaphor have fallen into the class of resemblance metaphors. If the resemblance hypothesis is correct, then many expressions like 'Achilles is a lion' or 'Man is a wolf,' which appear over and over in these discussions, are based on perceived parallelism between their source and target concepts – or to put it another way, the perception that there is a superordinate category which includes both concepts. I propose that the relatively unconstrained nature of resemblance and GENERIC-IS-SPECIFIC metaphors underlies various scholarly claims that metaphor is ungoverned by rules or principles, and that it is a tool for adding originality and color to texts (to be used with abandon or with caution depending on the authority one consults). The finite list of conventional, highly-motivated associations proposed by scholars like Lakoff and Johnson, on the other hand, might be associated with metaphors based on correlation.

Scholars such as Lakoff and Turner have already opened the door to the classification of metaphors based on distinct properties. Their proposals regarding the 'GENERIC IS SPECIFIC metaphor' and image metaphors, for instance, suggest that metaphors can involve quite different sorts of cognitive mechanisms and structures. The taxonomy I have suggested here follows up on proposals like those. I argue that we can refine our sense of the different types of metaphor further by carefully considering the motivations for these metaphors. When we do, we arrive at a classification which seems to explain some of the long-standing disagreements about the nature of metaphor. While it might prove to be the case that not all metaphors fall neatly into one or the other of the categories I suggest, the prototypical cases, and the differences between them, are clear, and the distinctions should help guide our continuing research into the nature of metaphorical thought and language.

Notes

1 Primary metaphors are the same as 'primitive metaphors' (Grady et al., 1996).

2 For a discussion of how schematic, conventional metaphors are elaborated in given instances, see Grady et al. (1999).

3 In the very crude representation in this section I ignore a number of important issues – perhaps chief among them, directionality, which is certainly a feature of primary metaphors.

4 Glucksberg and Keysar are primarily interested in the nature of metaphorical statements of the form 'A is B,' – including such issues as sentence ordering – which is not my focus here. Note that many basic patterns of metaphorical conceptualization show up in other sorts of linguistic contexts – e.g. 'They have *extracted* some new information from the photograph,' where the source term is a verb referring to a metaphorical action.

5 Looked at another way, the diagram represents the fact that the target, *risk-taking*, is an aspect or feature of the course scenario, *gambling*.

6 These statements might not strike some readers as metaphorical, but certainly strike others as being so. Glucksberg and Keysar (1993, p. 421) refer to the statement 'Xiao-Dong [a Chinese actor] is a Bela Lugosi' as a metaphor. The question here is one of degree of metaphoricity, and individuals differ regarding where the line ought to be drawn between metaphors per se and other sorts of reference.

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Press Final 27 July 2007

12 Towards a theory of metonymy

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1 The cognitive view of metonymy

Unlike metaphor, metonymy has always been described in conceptual, rather than purely linguistic, terms. In analyzing metonymic relationships, even traditional rhetoric operated with conceptual notions such as CAUSE FOR EFFECT, CONTAINER FOR CONTENTS, etc. Still, metonymy was mainly seen as a figure of speech, i.e. it was basically thought of as a matter of language, especially literary or figurative language. This view of metonymy is reflected in standard definitions, which tend to describe metonymy as 'a figure of speech that consists in using the name of one thing for that of something else with which it is associated' (*Webster's Third New International Dictionary*). These kinds of definition thus claim that metonymy operates on names of things, involves the substitution of the name of one thing for that of another thing and assumes that the two things are somehow associated. The cognitive view of metonymy espoused here makes different assumptions:

(i) Metonymy is a conceptual phenomenon;
(ii) Metonymy is a cognitive process;
(iii) Metonymy operates within an idealized cognitive model.

1.1 Metonymy is a conceptual phenomenon

As already pointed out by Lakoff and Johnson (1980: Ch. 8), metonymy, like metaphor, is part of our everyday way of thinking, is grounded in our experience, is subject to general and systematic principles, and structures our thoughts and actions. Lakoff and Johnson's example of the metonymy in *She's just a pretty face* illustrates the conceptual nature of metonymy. We derive the basic information about a person from the person's face. The conceptual metonymy THE FACE FOR THE PERSON is part of our everyday way of thinking about people.

The conceptual nature of metonymy is even more clearly manifested in the structure of categories. In his discussion of metonymic models, Lakoff (1987: 79–90) demonstrates that a member of a category may stand for the whole category and thereby account for prototype effects. His example of the stereotypical subcategory 'housewife mother' illustrates this point: we tend to think of the category 'mother' in terms of this stereotypical member even if the submember remains unnamed. Since most categories have prototypical structure, we may conclude that basically all categories are metonymically structured.

1.2 Metonymy is a cognitive process

The traditional view defines metonymy as a relationship involving substitution. This view is reflected in the notation generally used for stating metonymic relationships, namely X STANDS FOR Y. Metonymy does, however, not simply substitute one entity for another entity, but interrelates them to form a new, complex meaning. To use Warren's (1999: 128) example: 'We do not refer to music in *I like Mozart*, but to music composed by Mozart; we do not refer to water in *The bathtub is running over*, but to the water in the bathtub.' Metonymic relationships should therefore more adequately be represented by using an additive notation such as X PLUS Y. For the sake of simplicity we will keep the traditional formula X FOR Y, with the proviso, however, that the metonymic process is not understood to be one of substitution.

Following Langacker (1993: 30), we will think of metonymy as a cognitive process in which one conceptual entity is mentally accessed via another entity. The metonymic entity serves as a 'reference point' that affords mental access to another conceptual entity, the intended target.[1] We will refer to the reference-point entity as the 'vehicle' and to the intended entity as the 'target'. In the example of *She's just a pretty face*, the 'pretty face' serves as the vehicle for accessing the 'person' as the target.

1.3 Metonymy operates within an idealized cognitive model

The notion of 'contiguity' is at the core of most definitions of metonymy.[2] Lakoff and Johnson (1980) think of contiguity in terms of the whole range of conceptual associations commonly related to an expression; Lakoff (1987) accounts for metonymic contiguity within the framework of idealized cognitive models (ICMs); Croft (1993) deals with contiguity relations in terms of encyclopedic knowledge representation within a domain or domain matrix; and Blank (1999) and Panther and Thornburg (1999) describe the network of conceptual contiguity by using the notion of frame and scenario.

While all of these models are comparable with respect to claiming a cognitive basis, we believe that Lakoff's (1987) framework of 'idealized cognitive models' (ICMs) may capture metonymic processes best. The ICM concept is meant to include not only people's encyclopedic knowledge of a particular domain but also the idealized cultural models they are part of.

1.4 Theoretical issues of metonymy

On the basis of the three cognitive properties of metonymy discussed above, we will define metonymy as follows:

> Metonymy is a cognitive process in which one conceptual entity, the vehicle, provides mental access to another conceptual entity, the target, within the same idealized cognitive model.

This working definition allows us to raise further important empirical and theoretical issues. We believe that, amongst others, the following questions need to be addressed in developing a theoretical framework of metonymy.

A first question we need to ask is: where do we find metonymy? According to the above definition, metonymy may occur wherever we have idealized cognitive models. We have ICMs of everything that is conceptualized, which includes the conceptualization of things and events, word forms and their meanings, and things and events in the real world. We will refer to these types of conceptualization as 'ontological realms'.

A second question which needs to be addressed relates to the 'mental bridge' which allows the conceptualizer to access the desired target. This question concerns the nature of the relationship between the vehicle and one or more targets. Metonymy tends to make use of entrenched relationships within an ICM. The question that needs to be answered here is what types of conceptual relationships within an ICM may give rise to metonymy.

A third question pertains to the choice of vehicle and target. Unlike metaphorical mappings, which tend to be unidirectional, metonymic mappings are in principle reversible. This was already implicitly noticed in traditional approaches by listing both directions of a metonymic relationship such as CAUSE FOR EFFECT and EFFECT FOR CAUSE. We therefore need to ask if there are any preferred metonymic construals and, if this is the case, which 'cognitive principles' govern the selection of one type of vehicle entity over another. To the extent that there are such preferred routes, these will define the unmarked, or 'default', cases of metonymy.

A fourth question we need to ask relates to marked, or 'non-default', cases of metonymy. Given that there are default routes of metonymic construal, are there any principles that govern the choice of non-default vehicles?

The following four sections of this paper will be devoted to finding answers to these central questions which, for convenience, are summarized below:

(i) What are the ontological realms in which metonymy occurs? (Section 2);
(ii) What are the types of metonymy-producing relationships? (Section 3);
(iii) What are the cognitive principles that govern the selection of a preferred vehicle? (Section 4);
(iv) What are the overriding factors that yield 'non-default' cases of metonymy? (Section 5).

2 Ontological realms in which metonymy occurs

The following three ontological realms are distinguished for the present purpose: the realm of 'concepts', the realm of 'forms', in particular, forms of language, and the realm of 'things' and 'events'. These realms roughly correspond to the three entities that comprise the well-known semiotic triangle as developed by Ogden and Richards (1923: 11): thought, symbol, and referent. The interrelations between entities within the same ontological realm or across different ontological realms lead to different ICMs and possibilities for metonymy.

The pairing of a concept and a form establishes a sign and will be described as a 'Sign ICM'; the pairing of a thing or event and a sign, form or concept establishes a referential situation and will be described as a 'Reference ICM'; and the interrelation between two concepts, typically in conjunction with forms, will be described as a 'Concept ICM'. In as far as these ICMs lead to metonymy, the metonymies will be referred to as 'sign metonymy', 'reference metonymy', and 'concept metonymy'. Figure 1 illustrates the semiotic relationships that lead to a sign metonymy (1), the three types of reference metonymy (2)-(4), and a concept metonymy (5). The arrows indicate the direction of the metonymic mapping from vehicle to target.

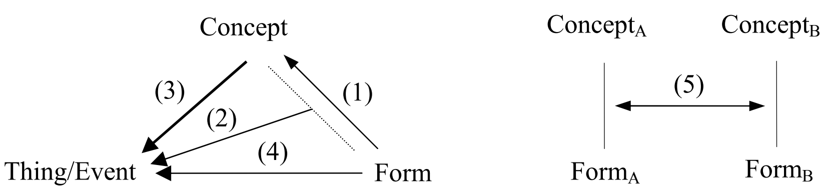

Figure 1 Sign metonymy (1), reference metonymies (2, 3,4), and concept metonymy

2.1 Sign ICMs and sign metonymies

The Sign ICM unites a form and one or more concepts. Thus, the word form *dollar* or the dollar sign *$* are linked with the 'currency denomination of dollar', 'currency', or 'money' in general. As a rule, the form metonymically stands for the concept it denotes.

(1) FORM FOR CONCEPT: *dollar* for 'money'

The very nature of language is based on this metonymic principle, which Lakoff and Turner (1989: 108) describe as WORDS STAND FOR THE CONCEPTS THEY EXPRESS. Since we have no other means of expressing and communicating our concepts than by using forms, language as well as other communication systems are of necessity metonymic. It is also for that reason that we fail to notice the metonymic nature of language.

2.2 Reference ICMs and reference metonymies

Reference ICMs relate real-world entities to signs, concepts or forms. We thus have three types of Reference ICMs and possible metonymies, as shown in Figure 1. In all three types of reference metonymies, the metonymic target is the real-world thing or event.

The standard situation of reference involves signs, i.e. form-concept units, which stand for the thing or event referred to. We thus have the metonymy:

(2) FORM-CONCEPT FOR THING/EVENT: word *cow* for a real cow

Strictly speaking, the sign does not refer to the world of reality but to our mental representation of reality. For example, in the world of reality, an event of punching involves a series of subevents: folding one's fist, moving one's arm, bringing it into contact with an object, and recoiling it. A punching event thus has duration. Linguistically, however, *to punch* is a punctual verb and, as such, cannot be used to describe a durational event, as in ??*It took five minutes to punch him* (Frawley 1992: 20ff). We do, however, firmly believe that words refer to the extensional world so that metonymy (2) has psychological validity.

In people's folk understanding of language, a concept or the form of a sign may refer to reality. Lakoff (1987: 168f) describes the former situation as 'reference via meaning,' and the latter as 'doctrine of direct reference'. According to the Reference-via-Meaning ICM, 'words have inherent meanings (called *intensions*) and designate objects by virtue of those meanings' (Lakoff 1987: 168f). In this view, the meaning associated with the word *cow* is assumed to stand for any cow in the world of reality – in contrast to the set-theoretic account, in which 'cow' denotes the set or class of cows.

(3) CONCEPT FOR THING/EVENT: concept 'cow' for a real cow

The Direct-Reference ICM most clearly applies to the use of proper names for persons of that name. The name *John Smith* directly refers to the bearer of this name. In our folk theory of language, the Direct-Reference ICM has a much wider metonymic application. Stephen Tylor (1978: 168) points out that in our common-sense view of language words are names of things, not names of classes. Thus the word *cow* stands for the object cow.

(4) FORM FOR THING/EVENT: word-form *cow* for a real cow

2.3 Concept ICMs and concept metonymies

Concept metonymies involve a shift from Concept_A to Concept_B which may, but need not, be accompanied by a shift in form. The two concepts form part of the same ICM and are related to each other in some specific way. The following four types of concept metonymies may be distinguished.

(5) FORM_A-CONCEPT_A FOR FORM_B-CONCEPT_B: *bus*-'bus' for *bus drivers*-'bus-drivers'

(6) FORM-CONCEPT_A FOR CONCEPT_B: *mother*-'mother' for 'housewife-mother'

(7) FORM_A-CONCEPT_A FOR FORM_A-CONCEPT_B: *White House*-'place' for *White House*-'institution'

(8) FORM$_A$-CONCEPT$_A$ FOR FORM$_B$-CONCEPT$_A$: *UN* for *United Nations*

The metonymic shift in (5) is the one most commonly associated with metonymy: two form-concept pairings which belong to the same ICM are interrelated. The metonymic relationship is that of control: a controlled entity, buses, is used to stand for its controlling entity, bus-drivers. The metonymy can thus be formulated as CONTROLLED FOR CONTROLLER.

The metonymic situation in (6) differs from (5) in that the target concept is not linked to a name. There may be different reasons for using this metonymy: the language may lack a word for the particular concept, the speaker may not be able to find a conventional name for the concept, or the speaker may not be aware of the different concepts. The metonymic relationship here is CATEGORY FOR A MEMBER OF THE CATEGORY.

The metonymic situation in (7) applies to polysemy, in which two senses of a word-form are relatable within the same ICM. Polysemy is a common way in which metonymic concepts manifest themselves in language (see Lakoff 1987 and Taylor 1995). Thus, the expression *White House* is lexically polysemous, with the senses of 'building' and 'executive branch of the US government'. The metonymy PLACE FOR INSTITUTION thus accounts for our understanding of *The White House did not intervene* in the sense of 'the US government did not intervene'.

The metonymic situation in (8) is characterized by a change in the form of an expression whose concept roughly remains the same. This metonymy applies to reductions of form as in clippings such as *exam* for *examination*, modifications of form as in the euphemism *What the heck are you doing?* for *What the hell are you doing?*, and substitutions by pro-forms such as pronouns.

3 Types of metonymy-producing relationships

Conceptual relationships within an ICM that may give rise to metonymy will be called 'metonymy-producing relationships'. The conceptual relationship that holds between an organ of perception and perception may give rise to metonymy, as in *The dog has a good nose*. However, not all relationships within an ICM can produce metonymies. For example, the nose cannot metonymically stand for the mouth, i.e. *I hit him in the nose* will not be understood to mean 'I hit him in the mouth'. Metonymy may only arise when 'the addressee's attention is directed to the intended target' (Langacker 1993: 30), i.e. when the intended target is more or less uniquely accessible. The more distinct vehicle and target are, the better is their relationship suited to be exploited metonymically. Thus, an ICM as a whole and its parts are generally conceptually distinct enough to license a metonymy from whole to part or part to whole.

The distinction between whole and part is in fact of paramount importance for metonymy. Given that our knowledge about the world is organized by structured ICMs which we perceive as wholes with parts, we suggest that the types of metonymy-producing relationships may be subsumed under two general conceptual configurations:

(i) Whole ICM and its part(s)
(ii) Parts of an ICM

Configuration (i) may lead to metonymies in which we access one part of an ICM via its whole or a whole ICM via one of its parts; configuration (ii) may lead to metonymies in which we access one part via another part of an ICM. This, of course, implies that the whole ICM is still present in the background.

The following typology of metonymy-producing relationships and metonymies is not meant to be exhaustive. It includes those types that are most frequently listed in classifications of metonymies and seem to reflect the most entrenched metonymic routes.

3.1 Whole ICM and its part(s)

The relationship between a whole and a part typically applies to things and their parts, where the notion of 'thing' is to be understood here in the schematic sense of Langacker (1991). Whole-part configurations are, however, also found in many other ICMs.

(i) *Thing-and-Part ICM*: This ICM may lead to the two metonymic variants:

(9) (a) WHOLE THING FOR A PART OF THE THING: *America* for 'United States'
(b) PART OF A THING FOR THE WHOLE THING: *England* for 'Great Britain'

People often speak of *America* but mean one of its geographical parts, the United States; conversely, people, especially foreigners, often speak of *England* but mean Great Britain, including Wales and Scotland.

A special type of WHOLE FOR PART metonymy is found in situations such as *Paul hit me* or *The car needs washing*, where *Paul* and *the car* may be said to stand as wholes for the parts 'Paul's fist' and 'the car's body', respectively. Langacker (1993: 31) describes these cases as 'active-zone/profile discrepancies', where an entity's active zone is defined as comprising 'those portions of the entity that participate most directly and crucially in that relationship'.

The PART FOR WHOLE metonymy has traditionally been given special attention and classified as a metonymic type of its own under the name of synecdoche. Examples of synecdoches are usages such as *Those are cool wheels you have there* and the widespread use of body parts such as *hand, face, head* or *leg* for a person. In these situations, the entity that is most crucially involved in the ICM is metonymically highlighted.

(ii) *Scale ICM*: Scales are a special class of things, and the scalar units are parts of them. Typically, a scale as a whole is used to stand for its upper end, and the upper end of a scale is used to stand for the scale as a whole:

(10) (a) WHOLE SCALE FOR THE UPPER END OF THE SCALE: *You're speeding again.* for 'You are going too fast'

(b) UPPER END OF A SCALE FOR THE WHOLE SCALE: *How old are you?* for 'What is your age?'

The expression *speed* defines the whole scale of velocity but we locate the velocity in (10a) at, or even beyond, the upper end of the scale. Conversely, mention of the positive end of the scale in (10b) evokes the whole scale. It is only for the purpose of achieving special effects that the negative end of a scale may be used, as in *How young are you?*

(iii) *Constitution ICM*: This ICM involves the material or substance that constitutes an object. Substances are unbounded and therefore uncountable. A substance may, however, be conceived of as bounded, i.e. as object-like, and is then coded as a count noun, as in (11a). Conversely, an object may be conceived of as unbounded, i.e. substance-like, and is then coded as a mass noun, as in (11b).

(11) (a) OBJECT FOR MATERIAL CONSTITUTING THE OBJECT: *I smell skunk.* for 'the smell produced by a skunk'
(b) MATERIAL CONSTITUTING AN OBJECT FOR THE OBJECT: *wood* for 'forest'

(iv) *Event ICM*: As with things, an event as a whole may stand for one of its subevents, and a subevent may stand for the whole event.

(12) (a) WHOLE EVENT FOR SUBEVENT: *Bill smoked marijuana.*
(b) SUBEVENT FOR WHOLE EVENT: *Mary speaks Spanish.*

The event in (12a) involves as some of its subevents lighting a marijuana cigarette, taking it to one's lips, inhaling the smoke, etc. The inhaling part is probably felt to be the central and most important subevent and the one that is normally meant by the speaker. This is exactly the reason why Clinton needed to exclude that part when he argued that, as a young man, he smoked marijuana but did not inhale.

The habitual event in (12b) is understood to refer not only to Mary's spoken command of a language, but also to include the skills of comprehension, reading and writing. Among these linguistic skills, speaking stands out as the most salient part in one's command of a language. Also less salient subevents may serve as metonymic reference points evoking an Event ICM as a whole. In *They went to the altar*, an initial subevent stands for the whole Wedding ICM, and in *Our teacher had 100 essays to grade*, a final subevent stands for a whole ICM involving reading, correcting, and eventually grading students' papers.

Sentence (12b) also illustrates the way metonymy pervades the grammatical system. Habitual events occur in past, present and future time, but are described in the Present Tense. If we assume that the Present Tense ideally locates events in present time, its use for habitual events is metonymic. Another time/tense metonymy is found in the use of the Present Tense for future events as in *I am off* for 'I will be off' or in the robber's threat *The money or you're a dead man*, where the present moment figures prominently for the future event. We thus have the following PART FOR WHOLE time metonymies:

(13) PRESENT FOR HABITUAL: *Mary speaks Spanish.*

(14) PRESENT FOR FUTURE: *I am off.* for 'I will be off'

Metonymy may also operate with respect to an event's status of actuality or potentiality. Thus, we normally use premodifying attributive adjectives in describing permanent properties of a person or object, as in *He is an intelligent person*. In *He is an angry person*, however, the attributive adjective *angry* does not describe a person's permanent anger or his present fit of anger but his disposition to get potentially angry; hence it involves the metonymy ACTUAL FOR POTENTIAL. This metonymic relationship also occurs in its reverse form, in which a potential event is described as real. As Gibbs (1994), Thornburg and Panther (1997), and Panther and Thornburg (1999) have shown, conditions of a speech act may as parts stand for the speech act as a whole. For example, in using *can* in *Can you pass the salt?* the speaker highlights a precondition, namely the addressee's ability to perform the act, for the directive speech act. Since such speech acts with *can* convey the notion of potentiality, Panther and Thornburg describe this metonymy as POTENTIALITY FOR ACTUALITY. The relationship between actuality and potentiality may thus give rise to reverse metonymies:

(15) (a) ACTUAL FOR POTENTIAL: *He is an angry person* for 'he can be angry'
(b) POTENTIAL FOR ACTUAL: *I can see your point* for 'I see your point'

(v) *Category-and-Member ICM*: A category and its members stand in a kind-of relation. As shown by Seto (1999), kind-of relations need to be distinguished from part-of relations. The relations of taxonomy and partonomy, however, tend to be confused. This is reflected in the German term for 'subset', *Teilmenge*, literally 'part-set'. Taxonomic hierarchies may also be metaphorically seen as part-whole structures in which '[e]ach higher-order category is a whole, with the immediately lower categories being its parts' (Lakoff 1987: 287). We, therefore, feel justified in analyzing Category-and-Member ICMs as instances of the whole-part configuration.

(16) (a) CATEGORY FOR A MEMBER OF THE CATEGORY: *the pill* for 'birth control pill'
(b) MEMBER OF A CATEGORY FOR THE CATEGORY: *aspirin* for 'any pain-relieving tablet'

A special type of this metonymic relationship is that between 'generic' and 'specific', or a type and a token:

(17) (a) GENERIC FOR SPECIFIC: *Boys don't cry.*
(b) SPECIFIC FOR GENERIC: *A spider has eight legs.*

Sentence (17a) describes a generic statement about boys, but it might be used in the specific situation of a boy's crying, where it is understood specifically. Conversely, specific tokens may be used to stand for generic types. In the situation of 'generic reference' expressed in (17b), the indefinite article *a* is used to refer to spiders in general. As pointed out by Norrick (1981: 35), 'any specific instantiation of a class calls forth the whole class.' A single violin may stand for the class of violins and a musical note may stand for the musical key system as such. At a more general level, this metonymic relationship also underlies our interpretation of proverbs. As shown by Lakoff and Turner (1989: Ch. 4), proverbs such as *Blind blames the ditch* describe a specific situation but convey a general understanding, which again is applied to a specific situation at hand.[3]

Subtypes of this metonymy are AN INDIVIDUAL (AS A TYPICAL MEMBER OF A CATEGORY) FOR A CATEGORY, as in *every Tom, Dick and Harry*, and SPECIFIC CASE FOR GENERAL RULE, which 'holds between laws and their concrete instantiations generally' (Norrick 1981: 37).

(vi) *Category-and-Property ICM*: Properties may either be seen metaphorically as possessed objects (PROPERTIES ARE POSSESSIONS) or metonymically as parts of an object. Categories typically evoke, and may metonymically stand for, one of their salient or essential properties and, conversely, a salient or essential property may evoke, and metonymically stand for, its category.

(18) (a) CATEGORY FOR SALIENT PROPERTY: *brain* for 'intelligence'
(b) SALIENT PROPERTY FOR CATEGORY: *blacks* for 'black people'

Some categories conventionally stand for specific properties such as *heart* for 'kind' or *Cadillac* for 'the best of'. Also certain well-known individuals may stand for an outstanding property they possess. When a person is described as a *Judas*, we know that he is meant to be 'treacherous', and when an upcoming star in linguistics is referred to as a *second Chomsky*, we have in mind his or her intellectual brilliance.

Stereotypical properties are evoked in our interpretation of 'colloquial tautologies' such as *Boys will be boys*. Since a tautology is literally uninformative, it can only be interpreted meaningfully in the sense of a salient, typically stereotypical, property associated with the category. The tautology in *Boys will be boys* may, depending on the context, mean 'boys are unruly' or 'boys are cute and adorable' (Gibbs 1994: 345–351). All these examples are instances of a WHOLE FOR PART metonymy, which may be characterized as in (19a); conversely, salient properties as parts of a category may stand for the category as a whole as in (19b):

(19) (a) CATEGORY FOR SALIENT PROPERTY: *Boys will be boys* for 'unruly'
(b) SALIENT PROPERTY FOR CATEGORY: *How do I find Mr. Right?*

(vii) *Reduction ICM*: A final type of a PART FOR WHOLE metonymy is found in the reduction of the form of a sign, which was already alluded to under (8) FORM$_A$-CONCEPT$_A$ FOR FORM$_B$-CONCEPT$_A$. Its specific variant may be described as:

(20) PART OF A FORM FOR THE WHOLE FORM: *crude* for *crude oil*

The reduction of forms may involve sophisticated metonymic chains. For example, the abbreviation *tg* stands for a longer abbreviated form, *tgif,* which represents the whole expression *Thank God, it's Friday*; and even this exclamation may be seen as a part of the whole target sense: 'it's the weekend – let's enjoy ourselves'.

3.2 Parts of an ICM

This configuration relates conceptual entities that function as parts with respect to a whole ICM. It typically applies to entities within an event. Events are constituted by a relation and participants, and PART FOR PART metonymies tend to build on a relation and one of its participants or between two participants related.

(i) *Action ICM*: Action ICMs include relationships such as those between an ACTION and an INSTRUMENT used in the action, an ACTION and the RESULT of this action, etc. The Action ICM includes the following types of metonymic relationships, the first four of which are reversible:

(21) (a) AGENT FOR ACTION: to *author* a book; to *butcher* a cow
(b) ACTION FOR AGENT: *writer*; *driver*

(22) (a) INSTRUMENT FOR ACTION: to *ski*; to *hammer*
(b) ACTION FOR INSTRUMENT: pencil *sharpener*; screw*driver*

(23) (a) OBJECT FOR ACTION: to *blanket* a bed; to *dust* the room
(b) ACTION FOR OBJECT: to have a *bite*; the *flight* is waiting

(24) (a) RESULT FOR ACTION: to *landscape* the garden
(b) ACTION FOR RESULT: the *production*; the *product*

(25) MANNER FOR ACTION: to *tiptoe* into the room

(26) MEANS FOR ACTION: He *sneezed* the tissue off the table.

(27) TIME FOR ACTION: to *summer* in Paris

(28) DESTINATION FOR MOTION: to *porch* the newspaper

(29) INSTRUMENT FOR AGENT: the *pen* for 'writer'

With the exception of (29), INSTRUMENT FOR AGENT, all the Action metonymies listed above involve predicates either as the vehicle or the target and typically also involve a change of their word class: nouns are converted into verbs and verbs are nominalized.

Noun-verb conversion and nominalization can therefore be seen as two complementary morphological processes leading to reversible metonymies.

The metonymic relationships listed in (21) – (28) are not restricted to changes of word classes. For example, the RESULT FOR ACTION metonymy may also arise within the same word class. Thus, the verb *to win* in its normal use describes the result of an event; in *Win a fortune!*, however, the imperative construction imposes the sense of an action such as gambling.

(ii) *Perception ICM*: Perception plays such an outstanding role in our cognitive world that it merits an ICM of its own. Since perceptions may also be intentional, the Perception ICM may cross-classify with the Action ICM. This applies to the metonymies INSTRUMENT/ORGAN OF PERCEPTION FOR THE PERCEPTION as in *to eye someone* and MANNER OF PERCEPTION FOR THE PERCEPTION as in *She squinted through the mailbox*. Non-intentional perceptions may produce the following reversible metonymies:

(30) (a) THING PERCEIVED FOR PERCEPTION: *There goes my knee.* for 'there goes the pain in my knee' (Lakoff 1987: 511)
(b) PERCEPTION FOR THING PERCEIVED: *sight* for 'thing seen'

(iii) *Causation ICM*: Cause and effect are so closely interdependent that they tend to imply each other. The causation ICM may give rise to reversible metonymies:

(31) (a) CAUSE FOR EFFECT: *healthy exercise* for 'the exercise bringing about the effect of good health'
(b) EFFECT FOR CAUSE: *healthy complexion* for 'the good state of health bringing about the effect of healthy complexion'

Effects more readily serve as metonymic vehicles than causes, which is evidenced most clearly in the following subtypes of EFFECT FOR CAUSE metonymies:

(32) STATE/EVENT FOR THING/PERSON/STATE CAUSING IT: *She was my ruin.*

(33) EMOTION FOR CAUSE OF EMOTION: *She is my joy.* for 'she makes me feel happy'

(34) MENTAL/PHYSICAL STATE FOR OBJECT/PERSON CAUSING IT: *You are a pain in the neck.* for 'you give me pain'

(35) PHYSICAL/BEHAVIORAL EFFECT FOR EMOTION CAUSING IT: *She was upset.* for 'something distressed her'

A causal metonymy may also be seen in situations in which an action or a motion brings about, or is accompanied by, a typical sound, which together establish an ICM:

(36) SOUND FOR EVENT CAUSING IT: *The car screeched to a halt.*

Here, the screeching noise results when the car brakes are applied. Similar metonymic situations are illustrated in *The train whistled into the station; The fire trucks wailed out of the firehouse*, and *She rang the money into the till.*

Causal metonymies also permeate the field of perception. A percept may stand for its cause (37a), and a cause may stand for the percept (37b):

(37) (a) SEEING SOMETHING DONE FOR MAKING SURE THAT IT IS DONE: *See that he gets his money.* (Lakoff 1987: 437)
(b) ACT OF FORMING A PERCEPT FOR PERCEPT: *to take a look* (Norvig and Lakoff 1987: 204)

(iv) *Production ICM*: Production ICMs involve actions in which one of the participants is a product created by the action. The production of objects seems to be a particularly salient type of causal action. The Production ICM leads to various types of metonymic relationships in which the thing produced tends to be the intended target:

(38) PRODUCER FOR PRODUCT: I've got a *Ford.* for 'car'

Due to our close association of artists with their artistic productions and inventors with their inventions, the metonymies ARTIST FOR HIS WORK as in *They are playing Mozart tonight* and INVENTOR FOR THE THING INVENTED as in *macadam* establish particularly common subtypes of the PRODUCER FOR PRODUCT metonymy. A producer and the thing produced are conceptually different enough to warrant clear identification of their roles. This also applies to an instrument used for producing something or the place of production:

(39) (a) INSTRUMENT FOR PRODUCT: Did you hear *the whistle?* for 'sound of the whistle'
(b) PRODUCT FOR INSTRUMENT: to turn up *the heat* for 'the radiator'

(40) PLACE FOR PRODUCT MADE THERE: *china, mocha, camembert*

(v) *Control ICM*: This ICM includes a controller and a person or object controlled. It gives rise to reversible metonymies.

(41) (a) CONTROLLER FOR CONTROLLED: *Schwartzkopf* defeated Iraq.
(b) CONTROLLED FOR CONTROLLER: *The Mercedes* has arrived.

Control ICMs seem to be naturally expressed by using the CONTROLLER FOR CONTROLLED metonymy as in (41a), in which *Schwartzkopf* stands for the US Army that did the fighting. Making the same statement using the CONTROLLED instead of the CONTROLLER, as in *The US Army defeated Iraq*, does not evoke the controller reading. The CONTROL-

LED FOR CONTROLLER metonymy seems to apply only to situations in which the thing controlled is particularly salient or the controller is unknown, as in (41b).

The notion of control normally also underlies that of possession. For example, the user of an object is at the same time in control of the object used and possesses it. This situation gives rise to the metonymy OBJECT FOR USE OF OBJECT, as in Lakoff and Johnson's (1980: 35) example *Mrs. Grundy frowns on blue jeans*, where the expression *blue jeans* stands for the wearing of blue jeans.

(vi) *Possession ICM*: The Possession ICM may lead to reversible metonymies:

(42) (a) POSSESSOR FOR POSSESSED: *That's me.* for 'my bus'
(b) POSSESSED FOR POSSESSOR: *He married money* for 'person with money'

There is, however, a clear preference for choosing the possessor as the vehicle and the possessed object as the target. This is also reflected in the use of anaphoric pronouns, which, if they can be used at all, refer to the human vehicle, as in *Bill is in the Guinness Book of Records; he is on page 7*, and not to the target, as in #*Bill is in the Guinness Book of Records; it is on page 7*. Conversely, anaphoric pronouns in POSSESSED FOR POSSESSOR metonymies refer to the human target, as in *Many big names have turned up and he was one of them*, and not to the vehicle, as in #*Many big names have turned up and it was one of them*.

(vii) *Containment ICM*: The image-schematic situation of containment is so basic that it deserves to be treated as an ICM of its own among spatial relations. As a rule, we are more interested in the contents of a container than in the mere container so that we commonly find metonymies which target the contents via the container, as in (43a), rather than the reverse metonymic relationship, as in (43b).

(43) (a) CONTAINER FOR CONTENTS: *The bottle is sour.* for 'milk'
(b) CONTENTS FOR CONTAINER: *The milk tipped over.* for 'the milk container' (Norrick 1981: 58)

(viii) *Location ICMs*: Places are often associated with people living there,[4] well-known institutions located there, events which occur or occurred there, and goods produced or shipped from there (see (40)). Hence, we find the following metonymies:

(44) (a) PLACE FOR INHABITANTS: *The whole town showed up* for 'the people'
(b) INHABITANTS FOR PLACE: *The French hosted the World Cup Soccer Games* for 'France'

(45) (a) PLACE FOR INSTITUTION: *Oxford won't publish the book* for 'Oxford University Press'
(b) INSTITUTION FOR PLACE: I *live close to the University.*

(46) (a) PLACE FOR EVENT: *Waterloo* for 'battle fought at Waterloo'
(b) EVENT FOR PLACE: *Battle* name of the village in East Sussex where the Battle of Hastings was fought

The relationship between places and people living there is often seen as a situation of containment. In this view, the metonymic relationship in (44) would be treated as a metaphorical extension of the container metonymy (43). The metonymic relationship in (46) comprises salient events which occurred at a particular place as well as activities typically performed at a given place. Relating places with what is typically done there is part of our cultural knowledge. It allows us to interpret the mention of the place in *I was behind the wheel all day* in the sense of the activity typically performed at that place, namely 'driving'. This subtype of metonymy may more adequately be described as PLACE FOR ACTIVITY PERFORMED AT THAT PLACE.

(ix) *Sign and Reference ICMs*: As shown in Section 2, Sign and Reference ICMs lead to metonymies cross-cutting ontological realms. In sign metonymies, a (word-) form stands for a conventionally associated concept; in reference metonymies, a sign, concept or (word-)form stands for the real thing. In each case, one part of an ICM stands for another part of the same ICM.

Sign metonymies may also apply to particular instances of the relationship between the form and content parts of a sign, as in:

(47) WORDS FOR THE CONCEPTS THEY EXPRESS: *a self-contradictory utterance*

In (47), we understand the word form *utterance* 'as referring to the conceptual content expressed by the utterance' (Lakoff and Turner 1989: 108). This metonymy also accounts for the compound expression *four-letter word*, where the formal property of 'four letters' stands for the category of 'swear words', and these types of words stand for the concept expressed by them. Since the expression *four-letter word* may also be used for swear words which have more or less than four letters such as *asshole* or *bastard*, metonymy (16b), MEMBER OF A CATEGORY FOR THE CATEGORY, also applies here.

(x) *Modification ICM*: This ICM mainly applies to variant forms of a sign. More specifically, we may distinguish between genuine cases of modification as in (48) and substitution as in (49), both of which seem to be unique to language:

(48) MODIFIED FORM FOR ORIGINAL FORM: *effing* for *fucking*

(49) SUBSTITUTE FORM FOR ORIGINAL FORM: Do you still love me? – Yes, I *do*.

4 Principles governing the selection of the preferred vehicle

The choice of vehicle and target in default cases of metonymy appears to be motivated or restrained by cognitive principles. The nature of such principles was pointed out by Langacker (1993: 30) in a very relevant observation on the function of metonymy:

> Metonymy allows an efficient reconciliation of two conflicting factors: the need to be accurate, i.e., of being sure that the addressee's attention is directed to the intended target, and our natural inclination to think and talk explicitly about those entities that have the greatest cognitive salience for us.

The first factor relates to communicative aspects and will be described here in terms of communicative principles, the latter factor pertains to cognitive aspects and will be described in terms of cognitive principles. We will first look at the cognitive principles governing the selection of the preferred vehicle (Section 4.1) and then briefly examine the issue of communicative principles (Section 4.2). The principles themselves are assumed to have the status of preferential tendencies and will be stated in the form of X OVER Y.

4.1 Cognitive principles

Some of the cognitive principles of salience that have been identified by Langacker (1993) for reference points[5] and Cooper and Ross (1975) for binomial expressions[6] are also relevant for default metonymies. They relate to three general determinants of conceptual organization, which tend to interact and overlap: human experience, perceptual selectivity, and cultural preference.

4.1.1 Human experience

Our basic human experiences are derived from our bodily interaction with people and objects around us and our anthropocentric view of the world. This is reflected in the following principles of relative salience.

(i) HUMAN OVER NON-HUMAN: This principle accounts for the default cases of the production, control and possession metonymies, namely (38) PRODUCER FOR PRODUCT (*I've got a Ford*), (41a) CONTROLLER FOR CONTROLLED (*Schwartzkopf defeated Iraq*), and (42a) POSSESSOR FOR POSSESSED (*I have a flat tire*).

(ii) SUBJECTIVE OVER OBJECTIVE: This principle is based on our subjective view of the world and accounts for metonymy (30b) PERCEPTION FOR THING PERCEIVED, as in *What a beautiful sight* for 'thing seen'.

(iii) CONCRETE OVER ABSTRACT: Our basic human experience relates to concrete physical objects. Body parts make particularly 'good' objects, and we routinely access various abstract human domains by reference to our body. We thus speak of *having one's hands on something* for 'controlling something', *holding one's tongue* for 'stopping speaking', *heart* for 'kindness', *brain* for 'intellect', *a good ear* for 'good hearing', etc. Since concrete objects are visible, the principle also entails VISIBLE OVER INVISIBLE, which is reflected in metonymies such as *to save one's skin* for 'to save one's life'. Visibility also accounts for the default metonymy (43a) CONTAINER FOR CONTENTS, since containers are visible but things in the container are, as a rule, not. The CONCRETE OVER ABSTRACT principle also accounts for the metonymies (1) FORM FOR CONCEPT and (47) WORDS FOR THE CONCEPTS THEY EXPRESS, where the concrete visual or acoustic shape of a sign stands for its concept.

(iv) INTERACTIONAL OVER NON-INTERACTIONAL: Entities we interact with form good reference points. We often interact with parts of a whole so that this principle provides a default motivation for PART FOR WHOLE metonymies. For example, the part we interact with most in driving is the steering wheel so that we speak of *sitting behind the wheel* for 'driving'. We mainly use our hands in interacting with the world and hence speak of *hand-on demonstration*, we use our fingers in typing on the computer keyboard and thus speak of *having the world at our fingertips* when we log into the Internet. Our interaction with things is also closely related to their function.

(v) FUNCTIONAL OVER NON-FUNCTIONAL: As shown by Tversky and Hemenway (1984), we attach particular salience to functional parts such as the engine and the wheels. We therefore speak of a *motorway* and a *24-wheeler*. Parts that have no important function in driving such as the doors, the windshield wipers, or the fenders are, of course, highly unlikely to be selected as metonymic reference points to stand for the car.

4.1.2 Perceptual selectivity

A number of cognitive principles are relatable to perceptual salience. The foci of perceptual selectivity can be stated in the following principles of cognitive preference.

(i) IMMEDIATE OVER NON-IMMEDIATE: This cognitive principle accounts for selecting stimuli in our spatial, temporal, and causal immediacy. The metonymy in I'll answer the phone for 'I'll answer the person speaking at the other end of the line' is motivated by spatial immediacy. Metonymies (13) PRESENT FOR HABITUAL, as in I always take the 9 o'clock train, and (14) PRESENT FOR FUTURE, as in I am off for 'I will be off', are motivated by temporal immediacy. Metonymy (33) EMOTION FOR CAUSE OF EMOTION, as in She is my joy for 'she makes me feel happy', is motivated by the immediacy of the effect. The immediacy principle also accounts for many emotion metonymies in which physiological and behavioral responses produced by emotions are used to stand for the emotions themselves, as in He got cold feet for 'he became frightened' (see Kövecses 1990).

(ii) OCCURRENT OVER NON-OCCURRENT: This principle reflects our preferential concern with real, factual, and occurrent experiences. It accounts for metonymy (15a) ACTUAL FOR POTENTIAL in expressions such as *He is an angry person* or *This is a fast car*.

(iii) MORE OVER LESS: This principle accounts for the naturalness of using expressions denoting the upper, but not the lower, end of a scale for the whole scale, as in *How tall are you?*, where *tall* refers to any size. In the social and political domains, size is related to power and dominance, which may be seen as metaphorical sizes.

(iv) DOMINANT OVER LESS DOMINANT: This principle explains the metonymic use of the biggest and most powerful country or part of a country for a larger geographical unit as in (9b) *England* for 'Great Britain', *Holland* for 'the Netherlands', and *Russia* for the former 'Soviet Union'. This principle probably also accounts for the use of masculine forms in a generic sense, as in *mankind, postman* or *you guys*.

(v) GOOD GESTALT OVER POOR GESTALT: A powerful perceptual principle is our tendency to perceive gestalts as a whole rather than separate parts. This principle accounts for the wide-spread use of humans and whole objects when in fact an 'active-zone' part is meant, as in *The car needs washing* for 'body of the car'. An essential requirement of any gestalt is that it has clearly delineated boundaries; hence the gestalt principle further relates to the following two principles.

(vi) BOUNDED OVER UNBOUNDED: The metonymic shift (11a) OBJECT FOR MATERIAL CONSTITUTING THE OBJECT allows us to construe a bounded thing as unbounded, as in *We had chicken today*. Its reverse metonymy (11b) MATERIAL CONSTITUTING AN OBJECT FOR THE OBJECT, as in *I sent you an e-mail*, is much less productive.

(vii) SPECIFIC OVER GENERIC: Specific and definite instances form better gestalts than general or unspecific entities. This principle underlies metonymy (17b) SPECIFIC FOR GENERIC and its subtypes. At a purely conceptual level, this principle accounts for people's tendency to generalize. For example, O.J. Simpson's verdict of 'not guilty' was taken by many Americans as a verdict for all black people.

4.1.3 Cultural preferences

Lakoff's work on metonymic models has shown that some members of a category are more salient than others with respect to certain dimensions. These dimensions are more or less strongly determined within a given culture.

(i) STEREOTYPICAL OVER NON-STEREOTYPICAL: Stereotypes probably provide the best cases of culture-bound concepts. We already came across the impact of stereotypes on metonymy in connection with categories such as 'housewife' and colloquial tautologies as in *Boys will be boys*.

(ii) IDEAL OVER NON-IDEAL: Ideals are social constructs within a culture and deined with respect to desirability, such as 'ideal love' (see Kövecses 1988); others are represented by a paragon like Babe Ruth for 'ideal baseball players' (Lakoff 1987). Also, negative categories may have ideal examples that can stand for the whole category, such as *Judas*, who is a betrayer par excellence in our culture and stands for 'betrayal' in general.

(iii) TYPICAL OVER NON-TYPICAL: Typical members of a category are often picked out when a category as a whole is described. For example, one may refer to the symptoms of *sneezing* and *coughing* in talking about a cold as in *You've got a bad cough*.

(iv) CENTRAL OVER PERIPHERAL: The cultural impact of centrality is nicely illustrated in Feyaerts' (1999) study of the conceptualization of stupidity in German. Expressions such as *You are not from here, are you?* demonstrate that people who are considered stupid are seen as living on the periphery of one's culture.

(v) INITIAL OR FINAL OVER MIDDLE: In our conception of events, an initial or final phase may be seen as being more important than the central phase. *To pull the trigger* for 'to shoot' focuses on an event's initial phase, *to sign a contract* for 'to make a contract' focuses on an event's final phase. The etymologies of *creed* and *mass* provide nice historical illustrations of the two aspects of this principle: *creed* derives from the first word of the Apostles' Creed, *Credo in unum Deum* 'I believe in one God', while *mass* for 'service' goes back to a formula said at the end of medieval church services, *Ite, missa est (contio)* 'go now, the meeting is dismissed' (Ullmann 1972: 219).

(vi) BASIC OVER NON-BASIC: This principle applies to simple and well-known 'ground' routines as in Lakoff's (1987: 88f) generators and submodels and in our preference for basic level categories. The use of the basic number *hundred* in *I've told you a hundred times* for 'several times' exemplifies this principle.

(vii) IMPORTANT OVER LESS IMPORTANT: This principle accounts for the use of *stage* for 'theater' as the most important part of the Theater ICM, the expression *speaking a language* for 'knowing a language', or the identification of a capital city with a country.

(viii) COMMON OVER LESS COMMON and

(ix) RARE OVER LESS RARE: Common members of a category are culturally given reference points and may be used metonymically, like *aspirin* for any pain-relieving tablet, while rare members stand out because of their uniqueness, as in Lakoff's (1987) example of a DC-10 crash, which people generalized to the extent that they refused to fly in any DC-10.

It is, without doubt, possible to identify more such cognitive principles, which, however, partly overlap with the ones discussed above. Among these we would probably have to list UNEXPECTED OVER EXPECTED, NEW OVER OLD, and TRADITIONAL OVER NON-TRADITIONAL.

4.2 Communicative principles

At least two principles seem to contribute to determining the default selection of a metonymic vehicle: the principle of clarity and the principle of relevance.

4.2.1 The principle of clarity

The communicative principle that ensures maximal ease of accessing the intended target via a metonymic vehicle may be stated in preferential terms as CLEAR OVER OBSCURE. This principle is, of course, reminiscent of Grice's (1975) maxim of manner, which, amongst other things, requires the speaker to avoid obscurity. It might be assumed that clarity in communication is best guaranteed by use of literal speech. Instances of metonymy which have a high degree of cognitive motivation, however, do not seem to require any more effort in directing the addressee's attention toward the intended target. Especially active-zone metonymies are highly motivated by the WHOLE FOR PART metonymy and, hence, are understood clearly and effortlessly. In Langacker's example *The dog bit the cat*, we effortlessly supply 'the dog's teeth' as the intended target. Here, the metonymic mode of expression is clearer and more 'accurate' than the literal one, **The dog's teeth bit the cat*. In a vague expression such as *They spent the night together*, however, the addressee cannot clearly access the intended target and so communicative success is not guaranteed.

4.2.2 The principle of relevance

Sperber and Wilson's (1995: 158) principle of relevance, according to which 'every act of ostensive communication communicates a presumption of its own optimal relevance', also applies to the use and interpretation of metonymy. As a communicative principle of preference, it may be stated as RELEVANT OVER IRRELEVANT. As a rule, a cognitively salient vehicle is also relevant to the situation at hand. It is only when the principle of relevance is in conflict with one or more of the cognitive principles that its impact comes to the fore. This is the case with in-group talk by nurses about their patients or waitresses about their customers. Thus, the much discussed metonymic example of *The ham sandwich is waiting for his check* in reference to a customer is well-motivated by the principle of relevance since, to the waitress, the food served provides the best reference point for identifying a customer in the Restaurant ICM.

4.3 Competing motivations

In light of the previous sections, we can reasonably suggest that the more cognitive principles apply, the greater the cognitive motivation of a metonymy. For example, the metonymy ARTIST FOR HIS WORK, as in *We are reading Shakespeare* for 'Shakespeare's plays', is motivated by a bundle of cognitive principles: HUMAN OVER NON-HUMAN, CONCRETE OVER ABSTRACT, and GOOD GESTALT OVER POOR GESTALT. Most instances of metonymy, however, are not 'fully' motivated; rather, we have a continuum of motivation ranging from fully motivated default metonymies to weakly or unmotivated non-default metonymies.

Consider again Lakoff and Johnson's example *The buses are on strike* for 'the bus-drivers are on strike'. Since passengers interact with the buses and buses are more relevant to them than their drivers, the metonymy is motivated by the cognitive principle INTERACTIONAL OVER NON-INTERACTIONAL and the communicative principle RELEVANT OVER IRRELEVANT, but it is inconsistent with the cognitive principle HUMAN OVER NON-HUMAN. The metonymy in *I'll answer the phone* is consistent with the principle IMMEDIATE OVER NON-IMMEDIATE, but is in conflict with the principle HUMAN OVER NON-HUMAN. The metonymic expression *paper* for 'essay on a subject' is motivated by the principle CONCRETE OVER ABSTRACT, in particular, VISIBLE OVER INVISIBLE, but, since *paper* is prototypically a mass noun, the principle BOUNDED OVER BON-BOUNDED is reversed. In all these cases, conflicting motivations decrease the naturalness of the overall motivation of the metonymy.

5 Overriding factors

The use of metonymy may also be motivated by a speaker's expressive needs or a given social situation. A speaker may use metonymy in order to achieve a rhetorical or social effect. These factors may override one or more of the above principles governing the selection of the preferred, or default, metonymic vehicle. Since these principles are overridden deliberately, the resulting non-default metonymy is usually felt to be figurative.

5.1 Rhetorical effects

Along with other figurative modes of thought, metonymy is commonly used to produce rhetorical effects as in humor, jargon, literature, persuasion, slang, poetry and the like. The rhetorical effects tend to derive from violations of default cognitive and communicative principles. For example, the aesthetic effect of the metonymies in *The pen is mightier than the sword* derives from the deliberate reversal of the cognitive principle HUMAN OVER NON-HUMAN. Shakespeare's wording *Let pride marry her* and the journalist's description *Many American lives were lost* for 'many Americans died' both violate the principle of CONCRETE OVER ABSTRACT.

5.2 Social-communicative effects

Social considerations may have a considerable impact on a speaker's choice of language in a given communicative situation. This particularly applies to face-threatening situations, which may be alleviated by metonymy-based euphemisms. For example, the euphemistic expressions *to go to the bathroom* and *to wash one's hands* (for 'to urinate/defecate') describe activities that only tangentially relate to the central and relevant event, hence they violate the principles CENTRAL OVER PERIPHERAL, RELEVANT OVER IRRELEVANT as well as CLEAR OVER OBSCURE. The euphemistic expressions may become so entrenched that they are no longer felt to be metonymic. Thus, *to go to the bathroom* is no longer associated with its spatial meaning 'to transport oneself to the bathroom', but evokes the target sense directly in expressions such as *The dog went to the bathroom on the living room rug.*[7] Metonymic expressions which are no longer felt to mystify a taboo topic tend to be replaced by new non-default metonymies. This happened to the originally euphemistic word *toilet,* which was replaced by *bathroom* and *restroom*, which in their turn have been supplanted by expressions such as *facilities* and *comfort station*.

Violation of the clarity principle also abounds in jargon. The official term used in British English for 'dismissal from a job' is *redundancy*, which refers to the cause or precondition of laying off workers or employees. The metonymy deliberately reverses the cognitive principle CENTRAL OVER PERIPHERAL and, since the target is not clearly identifiable, also violates the communicative principle CLEAR OVER OBSCURE. The clarity principle is also often violated in politically correct expressions such as *equal opportunity employer*.

These types of metonymy have traditionally been studied in rhetoric and literary criticism. In the cognitivist view presented here they now appear as non-default cases of metonymy, in which cognitive and/or communicative principles are deliberately overridden. Since the primary goal of this paper is to isolate the principles which determine default cases, the issue of non-default metonymies shall not be explored any further.

6 Conclusion

We have attempted to offer a relatively comprehensive and integrated theoretical framework of metonymy from a cognitivist point of view. The paper argues that metonymy is a cognitive process which operates within a single idealized cognitive model. Since ICMs may cross-cut ontological realms, we may also expect to find metonymy-producing relationships in and cross-cutting the three ontological realms of concepts, forms and things/events. We have been able to identify eight ICMs which give rise to 'ontological metonymies'.

The metonymy-producing relationships were subsumed under two general conceptual configurations: whole ICM and its part(s) and parts of an ICM. The former configuration typically gives rise to metonymies involving things, the latter primarily applies to metonymies involving predications. A small number of conceptual relationships only admit metonymization in one direction; the majority of metonymy-producing relationships, however, lead to reversible metonymies. Generally, however, one of these metonymic construals is conceptually preferred.

A number of cognitive and communicative principles govern the default selection of the preferred metonymic vehicle. The cognitive principles pertain to the areas of human experience, perceptual selectivity and cultural preferences. The communicative principles include those of clarity and relevance.

These cognitive and communicative principles may be overridden for expressive or social reasons. Non-default metonymies, which arise through such overriding factors, violate one or more of the default cognitive and communicative principles, in particular the principle CLEAR OVER OBSCURE.

We do not claim that we have carried out this project fully. On the contrary, what we have presented here are just the first steps towards of a theory of metonymy. We are certain that there are scholars who do not agree with us in matters of detail or even with respect to our general claims.

Notes

1 Langacker's notion of reference point applies to many other phenomena in language structure, in particular possessive constructions. The view of metonymy as a reference-point phenomenon is, however, not unproblematic. The process of first making mental contact to a reference point before accessing the target should take longer than that of accessing a conceptual entity directly. This, however, has not been confirmed experimentally in terms of the processing time needed to understand metonymy (Gibbs 1993).

2 See the discussion of the notion of contiguity in Koch (1999: 144–149). The notion of contiguity is also present in cognitive definitions as in Croft's (1993: 347) definition of metonymy as 'a shift of a word meaning from the entity it stands for to a 'contiguous' entity'.

3 Lakoff and Turner analyze proverbs as instances of the metaphor GENERIC IS SPECIFIC. Since both the specific and the generic levels belong to the same ICM, however, we prefer to analyze them as instances of the metonymy SPECIFIC FOR GENERIC.

4 Objects and animals may, of course, also be associated with a place. A nice example of metonymic association is the proper name *Canary Islands*, which goes back to the name *Canaria* given to it by the Romans on account of the many dogs seen there and which later on provided the name for the bird *canary*, which the Spanish found on the islands.

5 Langacker (1993: 30): 'Other things being equal, various principles of relative salience generally hold: human > non-human; whole > part; concrete > abstract; visible > non-visible; etc.'

6 The following semantic constraints identified by Cooper and Ross (1975) correspond to the cognitive principles as used here: *Here* and *Now* correspond to IMMEDIATE OVER NON-IMMEDIATE, *Singular* corresponds to SPECIFIC OVER GENERIC, *Animate* and *Agentive* correspond to HUMAN OVER NON-HUMAN, and *Count* corresponds to BOUNDED OVER UNBOUNDED. Possibly also the remaining semantic constraints are relevant for metonymy.

7 Cf. Morgan (1978: 263), who analyzes this example, which goes back to Robin Lakoff, as conventionalized conversational implicature.

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13 Conceptual integration networks*

Gilles Fauconnier and Mark Turner

1 Introduction

Much of the excitement about recent work on language, thought, and action stems from the discovery that the same structural cognitive principles are operating in areas that were once viewed as sharply distinct and technically incommensurable. Under the old view, there were word meanings, syntactic structures, sentence meanings (typically truth-conditional), discourse and pragmatic principles, and then, at a higher level, figures of speech like metaphor and metonymy, scripts and scenarios, rhetoric, forms of inductive and deductive reasoning, argumentation, narrative structure, etc. A recurrent finding in recent work has been that key notions, principles, and instruments of analysis cut across all these divisions and in fact operate in non-linguistic situations as well. Here are some of them:

Frames structure our conceptual and social life. As shown in the work of Fillmore, Langacker, Goldberg, and others, they are also, in their most generic, and schematic forms, a basis for grammatical constructions. Words are themselves viewed as constructions, and lexical meaning is an intricate web of connected frames. Furthermore, although cognitive framing is reflected and guided by language, it is not inherently linguistic. People manipulate many more frames than they have words and constructions for.

Analogical mapping, traditionally studied in connection with reasoning, shows up at all levels of grammar and meaning construction, such as the interpretation of counterfactuals and hypotheticals, category formation, and of course metaphor, whether creative or conventional.

Reference points, focus, viewpoints, and dominions are key notions not only at higher levels of narrative structure, but also at the seemingly micro-level of ordinary grammar, as shown convincingly by Langacker 1993, Zribi-Hertz 1989, Van Hoek 1997, Cutrer 1994, among others.

Connected mental spaces account for reference and inference phenomena across wide stretches of discourse, but also for sentence-internal multiple readings and tense/mood distributions. Mappings at all levels operate between such spaces, and like frames they are not specifically linguistic (Fauconnier 1997, Dinsmore 1991, Cutrer 1994, Fauconnier and Sweetser 1996).

Connectors and conceptual connections also operate at all levels, linking mental spaces and other domains for coreference, for metonymy (Nunberg 1978), and for analogy and metaphor (Turner 1991, Sweetser 1990).

There are other notions that apply uniformly at seemingly different levels, such as figure/ground organization (Talmy 1978), profiling, or pragmatic scales. Running through this research is the central cognitive scientific idea of *projection* between structures. Projection connects frames to specific situations, to related frames, and to conventional scenes. Projection connects related linguistic constructions. It connects one viewpoint to another and sets up new viewpoints partly on the basis of old. It connects counterfactual conceptions to non-counterfactual conceptions on which they are based. Projection is the backbone of analogy, categorization, and grammar.

In the present study, we show that *projection typically involves conceptual integration*. There is extensive previous research on varieties of projection, but not on conceptual integration. Empirical evidence suggests that an adequate characterization of mental projection requires a theory of conceptual integration. We propose the basis for such a theory and argue that conceptual integration – like framing or categorization – is a basic cognitive operation that operates uniformly at different levels of abstraction and under superficially divergent contextual circumstances. It also operates along a number of interacting gradients. Conceptual integration plays a significant role in many areas of cognition. It has uniform, systematic properties of structure and dynamics.

The nature of mapping between domains has enjoyed sustained attention as a central problem of cognitive science, and voluminous literatures have developed in this area, including studies by those who call their subject 'analogy' or 'similarity' (e.g., Hofstadter 1985, 1995a, Mitchell 1993, French 1995, Keane, Ledgeway, and Duff 1994; Holyoak and Thagard, 1989, 1984; Forbus, Gentner, and Law, 1994; Gentner 1983, 1989; Holland, Holyoak, Nesbett, and Thagard, 1986), studies by those who call their subject 'metaphor' (e.g., Lakoff and Johnson 1980; Lakoff and Turner 1989; Sweetser 1990; Turner 1987; Indurkhya 1992; Gibbs 1994) and studies that consider cross-domain mapping in general (e.g., Fauconnier 1997, Ortony 1979a, 1979b, Glucksberg and Keysar 1990, Turner 1991).

Our immediate goal is *not* to take a stand on issues and problems of cross-space mappings. Those issues are many and the debates over them will continue and will be further enriched, we hope, by taking blending into consideration. What we *will* be suggesting is that models of cross-space mapping do not by themselves explain the relevant data. These data involve conceptual integration and multiple projections in ways that have typically gone unnoticed. Cross-space mapping is only one aspect of conceptual integration, and the existing body of research on the subject overlooks conceptual integration, which it is our intention to foreground and analyze here. As we move through the data that crucially involves both cross-space mapping and conceptual integration, we will remark that much of it is neither metaphoric nor analogical.[1]

We take it as an established and fundamental finding of cognitive science that structure mapping and metaphorical projection play a central role in the construction of reasoning and meaning. In fact, the data we analyze shows that such projections are even more pervasive than previously envisioned. Given the existence and key role of such mappings, our focus is on the construction of additional spaces with emergent structure, not directly available from the input domains.

We also rely on another fundamental finding of cognitive science, the capacity for mental simulation, as demonstrated in Johnson-Laird (1983), Kahneman (1995), Grush (1995), Schwartz and Black (1996), Barsalou (1996) among others. In our analysis, the simulation capacity assists in the on-line elaboration of blended spaces ('running the blend'). There is the added twist that simulation can operate on mental spaces which need not have potential real world reference.

Our methodology and argumentation take the following form. Since the cognitive process of conceptual integration has been largely overlooked, it is useful to give evidence for its operation in a wide variety of areas. Since conceptual integration has uniform structural and dynamic properties, it is important to reveal this uniformity behind the appearance of observational and functional diversity. We proceed analytically and empirically, by showing that central inferences, emotions, and conceptualizations, not explained in currently available frameworks, are accounted for elegantly by the conceptual integration model. The argumentation often takes the following specific form: a particular process of meaning construction has particular input representations; during the process, inferences, emotions and event-integrations emerge which cannot reside in any of the inputs; they have been constructed dynamically in a new mental space – the blended space – linked to the inputs in systematic ways. For example, 'They dug their own financial grave' draws selectively from different and incompatible input frames to construct a blended space that has its own emergent structure and that provides central inferences. In this case, the blended space has become conventional.

The diversity of our data (of which only a small sample appears in the present paper) is necessary to support our claim for generality. (In showing that cell division is a basic process, it is necessary to study it for many kinds of cells. In arguing that natural selection is a general principle, it is necessary to exemplify it for widely different organisms and species.) In arguing that conceptual integration is a basic cognitive operation, we must show that it operates in many different kinds of cases.

Conceptual blending is not a compositional algorithmic process and cannot be modeled as such for even the most rudimentary cases. Blends are not predictable solely from the structure of the inputs. Rather, they are highly motivated by such structure, in harmony with independently available background and contextual structure; they comply with competing optimality constraints discussed in section VI, and with locally relevant functional goals. In this regard, the most suitable analog for conceptual integration is not chemical composition but biological evolution. Like analogy, metaphor, translation, and other high-level processes of meaning construction, integration offers a formidable challenge for explicit computational modeling.

Special cases of conceptual blending have been discussed insightfully by Koestler (1964), Goffman (1974), Talmy (1977), Fong (1988), Moser and Hofstadter (ms.), and Kunda, Miller and Clare (1990). Fauconnier (1990) and Turner (1991) also contain analyses of such phenomena. All these authors, however, take blends to be somewhat exotic, marginal manifestations of meaning. We will show here that the process is in fact central, uniform, and pervasive.

The data and analysis we consider here suggest many psychological and neuropsychological experiments (Coulson 1997), but in the present work our emphasis is on the understanding of ecologically valid data. Research on meaning, we suggest, requires analysis of extensive ranges of data, which must be connected theoretically across fields and disciplines by general cognitive principles.

We start our report with an effective but somewhat idealized example of blending, in order to illustrate the issues and terminology. We then outline the general process of conceptual integration and the systematic dynamic properties of blends. We work through some case-studies in a variety of areas. Section VI presents the competing optimality principles under which conceptual integration operates.

2 An illustration

The riddle of the Buddhist monk

Consider a classic puzzle of inferential problem-solving (Koestler 1964):

> A Buddhist monk begins at dawn one day walking up a mountain, reaches the top at sunset, meditates at the top for several days until one dawn when he begins to walk back to the foot of the mountain, which he reaches at sunset. Making no assumptions about his starting or stopping or about his pace during the trips, prove that there is a place on the path which he occupies at the same hour of the day on the two separate journeys.

Our demonstration of the power of blending is likely to be more effective if the reader will pause for a moment and try to solve the problem before reading further. The basic inferential step to showing that there is indeed such a place, occupied at exactly the same time going up and going down, is to imagine the Buddhist monk walking both up and down the path on the same day. Then there must be a place where he meets himself, and that place is clearly the one he would occupy at the same time of day on the two separate journeys.

The riddle is solved, but there is a cognitive puzzle here. The situation that we devised to make the solution transparent is a fantastic one. The monk cannot be making the two journeys simultaneously on the same day, and he cannot 'meet himself.' And yet this implausibility does not stand in the way of understanding the riddle and its solution. It is clearly disregarded. The situation imagined to solve the riddle is a blend: it combines features of the journey to the summit and of the journey back down, and uses emergent structure in that blend to make the affirmative answer apparent. Here is how this works.

Mental space. In our model, the input structures, generic structures, and blend structures in the network are *mental spaces.* Mental spaces are small conceptual packets constructed as we think and talk, for purposes of local understanding and action. Mental spaces are very partial assemblies containing elements, and structured by frames and cognitive models. They are interconnected, and can be modified as thought and discourse unfold. Mental spaces can be used generally to model dynamical mappings in thought and language. (Fauconnier 1994, Fauconnier 1997, Fauconnier & Sweetser 1996).

Blending is an operation that takes place over conceptual integrations networks. Conceptual integration networks often involve many mental spaces. Blending can occur at many different sites in the network. A blended space can have multiple input spaces. Blending is a dynamic process that can happen repeatedly in the same network. Conceptual work can moreover be done at any time at any site in the network. For simplicity, the static diagrams we use in this article involve only a few mental spaces. The purpose of these diagrams is to help clarify the principles of blending. The diagrams themselves are not to be overinterpreted as having any place in conceptual integration theory. In these diagrams, the mental spaces are represented by circles, elements by points (or sometimes icons) in the circles, and connections between elements in different spaces by lines. The frame structure recruited to the mental space is represented either outside in a rectangle or iconically inside the circle.

Input spaces. There are at least two input spaces to a blend. In the case of the Buddhist Monk, each is a partial structure corresponding to one of the two journeys (Figure 1). d_1 is the day of the upward journey, and d_2 the day of the downward journey. a_1 is the monk going up, a_2 is the monk going down.

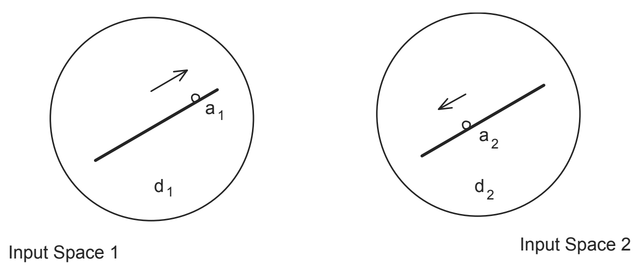


Figure 1

Cross-space mapping of counterpart connections. There is a partial cross-space mapping between the input spaces. The cross-space mapping connects counterparts in the input spaces. It connects the mountain, moving individual, day of travel, and motion in one space to the mountain, moving individual, day, and motion in the other space (Figure 2).

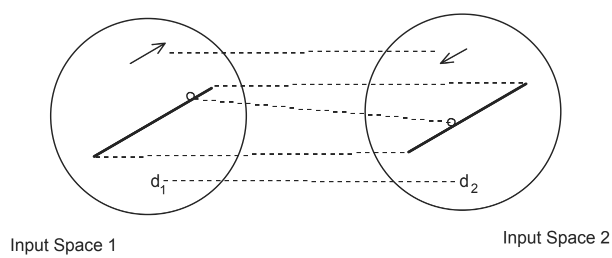


Figure 2

Generic space. There is a generic space, which maps onto each of two inputs. The generic space contains what those two inputs have in common at any moment in the development of the conceptual integration network. In the case of the Buddhist monk, the generic space has a moving individual and his position, a path linking foot and summit of the mountain, a day of travel. It does not specify the direction of motion or the actual day (Figure 3). (At this point in our exposition, it will not be clear why our model needs a generic space in addition to a cross-space mapping. Later, we will argue that powerful generic spaces can themselves become conventional and serve as resources to be drawn on in attempts to build new cross-space mappings in new integration networks.)

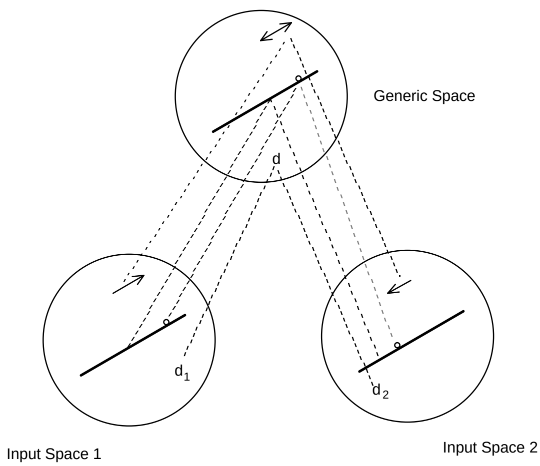


Figure 3

Blend. The input spaces project to another space, the blend. In the blend, the two counterpart identical mountain slopes are mapped onto a single slope. The two days of travel, d_1 and d_2, are mapped onto a single day d' and therefore fused. While in the generic space and each of the input spaces there is only one moving individual, in the blend there are two moving individuals. The moving individuals in the blend and their positions have been projected from the inputs in such a way as to preserve time of day and direction of motion, and *therefore the two moving individuals cannot be fused*. Input 1 represents dynamically the entire upward journey, while input 2 represents the entire downward journey. The projection into the blend preserves times and positions. The blend at time t of day d' contains a counterpart of a_1 at the position occupied by a_1 at time t of d1, and a counterpart of a_2 at the position occupied by a_2 at time t of day d_2 (Figure 4).

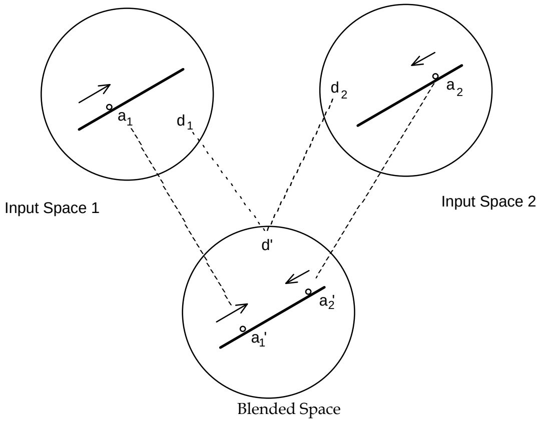


Figure 4

Selective projection. The projection of structure to the blend is selective. For example, the calendrical time of the journey is not projected to the blend.

Emergent structure. The blend contains emergent structure not in the inputs. First, *composition* of elements from the inputs makes relations available in the blend that did not exist in the separate inputs. In the blend but in neither of the inputs, there are two moving individuals instead of one. They are moving in opposite directions, starting from opposite ends of the path, and their positions can be compared at any time of the trip, since they are traveling on the same day, d'.

Second, *completion* brings additional structure to the blend. This structure of two people moving on the path can itself be viewed as a salient part of a familiar background frame: two people starting a journey at the same time from opposite ends of a path. By *completion*, this familiar structure is recruited into the blend. We know, from 'common sense,' i.e. familiarity with this background frame, that the two people will necessarily meet at some time t' of their journey. We do not have to compute this encounter afresh; it is supplied by completion from a pre-existing familiar frame. There is no encounter in the generic space or either of the inputs, but there is an encounter in the blend, and it supplies the central inference.

Importantly, the blend remains hooked up to the Inputs, so that structural properties of the blend can be mapped back onto the Inputs. In our example, because of the familiarity of the frame obtained by completion, the inference that there is a meeting time t' with a common position p is completely automatic. The mapping back to the input spaces yields Figure 5.

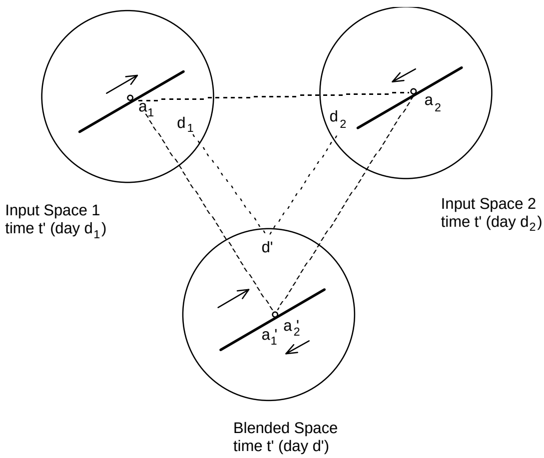


Figure 5

Since the projection of individuals into the blend preserves positions on the path, we 'know' through this mapping that the positions of a_1 and a_2 are the 'same' at time t' on the different days, simply because they are the same, by definition, in the frame of two people meeting, instantiated in the blend by their counterparts a_1' and a_2'.

It is worth emphasizing that the pragmatic incongruity in the blend of the same person traveling in two opposite directions and meeting himself is disregarded, because the focus of the problem is the meeting point and its counterparts in the Input spaces. Blends are used cognitively in flexible ways. By contrast, in examples we discuss later, similar incongruities in the blend get highlighted and mapped back to the Inputs for inferential and emotional effect. Incongruity makes blends more visible, but blends need not be incongruous – incongruity is not one of their defining characteristics.

Notice also that in this blend, some counterparts have been fused (the days, the path on the different days, and the corresponding times on different days), others have been projected separately (the monk on the way up, the monk on the way down, the directions of motion). Projection from the Inputs is only partial – the specific dates of the journeys are not projected, nor the fact that the monk will stay at the top for a while after his upward journey. But the blend has new 'emergent' structure not in the Inputs: two moving individuals whose positions can be compared and may coincide, and the richer frame of two travelers going in opposite directions on the same path and necessarily meeting each other. This emergent structure is crucial to the performance of the reasoning task.

Rather amazingly, the Buddhist monk blend shows up in real life. Hutchins (1995) studies the fascinating mental models set up by Micronesian navigators to sail across the Pacific. In such models, it is the islands that move, and virtual islands may serve as reference points. Hutchins reports a conversation between Micronesian and Western navigators who have trouble understanding each other's conceptualizations. As described in Lewis (1972), the Micronesian navigator Beiong succeeds in understanding a Western diagram of intersecting bearings in the following way:

> He eventually succeeded in achieving the mental tour de force of visualizing himself sailing simultaneously from Oroluk to Ponape and from Ponape to Oroluk and picturing the ETAK bearings to Ngatik at the start of both voyages. In this way he managed to comprehend the diagram and confirmed that it showed the island's position correctly. [the etak is the virtual island, and Ngatik is the island to be located.]

Previous insightful work by Kahneman (1995), Schwartz and Black (1996), Barsalou (1996), has emphasized the role of imaginative mental simulation and depiction in making inferences about physical scenarios. In the riddle of the Buddhist Monk, the physical system we are interested in consists of the sequence of the monk's departing, traveling up the hill, reaching the top, waiting, departing, traveling down the hill, and reaching the bottom. Imagining a mental depiction of this scenario does not solve the riddle, but representing it isomorphically as two input spaces to a blend and imagining a mental depiction of that blend does indeed create an event of encounter in the blend which points to a solution, not for the blend, but for the input spaces and therefore identically for the original scenario. Mental simulation, in this case, depends indispensably upon conceptual blending to provide the effective scenario to begin with.

3 The network model of conceptual integration

In this section, we present the central features of our network model, keyed to the illustration we have just given. In section V, we present advanced aspects of the model.

The network model is concerned with on-line, dynamical cognitive work people do to construct meaning for local purposes of thought and action. It focuses specifically on conceptual projection as an instrument of on-line work. Its central process is conceptual blending.

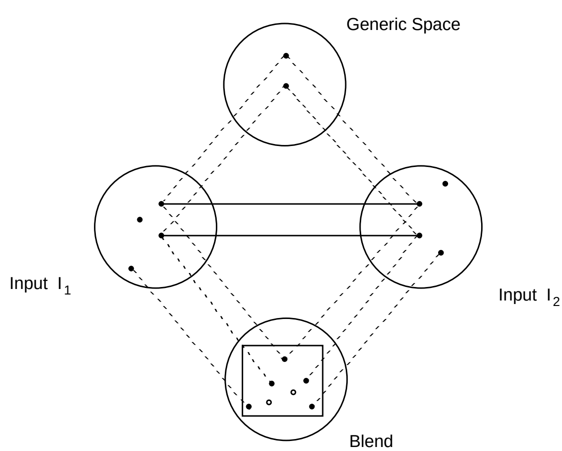


Figure 6

Mental spaces. The circles in Figure 6 represent mental spaces. We show the crucial four mental spaces for the monk example: the two inputs, the generic, and the blend. There are also background frames recruited to build these mental spaces, such as the background frame of two people approaching each other on a path. We emphasize that this is a minimal network. Networks in other cases of conceptual integration may have yet more input spaces and even multiple blended spaces.

Cross-space mapping of counterpart connections. In conceptual integration, there are partial counterpart connections between input spaces. The solid lines in Figure 6 represent counterpart connections. Such counterpart connections are of many kinds: connections between frames and roles in frames; connections of identity or transformation or representation; metaphoric connections, etc. In the monk example, the monks, paths, journeys, days, and so on are counterparts.

Generic space. As conceptual projection unfolds, whatever structure is recognized at any moment in the conceptual work as belonging to both of the input spaces constitutes a generic space. At any moment in the construction, the generic space maps onto each of the inputs. It defines the current cross-space mapping between them. A given element in the generic space maps onto paired counterparts in the two input spaces.

Blending. In blending, structure from at least two input mental spaces is projected to a third space, the 'blend.' In the monk example, the two input spaces have two journeys completely separated in time; the blend has two simultaneous journeys. Generic spaces and blended spaces are related: blends contain generic structure captured in the generic space, but also contain more specific structure, and can contain structure that is impossible for the inputs, such as two monks who are the same monk.

Selective projection. The projection from the inputs to the blend is typically partial. In Figure 6, not all elements from the inputs are projected to the blend.

There are three operations involved in constructing the blend: *composition, completion, and elaboration*.

Composition. Blending composes elements from the input spaces, providing relations that do not exist in the separate inputs. In the monk riddle, composition yields two travelers making two journeys. Fusion is one kind of composition. Counterparts may be brought into the blend as separate elements or as a fused element. Figure 6 represents one case in which counterparts are fused in the blend and one case in which counterparts are brought into the blend as distinct entities. In the monk example, the two days in the inputs are fused into one day in the blend, but the two monks from the inputs are brought into the blend as distinct entities.

Completion. Blends recruit a great range of background conceptual structure and knowledge without our recognizing it consciously. In this way, composed structure is *completed* with other structure. The fundamental subtype of recruitment is pattern completion. A minimal composition in the blend can be extensively completed by a larger conventional pattern. In the monk example, the structure achieved through composition is completed by the scenario of two people journeying toward each other on a path, which yields an *encounter*.

Elaboration. Elaboration develops the blend through imaginative mental simulation according to principles and logic in the blend. Some of these principles will have been brought to the blend by completion. Continued dynamic completion can recruit new principles and logic during elaboration. But new principles and logic may also arise through elaboration itself. We can 'run the blend' indefinitely: for example, the monks might meet each other and have a philosophical discussion about the concept of identity. Blended spaces can become extremely elaborated.

Emergent structure. Composition, completion, and elaboration lead to emergent structure in the blend; the blend contains structure that is not copied from the inputs. In Figure 6, the square inside the blend represents emergent structure.

4 Applications

The debate with Kant

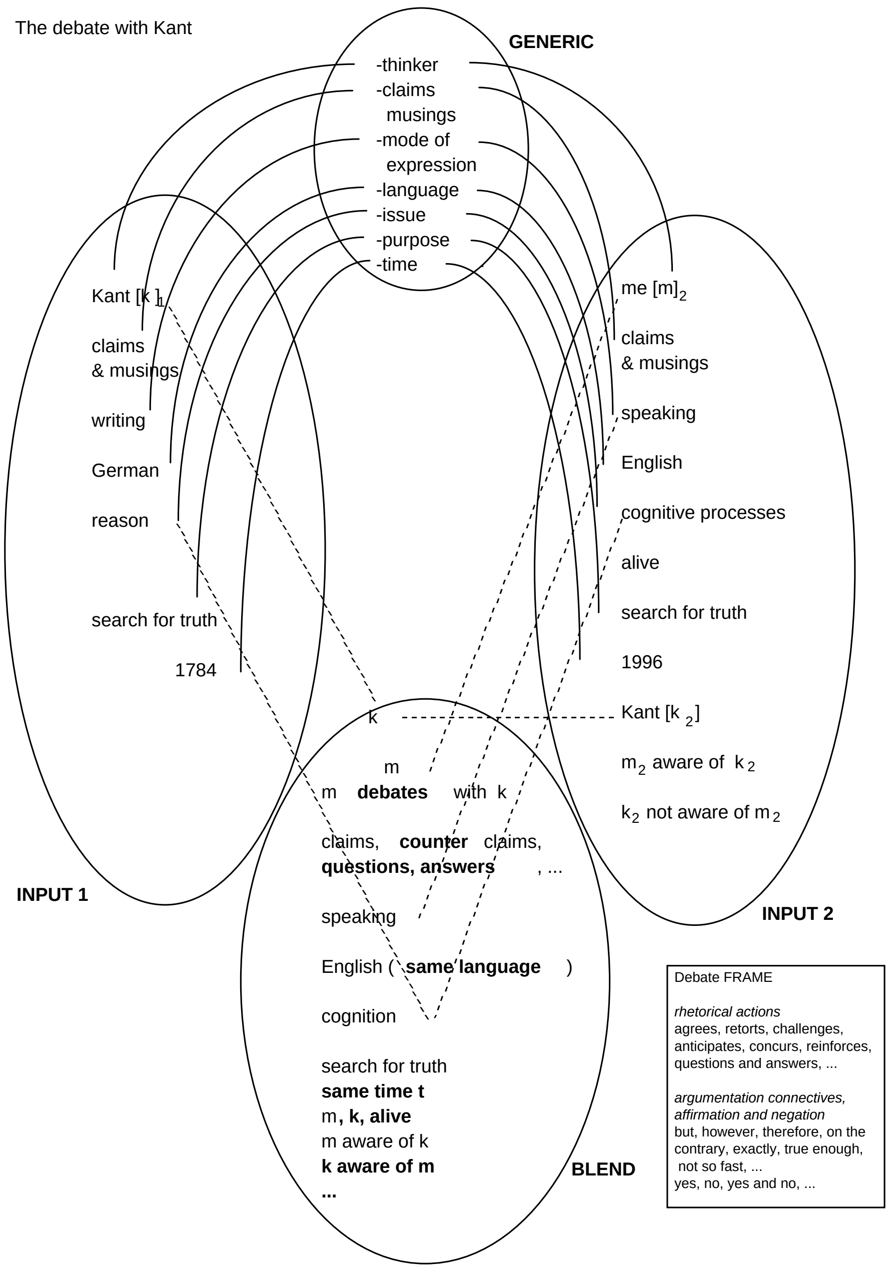
The monk example presents a salient and intuitively apparent blend, precisely because of its pragmatic anomaly. But our claim is that blends abound in all kinds of cases that go largely unnoticed. Some are created as we talk, others are conventional, and others are even more firmly entrenched in the grammatical structure. We discuss in Fauconnier & Turner 1996 the situation in which a contemporary philosopher says, while leading a seminar,

> I claim that reason is a self-developing capacity. Kant disagrees with me on this point. He says it's innate, but I answer that that's begging the question, to which he counters, in *Critique of Pure Reason,* that only innate ideas have power. But I say to that, what about neuronal group selection? He gives no answer.

In one input mental space, we have the modern philosopher, making claims. In a separate but related input mental space, we have Kant, thinking and writing. In neither input space is there a debate. The blended space has both the modern philosopher (from the first input space) and Kant (from the second input space). In the blend, the additional frame of *debate* has been recruited, to frame Kant and the modern philosopher as engaged in simultaneous debate, mutually aware, using a single language to treat a recognized topic (see figure below).

The debate frame comes up easily in the blend, through pattern completion, since so much of its structure is already in place in the composition of the two inputs. Once the blend is established, we can operate cognitively within that space, which allows us to manipulate the various events as an integrated unit. The debate frame brings with it conventional expressions, available for our use. We know the connection of the blend to the input spaces, and the way in which structure or inferences developed in the blend translate back to the input spaces.

A 'realist' interpretation of the passage would be quite fantastic. The philosophy professor and Kant would have to be brought together in time, would have to speak the same language, and so on. No one is fooled into thinking that this is the intended interpretation. In fact, using a debate blend of this type is so conventional that it will go unnoticed.



And yet, it has all the constitutive properties of blending. There is a *Cross-space mapping* linking Kant and his writings to the philosophy professor and his lecture. Counterparts include: Kant and the professor, their respective languages, topics, claims, times of activity, goals (e.g. search for truth), modes of expression (writing vs. speaking).

There is *Partial projection to the blend*: Kant, the professor, some of their ideas, and the search for truth are projected to the blend. Kant's time, language, mode of expression, the fact that he's dead, and the fact that he was never aware of the future existence of our professor are not projected.

There is *Emergent Structure* through *Composition*: we have two people talking in the same place at the same time. There is *Emergent Structure* through *Completion*: two people talking in the same place at the same time evoke the *cultural frame* of a conversation, a debate (if they are philosophers), an argument. This frame, the debate frame, structures the blend and is reflected by the syntax and vocabulary of the professor (*disagrees, answer, counters, what about, ...*).

This example allows us to observe that blends provide *Integration of Events*: Kant's ideas and the professor's claims are integrated into a unified event, the debate. Looking back now to the monk example, we see that the blend in that case integrated into a single scenario various events of uncertain relation spread out over time. Blends provide a space in which ranges of structure can be manipulated uniformly. The other spaces do not disappear once the blend has been formed. On the contrary, the blend is valuable only because it is connected conceptually to the inputs. The monk blend tells us something about the inputs. The debate with Kant tells us something about the inputs.

Complex numbers

Conceptual projection enables us to extend categories to cover new provisional members. The blended space that develops during such a projection merges the original category with its new extension. When categories are extended permanently, it is the structure of this blend that defines the new category structure, thus carving out a novel conceptual domain. The history of science, and of mathematics and physics in particular, is rich in such conceptual shifts. (See Fauconnier & Turner 1994; Lakoff & Núñez 2000; Lansing, personal communication.) It is customary to speak of models either replacing or extending previous models, but the pervasiveness and importance of merging may have been underestimated.

Consider as an example the stage of mathematical conceptual development at which complex numbers became endowed with angles (arguments) and magnitudes. Square roots of negative numbers had shown up in formulas of sixteenth-century mathematicians and operations on these numbers had been correctly formulated. But the very mathematicians who formulated such operations, Cardan and especially Bombelli, were also of the opinion that they were 'useless,' 'sophistic,' and 'impossible' or 'imaginary.' Such was also the opinion of Descartes a century later. Leibniz said no harm came of using them, and Euler thought them impossible but nevertheless useful. The square roots of negative numbers had the strange property of lending themselves to formal manipulations without fitting into a mathematical conceptual system. A genuine concept of complex number took time to develop, and the development proceeded in several steps along the lines explained above for analogical connections and blending.

The first step exploited the preexisting analogical mapping from numbers to one-dimensional space. Wallis is credited with having observed – in his *Algebra* (1685) – that if negative numbers could be mapped onto a directed line, complex numbers could be mapped onto points in a two-dimensional plane, and he provided geometrical constructions for the counterparts of the real or complex roots of $ax^2 + bx + c = 0$ (Kline 1980). In effect, Wallis provided a model for the mysterious numbers, thereby showing their consistency, and giving some substance to their formal manipulation. This is of course a standard case of extending analogical connections; geometric space is a source domain partially mapped onto the target domain of numbers. The mapping from a single axis is extended to mapping from the whole plane; some geometric constructions are mapped onto operations on numbers. Notice that neither the original mapping nor its extension requires more than two domains. We do not need a generic space, since there is no assumption in work like Wallis's that numbers and points in a plane share properties at some higher level of abstraction. The necessary structure is already present in the conceptual domain of two-dimensional space because it already contains the notion of distance which is expressed directly by means of numbers. (Of course, this source domain has a conceptual history of its own. We argue elsewhere that in fact it is itself the product of a non-trivial conceptual blend.) Nor does it involve a blend; numbers and points remain totally distinct categories at all levels. Although the mapping proposed by Wallis showed the formal consistency of a system including complex numbers, it did not provide a new extended concept of number. As Morris Kline reports, Wallis's work was ignored: it did not make mathematicians receptive to the use of such numbers. In itself, this is an interesting point. It shows that mapping a coherent space onto a conceptually incoherent space is not enough to give the incoherent space new conceptual structure. It also follows that coherent abstract structure is not enough, even in mathematics, to produce satisfactory conceptual structure: In Wallis's representation, the metric geometry provided abstract schemas for a unified interpretation of real and imaginary numbers, but this was insufficient cognitively for mathematicians to revise their domain of numbers accordingly.

In the analysis developed here, the novel conceptual structure in the mathematical case of numbers is first established within a blended space. In the blend, but not in the original inputs, it is possible for an element to be simultaneously a number and a geometric point, with cartesian coordinates (a,b) and polar coordinates (r,θ). In the blend, we find interesting general formal properties of such numbers, such as

$$(a, b) + (a', b') = (a+a', b+b')$$
$$(r, \theta) \times (r', \theta') = (rr', \theta + \theta')$$

Every number in this extended sense has a real part, an imaginary one, an argument, and a magnitude. By virtue of the link of the blend to the geometric input space, the numbers can be manipulated geometrically; by virtue of the link of the blend to the input space of real numbers, the new numbers in the blend are immediately conceptualized as an extension of the old numbers (which they include by way of the mapping). As in Wallis's scheme, the mapping from points on a line to numbers has been extended to a mapping from points in a plane to numbers. This mapping is partial from one input to the other – only one line of the plane is mapped onto the numbers of the target domain

– but it is total from the geometric input to the blend: all the points of the plane have counterpart complex numbers. And this in turn allows the blend to incorporate the full geometric structure of the geometric input space.

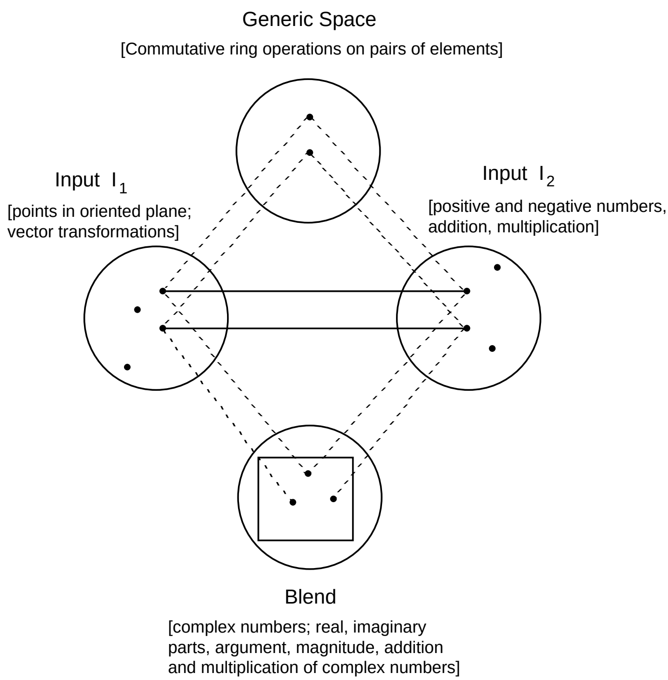


Figure 7

Interestingly, when a rich blended space of this sort is built, an abstract generic space will come along with it. Having the three spaces containing respectively points (input 1), numbers (input 2), complex point/numbers (blend) entails a fourth space with abstract elements having the properties 'common' to points and numbers. The relevant abstract notions in this case are those of 'operations' on pairs of elements. For numbers, the specific operations (in the target domain) are addition and multiplication. For points in the plane, the operations can be viewed as vector transformations – vector addition, and vector composition by adding angles and multiplying magnitudes. In the blended space of complex numbers, vector addition and number addition are the same operation, because they invariably yield the same result; similarly, vector transformation and number multiplication are conceptually one single operation. But such an operation can be instantiated algorithmically in different ways depending on which geometric and algebraic properties of the blend are exploited.[2]

In the generic space, specific geometric or number properties are absent. All that is left is the more abstract notion of two operations on pairs of elements, such that each operation is associative, commutative, and has an identity element; each element has under each operation an inverse element; and one of the two operations is distributive with respect to the other. Something with this structure is called by mathematicians a 'commutative ring.'

The emergence of the concept of complex numbers with arguments and magnitudes displays all the constitutive properties of blending. There is an initial *cross-space mapping* of numbers to geometric space, a *generic* space, a *projection* of both inputs to the blend, with numbers fused with geometric points, *emergent structure* by *completion* (arguments and magnitudes), and by *elaboration* (multiplication and addition reconstrued as operations on vectors).

The blend takes on a realist interpretation within mathematics. It constitutes a new and richer way to understand numbers and space. However, it also retains its connections to the earlier conceptions provided by the Input spaces. Conceptual change of this sort is not just replacement. It is the creation of more elaborate and richly connected networks of spaces.

Under our account, then, the evolution and extension of the concept of number includes a four-space stage at which the concept of complex number is logically and coherently constructed in a blended space, on the basis of a generic space structured as a commutative ring. (That generic space is not consciously conceptualized as an abstract domain when the full-blown concept of complex number gets formed. It becomes a conceptual domain in its own right when mathematicians later study it and name it.) The abstract and mathematical example of complex numbers supports the functioning of projection in conceptual integration networks, with their blended and generic spaces,[3] and confirms that we are dealing with an aspect of thought that is not purely linguistic or verbal. It highlights the deep difference between naming and conceptualizing; adding expressions like $\sqrt{-1}$ to the domain of numbers, and calling them numbers, is not enough to make them numbers conceptually, even when they fit a consistent model. This is true of category extension in general.

Digging your own grave

Coulson (1997) examines remarkable elaborations of the metaphor 'to dig one's own grave.' Consider the familiar idiomatic version of the metaphor. 'You are digging your own grave' is a conventional expression typically used as a warning or judgment, typically implying that (1) you are doing bad things that will cause you to have a very bad experience, and (2) you are unaware of this causal relation. A conservative parent who keeps his money in his mattress may express disapproval of an adult child's investing in the stock market by saying, 'you are digging your own grave.'

At first glance, what we have here is a straightforward projection from the concrete domain of graves, corpses, and burial to abstract domains of getting into trouble, unwittingly doing the wrong things, and ultimate failure. Failing is being dead and buried; bad moves that precede and cause failure are like events (grave-digging) that precede burial. It is foolish to facilitate one's own burial or one's own failure. And it is foolish not to be aware of one's own actions, especially when they are actions leading to one's very extinction.

But a closer look reveals extraordinary mismatches between the purported source and target of this metaphor. The *causal structure* is inverted. Foolish actions cause failure, but grave-digging does not cause death. It is typically someone's dying that prompts others to dig a grave. And if the grave is atypically prepared in advance, to secure a plot, to keep workers busy, or because the person is expected to die, there is still not the slightest causal connection from the digging to the dying. In the exceptional scenario in which a prisoner is threatened into digging his own grave, it is not the digging that causes the death, and the prisoner will be killed anyway if he refuses. The *intentional structure* does not carry over. Sextons do not dig graves in their sleep, unaware of what they are doing. In contrast, figurative digging of one's own grave is conceived as unintentional misconstrual of action. The *frame structure* of agents, patients, and sequence of events is not preserved. Our background knowledge is that the 'patient' dies, and then the 'agent' digs the grave and buries the 'patient.' But in the metaphor, the actors are fused and the ordering of events is reversed. The 'patient' does the digging, and if the grave is deep enough, has no other option than to die and occupy it. Even in the unusual real life case in which one might dig one's own grave in advance, there would be no necessary temporal connection between finishing the digging and perishing. The *internal event structure* does not match. In the target, it is certainly true that the more trouble you are in, the more you risk failure. Amount of trouble is mapped onto depth of grave. But again, in the source there is no correlation between the depth of a person's grave and their chances of dying.

Now recall the rationale often proposed for metaphor: Readily available background or experiential structure and inferences of the source are recruited to understand the target. By that standard, and in view of the considerable mismatch, *digging one's own grave* should be a doomed metaphor. In fact, it's a very successful one.

This paradox dissolves when we consider, in addition to the two input spaces, the blended space. In metaphoric cases, such as this one, the two inputs are the 'source Input' and the 'target Input.' The blend in *digging one's own grave* inherits the concrete structure of graves, digging, and burial, from the source Input. But it inherits causal, intentional, and internal event structure from the target Input. They are not simply juxtaposed. Rather, *emergent* structure specific to the blend is created. In the blend, all the curious properties noted above actually hold. The existence of a satisfactory grave causes death, and is a necessary precondition for it. It follows straightforwardly that the deeper the grave, the closer it is to completion, and the greater the chance for the grave's intended occupant to die. It follows that in the blend (as opposed to the Input source), digging one's grave is a grave mistake, since it makes dying more probable. In the blend, it becomes *possible* to be unaware of one's very concrete actions. This is projected from the target Input, where it is indeed fully possible, and frequent, to be unaware of the significance of one's actions. But in the blend, it remains *highly foolish* to be unaware of such concrete actions; this is projected from the source Input. And it will project back to the target Input to produce suitable inferences (i.e. highlight foolishness and misperception of individual's behavior).

We wish to emphasize that in the construction of the blend, a single shift in causal structure, *the existence of a grave* causes *death*, instead of *death* causes *the existence of a grave*, is enough to produce *emergent* structure, specific to the blend: undesirability of digging one's grave, exceptional foolishness in not being aware of it, correlation of depth of grave with probability of death. The causal inversion is guided by the target, but the *emergent* structure is deducible within the blend from the new causal structure and familiar common-sense background knowledge. This point is essential, because the *emergent* structure, although 'fantastic' from a literal interpretation point of view, is supremely efficient for the purpose of transferring the intended inferences back to the target Input, and thereby making real-world inferences. This emergent structure is not in the Inputs – it is part of the cognitive construction in the blend. But, also, it is not *stated* explicitly as part of the blend. It just follows, fairly automatically, from the unstated understanding that the causal structure has been projected from the target, not from the source.

The integration of events in the blend is indexed to events in both of the input spaces. We know how to translate structure in the blend back to structure in the inputs. The blend is an integrated platform for organizing and developing those other spaces. Consider a slightly fuller expression, 'with each investment you make, you are digging your grave a little deeper.' In the target Input, there are no graves, but there are investments; in the source Input, the graves are not financial, but one does dig; in the blend, investments are simultaneously instruments of digging, and what one digs is one's *financial grave.* A single action is simultaneously investing and digging; a single condition is simultaneously having finished the digging and having lost one's money. Digging your own grave does not kill you, but digging your own financial grave does cause your death/bankruptcy.

Such blends can of course be elaborate, as in Seana Coulson's example from an editorial in the *UCSD Guardian*:

> The U.S. is in a position to exhume itself from the shallow grave that we've dug for ourselves.

In this blend, the digger is identical to the body buried, which can exhume itself. This is impossible for the source Input, but possible for the target Input, where a nation can be in bad conditions but try to get out of them. In the blend, the ease of exhuming is related to the depth of the grave. This logic is available from both source and target Inputs: the shallower the grave, the easier the exhumation; the less bad the conditions, the easier it is to improve them. As in 'you are digging your own grave,' the actor is responsible but unaware, his actions were unwise, he is culpable for not recognizing that his actions were unwise, and the consequences of those actions are undesirable.

Pattern completion is at work in developing this blend. In recent U.S. history, there have been many disparate events, only some caused by actors, only some caused by American actors, and almost none caused by any single actor. Nonetheless, the blend asks us to integrate those many disparate target events, by blending them with a template, available to the blend from the source Input, of a single integrated action by a single actor, namely, digging as done by a digger. To do so, we must construct in the target a single entity, 'the United States,' that is causal for those many disparate events, which are in turn causal for current conditions in the United States. In the blend, the United States is a person, whom we want to convince to begin the process of self-exhumation.

Analogical counterfactuals

Consider an analogical counterfactual of the type studied by Fauconnier (1990, in press):

In France, Watergate would not have harmed Nixon.

Uncontroversially, understanding this counterfactual includes building a generic space that fits both *American politics* and *French politics*. It includes a leader who is elected, who is a member of a political party, and who is constrained by laws. This skeletal generic space fits the space of *American politics* and *French politics* so well and intricately that it is natural for someone to project a great deal more skeletal information from *American politics* into the generic space on the assumption that it will of course apply to *French politics*.

The rhetorical motive for saying, 'In France, Watergate wouldn't have done Nixon any harm' is exactly to stop someone from projecting certain kinds of information to the generic space on the assumption that it applies to *French politics*. The speaker lays down a limit to this projection by constructing a specific, counterfactual, and pragmatically anomalous blend.

Into this blend, the speaker has projected information associated with President Nixon and the Watergate break-in. Nixon and Watergate and so on are brought into the blend with only skeletal properties, such as being a president who breaks laws in order to place members of a political party at a disadvantage. It may be that such information in fact in no way belongs to *French politics*, that something like Watergate has in fact never happened in *French politics*. No matter, it can be imported to the blend from the 'Nixon in America' input. Additionally, from the 'France' input, we can project to the blend French cultural perspectives on such an event.

This counterfactual blended space operates according to its own logic. In this counterfactual blend, an illegal act directed with the knowledge of the elected leader against the opposing political party leader will not cause the public outrage associated with Watergate. For this central inference to take place, we must have both the nature of the event from the 'Nixon in America' input and the general cultural attitudes from the 'France' input. The blend is not a side-show or curiosity or merely an entertaining excrescence of the projection. It is the engine of the central inferences.

The constitutive properties of blending are apparent: cross-space mapping of the Input U.S. and France spaces; generic politics space; selective projection – Nixon and Watergate on the one hand, the frame of French politics on the other; emergent structure:

- composition provides a Watergate-like event in France;
- elaboration includes the explicit predication that the president is not harmed.

Finally, there is projection back to the Inputs: France has features that the U. S. does not have.

Clearly, in the case of such an analogical counterfactual, the construction of meaning cannot be mistaken as an attempt to impose structure from the one input onto the other. In fact, this particular analogical counterfactual is trying to do exactly the opposite. It is trying to make clear in just what areas information projected from one input cannot be imposed on the other. Moreover, its purpose is to illuminate not only the nature of the 'France' Input, but also the nature of the 'America' Input. The inferences are thus not one-way. They can go from the counterfactual space to both of the Inputs.

Nor are the analogical connections exclusively positive. It is disanalogy rather than analogy that is the central assertion of the statement. We recognize that a scenario can be shared by *American politics* and *French politics* but that in certain key respects these spaces have negative counterparts rather than positive counterparts. The utterance sets up a blend exactly for the purpose of illuminating these counterparts and their negative relation to each other. The projection in the case of 'In France, Watergate would not have harmed Nixon,' is thus not direct, not one-way, and not exclusively positive. This example lets us add to our model of conceptual projection the feature that even when, as in analogy, one input is in some way 'understood' by projection from the other, *the projection is in general not direct, not one-way, and not exclusively positive*.

Of course, one may object to the assertion about France. One can respond, 'You are wrong, look at all the harm the Greenpeace incident did to Mitterand.' This can be interpreted as asking us to change the blend so that the illegal act is now general enough to include not only acts directed at an opposing political party but even acts directed against any opposing group (Greenpeace). It asserts that the space does indeed include cultural perspectives that, contrary to the previous assertion, do apply to both *American politics* and *French politics*. This, in turn, has the effect of expanding the generic space. This is a fundamental and general point that will arise repeatedly in our analyses: the array of spaces is built up dynamically and inventively in order to achieve a conceptual projection. Our network model dictates no fixed sequence in this construction of meaning. It additionally accords notable place to energetic and imaginative effort and revision. It should also be emphasized that while the English sentence *In France, Watergate* ... instructs us to perform a blend, it considerably underspecifies what blend to perform. There are countless other interpretations of this sentence corresponding to different blending choices (e.g., it could be about the love of the French for Nixon, or the consequences for Nixon of living in France rather than running for a second term, and so on). Rather remarkably, we are capable of constructing the 'right' blend in context, in spite of the sparse grammatical clues.

We might ask, in what space does it hold that Watergate does not harm Nixon? Not in the 'Nixon in America' Input, or the 'France' Input, or in the Generic space. But if we shift to the blend, then the claim holds. It appears that a central part of conceptual projection is knowing how to construct a blend and how to shift to that blend in order to do real conceptual work, with the consequence that the vestiges of that real conceptual work are often projected to the one or both of the Inputs. But the structures of the blended space that would be impossible in the other spaces are left behind in such projection. That they are left behind does not mean that they are not indispensable to the central conceptual work.

Counterfactuals are not exotic curiosities of language. They are central to reasoning in everyday life (Kahneman 1995), and to scientific reasoning (Goodman 1947). Tetlock and Belkin (1996) show that argumentation in political science relies indispensably and extensively on counterfactual thought. Turner (1996a) shows that political scientists and others have not taken into account the complex blending that underlies the construction of counterfactuals, and the great range of conceptual structure and knowledge that it recruits without our noticing it (Turner & Fauconnier, in press). The biases smoothly integrated into the blend may serve the rhetorician, but not the social scientist.

Category extension and change

We frequently organize new material by extending a conventional category to it. Usually, these on-line category extensions are provisional, for local purposes, often purposes of expression and naming. Consider the attested case in which a handout for an academic talk has one column with elements listed 1 through 7, and another column with elements listed A through F. During the question period, people begin referring unselfconsciously to 'Number E.' The inputs to this blend are (1) the counting numbers and (2) the alphabet, ordered in its customary linear fashion. The generic space has only a well-ordered ordinal sequence. It defines the counterparts in the two Inputs. The blend has the well-ordered ordinal sequence, but also has, linked to it and thus to each other, two paired sets of counting numbers, one of which is the 'real' counting numbers and the other of which is the alphabet. But the blend does not have, for example, arithmetic properties from the input space with counting numbers, or spelling from the space with the alphabet.

In other cases, the blend may lead to permanent category change. Consider the phrase 'same-sex marriage'. In Turner and Fauconnier (1995), we show in detail how expressions with this syntactic form can be systematically used to trigger blends. For *same-sex marriage*, the Inputs are the traditional scenario of marriage on the one hand, and an alternative domestic scenario involving two people of the same sex on the other. The cross-space mapping may link prototypical elements like partners, common dwellings, commitment, love, etc. Selective projection then recruits additional structure from each Input, e.g. social recognition, wedding ceremonies, mode of taxation, and so on from the first Input of 'traditional marriage,' and same sex, no biologically common children, culturally defined roles of the partners, and so on from the second Input. Emergent properties will characterize this new social structure reflected by the blend.

At that stage of the construction, *same-sex marriage* will not be a subcategory of *marriage* for those who view *marriage* as having criterial attributes (e.g. heterosexual union for the sake of children) that *same-sex marriage* does not have. But now there can be pressure for these criterial attributes to change. The pressure comes from the activated generic space which made the blend possible. If that generic space (people living in a household, division of labor, mutual protection, financial planning done as a unit, or whatever) is understood to provide the essential criteria for the notion *marriage*, then *same-sex marriage* becomes a banal subcategory of the more general notion. Analogy and blending drive categorization. Clearly, different people using the same words in the same language may nevertheless entertain different categorization schemes. The same expression 'same-sex marriage' may correspond to an analogical and conflictual blend for one person, and to a straightforward subcategory for another. Interestingly, the clashing conceptions of two such persons will still share a large amount of meaning.

Regatta

Let us consider another case in which it is clear that the motivation for constructing the blend is to tell us something about an important input. A modern catamaran *Great American II,* sailing from San Francisco to Boston in 1993, is being compared to a clipper, *Northern Light*, that made the same run back in 1853. A few days before the catamaran reached Boston, observers were able to say:

> At this point, *Great American II* is 4.5 days ahead of *Northern Light*.

This expression frames the two boats as sailing on the same course during the same time period in 1993. It blends the event of 1853 and the event of 1993 into a single event. All the conditions for blending obtain. There is a *cross-space mapping* which links the two trajectories, the two boats, the two time periods, positions on the course, etc. *Projection to the blend* from the Inputs is partial: the 1853 date is dropped, as are the 1853 weather conditions, the purpose of the trip, and so on. But the blend has rich *emergent structure*: like the traveling monks, the boats are now in a position to be compared, so that one can be 'ahead' of the other. This structure itself, two boats moving in the same direction on the same course and having departed from San Francisco on the same day, fits into an obvious and familiar *cultural frame*, that of a *race*. This yields additional emergent structure by *completion*. The race frame in the blended space may be invoked more explicitly, as in:

> At this point, *Great American II* is barely maintaining a 4.5 day lead over *Northern Ligh*t.

'Maintaining a lead' is an intentional part of a race. Although in reality the catamaran is sailing alone, and the clipper's run took place 140 years before, the situation is described in terms of the blended space, in which, so to speak, the two boats left San Francisco on the same day in 1993, and are engaged in a race to Boston. As in the monk example, no one is fooled by the blend: the clipper has not magically reappeared. The blend remains solidly linked to the Inputs. Inferences from the Blend can be projected back to the inputs: in particular, the speeds and positions of the two boats on their respective runs many years apart can be projected back to the inputs. Another noteworthy property of the *race* frame in the blend is its emotional content. Sailors in a race are driven by emotions linked to winning, leading, losing, gaining, and so forth. This emotional value can be projected to Input 2. The solitary run of *Great American II* is conceived, thanks to the blend, as a race against the nineteenth century clipper, and can be lived with corresponding emotions.

The attested report that prompted our interest in the 'boat race' was actually a magazine article in *Latitude 38*, which contained the following:

> As we went to press, Rich Wilson and Bill Biewenga were barely maintaining a 4.5 day lead over the ghost of the clipper Northern Light, ...

The blend, here, has become reified. An explicit referent, the ghost, is set up for the opponent of *Great American II* in the blended space. The mapping is more extensive, although still implicit. '*Ghost*' allows the projection from Input 1 that the clipper no longer (i.e. in 1993) exists. But the starting times are still fused, and it is understood that the 'ghost' is retracing the exact run of the record-holding clipper.

Again, nobody is fooled into confusing the blend with reality. There is no inference that the sailors actually saw a ghost ship or even imagined one. The construction and operation of the blend is creative, but also conventional in the sense that readers know immediately and without conscious effort how to interpret it.

Because blending is neither deterministic nor compositional, there is more than one way to construct an acceptable blend, and this is confirmed by our boat race example. The preferred reading seems to be that *4.5 days* is the difference between the time N it took *Great American II* to reach its current position (point A), and the time N+4.5 it took *Northern Light* back in 1853 to reach point A. Under that interpretation, the boats' positions in the initial spaces (*1853, 1993*), and in the blend, are their positions (point A for GA, and point B for NL) after N days, which is the time on the clock in the *1993* space at the time of writing. In this reading, the 4.5 days are a time in the *1853* space – the time it took NL to get from B to A. Another conceivable reading has this reversed, taking the time on the clock in the *1853* space and the 4.5 days in the current *1993* space. Under that interpretation, *Northern Light* got to point B' after N days, *Great American II* got to point A after N days, and it took *Great American II* 4.5 days to get from B' to A.

Other readings may be available. Suppose *Great American* II is following a different course from its illustrious predecessor's, so that positions on the two journeys cannot be directly compared. But suppose also that experts can estimate, given current positions, how long it 'should' take *Great American II* to reach Boston. Then, the example sentence could be interpreted as saying that, given its current position, *Great American II* should end up making the run to Boston in 76 days, 8 hours minus 4.5 days, i.e. in 71 days, 20 hours. This time, in the blended space of *1853* and the experts' hypothetical *1993* space, *Great American II* reaches Boston 4.5 days ahead of Northern Light.

All these readings involve blended spaces. The blended space is different in each case, and its structure accounts for the corresponding difference of truth values in the interpretations. This is a nice point: far from being fuzzy and fantastic, the blends allow a totally precise quantified evaluation of the truth conditions they impose on the actual world.

The desktop

Now take a superficially very different example, offered by Dan Gruen, which involves the performance of a specific activity. Human-computer interfaces are often structured by the concept of a desktop, on which objects rest and can be manipulated and used to perform actions. The appearance of the computer screen carries icons corresponding to objects on a desktop. They can be opened and closed, put away, and so on. When working with the icons, we think of them and act upon them in some ways as we would on actual desktop material, and in some ways as when dealing with general computer commands. Clearly, the entire activity is coherent and integrated, once learned. It is not hampered by its obvious literal falsities: there is no actual desk, no folders, no putting of objects into folders, no shuffling of objects from one folder to another, no putting of objects into the trash, and so on.

The created blend has considerable emergent structure. For instance, dragging icons with the mouse belongs to neither moving objects on a desktop nor giving standard symbolic commands, or *a fortiori* using the machine language. The user is not manipulating this computer interface by means of an elaborate conscious analogy, but as an integrated form with its own coherent structure and properties. From an 'objective' point of view, this activity is totally novel – it shares no physical characteristics with moving real folders, and it is novel even for the traditional user of a computer who has issued commands exclusively from a keyboard rather than from a mouse. Yet the whole point of the desktop interface is that the integrated activity is immediately accessible and congenial. The reason, of course, is that a felicitous blend has been achieved which naturally inherits, in partial fashion, the right conceptual structure from both inputs, and then cultivates it into a fuller activity under pressure and constraints from reality and background knowledge.

The desktop example also nicely illustrates the non-arbitrary nature of blending: not just any discordant combination can be projected to the blend. Some discordant structure is irrelevant because it has no bad consequences – e.g., the trash can and the folders both sit on the desktop – but other discordant structure is objectionable – dragging the icon for a floppy disk to the trash as a command to eject the disk from the drive is notoriously disturbing to users. The inference from the domain of working at a desk that everything going into the trash is lost, and from the domain of computer use that everything deleted is irrecoverable, interfere with the intended inference that the trash can is a one-way chute between two worlds – the desktop interface and your actual desk.

Another point illustrated by the example is that input spaces are themselves often blends, often with an elaborate conceptual history. The domain of computer use has as input spaces, among possible others, the domain of computer operation and the domain of interpersonal command and performance. It is common to conceive of the deletion of files as an operation of complete destruction performed by the system at the command of the user. In fact, in the domain of actual computer operation, the files are not erased by that command, and can often be recovered. The user's sense of 'deletion' is already a blend of computer operation and human activity. More generally, it is the fact that, by means of blending, keyboard manipulation is already conceived as simultaneously typing and high-level action and interaction that provides the appropriate partial structure to later blends like desktops with icons. The existence of a good blend can make possible the development of a better blend.

5 Advanced aspects of the network model

The previous sections have outlined the general characteristics of the cognitive operation of blending as reflected in superficially very diverse cases. Blending as a cognitive operation is elegant and uniform, but offers a great variety of different instantiations. A general program of research arises from inquiring into the general features of blending, the variety of purposes it serves, and the different ways in which it can be formally applied. In this section, we consider further general features of blending and constraints on the process. In subsequent sections, we consider more detailed taxonomies of blends according to structure, function, status with respect to reality, and internal logic. In all of these sections, we present research questions for the theory of blending and offer in some cases provisional or partial answers.

Spaces, domains, and knowledge

A mental space is built up in part by recruiting structure from (possibly many) conceptual domains and from local context. We can build different and incompatible spaces by recruiting from the same conceptual domain. Consider a personification of death as an evil magician versus a benevolent magician: the evil magician makes objects disappear forever, while the benevolent magician transforms objects into other objects. The evil magician is a personification for a standard notion of death; the benevolent magician is a personification for a notion of death as involving reincarnation. In each case, one input space is built up by recruiting from the conceptual domain for *magician* and the other is built up by recruiting from the conceptual domain for *death*. But the two cases recruit different structure. The generic spaces have different event structure (deletion versus transformation). The blended spaces have different structure (evil versus benevolent magician). The feature of *evil* versus *benevolent* arises as an inference from blending – in the source conceptual domain of magic, there is nothing evil about making an object vanish and nothing benevolent about turning it into something else; but in the blend, the object is *us*, and our attitudes about our own vanishing or transformation provide the evaluations.

Consider also 'Italian is the daughter of Latin' versus 'Latin is the daughter of Italian [because students of Italian become interested in studying Latin].' Each has input spaces built up from conceptual domains of progeneration and languages, but quite different structure is recruited from the conceptual domains into the input spaces. 'Italian is the daughter of Latin: her ostentatious beauty is really a rebellion against her mother's austerity' recruits yet different structure from these conceptual domains to the input spaces. All three of these examples have the identical underlying conceptual domains, but quite different input spaces, generic spaces, and blends.

In our network model of conceptual projection, meaning is not constructed in any single space, but resides in the entire array and its connections. The 'meaning' is not contained in the blended space. We know each space in the array – no matter how elaborate the network – and can work and modify all of them and their connections. During blending, conceptual work may be required at any site in the conceptual array. Spaces, domains, and frames can proliferate and be modified. Blending can be applied successively during that proliferation. Achieving useful counterpart structure and useful integration may require activating different input mental spaces, changing the recruitment of structure to them, establishing different generic connections between them, projecting different structure from the inputs to the blend, recruiting different frames to the blend, projecting different structure from the blend back to the inputs, multiplying the blends, and so on.

Integration of events

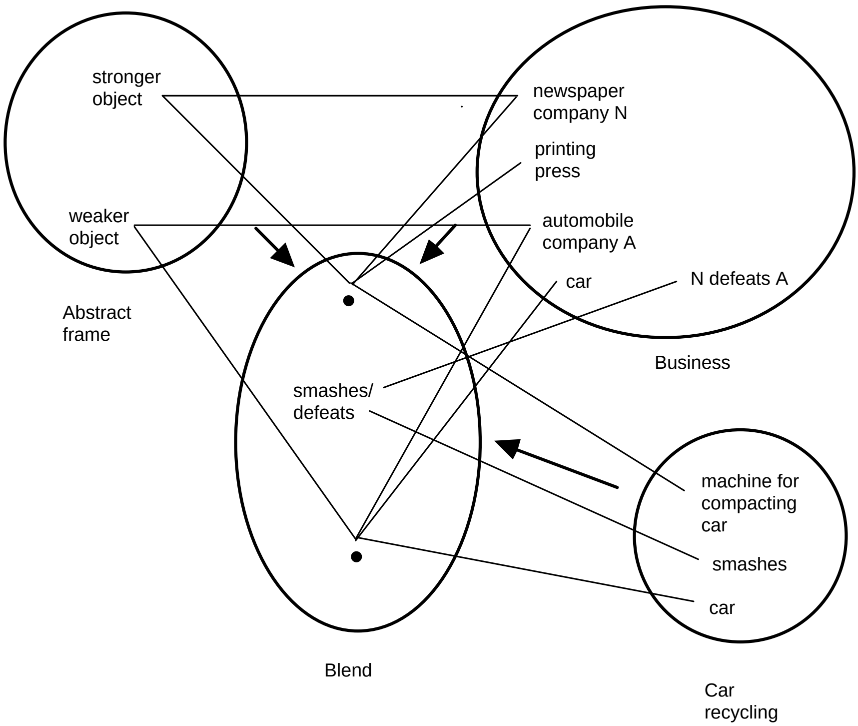
A fundamental motivating factor of blending is the integration of several events into a single unit. For example, although the boat race blend depends upon extensive connection of counterparts across different spaces, it also has integration of events: the sailing from one space is integrated with the sailing from the other space into a single event of racing, and this is the central point of the blend. In the desktop case, an action performed by the user of the computer is a single event that conceptually integrates the computer command and the manipulation of office items. It thus integrates both event components and conceptual counterparts. Even metaphoric mappings that ostensibly look most as if they depend entirely on the construction of metaphoric counterparts can have integration of events as a principal motivation and product. 'He digested the book' of course has metaphoric counterparts, such as food and book, but it also projects an integration of events. In the source, digesting already constitutes an integration of a number of different events. But its counterpart in the target is, independent of the metaphor, a series of discrete events – taking up the book, reading it, parsing its individual sentences, finishing it, thinking about it, understanding it as a whole, and so on. The integrity in the source is projected to the blend so that this array of events in the target acquires a conceptual integration of its events into a unit. On one hand, the metaphor blends conceptual counterparts in the two spaces – eating and reading. On the other hand, the metaphor helps us to integrate some distinct event sequences in the space of reading. The blend exploits the integrity of events already present in the space of eating, and exports that integrity of events to the target space of reading. In the 'digesting' metaphor, we export the integrity in the blend to induce an integrity of events in the target (picking up book, reading lines, finishing book, thinking about it, etc.). In the boat race, we export the integrity of events in the blend to induce an integrity of events in 1993 (preparing the boat, raising money, waving goodbye to well-wishers at the dock, trimming the sails, keeping the log, arriving at Boston, parting afterward, etc. etc. etc.) In both cases, there is a great range of events in one space (reading, 1993) that comes to acquire the integrity of an event structure in the blend (digesting, race). In some cases, like 'digesting the book,' the integration of events is already provided in one of the inputs and is recruited by the blend to provide integration for the other input. In other cases, like the boat race, the integration emerges in the blend.

In grammar, certain abstract scenarios are represented by corresponding grammatical constructions. A given construction goes with a given schematic scenario. To describe events using that construction is to prompt the hearer to integrate those events into that schematic scenario. 'John kicked the ball over the fence' describes events of kicking and motion of the ball in a direction. It uses a construction that represents the schematic scenario in which an action causes an object to move in a direction. When we use the same construction to describe an act of praying and an event of boys coming home in 'We prayed the boys home,'[4] we are prompting hearers to integrate the events into the pattern of caused motion.

Recruiting and integrating internal connections from the inputs into the blend

Inputs will have internal connections that are motivated conceptually and experientially. For example, if the topic is a newspaper company, that company is linked to the newspaper (its product), the building (its location), its publicly-traded shares, and so on. As Nunberg (1978) has discussed, these connections motivate expressions like 'The newspaper is on Main Street,' 'The newspaper went out of business,' 'The newspaper was sold for fifty million dollars,' and so on.

Blends make use of these connections in several creative ways. Consider the following example of a cartoon representing a powerful newspaper company about to succeed in a hostile takeover of a weaker automobile company that will be eliminated by selling off its assets. The cartoon shows a giant printing press smashing a car. This is a metaphorical blend like those we have seen in section IV: input one has the stronger and weaker objects; input two has the contest between companies. The cross-space mapping is the basic metaphor that maps stronger objects destroying weaker objects to winning and losing. The strong heavy object is mapped onto the powerful newspaper company; the weaker object is mapped onto the weaker automobile company. But in the blend, we find the printing press as the strong heavy object and the car as the weak object. This is an efficient exploitation of internal connections: the printing press is a salient instrument of producing newspapers, and cars are the salient products of automobile companies. In the input, the printing press is not an instrument of destruction, but it has a force-dynamic function associated with crushing which can be associated with a car-smashing machine of the sort used in recycling automobiles. In the blend, the printing press is fused with both the company and the car-smashing machine. What is going on here? The blend must achieve three goals. First, given that the cartoon is a visual representation, the blend must be concrete and specific. Second, it must fit the frame of stronger and weaker object. Third, these objects in the blend must be properly connected to the companies in input two. The companies in input two, being abstract, cannot in themselves provide the corresponding concrete elements in the blend. The weaker and stronger objects in input one are concrete but not specific, and so cannot in themselves provide the corresponding specific elements in the blend. But we can exploit internal connections in the inputs to make the elements in the blend adequate. The printing press and the car are concrete, specific objects associated with the companies that can also be fit into the frame of the stronger object destroying the weaker object. They fit this frame in part because the printing press intrinsically has force-dynamic structure capable of destruction and in part because we are familiar with car-smashing machines. In the blend, two elements are simultaneously (1) two concrete, specific objects; (2) a stronger object destroying a weaker object; and (3) two companies.



Clearly, such a blend is creative. Not just any connections will do. There has to be a search for elements that simultaneously satisfy a number of constraints. Below, we will discuss some candidate constraints for recruiting internal connections to blends.

Opportunism and path-dependency

Although the laws of biology motivate all biological change, it is not possible to predict the evolution of a species, since its evolution will depend at each step on local accidents. The genetic structure that evolution has to work with at any moment depends upon the history of those accidents. The path of accidents shows opportunistic exploitation of existing structures of the organism or features of the environment. We can speak because an existing mammalian supralaryngeal airway, previously adapted for breathing and eating, could be opportunistically adapted for speech, at the cost, as Darwin observed, of making us liable to choke to death on our food.

Similarly, blending shows us that reason looks for accidents to exploit opportunistically. It is accidental that fusing the monk's paths and days but not the monks results in a blend that is easily completed by our standard frame of *two people approaching* *each other along a path*, but this serendipitous accident, once found, provides the solution to the problem. The printing-press blend is effective only because we know about printing presses and about car-recycling machines that happen to share a force-dynamic structure with printing presses. Had historical accident given us a world without these car-recycling machines (e.g., the world in 1950) and with a different prototypical method of printing (e.g., spraying ink), an entirely different blend would be required in order to achieve specificity, concreteness, conformity to the frame of stronger and weaker object, and proper connection to the companies in input two. Constructing that blend would require opportunism in the seeking of accidents to exploit.

Opportunism is sometimes displayed as a mark of wit: Consider 'Banging a Tin Cup With a Silver Spoon.' This headline announced a news story about Orange County, whose financial managers lost much of the county's assets betting heavily on interest trends. Although the county remained extremely rich, it declared bankruptcy and asked creditors for debt forgiveness. The reporter described the county as a 'wealthy deadbeat.' In one blend, Orange County is personified as a beggar with a tin cup. In another, it is personified as a wealthy individual with a silver spoon. Both of these blends are conventional. In a hyper-blend of these two blends, the county is personified as a wealthy beggar. It is accidental that a person can hold both a tin cup and a silver spoon and bang the cup with the spoon in the manner of a beggar drawing attention to his begging. The headline asks for applause for its ingenuity in finding these accidental connections. This turns out to be a general property of blends: they are judged to be better as they exploit more accidental connections.

Entrenchment

Like other forms of thought and action, blends can be either entrenched or novel. 'Digging your own grave' is a complex blend entrenched conceptually and linguistically. The Buddhist monk blend is novel and is used for only that one riddle. We often recruit entrenched projections to help us do on-line conceptual projection. On-line projections and entrenched projections are not different in kind; entrenched projections are on-line projections that have become entrenched. Our seemingly fixed projections are highly entrenched projections of an imaginative sort. Because the mechanisms of projection are shared in the two cases, entrenched structures are subject to transformation under work by on-line projection.

Fusion

Fusion of Counterparts

Blending can fuse counterparts in input spaces. In the monk example, the days are fused and the positions are fused; in the debate with Kant, fusion operates over issues, languages used, and modes of expression for debate.

But the fusion is not always simple. In the debate blend, the time of the debate is a fusion – there is only one time in the blend, not two times. But it is neither the time of the inputs nor some combination of them. It is a special transcendent time – it would be odd to say, 'Two years ago, Kant disagreed with me, when I thought reason was a self-developing capacity.'

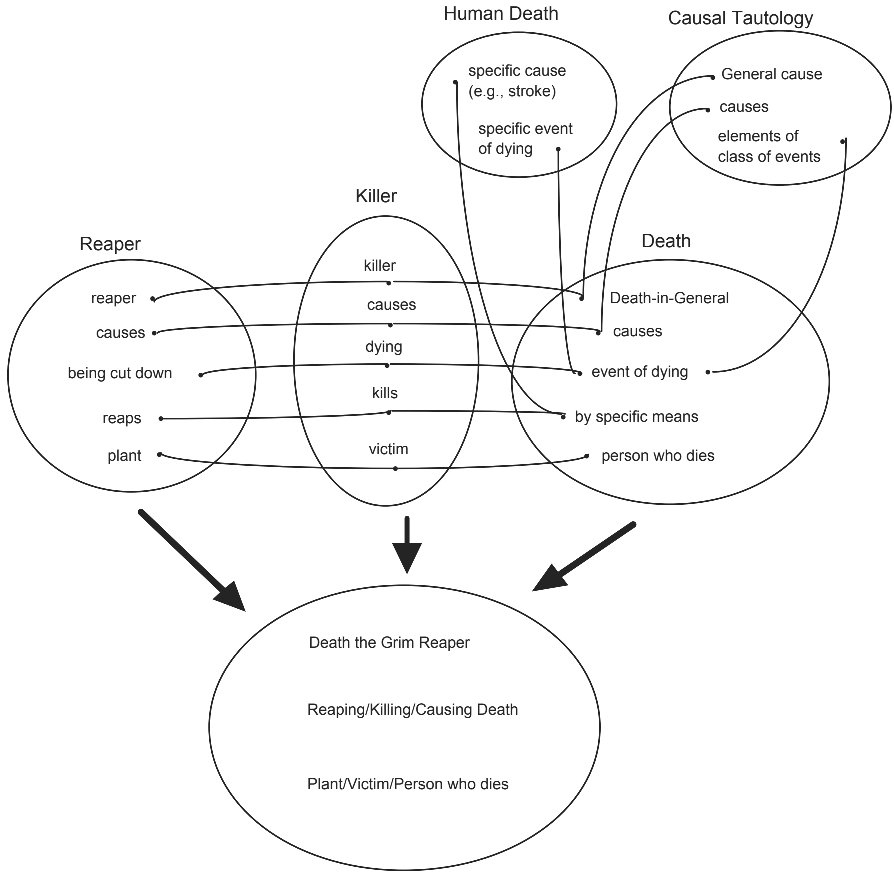
Non-fusion of counterparts

Blending need not fuse counterparts in input spaces. In the monk example, the two monks are not fused. In regatta, the two boats are not fused. In the debate with Kant, Kant and the modern philosopher are not fused.

Combination of non-counterparts

Blends can combine non-counterpart elements that come from different inputs. Consider The Grim Reaper, which is a blend with several input spaces, including a space of harvest and a space of particular human death. A reaper in input 1 is the counterpart of Death in input 2, not of the skeleton, but since Death as a cause is metonymically associated with *skeleton* as an effect, the blend can combine the reaper (from one input) with the skeleton (from the other), even though they are not counterparts. Similarly, elements in a single input space that are metonymically related can be combined in the blend. Priests, monks, mourners, and members of lay brotherhoods that are associated with dying, funerals, burial, and afterlife are metonymically associated with Death. They are not counterparts of Death, but in the blend, an attire we associate with them – robe and cowl – can be the attire of The Grim Reaper. The cowl, pulled over the head of The Grim Reaper, at once evokes both connotations of death and the impression of Death as mysterious, unknown, and set apart from human society (see below).

The possibility of combining non-counterparts on the basis of metonymic connections – like the connection between Death and a skeleton – gives blending a great power: the blend can combine elements that contribute to the desired effect *even though those elements are not counterparts*. The combined elements 'go together' in evoking the same effect even if they do not 'go together' according to the counterpart connections between the input spaces. In general, there are several vital conceptual relations that connect elements in mental spaces – Change, Identity, Time, Space, Cause-effect, Part-whole, Representation, Role-Value, Analogy, Disanalogy, Property, Similarity, Category, Intentionality, Uniqueness – and under blending these vital conceptual relations can be compressed to create more powerful and efficient structure in the blend. Compression in the blend of non-counterparts is routine. In 'He was red-hot with anger; I could see smoke coming out his ears,' *heat* in one input has the metaphoric counterpart *anger* in the other input, but *anger* has a metonymic connection to physiological reactions, including redness of skin and increased body heat. *Heat* in the blend combines *heat* from the source input, *anger* from the target input, and *body heat* from the target input, even though the two 'heats' in the inputs are not counterparts in the metaphor. (See the study by Lakoff and Kövecses, described in Lakoff, 1987.) The Birth Stork blend, which



Blend: Death The Grim Reaper

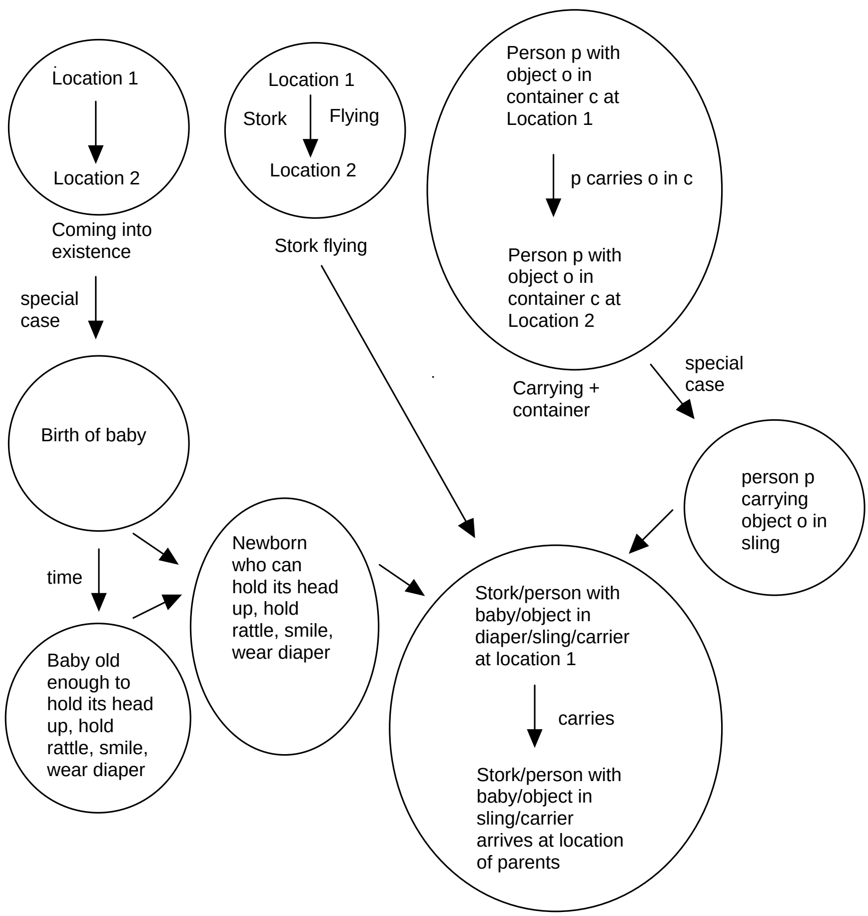
is based on the counterparts provided by the conventional metaphor BIRTH IS ARRIVAL, ingeniously provides a stork-with-diaper-sling that has as its counterpart in one input the vehicle of ARRIVAL and in the other input general causal processes of birth; the diaper belongs to neither of these counterparts, but because the baby, which is the product of birth, is metonymically associated with diapers, the diaper can be combined with the general process of birth and used concretely as part of the blend-vehicle.

The Birth Stork network makes use of some pre-existing blends. When an element in one state is later in a different state, we can compress this into a space in which the element undergoes a 'change of state.' When an element in one location is later in a different location, we can compress this into a space in which the element undergoes a 'change of location.' In general, when two spaces are related by both counterfactuality and temporal distance, we have the chance to compress those spaces and their vital relations into a single 'change' blend. These two networks, 'change of state' and 'change of location' have, as metaphor theorists have noted, served as inputs to a further blend in which the change of state is blended with the change of location, as in 'the water is coming to a boil.'

There is a third network related to these two: in one space, there is an element, but in a temporally prior space, there is no element. These two spaces also have outer-space vital relations of counterfactuality and time, and, following the general pattern, they are compressed into a single blend in which the element is always there, but undergoes a change of state from non-existence to existence.

This third blend of nothing-then-something is blended with the standard change of state/location blend into a very standard blend of 'coming into existence.' In this way, we understand the passage from nothing to something as motion from one location to another. This 'coming into existence' blend is naturally used to frame birth as the coming into existence of the baby: 'Has the baby arrived yet?' 'It's on its way.' 'It should be here any day now.'

The following diagram takes as one of its inputs this already complicated blend of 'coming into existence.'



Biases

Composition, completion, and elaboration all recruit selectively from our most favored patterns of knowing and thinking. This makes blending a powerful cognitive instrument, but it also makes it highly subject to bias. Composition, completion, and elaboration operate for the most part automatically and below the horizon of conscious observation. This makes the detection of biases difficult. Seepage into the blend can come from defaults, prototypes, category information, conventional scenarios, and any other routine knowledge.

6 Overarching goals and governing principles

There is one overarching goal driving all of the principles of conceptual integration:

- Achieve Human Scale.

The constitutive and governing principles have the effect of creating blended spaces at human scale. The most obvious human scale situations have direct perception and action in familiar frames that are easily apprehended by human beings: an object falls, someone lifts an object, two people converse, one person goes somewhere. They typically have very few participants, direct intentionality, and immediate bodily effect and are immediately apprehended as coherent.

Once blending achieves a human-scale blend, the blend also counts as human-scale, and so can participate in producing other human-scale blends, in a bootstrapping pattern that characterizes much of cultural evolution.

To achieve a human-scale blend will often require imaginative transformations of elements and structure in integration network as they are projected to the blend. There are several sub-goals that are worth noting. They are:

- Compress what is diffuse.
- Obtain global insight.
- Strengthen vital relations.
- Come up with a story.
- Go from Many to One.

Not all phenomena that meet the constitutive principles of conceptual integration are equally good blends. Some blends are better than others. There are governing principles that a blend can meet more or less well. These principles compete. In this technical sense, they are 'optimality' principles. Here we discuss some of the governing principles we have been able to substantiate and some of these more specific blend structures.

Intensifying Vital Relations
Compress what is diffuse by scaling a single vital conceptual relation or transforming vital conceptual relations into others. This is intensification of vital relations.

Maximizing Vital Relations
Create human scale structure in the blend by maximizing vital relations.

Integration
The blend must constitute a tightly integrated scene that can be manipulated as a unit. More generally, every space in the blend structure should have integration.

Topology
For any input space and any element in that space projected into the blend, it is optimal for the relations of the element in the blend to match the relations of its counterpart.

Web
Manipulating the blend as a unit must maintain the web of appropriate connections to the input spaces easily and without additional surveillance or computation.

Unpacking
The blend alone must enable the understander to unpack the blend to reconstruct the inputs, the cross-space mapping, the generic space, and the network of connections between all these spaces.

Relevance
All things being equal, if an element appears in the blend, there will be pressure to find significance for this element. Significance will include relevant links to other spaces and relevant functions in running the blend.

Satisfaction of the governing principles in some basic kinds of conceptual integration network

Mirror networks. To see a standard strategy of satisfying these governing principles, consider again three examples: the Buddhist monk, the Debate, and Regatta. Of course, they all have cross-space mapping, selective projection to the blend, and a generic space that applies to both inputs. In addition, in each of these cases, all of the spaces share a rich frame and much of its content: in the Buddhist monk, all the spaces have *man walking along a mountain path*; in the Debate, all the spaces have *philosopher musing on a philosophical problem*; in Regatta, all the spaces have *boat sailing along an ocean course*.

A *mirror network* is a conceptual integration network in which all spaces, inputs, generic, and blend, share topology given by an organizing frame. An organizing frame for a mental space is a frame that specifies the nature of the relevant activity, events, and participants. An abstract frame like *competition* is not an organizing frame, because it does not specify a cognitively representable type of activity and event structure.

Regatta, Debate with Kant, and the Buddhist monk are all mirror networks. Typically, in a mirror network, the common frame F inheres in the more elaborate frame FB in the blend. In the boat race example, the shared organizing frame *boat sailing along an ocean course* inheres in the more elaborate frame in the blend of *sailboats racing along an ocean course.* In the debate with Kant, the shared organizing frame *philosopher musing on a problem* inheres in the more elaborate frame in the blend of *philosophers debating about a problem*. In the Buddhist monk, the shared organizing frame *man walking along a mountain path* inheres in the more elaborate frame in the blend of *two men meeting on a mountain path*.

An organizing frame provides a topology for the space it organizes – that is, it provides a set of organizing relations among the elements in the space. When two spaces share the same organizing frame, they share the corresponding topology and so can easily be put into correspondence. Establishing a cross-space mapping between inputs is straightforward when they share the same organizing frame.

While spaces in a mirror network share topology at the level of an organizing frame (we call this frame topology or TF), they may differ at a more specific level (specific topology or TS). For example, in the boat race network, there are two elements that fit the role *boat* in the organizing frame and so have identical TF topology. More specific relations, however, define finer topologies that often differ. For example, in the boat race network, one of the elements fits the more specific frame *nineteenth-century clipper on a freight run* and the other fits the more specific frame *late-twentieth-century exotic catamaran on a speed run*. The two more specific frames are different, and so the topologies are different at the TS level. More precisely, we reserve the term 'specific' or TS for finer topology that specifies values of roles that are in the organizing frame. These values may themselves be roles of a more finely specified frame. In our example, *boat* is a role of the organizing frame, *clipper* gives that role a more specific value and is itself a role of a more specific frame *clipper on a freight run*. Features of these more specific values – like monohull versus catamaran – can be projected to the blend.

There will also be incidental topology, TI, in both input spaces. We use the term TI for finer topology that does not have to be included or specified, given the organizing frame. In our example, it may be fully part of the actual ocean voyages that dolphins escort the boats and that they pass by a certain uncharted island, but these are not assigned a role in the organizing frame. In general, features of incidental topology can also be projected to the blend.

The selection of an organizing frame for a space is not a once-and-for-all decision. The organizing frame can be modified and elaborated as the integration network is constructed. Topology at the TF, TS, or TI level may come to be promoted or demoted as needed. For example, *obstacles* may be a role in the frame *boat making an ocean voyage*, and if the clipper has difficulty traveling near the uncharted island because of technical problems of navigation that had not been solved in 1853 while the catamaran has difficulty traveling near dolphins because it is forbidden under international law from sailing through a school of dolphins, then *uncharted island* for the clipper and *dolphins* for the catamaran get promoted to the TS level as fitting the role *obstacle*, while *uncharted island* for the catamaran and *dolphins* for the clipper remain at the TI level.

Organizing frame is shared by all spaces:

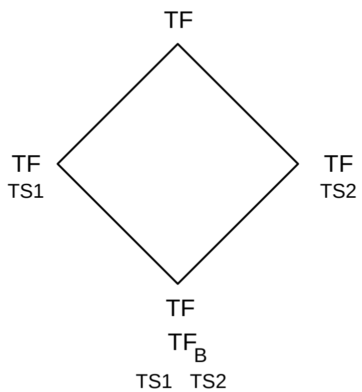


Figure 8: Mirror network

Shared topology network. In a conceptual integration network over two inputs, the topology of the generic space is always shared by all four spaces – the blend, the two inputs, and the generic space. We will call a structure in which all spaces share the topology of a generic space a *shared topology network*. Four-space blends are *shared topology networks*, but multiple blends need not be, as we shall see below.

A mirror network is a shared topology network whose shared topology is moreover an organizing frame. Other shared topology networks do not share organizing frame but do share topology. For example, simple metaphors such as the portrayal of two business competitors as boxing opponents do not have a shared organizing frame: the source input in the example has *boxing* as its organizing frame, while the target input has *business competition* as its organizing frame. But the source and target inputs do share a higher-level structure of *competition* which gives them a shared topology and makes the cross-space mapping and the generic space possible.

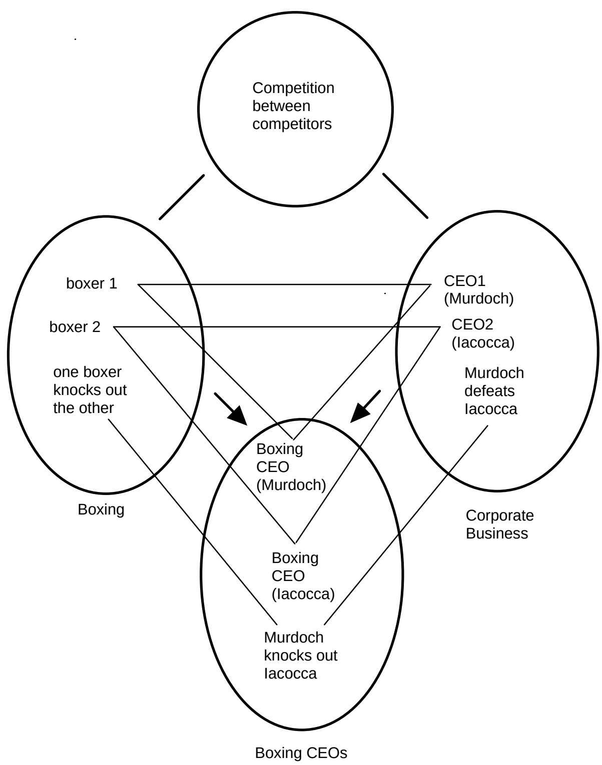
The case of complex numbers is another example, where one input has the organizing frame of two-dimensional geometry and the other has the very different organizing frame of real/imaginary numbers. The development of the cross-space mapping and the recognition of the topology shared by the inputs required a long and arduous period of conceptual work by mathematicians, and it was only at the end of the historical process that the generic space defined by this cross-space mapping came to be recognized and named: a commutative ring.

We can now define a *mirror network* briefly and more systematically as a *shared topology network* whose generic space, cross-space mapping, and shared topology are all given by virtue of a shared organizing frame for all spaces.

Single-scope networks. A shared topology network is *single-scope* if the inputs have different organizing frames and one of them is projected to organize the blend. Its defining property is that the organizing frame of the blend is an extension of the organizing frame of one of the inputs but not the other: TFB > TF1.

The case of the two boxing business competitors is a single-scope network, whose generic space has an abstract relation of adversarial competition between two agents. The blend inherits the frame of Input 1, *boxing*. The cross-space mapping is metaphoric, with Input 1 as the source and Input 2 as the target.

In a simple metaphoric blend like this, projection from inputs to blend is highly asymmetric: one of the inputs but not the other supplies the organizing frame and therefore frame-topology. This is why it seems appropriate to call that input the *source input*. The projection of the source frame to the blend carries with it linguistic constructions (e.g., vocabulary) used to evoke the source frame. Of course, there are projections from the target input to the blend that also provide linguistic constructions for the blend, but they refer to elements below the TF level, at the TS or TI level. For example, if the two business competitors are named Murdoch and Iacocca, we may say that 'Murdoch knocked Iacocca out': 'knocked out' belongs to the TF level of the source while 'Murdoch' and 'Iacocca' belong to the TS level of the target.



Any particular simple metaphoric single-scope network may have inhering within it a higher-order conventional metaphoric mapping, called by Lakoff and Johnson (1980) a *basic metaphor*. Such a basic metaphor is highly productive and inheres in indefinitely many particular constructions of meaning but is itself abstract. For example, the blend structure for the boxing business competitors is an active, on-line, specific conceptual structure that has inhering within it the abstract, basic metaphor of competition as physical combat. A basic metaphor itself never constitutes an active, complete, on-line construction of meaning. It always requires additional conceptual specification and projection to supply a particular construction of meaning.

Double-scope networks. A shared topology network is *double-scope* if the inputs are organized by different frames but some topology is projected from both frames to the blend to build the frame of the blend. Gruen's example of the computer desktop interface is a double-scope network. The two principal inputs have different organizing frames, the frame F1 of office work with folders, files, trashcans on one hand, and the frame F2 of traditional computer commands on the other. (There is also the lesser input of *choosing from a list*.) In the blend, some of the elements have F1 topology from one input while others have F2 topology from the other input.

The metaphor 'digging your own grave' is also a double-scope network with frame structure projected from both inputs. Death and graves come from the source input of the 'dying' scenario, but causality and intentionality are projected from the target input of discretionary action and mistakes that lead to failure, in the following way. In the target input, making mistakes is unintentional and brings one closer to failure. The blend receives this causal and intentional structure by selective projection from the target input: in the blend, digging is unintentional and brings one closer to death. But in the source input, both the causal order and the intentionality have the reverse structure: in this source, it is someone's dying that causes the grave to be dug and the digging is moreover intentional. The temporal order of events in the blend (digging before dying, making mistakes before failing) is also taken from the target input, not the source input.

Complex numbers are another case of a double-scope network. The inputs are respectively two dimensional space and real/imaginary numbers. Frame structure is projected from each of the inputs, e.g., angles, rotations, and coordinates from two-dimensional space, and multiplication, addition, and square roots, from the space of numbers.

We also see a double-scope network in *same-sex marriage*: input 1 has marriage but not same-sex partners; input 2 has same-sex partners but not marriage. The blend takes marriage from the TF level of input 1 and same-sex from the TF level of input 2.

In all these cases, as in most networks, the blended space develops emergent structure of its own, and ends up with a richer specific frame FB. For example, in the case of complex numbers, multiplication in the blend includes addition of angles. This operation is unavailable in either of the inputs. The input of two-dimensional space doesn't have multiplication; the input of numbers doesn't have angles.

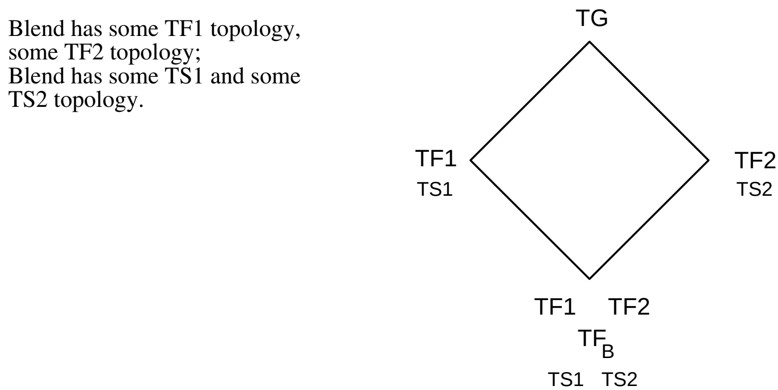


Figure 9: Double-scope network

There is a gradient between single-scope and double-scope networks. Consider as an example the case in which one person, observing that the Vatican seems to be flat-footed in the metaphorical boxing match over abortion, says, 'I suppose it's hard to bob and weave when you have a mitre on your head.' The Pope's competition with an adversary is portrayed as a boxing match, where the Pope is impeded as a boxer by the mitre he is obliged as Pope to wear on ritual occasions, and we interpret this as meaning (with respect to the input space with the Pope) that his obligation as Pope to remain dignified impedes him in his competition. In the input space with the Pope, there is a relationship at the level of the organizing frame between the Pope and dignified behavior and also between the Pope and his mitre. The cross-space mapping between inputs does not give counterparts in Input 1 for the *required dignity* or *required headgear* elements in Input 2. The Pope's obligation and his headgear in Input 2 both project to the headgear of the boxing Pope in the blend.

In the organizing frame of the input of boxing, the boxers have no headgear that is an impediment. In the blend, the organizing frame is slightly different: it contains the role *heavy headgear that makes fighting difficult*. This organizing frame is an extension of the frame of boxing, not of the frame of Pope and Roman Catholicism. Specifically, the frame of the blend has all the roles of *boxing*. But, the headgear – namely, the mitre – is projected from input 2. In that input 2 frame, there is a crucial relation R: the dignity of the Pope makes it harder for him to compete because he must always be honest and decorous. In input 2, the role *mitre* is directly linked (as a symbol) to the role *dignity and obligation* of *Pope*. The crucial relation R in input 2 is projected to R' in the blend: the mitre/dignity makes it harder for the Pope to box. *Mitre* and *dignity* in input 2 are both projected to the same element in the blend, and, crucially, they have no counterpart in input 1. The blend gets an organizing frame from input 1 but also the frame-level relation R from input 2, and this is what makes it double-scope.

In the blend, we find all the elements of the frame of boxing plus the heavy and unwieldy mitre on the boxer's head. It turns out that having a heavy object on the head is an impediment to fighting, and so we have a very natural and automatic pattern completion of the blend, leading to a new frame *boxing as impeded by heavy headgear*.

This frame is an extension of the organizing frame of input 1, not of input 2, but it is nonetheless double-scope. Recall that in *digging your own grave*, the cross-space mapping connected incompatible counterpart relations, such as direction of causality, and that to project causal direction to the blend, it was necessary therefore to choose one rather than the other of these counterpart relations. In the Pope example, because relation R in input 2 has no counterpart relation in input 1 (and *a fortiori* no incompatible counterpart relation), it can be projected to the blend (appropriately extended by completion), and no choice needs to be made between incompatible counterpart relations.

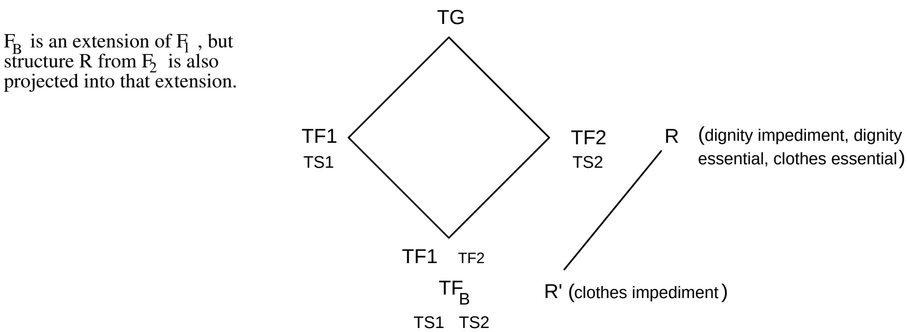


Figure 10: Asymmetric double-scope network

All conceptual projection appears to be particularly sensitive to certain kinds of abstract structure: causal relations, image-schematic relations, modalities, basic ontological categories, and event-shape. There are cases in shared topology networks where a relation is unspecified in the generic space but specified in incompatible ways in the inputs. For example, in the frame network of the Buddhist monk, all four spaces share the frame *man walking along a (directed) mountain path*, but Input 1 has a direction for that motion (up), and Input 2 has a different direction for that motion (down). The specific direction of the motion is part of the event-shape of the motion, and moreover it is projected from each input into the blend. This does not create a clash in the blend, because the counterpart monks in the inputs are not fused when projected to the blend, so we have in the blend one monk ascending and the other descending. The two specific directions do not correspond in the inputs and are not connected in the cross-space mapping.

Simplex networks. A basic kind of conceptual integration network we have not explored in this article is a simplex network. Briefly, a simplex network has an abstract frame as one input and as the other input a specific situation that has no organizing frame at all for the purpose of the integration, and so no potential for competition with the organizing frame of the first input. For example, 'Sally is the daughter of Paul' has the kinship frame *daughter-ego* as one input and as the other input a specific situation containing nothing but Sally and Paul. In the blend, Sally is framed as *daughter* and Paul is framed as *ego*. There is crucial emergent structure in this blend: the blend has a role *daughter of Paul* that is unavailable from either input. Moreover, the *ego* role in the kinship input is specified in the blend to be a father rather than a mother.

Vital relations

Before we complete the taxonomy of blend structures by topology, we must discuss a further governing constraint, concerning the compression of vital relations.

Recruiting special connections in one of the inputs can be used to bring in additional structure that assists in satisfying the governing principles. Where an element in the blend has a topology that does not match the topology of a counterpart in one input, special connections internal to that input can be recruited to increase topological connections and help satisfy other governing principles.

For example, in the Birth Stork blend, the diaper has a topology of being used as a sling (and more generally as part of the vehicle), which does not match the topology of the diaper in the Newborn input. But bringing the diaper into the blend helps satisfy Web, since it establishes more connections to the Birth space; and Unpacking, since it includes an element of the Birth space along with elements from the space of Transport; and Relevance, since an alternative way of carrying the baby – in a paper sack, or net, for example – would not have the Relevance of close association with the baby in the Birth space.

The analysis is similar for the cowl worn by the Grim Reaper. In the blend, the cowl has a topology – attire of the agent – that is not matched by the cowl in the input space. But exploiting the special and distant connection in the Death space of the relationship between dying and the priest and the attire of the priest, and thereby bringing the cowl into the blend, helps satisfy Web, Unpacking, and Relevance.

The skeleton as the form of the Grim Reaper is slightly more complicated, because in this case the skeleton in the Death input has some useful topology – on its own, it is frightening or at least impressive as a salient result of the death of a human being. Exploiting the special connection in the Death input of the relationship between dying and the final result of a skeleton, in order to bring the skeleton into the blend, helps satisfy Topology as well.

We have seen a continuum of blend structures – from simplex networks to mirror networks to single-scope and double-scope networks. Along this continuum, the topological connections in the basic cross-space mapping between input spaces typically grow weaker, but other connections are employed for the purpose of maximizing Topology, Integration, and Web. By contrast, as this continuum is ascended, it grows easier to satisfy Unpacking since the blend increasingly incorporates special connections from one input without counterparts in the basic cross-space mapping. Generally, along this continuum, as the basic cross-space topology is weakened, Unpacking is strengthened.

Intensification of vital relations

When an element is projected from an input to the blend and a second element from that input is projected because of its vital relation to the first, intensify the vital relation in the blend.

We saw above that blending can compress non-counterpart elements from a single input, such as Death, the cowl of the priest, and the skeleton of the person who has died. The metonymic distance is large between abstract death as the general cause of all deaths and the cowl worn by a certain kind of participant in a ritual associated with particular deaths. But in the blend, the metonymic connection is direct: the cowl is the attire of Death. Similarly, the skeleton after decomposition of the body is a distant product of death. But in the blend the skeleton is actually a body part of Death. The fact that metonymy is preserved in such cases can be viewed as a consequence of Topology. The Intensification of Vital Relations constraint additionally specifies that the metonymies get tighter under projection: distant cause-effect is compressed into part-whole.

Satisfying the Intensification of Vital Relations constraint is not a matter of blindly projecting vital relations. The internal integration of the blend provides opportunities for some acceptable vital relations but not for others. Since Death is an active person in the blend, and active persons are known to have skeletons (although they are not normally visible), the part-whole relation between the skeleton and the body becomes available as the counterpart of the distant cause-effect relation in the input.

Intensifying Vital Relations under projection typically optimizes integration in the blend, since it helps build a tighter and more easily manipulated unit.

Now we return to the taxonomy of blend structures by topology.

Single-scope network with compression of vital relation. Suppose the example of the boxing business competitors is elaborated slightly – the competitors are now a newspaper magnate and an automobile magnate, and they are identifiable in part because one has a rolled-up newspaper in his back pocket and the other has a car key on a key ring hanging out of his back pocket, each with an appropriate label. The organizing frame of the blend is still projected from the Boxing input, so the network is single-scope. But there is a frame relation in Input 2 that, in accord with the intensification of vital relations constraint, is projected to the TI level of the blend. The frame-relation in Input 2 is that the newspaper is the commercial product of the magnate's activities. The newspaper in the blend is connected to a newspaper in Input 2. The newspaper in Input 2 has no counterpart in Input 1 and its relevant topology in Input 2 – product of the magnate's activities – is not the topology in the blend – copy of newspaper read by the boxer-magnate. The blend has an element – newspaper – projected from an input but the topology of that element in the blend is inherited from neither input. The metonymy between the magnate and the newspaper as commercial product in the blend is tightened under projection, so that it becomes part of the magnate's appearance. The analysis is similar for the car key.

Double-scope Network with Intensification of Vital Relation. Recall the visual cartoon in which the printing press smashes the car. We pointed out that the printing press and car have topology in the blend (the press crushes and the car is crushed) that their counterparts in Input 2 do not have (the press is an instrument of making newspapers and the car is a salient product of the automobile company). Additionally, the printing press and car in Input 2 have no counterparts in Input 1. Interestingly, the elements that did not project their input-topology (printing press and car) end up being the only objects in the blend. This contrasts with the cartoon where the newspaper-in-the-back-pocket is only an optional element in the frame organizing the blend. The cartoon of the printing press smashing the car is remarkable because it is a case where Integration and Topology are maximized by recruiting vital relations in Input 2. Because the topologies of strong and weak object on the one hand and competing companies on the other will match only at a very abstract level, we find that in addition to the companies, objects closely connected to them are projected to the blend in a way that closely matches and elaborates the Input 1 topology of strong and weak objects.

This blend structure is double-scope because the topology of strong and weak object comes from Input 1 but the topology of intentionality (the printing press intends to crush the car and the car hates it) comes from Input 2, where it is attached not to the printing press and the automobile but rather to the respective companies. The projection to the printing press and the car in the blend is symmetric: their topology in the blend matches frame topology in both inputs.

This example emphasizes that conceptual projection is a dynamic process that cannot be adequately represented by a static drawing. Once the conceptual projection is achieved, it may look as if the printing press has always corresponded to the stronger object and the car to the weaker. But in the cross-space mapping, the printing press and the car play no role; they have no counterparts in Input 1. Rather, the cross-space counterparts are stronger object and newspaper company, weaker object and automobile company. Under projection of the metonymies from Input 2, the printing press *in the blend* becomes the counterpart of the stronger object in Input 1, and the car *in the blend* becomes the counterpart of the weaker object in Input 1.

This example also shows that identity is metonymy of zero distance. The metonymic relation in Input 2 between company and commercial product is transformed into identity in the blend, where the printing press is identically both a printing press and the newspaper company to which it is metonymically related as an instrument (in one of the inputs).

Double-scope network with intensification of Vital Relations and additional frame recruitment

Suppose the cartoon now contains the newspaper magnate operating the printing press to smash the car, which is being driven by the car magnate. Here the blend structure becomes elaborate through the recruitment to the blend of an additional adversaries-with-instruments frame in which adversaries fight with opposing instruments, and in which the winning adversary has the superior instrument. Now the printing press and car in Input 2 have counterparts in the adversaries-with-instruments frame: in input 2, the printing press is a symbol of a capacity for productivity that is an instrument of corporate competition, and the car is a product that is an instrument of corporate competition; these instruments in Input 2 are the counterparts of the instruments in the adversaries-with-instruments frame. Now, the topology of opposing instruments in the blend matches the topology of opposing instruments in the adversaries-with-instruments frame. This frame has the useful property of aligning superiority of instrument with superiority of adversary. In this case, we see that exploiting special internal connections in Input 2 makes it possible to recruit a frame that makes Topology much stronger in the blend structure.

Governing principles and single-scope networks

In the single-scope network exemplified by the business competitors portrayed metaphorically as boxers, Integration in the blend is automatically satisfied because the blend inherits an organizing frame from the source, *boxing*. Topology is satisfied between blend and source for the same reason. But Topology is also satisfied between blend and target because the conventional metaphor of competition as physical combat has aligned the relevant topologies of the source and target input spaces. Thus, when an element in the blend inherits topology from an element in either input that is involved in the cross-space metaphoric mapping, the topology it inherits is automatically, by virtue of the metaphor, compatible with the topology of that input element's counterpart in the other input. Web is similarly satisfied by this shared topology. Unpacking is provided just as it was for a mirror network – although the blend is integrated at the TF level, it is disintegrated at the TS level. Suppose, for example, that the competitors are represented in a cartoon as boxing in business suits. This lack of integration between business suits and boxing prompts us to unpack to two different spaces, one of boxing and one of business. In the same way, if we know that 'Murdoch' and 'Iacocca' refer to businessmen and not boxers, then their use in the sentence 'Murdoch knocked out Iacocca' directs us to the TS level of the input of businessmen, and this helps satisfy Unpacking.

Governing principles and double-scope networks

In a double-scope network, Topology, Integration, and Web are not satisfied in such an automatic and routine fashion: it is necessary to use a frame that has been developed specifically for the blend and that has central emergent structure. (This may be why double-scope networks – such as the desktop, complex numbers, and digging your own grave – are often typically thought of as more creative, at least until they become entrenched.) In double-scope networks, then, we expect to see increasing competition between governing principles and increasingly many opportunities for failure to satisfy them.

The computer desktop provides an illustration of many of these competitions and opportunities for failure. First let us consider an aspect of the desktop blend in which Topology clashes with Integration, and Integration of the blend wins. The purpose of the blend is to provide an integrated conceptual space that can serve as the basis for integrated action. The basic integrative principle of the computer desktop is that everything is on the two-dimensional computer screen. But in the input space of real office work, the trashcan is not on the desktop. By Topology, the location of the trashcan as not on the desktop would be projected to the computer interface blend; but doing so would destroy the internal integration of the blend, which is why, on the computer screen desktop, the trashcan is on the desktop. Integration of the blend in this case can only be achieved by relaxing the topology constraint as we develop a new frame for the blend.

There are at least two reasons why we are content to relax topology in this way. First, the topology that is being dropped from the desktop input is incidental to the cross-space mapping – the three-dimensionality of the office and the position of trashcans under desks has no counterpart in the cross-space mapping to the input of computer operation. Second, as we have mentioned, the purpose of constructing this blend is to develop a conceptual basis for extended action, and not to draw conclusions about the input space of offices. In a contrasting case, like the Buddhist monk, the purpose is to draw conclusions about topology of input spaces – specifically coincidence of locations and times. In such a case, relaxing Topology is likely to allow inferences in the blend that would project wrongly or not at all back to the input, and so defeat the purpose of the blend. In that case, Topology is not relaxed.

It is also possible for the frame elaborated for a blend to fail to satisfy the governing constraints. The most noticeable such failure for the computer desktop is the use of the trashcan both as the container of what is to be deleted and as the instrument of ejecting floppy disks. This failure involves failures of Integration, Topology, and Web.

The trashcan-for-both-deletion-and-ejection violates Integration for the frame elaborated for the blend in three ways. First, in the frame elaborated for the blend, the dual roles of the trashcan are contradictory, since one ejects the floppy disk to keep it rather than discard it. Second, in the frame elaborated for the blend, all other operations of dragging one icon to another have as their result that the first is *contained* in the second, but that is not so in the uniquely exceptional case of dragging the floppy to the trashcan. Third, for all other manipulations of icons on the desktop, the result is a *computation*, but in this case it is a physical *interaction* at the level of hardware.

The trashcan-for-both-deletion-and-ejection violates Topology. In the input of office spaces, putting an object in a folder or in the trashcan results in containment. This topology is projected to the blend. The trashcan in the desktop is like any icon that represents a metaphoric container: if we drag a file to a folder icon or to the trashcan icon, the file is then deposited there, and this is the topology of the input of office spaces. However, putting the floppy disk icon into the trashcan icon so as to eject it is an exceptional and contrary case that violates the projection of topology from the input of offices. It also violates topology by not preserving the relation Input 2 (the space of real offices) that items transferred to the trashcan are unwanted and destined to become non-retrievable.

The trashcan-for-both-deletion-and-ejection also violates Web. The very opportunity of ejecting floppy disks from the computer desktop creates non-optimal web connections, since sometimes the floppy disk is 'inside' the world of computer operations and sometimes it is 'inside' the world of the real office.

We now turn to questions of optimality in word-processing programs on the desktop. The command sequence Select-Copy-Paste on word-processing applications violates both Topology and Web. It violates Topology as follows. In the Input where text is actually copied by scribes or Xerox machines, copying (after selection) is a one-step operation. There is no pasting and no clipboard. Properties specific to the Integration in the blend make it convenient to decompose this operation into two steps, but they do not map topologically onto corresponding operations in the Input of 'real copying.'

The labels 'Copy' and 'Paste' chosen for these two operations in the blend also violate Web: the Copy operation in the blend (which actually produces no visible change in the text) does not correspond to the Copy operation in the Input (which does produce visible change); the Paste operation, which does produce change, is closer to 'copying' in the Input, but the label 'Paste' suggests a counterpart (pasting), which is not even part of the copying process. Not surprisingly, these flaws in the overall blend lead to mistakes by novice users. They click Copy instead of Paste, or try sequences like: Select – Select Insertion Point – Copy. This fails miserably because the first selection (not marked for copying) is lost when the second selection occurs, and anyway Copy at that point is the wrong command. Mistakes like this are interesting however, because they represent the user's effort to maintain optimal Topology and Web connections. If double selection were possible on the blended interface (as it is, in terms of attention, in the Input), Copy and Paste could easily be reintegrated into a single process operating on both selections, and the attempted sequence would be viable. In fact, the Microsoft Word® application being used to type the present text has a keyboard command (with no counterpart in the menus) which comes closer to this conception.

The 'Cut and Paste' method of moving text is a less severe violation, because the projected operations from the 'office' Input are plausible and properly web-connected. But it does add conceptual complexity to what is more easily conceived of as simple unitary 'moving.' Recent versions of Word® have added to the interface the possibility of selecting and dragging text directly to the appropriate location. The portion of text does not actually 'move' (only the arrow does) until the mouse is unclicked.

Despite all these failures to satisfy optimality principles, nonetheless the desktop blend draws rich and effective structure from familiar frames, and users are able to use it in a rudimentary fashion very quickly and to learn the elaborated frame, warts and all. The non-optimality creates difficulty for novices, who are reluctant to put the floppy disk in the trashcan since by topology it should then be lost, but this difficulty is forgotten by advanced users, who learn a less optimal but more elaborate blend.

The fact that in double-scope networks the organizing frame of the blend is not available by extension from the organizing frame of either input increases chances of non-optimality and of competition between the governing principles, but it also offers opportunity for creativity in attempting to satisfy the governing principles. Pressure to satisfy governing principles in highly complex double-scope networks has historically given rise to some of the most fundamental and creative scientific discoveries. The development of the concept of complex numbers in mathematics is a case in point. The complex number blend turns out to be a double-scope shared topology network.

Some key elements in each input have no counterparts in the basic cross-space mapping. The operation of multiplication for numbers has no counterpart in the geometry input, and the angles of vectors in the geometry input have no counterparts in the number input. The blend, however, inherits both the multiplication operation from the frame of the 'number' input and the vector angle from the frame of the 'geometric' input. This is already enough to make it a double-scope shared topology network, since multiplication in the blend has TF2 topology while angle in the blend has TF1 topology. But furthermore, in the blend, multiplication includes addition of angles as one of its constitutive components. This is discovered by running the blend; it turns out to be a highly unexpected essential property of the new concept of number which has emerged. So in this instance, the pressures to satisfy optimality in this double-scope shared topology network led to important mathematical discovery. Jeff Lansing has pointed out to us other marvelous examples of important scientific blends leading to discovery (by Fourier, Maxwell, and Faraday), which suggests that this is a general process. We emphasize that this type of creativity is possible by virtue of the competition of governing principles and the power of blending to accommodate them.

Unpacking is actually relatively easy to satisfy in the double-scope case since key elements in the blend cannot all be projected back to the same organizing frame of one of the inputs. For example, in *digging your own grave*, the gravedigger is responsible for the death, and this structure cannot be provided by the single organizing frame of digging graves, making it clear that the blend must be unpacked to the organizing frames of different inputs.

Competition among pressures motivated by optimality

At the top level of our model, there are general constitutive principles characteristic of all blend structures, like cross-space mappings. At a lower level, there are governing principles like Integration. But these governing principles themselves compete, as we have seen and as we will discuss further, and that competition results in a variety of yet lower-level governing pressures for constructing the blend. In this section, we discuss the candidate governing pressures for which we have found evidence.

Non-disintegration: Neutralize projections and topological relations that would dis-integrate the blend.

For example, as we saw above in the section called 'Governing principles and double-scope networks,' since the integrative principle of the computer desktop blend is that everything is on the computer desktop, Topology must be relaxed in projecting the trashcan to the blend so as to filter out the three-dimensionality of the real office space. In the regatta example, weather in 1853 (even if known) is not projected because it would clash with the projected 1993 weather. In the Debate with Kant, the language, German, from Input 1, is not projected; Integration in the debate frame requires a single language.

Non-displacement: Do not disconnect valuable web connections to inputs.

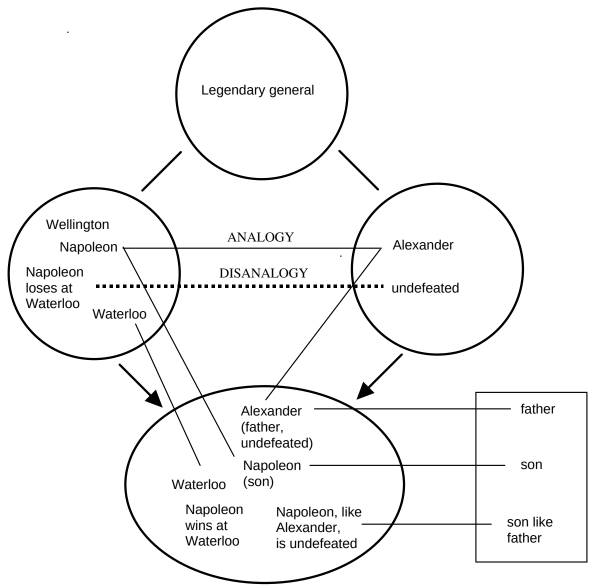
The computer desktop has web connections to the space of computer operations, in which all shifts of focus require only a simple click. For example, if a user is running five different applications on the desktop and wants to see only one of them, he can click 'Hide Others' (conversely, 'Show others'); to see a given document partially occluded by another, he need only click anywhere on the desired document. But in the space of offices, to hide everything on your desk except the one thing you wish to focus on would require complex physical operations. If these operations were all projected to the blend, it would sever its useful web connections to the input of computer operation. Function guides competition here. The web connection to 'change of focus' in the computer operations input is important because the desktop interface is designed to run a computer. If its function were to simulate the working environment of an office worker, then the complexity of the physical operations would be maintained at the expense of computing efficiency.

Non-displacement combines with Integration to force novel integrations in the blend. For instance, in the case of the metaphor 'digging one's own grave,' the blend's causal, temporal, and intentional structure (*digger is unaware of his actions, a deep enough grave causes death*) are projected from the target space of mistakes and failure. This web connection is crucial to the reasoning, but would be destroyed if the commonplace structure of the source (death followed by conscious grave-digging by somebody else) were projected. In the Nixon-in-France example, we project to the blend Nixon, but not his U.S. citizenship, which would prevent him from being president of France, thus cutting off a crucial web link from the blend to the second input.

Non-interference: Avoid projections from input spaces to the blend that defeat each other in the blend.

For example, in the space of office work, we often write 'discard' across the top of an outdated version to be discarded. In the computer desktop, the icon for a file has only one place for a label. If we projected to the computer desktop the operation of labeling the document 'discard' by making a click-command that put that label on the icon, we would lose the title of the file. So the 'title' label and the 'discard' label from the space of office work defeat each other if both are projected to the blend.

In a counterfactual blend like 'If Napoleon had been the son of Alexander, he would have won the battle of Waterloo,' we do not attempt to project Napoleon's actual father. There is no inference that if Napoleon had been the son of Alexander, Charles Bonaparte would have been Alexander, although formally this leads to an integrated scene. (If the goal is to point out that Napoleon lacked some military qualities that perhaps Alexander possessed, it is odd to say 'If Charles Bonaparte had been Alexander, Napoleon would have won the battle of Waterloo.' But if we really mean that some deficiency was actually transmitted by Charles, through genes or education, then the counterfactual sounds ok. The blend in that case contains an efficient father appropriately connected to Charles and Alexander.) The traits of fathers Alexander and Charles would defeat each other in the blend.



In the metaphor of Death as the Grim Reaper, Death, which inherits from the cadaver its skeleton, could additionally inherit its shredded, decayed clothing. The cowl would thus be shredded, but this interferes with the projection of the cowl as a piece of clothing of a live priest at the funeral. Technically, the projections from the blend to the input, of the skeleton, the sickle, etc., are one-to-one, but the projection of the shredded cowl would be one-to-many (the priest's head-dress/the dead man's hat). Similarly, in a 'bad' desktop blend, the projection (from the blend to the space of real offices) of the label on the desktop file would be one-to-many: the title of a document, or the instruction to discard it.

Non-ambiguity: Do not create ambiguity in the blend that interferes with the computation.

The method of ejecting floppy disks 'through' the trash on the computer desktop violates several constraints, as we have seen above. It also violates non-ambiguity. Superposition of icon a over icon b 'means' copying/inserting the contents of a 'into' b. So a plausible interpretation of the disk icon's being moved over the trashcan icon is that the contents of the disk are transferred to the trashcan. But in fact, the meaning in this particular case is entirely different ('eject disk from computer'). This makes the superposition schema in the blend ambiguous. Similarly, a debate-blend, which works with Kant and philosophy, might fail with a deity or prophet and religion, because we would not know whether to count victory in the debate as superior religious insight or as heresy. We would not have a straightforward way of running the ambiguous blend.

A cartoon blend advertising the magazine *Success* has a man blended into a rocket shooting into outer space. People judge this to be a 'bad metaphor.' One reason, presumably, is the inherent ambiguity in the blend: it is good for a rocket to fly, but not good for a man to be shot out of a cannon with no control over his actions and fate.

Backward projection: As the blend is run and develops emergent structure, avoid backward projection to an input that will disrupt the integration of the input itself.

During blending, conceptual work may be performed at any site in the conceptual array. For example, one straightforward way to optimize Topology is to project the topology of the blend back to reform the inputs. But doing so will conflict with the original Integration of the inputs. Usually, this is undesirable, which gives rise to pressure to avoid backward projection.

For example, under pressure from Integration, the desktop blend places the trashcan on the desktop, but projecting this relation backward to the input of the actual desks would disrupt their efficient use. In the grave-digging metaphor, we do not want to start thinking, through backward projection to the source input, that digging graves actually causes death. We do not interpret the printing press cartoon as additionally suggesting that smashing cars with a printing press is a good idea.

Many blends, however, have the purpose of modifying the structure of an input. Coulson (1995) considers such blends.

The Topology constraint and the invariance hypothesis

One goal of the network model is to account for inferencing during conceptual projection. For example, we have shown in our pedagogical riddle of the Buddhist monk that if the blend and its inputs have the same co-occurrence of locations and times (under Topology) and this mirroring survives as we run the blend (under Web), then the inference of an *encounter* in the blend entails inferences for the inputs which effectively solve the riddle.

An earlier attempt to account for inferencing during conceptual projection in the special case of metaphor goes under the name of 'the invariance principle' – launched by analysis in Turner (1987: 143–148), stated briefly in Lakoff and Turner (1989: 82), and analyzed in Lakoff (1989), Turner (1991: 172–182), Lakoff (1993), and Turner (1996b). The invariance principle proposes that in metaphor, we attempt to project image-schematic structure (with inferences) from source to target while avoiding the creation of an image-schematic clash in the target. Importing new image-schematic structure to the target by projection does not violate the invariance principle if the original target is appropriately indeterminate. Asserting by means of the metaphor that the target's image-schematic structure is to be overridden does not violate the constraint, since the changed target contains no clash.

Our network model of conceptual projection extends and modifies the invariance principle. We emphasize the importance of image-schematic topology in all conceptual projection, not only metaphoric projection. In the network model, there are productive matches of image-schematic structure between inputs, generic space, and blend. First, consider the generic space and the inputs. The structure of the finished generic space, taken as applying to both inputs, frequently contains extensive image-schematic structure, as in the riddle of the Buddhist monk, where the two input spaces do not stand in metaphoric relation (we do not understand the descending monk by metaphoric projection from the ascending monk or conversely).

Second, consider the blend and the inputs. There is always important matching of image-schematic topology between blend and inputs under Topology: the Buddhist monk blend requires an extensive topological match between parts of the blend and each of the inputs.

But the Topology constraint is not a generalization of the invariance principle to non-metaphoric cases. The Topology constraint does not require that we project image-schematic structure from one input to the other or from the blend to the inputs. It does require that we project image-schematic structure from the inputs to the blend. In the Buddhist monk riddle, we do not import image-schematic structure from one input to the other, because *the detailed relevant image-schematic structure already exists in each input independently of the other input*. Furthermore, although we 'understand' the Buddhist monk input spaces by drawing on the image-schematic structure of the 'encounter' in the blend, we do not project that image-schematic structure from the blend to the inputs; quite the contrary. The blend has the image-schema for 'encounter'; the inputs do not have it; we do not project that image-schema to the inputs; instead, we infer from this image-schema in the blend a different and complicated relation of image-schemas between the inputs: namely, there exists in each input a time-location pair, and these two pairs in the two inputs have the identical times and the identical locations.

Topological structure in the blend may be elaborated that is important for the construction of meaning but that is not projected identically back to the inputs. This is clearest in the case of science fiction or fantasy blends meant for entertainment, where we are not solving over the inputs, and where Topology and Web may be thoroughly relaxed, but it is also true for cases where inferences are drawn for the inputs: the existence of the race in the *Great American II* blend is crucial for the construction of meaning and inference, but the race structure in the blend does not displace the structure of the inputs in which each boat is making a solitary run. Each space in the conceptual projection has a different structure, and each space is useful.

Now let us consider examples that are felt to be clearly metaphoric. What is the relationship for clearly metaphoric cases between the topology constraint – which we claim applies to all integration networks – and the invariance principle – which was advanced exclusively for the metaphoric cases? The network model, far from eliminating the need for a theory of metaphor and a consideration of the mapping of image-schemas, requires such a theory, in the following way. Consider the status of the generic space and the origin of its content. Typically, the generic space contains image-schematic topology, which is taken to apply to two inputs. Often, much or even all of that content is supplied processually by activating a conventional metaphoric mapping between the domains underlying the two inputs. Indeed, in many cases, some of them quite important, it may be that the image-schematic structure belongs to the target only because metaphoric projection installed it in the target. In sum, a counterpart mapping is needed to launch on-line blending, and that counterpart structure is often supplied by activating a conventional metaphor, and the counterpart structure may have been created by the basic metaphor projection rather than merely being picked out as a template for the projection.

Now consider the case where the metaphoric meaning that arises in an integration network is not supplied by activating a conventional conceptual metaphor. In these cases, the invariance principle survives with modification into our model. Under the topology and web constraints, the projection of image-schematic structure from the source space plays an important role in blending. Under the topology constraint and the non-disintegration pressure for the inputs, image-schematic clashes are avoided in the target space. Moreover, if there is a clash of topology between source and target, then since it is the target we care about, we typically prefer the topology in the target: structure in the blend needed to deliver inferences for the target will accord with the important image-schematic structure in the target as opposed to the source. We see a clear example of this in digging your own grave, where the causal, intentional, frame, and internal event structure of the blend suit the topology of the target space but not at all that of the source space, although some structure – the foolishness of failing to recognize concrete actions – comes from the source into the blend. In general, the topology of the blend needed for delivering inferences for the target cannot do so if it conflicts with the protected topology of the target. A clash of this nature is to be avoided. This principle is equivalent in spirit and effect to the invariance principle's proposal that an image-schematic clash is not to be created in the target.

But the network model and its Topology principle differ from the two-domain model of metaphor and its invariance principle. Under the invariance principle, all the inferential structure had to be supplied by either the target and its protected image-schematic structure or by the source image-schematic structure projected to the target. We have demonstrated that the blend often has *emergent structure* not available from either input, but which is important for inferencing. In *digging your own grave*, there is important causal structure and event structure: the person addressed is digging a grave and the existence of a satisfactory grave causes death. This structure is image-schematic, but it is not given by either input. The causal structure of the blend is the inverse of the causal structure of the source, and in the target it is not given, prior to the blend, that the person addressed is performing bad acts, that performing them completes in a cumulative manner a certain gradual action, or that completing that action causes disaster. This image-schematic structure, with its inferences, is developed in the blend so as to permit the projection of certain inferences to the target that the target can accept.

Similarly, the desktop has emergent structure provided by neither input, such as dragging a file icon from the hard disk icon to the floppy disk icon to *duplicate* the file onto the floppy disk rather than *move* it off the hard disk and onto the floppy disk. The image-schematic topology of the blend in this instance violates the topology of the source of actual desktops and moving things on them, and it is not given by the target space of symbolic computer commands, although it can be projected there.

There is another important difference. The two-domain model of metaphor with its invariance principle is not a theory of the development of metaphoric mappings. In our view, the development of a conventional metaphoric mapping involves conceptual integration. In cases where useful inferences or structure have emerged in the blend and become thoroughly conventional, the blend itself becomes the conventional conceptual structure of the 'target' domain. Additionally, blending is always available to someone who activates a conventional metaphor, and many of the conventional metaphors studied so far, like ANGER IS HEAT or The Grim Reaper, are actually conventional blends.

7 Additional dimensions of conceptual integration

Activation

In Fauconnier & Turner (1994), we provided a taxonomy of blends by a kind of conceptual activation. The parameters in this taxonomy are: the number and type of spaces involved; the degree to which any particular space in the array is active as a working space in which new on-line conceptual construction must be done; the degree of blending and of abstraction; whether the vocabulary transfer is on-line or permanent; the number of conceptual domains involved in building up the inputs and the blend; whether or not the conceptual domain involved is consciously focused upon; and the extent to which the blended space gives birth to a new conceptual domain. The existence of a blended space does not entail that it serve as the basis for an imaginary conceptual domain, like the ghost ships of the boatrace example or the sinners of Dante's hell. Most blends, while serving important local cognitive functions, have no corresponding conceptual domains.

Functions of blends and topic spaces

The function of the desktop blend is to provide an integrated activity that the computer user can inhabit; naturally, the integration principle dominates. But in the monk example, the function of the blend is to solve for a puzzle in the inputs; naturally, the web principle dominates. The many examples analyzed in previous work on blending supply a survey of functions of blends. They include: reasoning on inputs (the monk example); adding meaning and emotion to inputs (enthusiasm in the boat race example); creating rhetorical presence (Oakley 1995) for some aspect of the inputs ('If gnatcatchers were dolphins, we would not be permitting them to become extinct'); jokes (analyzed by Seana Coulson); conceptual change ('artificial life'); cultural change ('same-sex marriage'); provisional category extension ('he's a real fish'); enhancing one of the inputs (the debate with Kant enhances the modern philosophy teacher's authority, status, etc.); supplying new action (desktop); providing integrated conceptual structure over an unintegrated array (as in giving the structure of caused motion to unintegrated events in 'John sped the toy car around the Christmas tree'); and integrating the performance of actions (learning to ski). It is important to remember that functions cannot be predicted from structural features.

For functional reasons, the input spaces are rhetorically unequal. For example, in the boat race, it is 1993 that the reporter cares about and talks about. It is 1993 that he is interested in understanding and reporting fully. We label 1993 the *topic space* of the projection. It is possible for there to be more than one topic space (in the monk example, both spaces are equally topic spaces). It is also possible for the topic space to shift: if we are descendants of the captain of *Northern Light*, it may be 1853 that we care about understanding. Coulson (1995) shows that a source input space in a metaphoric projection can be the topic space.

8 Summary and further results

Conceptual integration – 'blending' – is a basic cognitive operation. Conceptual integration networks involve input spaces, generic spaces, and blended spaces. There is a cross-space mapping of counterpart connections between input spaces and selective projection of structure from the inputs to the blend. Blends develop through composition, completion, and elaboration. Blends provide the possibility of backward projection to the inputs of inferential and other structure. Conceptual integration networks arise under competing governing principles of Topology, Integration, Web, Unpacking, Relevance, Intensification of Vital Relations, and Maximizing Vital Relations. Some basic patterns of satisfying these constraints are simplex networks, mirror networks, single-scope networks, and double-scope networks.

There are many other results of this research that can only be referred to here, without further explanation. We provide an analysis of grammatical constructions used to evoke conceptual integration, and of the way those grammatical constructions can be composed to evoke compositions of conceptual integrations. We analyze the mechanisms of frame integration, including composition of frame integrations. Unsurprisingly, we find that the construction of meaning is not truth-conditionally compositional: construction of meaning is not just a matter of specifying contextual elements and composing truth conditions. However, it turns out that there *is* compositionality at the level of the general schemes for conceptual integration networks and at the level of the syntactic forms that prompt for those schemes. We show that one purpose of grammatical constructions is to prompt for conceptual integrations of certain types. We also show that there is a process of *formal* blending at the level of grammar that is parallel to the process of *conceptual* blending, and that the two processes interact in intricate ways. In particular, conceptual blending can guide formal blending to produce new grammatical constructions suited to evoke just those conceptual blends. In these ways, blending is a central process of grammar. We analyze the role of conceptual integration in conceiving of space, form, and motion. We explore typical uses of conceptual integration in literature and the visual arts. We argue that conceptual integration interacts with cognitive activities like category assignment, analogy, metaphor, framing, metonymy, grammatical constructions, and so on. Moreover, the model of conceptual intergation suggests that these are not sharply distinguished kinds of cognitive activity. Distinctions among the products of conceptual integration are real, but arise from a number of interacting graded dimensions of difference. A number of locations in the grid of all these dimensions stand out as prototypes or cognitive reference points, and these locations have been given the name 'categorization,' 'framing,' 'metaphor,' and so on. These reference points are convenient, but there are not sharp divisions in the very nature of the types of phenomena that fall under these labels. The underlying cognitive operations are general, while the differences stem from the nature of the appropriate domains and mappings and the many interacting dimensions along which they vary.

Further research on blending is presented at http://blending.stanford.edu.

9 Conclusion

This paper has presented evidence for a general cognitive operation, conceptual integration, which builds up networks of connected spaces – inputs, generic, and blended spaces. The construction of such networks depends quite generally on establishing cross-space mappings of the sort commonly studied in theories of metaphor and analogy. But metaphor and analogy phenomena are only a small subset of the range of conceptual integration phenomena. Conceptual integration networks are equally prominent in counterfactuals, category extension, event integration, grammatical constructions, conceptual change (as in scientific evolution), and literary and rhetorical invention. The salient feature of such networks is the construction of a blended space, which develops specific emergent structure and dynamics while remaining linked to the overall network. Projection in a network can occur in different ways and in different directions, as we analyzed in the taxonomy of section VI.

Theories of metaphor and analogy have typically focused on the case where projection is one-way (from a 'source' to a 'target') and they have overlooked the construction of blended spaces. Accordingly, the overall picture is even richer than previously envisioned, and any explicit computational modeling of the entire process will presumably face obstacles in addition to the already formidable ones encountered for analogy. At the same time, however, the conceptual integration view yields a far more unified general conception of meaning construction at all levels, and this should prove to be a major simplification.

It is remarkable that blending – a general-purpose, fundamental, indispensable cognitive operation, routinely employed in a variety of domains, commonly interactive with other cognitive operations that have received extensive analysis – should have received so little systematic attention in the study of cognition and language. The routine and largely unconscious nature of blending may have helped it escape scrutiny. The many well-known spectacular blends – sirens, mermaids, chimerae, space aliens, cybernetic organisms, Bambi – may have made blending seem merely exotic. Blending is a central, orderly, powerful, systematic, and commonplace cognitive operation. We have proposed a theoretical model of its constitutive and governing principles.

Notes

* This article is a reprint with revisions of an article published in *Cognitive Science*, 22(2) 1998, 133–187. Copyright © Cognitive Science Society, Inc. Used by permission.

This paper was written in part while Mark Turner was a Fellow at the Center for Advanced Study in the Behavioral Sciences. He is grateful for financial support provided during that time by the Andrew W. Mellon Foundation. It was completed while he was Agnes Gund Member in the School of Social Science in the Institute for Advanced Study, Princeton. The authors are grateful for comments from David Collier, Seana Coulson, Chuck Fillmore, Raymond Gibbs, Jr., Adele Goldberg, James Greeno, George Lakoff, Nili Mandelblit, Todd Oakley, and an anonymous reviewer for *Cognitive Science*.

1 There is widespread agreement in research on analogy and metaphor that cross-space mappings operate and transfer inferences by extracting or creating common schematic structure. The modeling of such processes has typically focused on the stage at which two domains are already appropriately structured and alignment takes place. Most researchers acknowledge, however, that this is only a part (perhaps even a small part) of the entire process, given the richness of domains and the corresponding multitude of ways to structure them (or 're-represent' them). These issues are discussed in many places (e.g. Burns (1995), Hofstadter (1995), Hofstadter (1995a, 1995b), Holyoak and Thagard (1994), Forbus et al. (1997), Hummel and Holyoak (1996)). The work we present in this article does not bear directly on this issue (but see footnote 3). It takes as given the undeniable, but admittedly still poorly understood cognitive capacity for schema induction and cross-domain mapping.

What we find with respect to cross-space mappings is:

- they operate in many phenomena other than metaphor and analogy;
- they operate extensively in the construction of simple everyday sentence meaning;
- they operate not just between a source and a target, but more generally between the various spaces of a conceptual integration network, including generic and blended spaces.

Our analyses of conceptual integration do, inevitably, have some consequences for the research on cross-space mapping. For example, we find evidence against all three of the claims in Dedre Gentner's classic paper on structure mapping (Gentner, 1983). (1) We find that, as a general principle, analogy is not compositional; the meaning of an analogy does not derive from the meaning of its parts. For example, 'This surgeon is a butcher' has as part of its central meaning 'incompetence,' which is not available from either the input for the surgeon or the input for the butcher, but which is emergent in the blend. Personifying Death as a magician who is evil because he makes people disappear depends upon the emergence of *evil* in the blend: absent the blend, Death is not intentional and hence not evil, and a magician who performs disappearing tricks is not evil either. (2) We find, as a general principle, that mapping does depend upon specific content of the domains and not just on structural properties: the attribution of incompetence to the surgeon-butcher depends upon attitudes toward what happens to human bodies. (3) We find, as a general principle, that there are not clean distinctions in kind between various products of conceptual projection and conceptual integration, but rather several interacting gradients of distinction. On the other hand, we concur in general with Holyoak & Thagard (1989) and Holland, Holyoak, Nisbett, & Thagard (1986) that pragmatic goals and purposes influence mapping, and with Keane, Ledgeway, and Duff (1994) that cognitive constraints (including, e.g., constraints on working memory, influence from background knowledge, influence of prior activity) influence mapping.

2 For example, if $(r,\theta) = a + bi$ and

$(r',\theta') = a' + b'i$, then

$(r,\theta) \times (r', \theta') = (rr', \theta+\theta') =$

$(a+bi) \square (a'+b'i) = aa'-bb' + (a'b+ab')I$

3 Douglas Hofstadter (personal communication) reports his discovery of how to 'make' new geometries by blending. Taking projective geometry as a generic, and Euclidean as a source, he obtained a dual target for the latter, and a new 'contrajective' geometry as a blend of the Euclidean and the Euclidual. Adrian Robert (in press) has shown that

informal proofs in mathematics involve massive on-line blending of schematic structures, performed unconsciously by authors and readers of proofs.

4 'So far, the people of this small textile town in northwestern Carolina have been unable to pray Mrs. Smith's two little boys home again. ' (NY Times). This is an example of the Caused Motion construction studied in particular by Goldberg (1994), who explicitly addresses the issue of fusing grammatical constructions, within the framework of Construction Grammar (Fillmore and Kay nd ms). We see this fusion as the reflex of conceptual blending. Fauconnier and Turner (1996) and Mandelblit (1997) offer detailed accounts of the Causative Construction in French and Hebrew respectively, using the blending approach. We also see Langacker's general approach to grammar as very congenial to the one described here. In Langacker's Cognitive Grammar, schemas are put in correspondence and integrated in succession to form functional assemblies. Interestingly, emergent structure also develops at this elementary level of sentence formation.

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14 Blending and metaphor

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1 Introduction

The framework sometimes referred to as 'conceptual metaphor theory', with its origins in Lakoff and Johnson (1980), is one of the central areas of research in the more general field of cognitive linguistics. Within this field, the notions of 'source domains' and 'target domains', 'invariance', 'mappings', and so forth have become a common, though not universal, vocabulary for discussing the linguistic and conceptual phenomena of metaphor. The findings and principles of this framework have been applied in numerous studies, both within and outside of the field of linguistics.

A more recent framework, proposed by Fauconnier and Turner (1994; 1998) seeks to explain much of the same linguistic data, and also to unify the analysis of metaphor with the analysis of a variety of other linguistic and conceptual phenomena. This framework – referred to variously as the theory of 'blending', 'conceptual blending', and 'conceptual integration' – shares many aspects of conceptual metaphor theory (CMT). For instance, both approaches treat metaphor as a conceptual rather than a purely linguistic phenomenon; both involve systematic projection of language, imagery and inferential structure between conceptual domains; both propose constraints on this projection; and so forth. However, there are also important differences between the approaches: CMT posits relationships between pairs of mental representations, while blending theory (BT) allows for more than two; CMT has defined metaphor as a strictly directional phenomenon, while BT has not; and, whereas CMT analyses are typically concerned with entrenched conceptual relationships (and the ways in which they may be elaborated), BT research often focuses on novel conceptualizations which may be short-lived.

In this article we explore the relationship between BT, CMT and the phenomena they address, arguing that the two approaches are complementary. In particular, the cross-domain relationships which have been identified by CMT researchers shape and constrain the more complex process of conceptual blending. The nature of this relationship has relevance for anyone interested in the conceptual analysis of language and, more broadly, for anyone interested in conceptual structure.

We begin with an overview of the BT framework, focusing on similarities and differences with the CMT framework.

2 Blending theory and conceptual metaphor theory

2.1 Domains vs. mental spaces

In the CMT framework, metaphors are analyzed as stable and systematic relationships between two conceptual 'domains'. In a metaphorical expression like:

(1) The committee has kept me in the dark about this matter.

language and conceptual structure from the 'source' domain of vision is used to depict a situation in the 'target' domain of knowledge and understanding. Particular elements of the source and target domains are picked out through a combination of the source language used ('in the dark') and the relevant conceptual metaphor, a 'mapping' – presumably stored as a knowledge structure in long-term memory – which tells us how elements in the two domains line up with each other. In this metaphor, knowledge structures which concern seeing have been put into correspondence with structures concerning knowledge and awareness. Because the mapping is principled, ignorance is associated with darkness as well as other conditions which preclude sight. In fact, thanks to the general mapping between visual perception and intellectual activity, nearly any concept related to the experience of vision is likely to have a clear counterpart in the realm of knowledge and ideas. We easily understand a novel sentence like 'You'd need an electron microscope to find the point of this article' – and the conceptual metaphor is the mechanism by which we interpret such references.[1]

In BT, by contrast, the basic unit of cognitive organization is not the domain but the 'mental space' (Fauconnier, 1994 [1985]), a partial and temporary representational structure which speakers construct when thinking or talking about a perceived, imagined, past, present, or future situation. Mental spaces (or, 'spaces', for short) are not equivalent to domains, but, rather, they depend on them: spaces represent particular scenarios which are structured by given domains. For instance, a BT account of example 1 would involve a space in which the agent is standing in the dark. While this representation appeals to our knowledge of visual experience, the recruited structure is only a small subset of knowledge of that domain. In short, a mental space is a short-term construct informed by the more general and more stable knowledge structures associated with a particular domain.

2.2 Two domains vs. four spaces

While CMT analyses involve mappings between precisely two conceptual structures, BT typically makes use of a four-space model. These spaces include two 'input' spaces (which, in a metaphorical case, are associated with the source and target of CMT), plus a 'generic' space, representing conceptual structure that is shared by both inputs, and the 'blend' space, where material from the inputs combines and interacts. A BT account of example 1 would include the following spaces: an input space drawing on the domain of vision, in which a person (A) is surrounded by darkness; another input space, drawing on the domain of intellectual activity, in which a committee has withheld information from an individual (A'); a mapping between these spaces, specifying that A and A' are to be taken as one and the same person, that the person's inability to see corresponds to unawareness, and so forth; a generic space containing the shared material the two inputs have in common (roughly, 'a person who has no access to a particular stimulus'); and the blended space, in which a committee is causing an individual to remain in the dark.

Note that in the 4-space model material is projected from both the source and target spaces to the blend. This arrangement contrasts with the simple, unidirectional projection posited by CMT, in which mappings are from source to target.

2.3 Emergent structure

One of the chief motivations for BT, according to proponents, is that the four-space model can account for phenomena that are not explicitly addressed by mechanisms of the two-domain model. Consider, for example, the well-worn metaphor

(2) This surgeon is a butcher.

intended as a damning statement about an incompetent practitioner (Veale, 1996). Initially, the metaphor may seem to be explainable in terms of direct projection from the source domain of butchery to the target domain of surgery, guided by a series of fixed counterpart mappings: 'butcher' onto 'surgeon'; 'animal' (cow) maps onto 'human being'; 'commodity' onto 'patient'; 'cleaver' onto 'scalpel'; and so forth. This analysis of the cross-domain relationships, however, cannot by itself explain a crucial element of the statement's meaning: The surgeon is incompetent. A butcher, though less prestigious than a surgeon, is typically competent at what he does and may be highly respected. The notion of incompetence is not being projected from source to target.

Discussions in the CMT tradition have touched on some related points. Lakoff & Turner (1989:79), for instance, ask, in the course of discussing personifications of death, 'why is the reaper grim?' After all, real reapers are not necessarily grim, any more than butchers are necessarily incompetent. Their answer, in part, is that '[t]he way we feel about the appearance and character of the personification must correspond to the way we feel about the event.' This is an intuitively satisfying explanation for the reaper's grimness, but, as Lakoff & Turner point out, there are independent reasons why death is personified as a reaper in the first place, including a metaphorical conceptualization of the human lifecycle as the lifecycle of a plant. We cannot apply the same logic to the case of the incompetent butcher: Why would we select a butcher as an appropriate source image for a surgeon, and how would that selection (in itself, without requiring us to specify 'a bad butcher' or the like) communicate the notion of incompetence? The intuitive answer is that the selection of the source image, and the interpretation of the sentence, depend partly on contrasts between surgeons and butchers; this is a factor which the mechanisms of CMT cannot cope with directly.

The BT model accounts for the inference of incompetence as follows. First, the blend inherits some structure from each of the inputs (in accordance with constraining principles, discussed below). From the target input space, structured by the domain of SURGERY, it inherits such elements as the identity of a particular person being operated on (i.e. the speaker), the identity of another individual who is performing the operation, and perhaps details of the operating room setting. From the source input space, which draws on the domain of BUTCHERY, it inherits the role 'butcher' and associated activities. The two input spaces share some structure, represented in the generic space, in which a person uses a sharp instrument to perform a procedure on some other being.

In Figure 1, solid lines represent the cross-space correspondences that constitute the mapping between the input spaces, dotted lines represent projections between spaces, and the dashed line between the Surgeon role in Input 1 and the Butcher role in the blend represents the fact that the butcher in the blend is associated with the surgeon in the target space (see the discussion of 'fusion with accommodation' in Section 5.1).

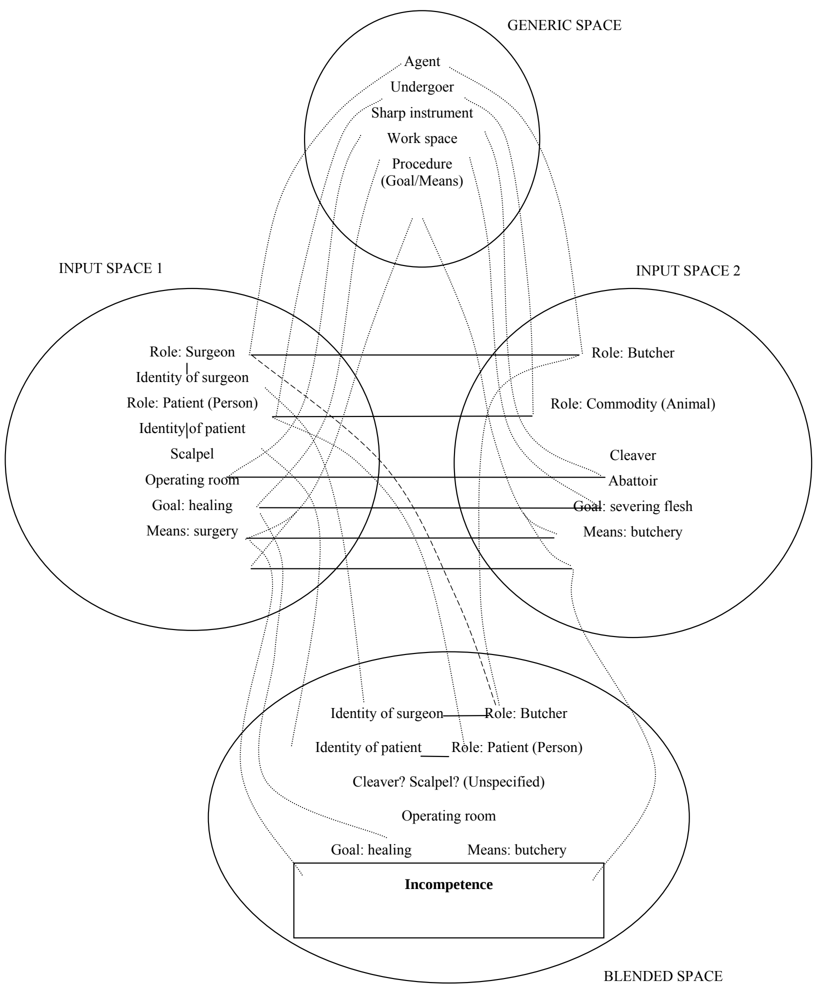

Figure 1 Conceptual integration network: surgeon as butcher

Besides inheriting partial structure from each input space, the blend develops 'emergent' content of its own, which results from the juxtaposition of elements from the inputs. In particular, the BUTCHERY space projects a means-end relationship incompatible with the means-end relationship in the SURGERY space. In butchery, the goal of the procedure is to kill the animal and then sever its flesh from its bones. By contrast, the default goal in surgery is to heal the patient. In the blended space, the means of BUTCHERY have been combined with the ends, the individuals and the surgical context of the SURGERY space. The incongruity of the butcher's means with the surgeon's ends leads to the central inference that the butcher is incompetent (see the box within the blended space in figure 1). This emergent property of the blend cannot be captured so explicitly within a CMT-style analysis focusing on correspondences and projections from source to target.

2.4 On-line processing and entrenchment

Imagine we were observing a young, apprentice butcher at work, taking too much time and being too tentative as he cut up a piece of meat. Someone might comment,

(3) He's not a butcher, he's a surgeon.

In context, this sentence could be intended and understood as a negative evaluation of the butcher's competence. Casting him as a surgeon highlights the incongruity between his methods and those appropriate to a butcher.

Since the blend is probably novel at the time it is uttered, this example illustrates the conception of blending as an on-line, real-time process that creates new meaning through the juxtaposition of familiar material. A sentence like 2 probably draws on conventional associations with the word butcher, and the blending analysis may really be an account of the historical derivation of such usages, rather than of the on-line processing a hearer might use today. But sentence 3, which depends on a very similar conceptual integration network, calls more strongly for explanation in terms of real-time processing by means of a cognitive structure like the one represented in the blending diagrams.

Whereas CMT has been primarily concerned with identifying regular, conventional patterns of metaphorical conceptualization (and explaining motivated extensions of these conventional structures), BT has often explicitly addressed itself to novel and unique examples which do not arise from entrenched cross-domain relationships. Since we encounter so many novel blends – e.g. in cartoons, jokes, newly coined terms, terms we apply in unusual ways, etc. – and since we create and understand them so effortlessly, such examples suggest that the processes used to generate and interpret blends are well-developed, basic elements of our cognitive machinery.

2.5 Basic processes of blending

As conceived within BT, blending involves three basic processes – 'composition', 'completion', and 'elaboration'. Composition, the most straightforward process, refers to the projection of content from each of the inputs into the blended space. Sometimes this process involves the 'fusion' of elements from the inputs, as when the blend contains only a single individual who is associated with the butcher from one space and the surgeon from the other. The representations resulting from the composition process may or may not be realistic. For instance, it is not plausible that a butcher would be allowed to operate on a surgery patient, but nonetheless we easily construct and manipulate such a blended image.

Completion is the filling out of a pattern in the blend, evoked when structure projected from the input spaces matches information in long-term memory. For example, when we mentally project a butcher into an operating room, we end up introducing the notion of incompetence and/or malice into the scene as well, in order to make sense of the scene. We complete our understanding of the scenario by introducing a new feature of the person, prompted by the juxtaposition of elements from the inputs. The idea of destructive, inappropriate action calls to mind the notion of an incompetent and/or malicious person. In this way, the completion process is often a source of emergent content in the blend.

Finally, elaboration is the simulated mental performance of the event in the blend, which we may continue indefinitely. For instance, we might proceed from the image of a butcher carving a patient to the even more grotesque image of a butcher packaging the patient's tissue as cold cuts. Once the connections to long term knowledge about operations and butchery have been made, we are able to imagine scenarios which unfold along various possible trajectories.

At each of these stages there is the potential for emergence of new content, not available from either of the input spaces. New juxtapositions, new frames, new features all arise when we combine elements from distinct mental spaces. These bits of emergent structure (cf. Hofstadter's notion of 'slippage') are chief diagnostics for the occurrence of blending.[2]

2.6 Optimality principles of BT

Fauconnier and Turner (1998) lay out five 'optimality principles' of conceptual blending, constraints under which blends work most effectively. These are:

Integration:	The scenario in the blended space should be a well-integrated scene.
Web:	Tight connections between the blend and the inputs should be maintained, so that an event in one of the input spaces, for instance, is construed as implying a corresponding event in the blend.

Unpacking:	It should be easy to reconstruct the inputs and the network of connections, given the blend.
Topology:	Elements in the blend should participate in the same sorts of relations as their counterparts in the inputs.
Good Reason:	If an element appears in the blend, it should have meaning.

An additional principle, leading to some of the fanciful imagery encountered in blends, is referred to as Metonymic Tightening: Relationships between elements from the same input should become as close as possible within the blend. For instance, Western images of personified Death often depict the figure as a skeleton, thus closely associating the event of death with an object that, in our more literal understandings, is indirectly but saliently associated with it.

There is tension among some of these principles, and so each blend satisfies them to varying degrees.[3]

Next, we move to a more detailed discussion of a particular metaphoric blend.

3 The ship of state

This sentence taken from a piece of political commentary illustrates the common conceptualization of a nation or society as a ship:

(4) With Trent Lott as Senate Majority Leader, and Gingrich at the helm in the House, the list to the Right could destabilize the entire Ship of State.[4]

Before examining the details of this particular blend, let us look at the conventional mapping it builds upon. As it is used in popular discourse, the Nation-as-Ship metaphor includes at least the following cross-domain correspondences:

Nation	Ship
National policies/actions	Ship's course
Determining national policies/actions	Steering the ship
National success/improvement	Forward motion of the ship
National failures/problems	Sailing mishaps (e.g., foundering)
Circumstances affecting the nation (e.g. on the political or economic levels)	Sea conditions

Consider the following attested instance of the metaphor:

(5) Without the consent of our fellow citizens, we lose our moral authority to steer the ship of state.[5]

The metaphorical correspondences underlying example 5 reflect the conventional mapping described above, with the ship's course standing for the nation's policies, and determining the ship's course (steering it) corresponding to determining the nation's policies. The next example evokes a richer scenario.

(6) The [Sri Lankan] ship of state needs to radically alter course; weather the stormy seas ahead and enter safe harbour.[6]

Here we have the image of a harbor in addition to the more standard notion of sea conditions. The harbor stands presumably for stable political and economic circumstances.

While the Nation-as-Ship is a conventional conceptualization, it is also related to more fundamental metaphorical mappings, such as ACTION IS SELF-PROPELLED MOTION, COURSES OF ACTION ARE PATHS, TIME IS MOTION, A SOCIAL RELATIONSHIP IS PHYSICAL PROXIMITY (e.g., within a single sailing vessel), CIRCUMSTANCES ARE WEATHER, STATES ARE LOCATIONS and so forth. All these conventional metaphors help motivate the framing of a nation and its history as a ship plying the seas. The idea that simple metaphors interact to yield more elaborate conceptualizations has been discussed by researchers working in the CMT framework. (See, for instance, Lakoff & Turner's (1989) discussion of 'composite' metaphors, and Grady's (1997) more explicit analysis of the 'unification' or 'binding' of metaphors.) The blending framework offers a neat way of representing this complex interaction of concepts and links, since it explicitly allows for multiple spaces and multiple iterations of the integration process. One blend may be the input for another.

More significantly, the blending framework here offers a way of accounting for those elements of the Nation-as-ship image that have no specific counterparts in the target space of nations and politics. For instance, ships have very particular shapes and are made of particular materials. These important aspects of ships have no conventional counterparts in the target domain of nations, but they figure nonetheless in any metaphorical projection of the ship frame. We simply cannot conceive of ships without evoking some aspects of their physical character.

Within the blending framework, we can account for this fact in terms of pattern completion: Once we have evoked, by means of more basic metaphors, the image of a large container holding many people, or of a society moving forward through space, and/or the idea that political events are partially determined by the (metaphorical) weather, these images may match, and call up, stored representations of a ship, and then all other elements of the ship domain are immediately available for recruitment (i.e. they are 'primed'). The ship image in the blend integrates a number of metaphorical understandings of society. Once it is evoked, it may become as elaborate as our imaginations will allow, and like any other conceptualization it has the potential to become conventional.

The Lott and Gingrich example in 4 provides a clear example of how metaphoric expressions may recruit more mappings than those between a single source and target domain. For instance, this example introduces the notion of right-hand directionality (i.e. starboard, in the context of a ship), which is independent of the Nations-as-Ships metaphor. The standard association between right-left polarity and conservative-liberal alignments is clearly not based on the ship model, as it is frequently encountered in contexts where there is no ship imagery.

Furthermore, 4 suggests that the presence of two individuals will predictably cause a ship to list dangerously to one side. While we can imagine a complicated scenario in which their actions could lead to such an outcome – e.g. their handling of very heavy cargo, or their steering and handling of the sails in particular wind conditions – the sentence implies a simpler and more direct causal connection than this. This causal structure appears not to be projected from the source domain of ships, but from target domain logic, in which the Senate Majority Leader and the Speaker of the House inevitably have a considerable, direct influence on national policies and the overall political orientation of government. Blending theory suggests that selective projection from the two input spaces yields an image which is inconsistent with our understanding of the source space – two people whose presence is likely to cause a ship to list to one side – but that the web of underlying connections allow us to draw inferences from the blend nonetheless. When we encounter sentence 4, we easily infer that the strong shift towards conservatism may lead to political instability.[7]

4 Metaphors as inputs to blending

If conceptual metaphor theory is primarily concerned with well-established metaphoric associations between concepts, and blending theory focuses on the ability to combine elements from familiar conceptualizations into new and meaningful ones, then conceptual metaphors are among the stable structures available for exploitation by the blending process. As we have just seen in the ship of state examples, conventional metaphors feed the blending process by establishing links between elements in distinct domains and spaces. In this section we explore this relationship in a bit more detail.

4.1 Types of counterpart connection

The network of connections which ultimately constitutes a blend depends first on the establishment of links between the input spaces (Fauconnier & Turner, 1998). These counterpart relations guide the construction of the blend.

Cross-space counterparts may be related to each other in a variety of ways. For instance, in the case of an individual 'kept in the dark' by a committee (see Section 2), the counterpart relationship between the person (in one input) who is in darkness and the person (in the other input) who is kept uninformed, is based on Identity. The same individual is represented in each input space, and these two representations are, quite naturally, linked, in a way that helps guide the construction and interpretation of the blend.

Other types of counterpart relationship across mental spaces include the connection between a role and a value – e.g., the connection between 'Jocasta' and 'Oedipus' mother,' discussed by Fauconnier (1994 [1985]) – and the connection between an entity and a representation of the entity, such as a man and his portrait. Similarity and Analogy are relations which play obvious roles in many conceptual integration networks, including ones we call metaphorical blends. For instance, surgeons and butchers share the generic structure of a person wielding a sharp object to cut flesh.

Conventional metaphors can also provide the counterpart mappings to launch blends. For instance, the metaphorical association between nations and ships is thoroughly conventional, and forms part of many people's conceptual repertoires. What started out (undoubtedly) as some individual's creative, on-line, conceptual achievement has become a shared, entrenched conceptualization, presumably because the blend proved successful for some purpose, therefore arose again, and through repeated experience became conventional. As a result, the metaphorical mapping between the nation and the ship, the nation's history and the ship's course over the sea, and so forth, is now stored in memory and provides a trigger that allows conceptual blending to proceed, including the kinds of creative conceptual manipulation we examined in the last section.

Of course for a conventional metaphoric blend to have arisen in the first place, it must, itself, be based on some kind of counterpart mapping. This is an area where CMT, and the associated body of work accumulated over the past eighteen years, informs the blending framework. Numerous principles regarding the kinds of concepts which become associated by conventional metaphor have been uncovered and described, including patterns in the relationship between the image-schematic structure of source and target ('Invariance', Brugman, 1990; Lakoff, 1990; Turner, 1991), the relationships holding among different mappings, the kinds of content that may be associated with source and target[8], and the ways in which source and target may or may not be similar.

Importantly, there is a class of entrenched metaphors which are not based on similarity or analogy, and which are therefore unlike the metaphoric counterpart relations which arise on-line.

(7) a. These two colors are not particularly close [i.e. similar].
b. His sunny smile lit up the room.
c. Tomorrow is a big day for this organization.

These sentences are illustrations, respectively, of the following conventional metaphors: SIMILARITY IS PROXIMITY, HAPPINESS IS BRIGHTNESS, IMPORTANCE IS SIZE (all known by various names in the conceptual metaphor literature). There is no obvious sense in which the concepts paired in these metaphors are similar or analogous to one another. Each is scalar in some sense, but this is not sufficient motivation for the particular pairings evidenced here. (Consider the fact that Brightness may not stand for Similarity, and so forth.) Instead these metaphors are most plausibly explained as entrenched conceptual associations arising from recurring correlations in experience. Just as the recurring correlation between quantity and height (e.g. of a pile) motivates the metaphor MORE IS UP (as in, 'Crime figures have soared'), these metaphors are motivated by recurrent types of episodes which bring together particular dimensions of experience. For instance, brightness is correlated with warmth and increased visibility, both of which trigger contentment (cf. HAPPINESS IS BRIGHTNESS). Lakoff & Johnson (1980) argued convincingly that various metaphors relating 'UP' to other concepts could not be based on objective similarity or shared features, and the same holds in the cases mentioned here. They are not based on similarity or analogy, but must instead be based on experiential correlation.[9]

Metaphors like SIMILARITY IS PROXIMITY, HAPPINESS IS BRIGHTNESS, and IMPORTANCE IS SIZE are 'primary metaphors' (see Grady et al., 1996; Grady, 1997; Lakoff & Johnson in press), a special class of entrenched associations, based on neither similarity nor analogy. They seem to constitute a distinct sort of counterpart connection on which blends may be based.

4.2 Complex metaphorical blends

Since blending is an opportunistic process of on-line space-building, any conceptualization that starts out as a primary metaphor, or other simple conceptual association, is susceptible to being elaborated. The source concept of any basic metaphor can trigger the construction of a richer image. If difficulty is understood as heaviness – due to a correlation between, on the one hand, our sensory judgment of mass and, on the other, affective states associated with exertion – then we can talk about tons of work. If a cheery disposition is metaphorically associated with bright light, then we understand what a thousand-kilowatt smile must be like (given some additional input from our knowledge of electricity). If the experience of moving forward is correlated with an affective state telling us we are about to achieve some purpose, then the Ship of State makes headway as the nation works to accomplish its objectives.

The Nation-as-Ship example also illustrates the way in which multiple simple metaphors can be relevant within a single complex blend. The ship's forward motion is understood in terms of a conventional metaphorical association with goals more generally. The notion of 'safe harbour,' as in example 7, derives from a metaphorical understanding of circumstances as locations and surroundings. While the image of a 'lookout' is not a conventional part of the Nation-as-Ship blend, it can easily be incorporated, and linked to a target domain notion of anticipating future events (i.e. foresight), based on a metaphorical association between vision and thought (cf. KNOWING IS SEEING). The metaphorical right-left orientation of political parties is another conventional counterpart connection which can be recruited to enrich the blend, as we have seen.

The role of basic metaphors in complex blends illustrates an important principle about the relationship between metaphor and blending: It is particular connections within an entire conceptual integration network which we regard as metaphoric. For instance, it is, in a way, misleading to refer to the Lott-Gingrich example, or the cognitive representation that motivates the words, as 'a metaphor.' Within the conceptual complex that underlies the sentence there are several distinct metaphoric connections – e.g. nation/ship, conservative/right – and the blend as a whole does not represent the systematic mapping of one domain onto another.

Furthermore, metaphoric blends may contain figurative links that are not, themselves, metaphoric. For instance, when we personify death as a skeleton carrying a sickle, we are dealing with a metaphorical image, but one which has been elaborated via the addition of details which do not derive from a metaphoric mapping. The relationship between skeletons and death is not metaphorical but metonymic; skeletons figure literally in scenarios involving death. In accordance with the principle of Metonymic Tightening (see Section 2), the skeleton becomes even more closely associated with Death in the blend than it is in the source input.

In short, conventional metaphoric relationships may be the starting points for the process of creating complex conceptual blends. And identifying a metaphoric relationship holding between source and target elements is sometimes only the starting point for analyzing a blend.

5 What makes a blend metaphoric

Given that many of the blending examples discussed in the BT literature are not metaphoric, it is helpful to understand what characterizes metaphoric blends and distinguishes them from others. As we have seen, some blends depend on counterpart relations dictated by conventional metaphoric associations, such as the one between nations and ships. There are other aspects of blends, though – relating to their structure, their content, and the linguistic and conceptual setting in which they appear – that make them seem metaphoric to us.

5.1 Fusion with accommodation

In a metaphoric blend, prominent counterparts from the input spaces project to a single element in the blended space – they are 'fused'. A single element in the blend corresponds to an element in each of the input spaces. A ship in the blend is linked to a ship in the source space and a nation in the target, a surgeon is linked to both a surgeon and a butcher, and so forth. Intuitively speaking, the point of metaphors is precisely that one thing is depicted as or equated with another. In the blending framework this means a single element in the blended space has links to each of the input spaces.

By contrast, in other sorts of blends these counterparts may project to distinct elements in the blended space. For example, Fauconnier and Turner (1998, and elsewhere) have discussed the following passage, in which a modern philosopher describes his 'debates' with Kant – i.e. his musings over particular topics, in relation to Kant's views of the same topics:

(8) I claim that reason is a self-developing capacity. Kant disagrees with me on this point. He says it's innate, but I answer that that's begging the question, to which he counters, in Critique of Pure Reason, that only innate ideas have power. But I say to that, what about neuronal group selection? He gives no answer.

The sentences arise from a blended conceptualization in which the two philosophers are imaginatively juxtaposed with each other and engage in conversation about particular issues. In this blend, which strikes us as fictive but not metaphorical, the philosophers who correspond to each other in the two input spaces (and are therefore connected by an Analogy link) are not, in fact, fused in the blended space. Instead, they retain their individual identities, and the nature of their interaction is the focus of the blend.

While the philosophers are projected as distinct participants, other aspects of these input spaces are fused in the blend. For example, the languages of the philosophers are fused into a single language (not necessarily specified), the historical gap between them is collapsed, the geographical settings are also merged, and so forth. Thus fusion alone does not identify metaphors.

Another sort of non-metaphorical fusion occurs in 'framing', a variety of conceptual integration which operates by the same basic principles outlined above (Fauconnier & Turner, 1998). In framing we identify a particular entity with a slot in a more general conceptual frame. For instance, the statement, 'Carl is a bachelor' depends on the following conceptual operation: A particular unmarried man we know ('Carl') is associated with our cultural model of bachelors, which in turn is informed by our models of marriage and so forth (see Fillmore, 1982). Our knowledge of Carl and of the BACHELOR frame represent the input spaces for a conceptual integration. In the blend, Carl is fused with the frame role 'bachelor.'

This example, like framing examples in general, does not strike us as metaphorical, since it represents a particular variety of fusion: the elements which are counterparts in the cross-space mapping are combined by composition in the blend. While all blends are selective in that they only draw on some of our knowledge of the input domains, framing involves counterparts which are essentially compatible, such that information about each serves to specify the fused element in the blend.

Metaphorical blends, on the other hand, involve a different kind of fusion, in which certain very salient aspects of input domain structure are prohibited from entering the blend, and in which some salient structure in the blended space is prevented from floating back to the inputs. That is, there is information from one of the inputs (the target) that must be ignored in the blend: nations do not move across the sea, ignorance is not literally associated with darkness, etc. An important feature of metaphorical fusion of counterparts, then, is that it involves overriding, and therefore not projecting, salient aspects of our knowledge of the target. This sort of asymmetrical projection occurs in any case where the organizing frame in the blend is projected from one input at the expense of the other, e.g. the ship frame in the Nation-as-Ship cases. The fact that source and target must be incompatible in some sense relates to an old claim about metaphor, which can be considered here in a new light.

Philosophers (e.g. Davidson, Grice, Searle) have argued that listeners are cued to interpret a particular reference as metaphorical by anomalies of meaning. On this view, when we hear a statement such as 'Inflation soared,' the impossibility of the event is our cue that the statement is intended metaphorically. Arguing against this claim, Keysar (1989) has shown that subjects are able to interpret a statement like 'Paul is a magician' as a metaphorical reference to Paul's abilities as an accountant, even when Paul is actually a magician by trade. In other words, the recognition of metaphor does not depend on surface anomalies of meaning. In the blending framework the notion of anomaly can be defined with greater subtlety and specificity: the network of conceptual connections which comprises the meaning of the utterance includes a counterpart relation between entities which we know to be incompatible in some important sense. (In Paul's case the counterpart relation is an analogical connection between skillful bookkeeping and the supernatural manipulation of matter). Whether or not this fact is relevant to on-line processing of metaphorical language – still a controversial question among philosophers and psycholinguists – part of what defines metaphors is that they involve (temporary) suppression of critical knowledge of a given conceptual domain, and therefore are not compatible with our understanding of reality. We refer to this particular phenomenon, in which structure from one fused element is blocked, as 'accommodation': the target material yields to the source material, which is explicitly represented in the blend.

Knowing whether the fusion of elements from two inputs involves accommodation depends crucially on how specifically those elements are construed. Consider the issue of language in the Debate-with-Kant example in 8. We do not feel it is metaphoric to report the debate as though it happened in English, even though Kant was a German speaker. This is almost certainly because the details of the languages are not at issue in any part of this conceptual network, and so we might say that each input simply contains the generic notion Language. For the purposes of this blend we are not 'construing' (in the sense of Langacker, 1987) the languages of the philosophers as, specifically, English and German.

To highlight the importance of construal in this case, consider that it is easy to create a context in which a mapping between German and English does feel metaphorical, or at least more metaphorical than in the Kant blend. Imagine reading a philosophy essay written in dense, convoluted English, perhaps overly influenced by translations of Heidegger, and exclaiming, 'This isn't English, it's German!'. Here we have a blend based on the same pairing of counterparts, and yet this case is metaphorical where the previous one is not. This is because in the Bad Essay case we are interested in the particulars of the languages and their differences, while in the Kant case we are only interested at the level of unspecified 'Language,' as a means of communication and medium of debate. That is, one construal profiles features of English and German while the other profiles entities at a more schematic level. In the Kant case, the active representations in the input spaces do not include particulars about language, and so there is no conflicting information to resolve or accommodate. The Bad Essay example, though, does have fusion with accommodation, because it represents a construal at a different level of schematicity; consequently, it is felt to be (more) metaphorical.

Our discussion of fusion with accommodation echoes, in new terms, various discussions of metaphor as a phenomenon of 'category extension,' or 'class inclusion,' and is compatible with psycholinguistic results showing that subjects are more apt to see metaphor in cases where there is greater semantic distance between elements. The CMT principle that source and target come from different 'domains' is also in the same spirit as our more general statement that metaphors involve the fusion of saliently distinct elements from two inputs. Note, though, that metaphoric counterparts do not obligatorily come from different conceptual domains or frames. For instance, a modern philosopher might come out of a colleague's office and mutter, 'I've just spent the afternoon debating with Immanuel Kant!'[10]. Here 'Kant' and his modern counterpart are understood in terms of the same frames and domains, yet the statement would strike some as metaphorical.

Finally, note that if metaphor depends on salient differences between the relevant concepts, this implies that there are degrees of metaphoricity. Many researchers have suggested this (e.g., Fauconnier & Turner, 1998), and the examples here offer further support. While some utterances are prototypically metaphoric and others prototypically nonmetaphoric, there seems to be no hard and fast distinction between these categories.

5.2 Directionality and asymmetric topicality

Another important feature of metaphoric blends is that their input spaces do not have equal status as topics. In the non-metaphorical Debate-with-Kant blend, both philosophers, along with their positions, are the focus of attention. It is the interaction between the two, and a consideration of their relative merits, that motivate the blend. In other words, each of the inputs has high topicality. A given inference may relate to one more than the other, but both are held up to scrutiny and comparison by means of the blend, and the blend's function is to give us a means of examining the relationship between the two.

Metaphors, by contrast, are distinguished by asymmetric topicality. One of the inputs is topical and the other provides a means of re-framing the first for some conceptual or communicative purpose; these are, respectively, the target and source inputs of the metaphor. For instance, in the Nation-as-ship blend, the nation is the actual topic of interest, the target space; when we use the blend we are interested in conceptualizing, picturing, or describing aspects of the nation, not in understanding more about ships. Similarly, 'My surgeon is a butcher' is a (damning) statement about a surgeon, not a butcher.

Coulson (1997) has pointed out that some metaphorical blends allow us to project inferences in more than one direction. In a joke about the 'Menendez Brothers [Computer] Virus,' the blend establishes a (darkly) humorous connection between actions of the virus and alleged actions of human agents. Erik and Lyle Menendez, two brothers in their twenties, killed their parents and subsequently inherited their substantial wealth. At their widely-publicized trial, the brothers argued that they had been the victims of long-term abuse, and that the killings had therefore been a form of self-defense, although their parents were unarmed at the time. According to the joke, the virus 'eliminates your files, takes the disk space they previously occupied, and then claims it was a victim of physical and sexual abuse on the part of the files it erased' (Coulson, 1997:252). While the joke uses details of the criminal case to explain the virus, which is in this sense the target input of the blend, it also invites inferences about the brothers. Because the criminal case was controversial, one of the effects of the joke is to support a particular view, namely that the Menendez brothers were guilty of murder, and that the defense they offered was absurd. Given that the same network of connections is used to make inferences about the brothers and about the virus, this example is an apparent exception to the principle that metaphors involve asymmetric topicality: A single conceptual integration network – which feels metaphorical and involves fusion (with accommodation) between profiled participants – allows inferences in either direction, and invites us to focus on aspects of each input.

However, the Menendez Brothers Virus blend operates on distinct levels (and possibly in distinct stages) and different directionality is associated with each. An initial understanding of the virus depends on successfully mapping the description of human actions onto the domain of computer operations and files. Understanding the implications about the criminal case is a separate process which involves unpacking one of the input spaces on which the joke is based. (To put it another way, this process involves retrieval of presuppositions, guided by the connections in the network.) Topicality is asymmetrical during each of these processes.

Moreover, topicality is not the only factor determining the directionality of metaphor. A metaphoric blend which recruits conventional mappings inherits the directionality of those mappings, as the Nation-as-ship blend inherits the directionality of metaphors for change, time, society, political orientation, etc. and maps source concepts onto all these target concepts. Furthermore, there is a long tradition of describing the greater concreteness of metaphoric sources as opposed to targets. Topicality probably correlates with these other factors in that certain kinds of topics are more likely to evoke metaphoric counterparts, which in turn are likely to be relatively rich in sensory content.

5.3 Metaphors vs. counterfactuals: the role of linguistic context

Like metaphors, counterfactuals involve counterpart relations between entities that are construed as essentially different. Consider this hypothetical example, spoken by a senior professor to a junior colleague:

(9) If I were you I'd be working on finishing my book.

Like metaphors, the conceptual blend underlying this sentence involves counterparts, construed as crucially different, which are fused in the blended space; a single entity there corresponds to a different person in each of the inputs. The hypothetical professor does not (and could not) have all the properties of both input professors; it is their differences which motivate the blend. Specifically, the professor in the blend is in the situation of the junior professor, who must publish a book in order to be tenured, but has the attitudes and priorities of the senior professor. If this blend includes fusion of distinct entities, why does it not strike us as metaphorical?

It is likely that one of the factors is the perceived degree of difference between the counterparts. As we mentioned earlier, and as many previous works on metaphor have noted using various terminology, the perceived difference between two entities is an important determinant of how metaphorical an association between them may seem. A sentence starting with 'If I were a cloud' strikes us as more figurative than one starting with 'If I were you.' A sentence starting with 'If I were Napoleon' probably falls in between. This relative scale is plausibly based on the degree of perceived category difference, at the relevant level of abstraction, between the 'I' element and the counterpart in each case.

Another factor, though, is the construction of the sentences themselves. The rhetorical force – i.e. the profiling effects – of counterfactual statements may run contrary to those we associate with metaphor. A sentence starting with 'If I were a cloud' may strike us as less metaphoric than one starting with 'I am a cloud,' since the counterfactual specifically negates the proposition that the two entities can be equated in some sense. That is, while both sentences may be interpreted based on the same network of conceptual links and projections, the profiling may be different in the two cases, such that one is more consistent with our prototype of metaphors. Metaphors typically assert counterpart connections without drawing explicit attention to incongruities between the connected entities.

The above concerns suggest that metaphor is not a sharply delineated phenomenon, and underscore the need for a framework like BT which can account for the mapping operations that underlie central and peripheral cases alike.

6 Conclusion

Differences between conceptual metaphor theory and blending theory, such as the distinct nature of directionality in the two frameworks, have led some researchers to treat them as competing theories (e.g. Coulson, 1996). Alternatively, one might consider the two approaches to be incommensurable. After all, CMT addresses recurring patterns in figurative language, while BT seems to focus on the particulars of individual cases. And the phenomena accounted for by CMT consist of stable knowledge structures represented in long-term memory, while BT seeks to model the dynamic evolution of speakers' on-line representations.

In this paper we have taken neither of these positions. Rather, we propose that because they tackle different aspects of metaphoric conceptualization, the two frameworks are largely complementary. The conventional conceptual pairings and one-way mappings studied within CMT are inputs to and constraints on the kinds of dynamic conceptual networks posited within BT.

If we establish that the findings of CMT and BT are consistent, the potential rewards are significant, since this allows us to unify two streams of research into a more general and comprehensive treatment of linguistic and conceptual phenomena. BT researchers have argued that the same principles which speakers use to understand metaphor operate similarly across a wide range of nonmetaphorical phenomena.

The generality of conceptual blending theory derives in part from its roots in mental space theory which treats metaphor as a special case of indirect reference. As our examples illustrate, metaphoric and non-metaphoric conceptualizations alike rely on selective projection from two or more input spaces into a blended space, the establishment of cross-space mappings, structuring the blended space via processes of composition, completion, and elaboration, and subsequent projection of structure from the blended space to the inputs. By treating all sorts of mappings as formally identical at a certain level we can understand the transfer of structure in metaphor as fundamentally similar to the transfer of structure in non-metaphoric instances.

Among the non-metaphoric types of linguistic structure which can be treated in a blending framework are counterfactuals and conditionals. A number of researchers working within the framework of conceptual blending have addressed its implications for how people reason about events which could have happened, but did not (e.g. Fauconnier, 1997; Oakley, 1995, 1998; Turner, 1996). The tools of blending theory, including the cline between identity, similarity, and analogy links, have also proven useful in explaining the variety of complex concept combinations coded for by modified noun phrases. For example, blending theory has been used to explore issues of concept combination in seemingly simple cases like 'red pencil' (Turner & Fauconnier, 1995; Sweetser, in prep.), more exotic cases like 'land yacht' and 'dolphin-safe tuna' (Turner & Fauconnier, 1995), and privative constructions such as 'alleged affair' and 'fake gun' (Coulson & Fauconnier, in press).

Conceptual metaphor theory has often emphasized the role played by metaphors in structuring abstract concepts with cognitive models projected from more concrete source domains. With its additional machinery for recruiting knowledge structures, blending theory has also proven to be powerful in explaining how abstract concepts can be understood with the help of blended models. Although blended models are not always plausible – cf. the debate between Kant and a modern philosopher – blends can promote integrated construals that help us reason about abstract phenomena. Accordingly, a number of researchers have demonstrated the importance of particular blends in the invention of mathematical concepts (Fauconnier & Turner, 1998; Lakoff & Nunez, in press) and proofs (Robert, 1998). Moreover, Maglio & Matlock (1998) demonstrate the roles of distinct conceptual blends as experts and novices interact with Web browsers.

Blending theory has also been taken up by literary theorists interested in the cognitive underpinnings of verbal creativity. For example, Brandt (in press) shows how integration networks can be used to represent the complex flow of inferences and imagery in the poetry of Baudelaire. Turner (1996) shows how the machinery of conceptual blending operates in a wide range of literary genres from simple parables, to the imagery in Dante's Inferno, to Shakespearean drama.

More surprising, perhaps, is the suggestion that the very same integrative mechanisms underlie the most banal aspects of language processing (Turner & Fauconnier, 1995; Mandelblit, 1997). Sweetser (in prep.) demonstrates the ubiquity of blending phenomena and shows how its processes are used to combine the semantic properties of grammatical constructions with the lexical semantics of the words used in their instantiations. Similarly, Fauconnier and Turner (1996) have suggested that integrative mechanisms of blending are needed to understand particular instances of the caused-motion construction such as 'He sneezed the napkin off the table,' (cf. Goldberg, 1996).

In arguing that conceptual metaphor theory and blending theory provide largely complementary formalisms, we have suggested that many of the differences between them reflect their motivation in different aspects of the same data. While the metaphor theorist strives to capture generalizations across a broad range of metaphoric expressions, the blending theorist typically focuses on the particulars of individual examples. Because it is useful to separate entrenched associations in long-term memory from the on-line processes that recruit them, we have argued that the former issue is the province of metaphor theory, and the latter, the province of blending theory. Consequently, metaphor theory will continue to address such questions as which concepts are conventionally associated with each other, how and why such conventional associations arise, and how cross-domain mappings are structured. As argued above, such issues are central to the question of how metaphoric blends arise, and may have important implications for the quasi-metaphoric blending in other sorts of examples. To be sure, a full understanding of the conceptual feats that underlie the examples considered above will require both a rich theory of metaphor and a fully specified model of conceptual blending.

Notes

1 Grady (1997) has argued that conceptual domains are often too general as units of analysis for conceptual metaphors, and that many mappings are better described as associations between particular source and target *concepts*, belonging to distinct domains. Both approaches treat metaphors as relationships between established, long-term knowledge structures.

2 This is *not* to say that emergent structure is a necessary feature of conceptual blends: some blends are truth-functionally compositional. However, it is the frequent need to account for emergent structure that motivates BT.

3 See Gentner (1983) for another approach to constraining and optimizing cross-domain mappings. Gentner's framework applies to relations between (what BT treats as) input spaces to a blend.

4 From Carol R. Campbell, 'Cave Man Bill And The Doleful State of American Politics,' published by The Written Word, an on-line journal of economic, political and social commentary

5 Bruce E. Johnson, 'Making a difference,' Federal Executive Institute Alumni Association Newsletter President's Report, April 1997, No. 225.

6 From 'Two years of PA [the People's Alliance]: the state of the Nation,' Editorial in 'The Sunday Times [of Sri Lanka] on the Web' Aug. 18, 1996.

7 While a reference to the ship's course (rather than to listing) might have been more conventional in this context, the fact that we easily interpret the sentence demands that we account for it as it stands. In the BT framework it does not matter whether such an improbable image results from deliberate innovation or the accidental 'mixing' of metaphors.

8 See, e.g., Grady's (1997) discussion of primary metaphors, in which source concepts have 'image content' while target concepts have 'response content.'

9 For more on the contrast between *resemblance metaphors* and *correlation metaphors*, see Grady (1999).

10 This statement will strike some readers, but not others, as metaphorical. The dividing line between metaphor and other sorts of figurative reference is not sharply drawn or universally agreed upon.

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Press Final 27 July 2007

Section V Introduction

Cognitive approaches to grammar

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Cognitive approaches to grammar developed most immediately as an offshoot of the generative syntax paradigm. Consequently, they show a notable resemblance to their generative predecessors. Most clearly, both take as their object of study individual mental grammars, rather than the externalized language of the community. Both produce highly detailed analyses of the form and combinatorial possibilities afforded by grammatical systems. And both take linguistic phenomena as informative about universal aspects of human cognition.

However, cognitive approaches to grammar deviate substantially from the generative paradigm in several ways, as Langacker and Goldberg explain below in their descriptions of Cognitive and Construction Grammar. First is the centrality of meaning (including semantics and pragmatics) in representations of grammar. In contrast with generative theories, which assume that linguistic subsystems are modular – permitting syntax to be studied in isolation from meaning or function – cognitive approaches tightly integrate meaning into both descriptions and explanations of language phenomena, as shown by Talmy, below. On the cognitive view, it is insufficient to describe the form of the passive, for example, without also detailing its function, and similarly the meaning of a piece of language can explain formal characteristics. Second is the scope of grammar. Cognitive approaches to grammar view all combinatorial linguistic knowledge as the substance of grammar. As a result, whereas generative grammar focuses exclusively on a privileged 'core', cognitively oriented grammars have much broader scope, including phenomena as diverse as argument structure constructions, morphological patterns, and idioms, as shown by Fillmore, Kay, and O'Connor, below. The ideal grammatical description is thus the minimal set of grammatical units that adequately cover the full range of specific and general knowledge that language users have.

Concretely, these two commitments of cognitive approaches to grammar translate into unique primitives of grammatical theory. Rather than abstract rules, parameters, or principles, the primitives are pairings of form with meaning/function, known as *constructions* in construction grammars or *symbolic assemblies* in Cognitive Grammar. These constructions vary in their size, specificity, and variability (as Croft discusses below), ranging from specific and invariant ones, including morphemes like simple words, and idioms like 'birds of a feather flock together', to abstract and highly variable argument structure constructions like the ditransitive construction. These primitive constructions must be able to combine – words for example have to fit into slots in larger constructions – and cognitive approaches to grammar thus require principles determining how this *binding* or *unification* between constructions is effected. Because constructions include both form and function specifications, both formal and functional constraints can be placed on their combination, as made explicit in a number of the papers collected below. For instance, the active ditransitive construction described by Bergen and Chang is specified as constraining any construction that fills its subject slot to be not only a referring expression (roughly equivalent to a noun phrase) but also one that semantically encodes something that is literally or metaphorically able to transfer something.

Benefits fall out immediately from the cognitive approach to grammar. First, including function in grammatical descriptions, and representing general and specific linguistic knowledge commonly as constructions, yields a broader range of language phenomena that are describable in a common system. Idiomatic expressions, morphological patterns, argument structure constructions, and words can all be expressed in a common architecture. Second, integrating form with function affords the system greater explanatory power. Formal phenomena can be explained more parsimoniously – rather than inventing ad hoc 'formal' features recapitulating aspects of function, the function itself is used to explain form. This is especially advantageous in that it makes explanations non-circular. Rather than hypothesizing a diacritic formal explanation on the basis of some formal phenomenon that that diacritic is circularly meant to explain, formal patterns can be explained on the basis of another given domain – the functions those formal elements serve.

The collection of papers in this section begins with three articles from the 1980s that define the three streams in which cognitive approaches to grammar have since developed. Langacker's seminal introduction to Cognitive Grammar provides theoretical motivation for and the basic workings of this model that has, in the decades since its publication, developed into the most fully developed and arguably also the most influential cognitive theory of grammar, fleshed out in hundreds of publications by Langacker and other proponents of the theory. The technical detail of Langacker's work is complemented by the typological breadth displayed by work on the cognitive approach to grammar advocated by Talmy in his article on 'The relation of grammar to cognition'. The third and final major stream of grammatical theory housed under cognitive linguistics is Construction Grammar, represented here by the contribution by Fillmore, Kay, and O' Connor, which originally appeared in *Language*.

The section ends with three papers describing recent directions in which the field has developed. Goldberg surveys the current state of construction grammars, identifying their key components and distinguishing them from competing models. Bergen and Chang introduce Embodied Construction Grammar, which weds together key elements of Cognitive Grammar and construction grammars, by applying the formal rigor of constructional approaches in the context of an embodied theory of language understanding. Their emphasis on processes of language use, especially mental simulation underlying deep language understanding, connects the cognitive linguistics enterprise to work in cognitive psychology, artificial intelligence, and psycholinguistics. Finally, Croft's Radical Construction Grammar develops the theoretical ramifications of taking seriously the notion of constructions; arguing on the basis of logical and typological evidence that constructions, and not grammatical categories, are the linguistic primitives that best lend themselves to typological investigation and explanation.

15 An introduction to cognitive grammar

Ronald W. Langacker

Despite the diversity of contemporary linguistic theory, certain fundamental views enjoy a rough consensus and are widely accepted without serious question. Points of general agreement include the following: (a) language is a self-contained system amenable to algorithmic characterization, with sufficient autonomy to be studied in essential isolation from broader cognitive concerns; (b) grammar (syntax in particular) is an independent aspect of linguistic structure distinct from both lexicon and semantics; and (c) if meaning falls within the purview of linguistic analysis, it is properly described by some type of formal logic based on truth conditions. Individual theorists would doubtlessly qualify their assent in various ways, but (a) – (c) certainly come much closer than their denials to representing majority opinion.

What follows is a minority report. Since 1976, I have been developing a linguistic theory that departs quite radically from the assumptions of the currently predominant paradigm. Called 'cognitive grammar' (alias 'space grammar'), this model assumes that language is neither self-contained nor describable without essential reference to cognitive processing (regardless of whether one posits a special faculté de langage). Grammatical structures do not constitute an autonomous formal system or level of representation: They are claimed instead to be inherently symbolic, providing for the structuring and conventional symbolization of conceptual content. Lexicon, morphology, and syntax form a continuum of symbolic units, divided only arbitrarily into separate 'components' – it is ultimately as pointless to analyze grammatical units without reference to their semantic value as to write a dictionary which omits the meanings of its lexical items. Moreover, a formal semantics based on truth conditions is deemed inadequate for describing the meaning of linguistic expressions. One reason is that semantic structures are characterized relative to knowledge systems whose scope is essentially open-ended. A second is that their value reflects not only the content of a conceived situation, but also how this content is structured and construed.

In the confines of a short article, I can neither articulate this framework in careful detail nor present the full rationale for its adoption. My objectives are necessarily more limited: to make its existence known to scholars with overlapping concerns; to afford an overview of its basic concepts and organizing assumptions; and, in restricted areas, to give some brief indication of its descriptive potential. The discussion is therefore aimed at presenting these notions concisely, not at offering definitive justification or arguing against conceivable alternatives. For extensive exposition and illustration, I refer the interested reader to the following works: Casad and Langacker (1985), Hawkins (1984), Langacker (1982a, 1982b, 1984, 1985, in press), Lindner (1981, 1982), Tuggy (1981), and Vandeloise (1984).

Cognitive scientists will note many similarities to their own concepts and approaches; I will not attempt to point them all out. Cognitive grammar departs from most varieties of traditional and formal semantics, as well as the newer 'situation semantics' of Barwise and Perry (1983), by equating meaning with conceptualization (or cognitive processing). It agrees in this regard with the 'procedural semantics' of Miller and Johnson-Laird (1976) and Johnson-Laird (1983) and the linguistic theories of Chafe (1970) and Jackendoff (1983), however it is quite different from all of these in its conception of grammatical organization and its specific proposals concerning semantic structure. Although cognitive grammar is not a direct outgrowth or a variant of any other linguistic theory, I do consider it compatible with a variety of ongoing research programs. Among these are work of Lakoff (in press) and Lakoff and Johnson (1980) on categorization and metaphor, Fauconnier's (1985) study of 'mental spaces', Haiman's (1980, 1983) ideas on iconicity and encyclopedic semantics, Talmy's (1975, 1977, 1978, 1983) research on spatial terms and related problems, the proposals of Moore and Carling (1982) concerning the nonautonomy of linguistic structure, Fillmore's (1982) conception of frame semantics, and the multifaceted investigations by scholars of the 'functional' school, too numerous to cite individually (though Givón [1979, 1984] must certainly be mentioned).

1 Linguistic semantics

Meaning is equated with conceptualization. Linguistic semantics must therefore attempt the structural analysis and explicit description of abstract entities like thoughts and concepts. The term conceptualization is interpreted quite broadly: it encompasses novel conceptions as well as fixed concepts; sensory, kinesthetic, and emotive experience; recognition of the immediate context (social, physical, and linguistic); and so on. Because conceptualization resides in cognitive processing, our ultimate objective must be to characterize the types of cognitive events whose occurrence constitutes a given mental experience. The remoteness of this goal is not a valid argument for denying the conceptual basis of meaning.

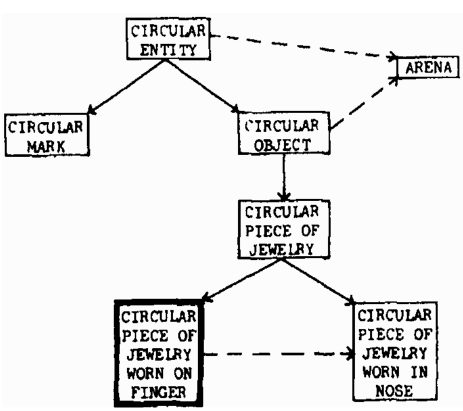

Figure 1

Most lexical items have a considerable array of interrelated senses, which define the range of their conventionally sanctioned usage. These alternate senses are conveniently represented in network form; Figure 1 depicts a fragment of the network associated with the noun *ring*. Certain senses are 'schematic' for others, as indicated by the solid arrows. Some represent 'extensions' from others (i.e., There is some conflict in specifications), as indicated by the broken-line arrows. The nodes and categorizing relationships in such a network differ in their degree of entrenchment and cognitive salience – for instance, the boldface box in Figure 1 corresponds to the category prototype. The precise configuration of such a network is less important than recognizing the inadequacy of any reductionist description of lexical meaning. A speaker's knowledge of the conventional value of a lexical item cannot in general be reduced to a single structure, such as the category prototype or the highest-level schema. For one thing, not every lexical category has a single, clearly determined prototype, nor can we invariably assume a high-level schema fully compatible with the specifications of every node in the network (none is shown in Figure 1). Even if such a structure is posited, moreover, there is no way to predict precisely which array of extensions and elaborations – out of all those that are conceivable and linguistically plausible – have in fact achieved conventional status. The conventional meaning of a lexical item must be equated with the entire network, not with any single node.

Because polysemy is not our central concern, we will nevertheless focus on individual nodes. What is required to adequately characterize any particular sense of a linguistic expression? Specifically rejected is the idea that a semantic structure reduces to a bundle of features or semantic markers (cf. Katz & Fodor, 1963). Rejected as well is the notion that all meanings are described directly in terms of semantic primitives. It is claimed instead that semantic structures (or 'predications') are characterized relative to 'cognitive domains,' where a domain can be any sort of conceptualization: a perceptual experience, a concept, a conceptual complex, an elaborate knowledge system, and so forth. The semantic description of an expression therefore takes for its starting point an integrated conception of arbitrary complexity and possibly encyclopedic scope. The basic observation supporting this position is that certain conceptions presuppose others for their characterization. We can thus posit hierarchies of conceptual complexity, where structures at a given level arise through various operations (e.g., coordination) performed on structures at lower levels. Crucially, the cognitive domains required by linguistic predications can occur at any level in such hierarchies.

Consider some examples. The notion [HYPOTENUSE] is readily characterized given the prior conception of a right triangle, but incoherent without it; [RIGHT TRIANGLE] therefore functions as the cognitive domain for [HYPOTENUSE]. Central to the value of [ELBOW] is the position of the designated entity relative to the overall configuration of the human arm (try explaining what an elbow is without referring in any way to an arm!), so [ARM] is a domain for [ELBOW]. Similarly, [TIP] presupposes the conception of an elongated object, and [APRIL], of the calendrical cycle devised to plot the passage of a year. A meaningful description of [SHORTSTOP] or [SACRIFICE FLY] is possible only granted substantial knowledge of the rules and objectives of baseball.

The implications of this position are apparent: the full and definitive characterization of a semantic structure must incorporate a comparable description of its domain, and ultimately of the entire hierarchy of more fundamental conceptions on which it depends. Pushing things to their logical conclusion, we must recognize that linguistic semantics is not an autonomous enterprise, and that a complete analysis of meaning is tantamount to a complete account of developmental cognition. This consequence is terribly inconvenient for linguistic theorists imprinted on autonomous formal systems, but that is not a legitimate argument against its validity.

What occupies the lowest level in conceptual hierarchies? I am neutral in regard to the possible existence of conceptual primitives. It is however necessary to posit a number of 'basic domains,' that is, cognitively irreducible representational spaces or fields of conceptual potential. Among these basic domains are the experience of time and our capacity for dealing with two- and three-dimensional spatial configurations. There are basic domains associated with the various senses: color space (an array of possible color sensations), coordinated with the extension of the visual field; the pitch scale; a range of possible temperature sensations (coordinated with positions on the body); and so on. Emotive domains must also be assumed. It is possible that certain linguistic predications are characterized solely in relation to one or more basic domains, for example, time for [BEFORE], color space for [RED], or time and the pitch scale for [BEEP]. However most expressions pertain to higher levels of conceptual organization and presuppose nonbasic domains for their semantic characterization.

Most predications also require more than one domain for their full description, in which case I refer to the set as a 'complex matrix,' as illustrated for [KNIFE] in Figure 2. One dimension of its characterization is a shape specification (or a family of such specifications). Another is the canonical role of a knife in the process of cutting. Additional properties are its inclusion in a typical place setting with other pieces of silverware; specifications of size, weight, and material; information about the manufacture of knives; the existence of knife-throwing acts in circuses; and so on indefinitely. Obviously these specifications are not all on a par. They differ greatly in their degree of 'centrality,' that is, the likelihood of their activation on a given occasion of the expression's use. Moreover, some are probably incorporated as components of others – for instance, Figure 2 plausibly suggests that a shape specification is typically included in the conceptions constituting other domains of the complex matrix. I do however adopt an encyclopedic view of semantics. There is no sharp dividing line such that all specifications on one side of the line are linguistically relevant and all those on the other side clearly irrelevant; Any facet of our knowledge of an entity can play a role in determining the linguistic behavior of an expression that designates it (e.g., in semantic extension, or in its combination with other expressions).

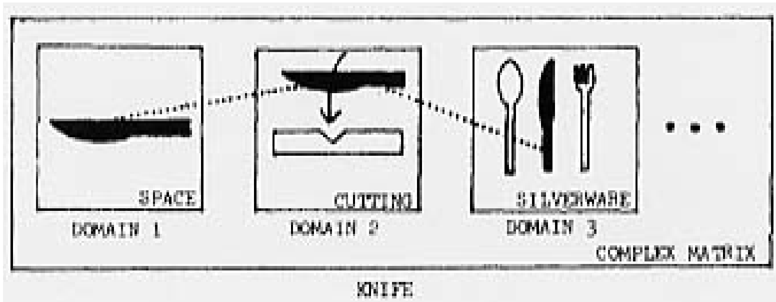

Figure 2

If we succeed in identifying and describing the domain or complex matrix invoked by a linguistic predication, we have not yet finished its characterization. Equally significant for semantic structure is the 'conventional imagery' inherent to the meaning of an expression. By imagery, I do not mean sensory images à la Shepard (1978) or Kosslyn (1980), though sensory images – as one type of conceptualization – are quite important for semantic analysis. I refer instead to our manifest capacity to 'structure' or 'construe' the content of a domain in alternate ways. This multifaceted ability is far too often neglected in semantic studies. Let us explore its dimensions and briefly note their grammatical significance.

2 Dimensions of imagery

The first dimension of imagery, observed in every linguistic predication, is the imposition of a 'profile' on a 'base.' The base of a predication is simply its domain (or each domain in a complex matrix). Its profile is a substructure elevated to a special level of prominence within the base, namely that substructure which the expression 'designates.'[1] Some examples are sketched in Figure 3, with the profile given in boldface. The base (or domain) for the characterization of [HYPOTENUSE] is the conception of a right triangle; for [TIP], the base is the conception of an elongated object, and for [UNCLE], a set of individuals linked by kinship relations. The base is obviously essential to the semantic value of each predication, but it does not per se constitute that value: A hypotenuse is not a right triangle, a tip is not an elongated object, and an uncle is not a kinship network. The meaning of *hypotenuse, tip,* and *uncle* is in each case given only by the selection of a particular substructure within the base for the distinctive prominence characteristic of a profile. The semantic value of an expression does not reside in either the base or the profile individually, but rather in the relationship between the two.

Some further examples will demonstrate both the descriptive utility and the grammatical import of these constructs. Consider first the particular sense of *go* that is diagrammed in Figure 4(a). This is a relational rather than a nominal predication, that is, it profiles the 'interconnections' between conceived entities; these interconnections are indicated in Figure 4 by the dashed, boldface lines. The relevant domains are space and time. With the passage of time, one individual, referred to here as the 'trajector' *(tr),* moves from a position within the neighborhood of another individual, the 'landmark' *(lm),* to a final position outside that neighborhood. Only four states in the process are shown explicitly, but they represent a continuous series. The dotted lines indicate that the trajectors 'correspond' from one state to the next (i.e., they are construed as identical), as do the landmarks.

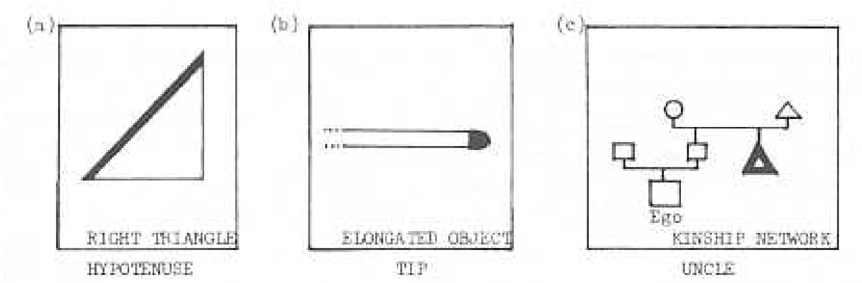

Figure 3

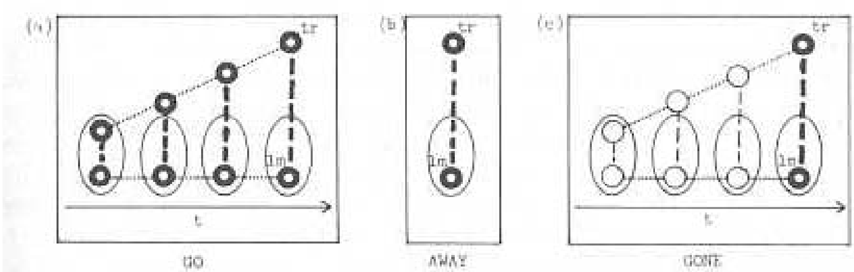

Figure 4

Figures 4(b) and 4(c) represent the sense of *away* that occurs in sentences like 1(a), and the sense of *gone* found in sentences like l(b).

(l) (a) China is very far away.
(b) When I arrived, he was already gone.

Away profiles a relationship that is identical to the final state of *go:* The trajector is situated outside the vicinity of the landmark. Observe now that the participle *gone* profiles this same relationship, but it does so with respect to a different base. The base for *away* is simply the spatial domain, but the base for *gone* is the same process that is profiled by go – something cannot be *gone* except by virtue of the process of going. The semantic contribution of the past participial inflection is to restrict the profile of the stem, in this case *go,* to its final state. *Gone* thus differs from *go* by virtue of its profile, and from *away* by virtue of its base.

A second dimension of imagery is the 'level of specificity' at which a situation is construed. The same situation, for example, might be described by any of the sentences in (2):

(2) (a) That player is tall.
(b) That defensive player is over 6 feet tall.
(c) That linebacker is about 6 feet 5 inches tall.
(d) That middle linebacker is precisely 6 feet 5 inches tall.

Each of these sentences can be regarded as schematic for the one that follows, which elaborates its specifications and confines their possible values to a narrower range. It is well known that alternate lexical items are generally available to characterize conceived entities at different levels of schematicity, for example, *animal – reptile – snake – rattlesnake – sidewinder.* Relationships of schematicity are also important for grammatical structure. Consider the combination of *drop* and *the cup* to form the composite expression *drop the cup.* As part of its internal structure, the predicate [DROP] makes schematic reference to two central participants. The combination of *drop* and *the cup* is effected through a correspondence established between one of these participants (its landmark) and the entity profiled by *the cup,* which is characterized with far greater specificity. One of the component expressions thus elaborates a schematic substructure within the other, as is typically the case in a grammatical construction.

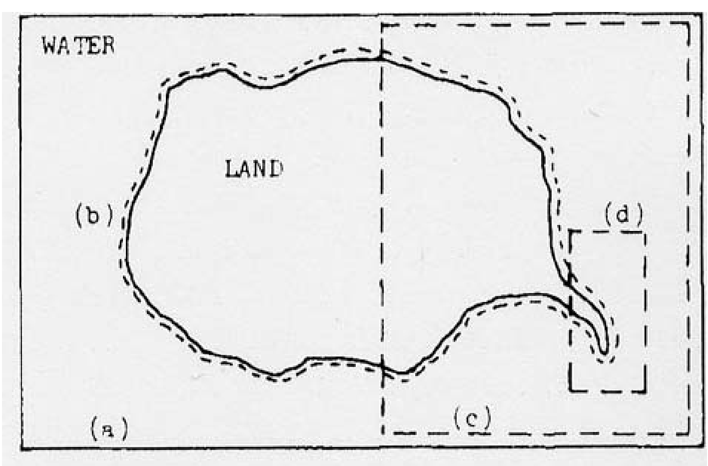

Figure 5

A third dimension of imagery pertains to the 'scale' and 'scope of predication.' The scope of a predication is the extent of its coverage in relevant domains. A predication's scope is not always sharply delimited or explicitly indicated, but the construct is nonetheless of considerable structural significance (cf. Casad & Langacker, 1985). Consider the notion [ISLAND] with respect to the various scopes indicated in Figure 5. The outer box, scope (a), is presumably sufficient to establish the land mass as an island, but scope (b) is at best problematic. There is no precise requirement on how extensive the body of water surrounding an island must be, but the narrow strip of water included in (b) does not have the necessary expanse (e.g., It could simply be a moat – the land inside a moat is not thought of as an island). Similarly, the finger of land projecting out into the water qualifies as a peninsula given scope (c), but not (d); only from the former can we determine that the overall land mass is quite large relative to the finger-like projection. We can see that predications often imply a particular scale by noting the infelicity of using *island* to designate a handful of mud lying in the middle of a puddle. In my own speech, *bay* and *cove* are quite comparable in meaning except that bay specifies the requisite configuration of land and water on a larger scale.

Body-part terms illustrate the semantic and structural significance of these constructs. Essential to the characterization of terms like *head, arm,* and *leg* is the position of the profiled entity relative to the body as a whole, whose conception functions as their domain and immediate scope of predication. Each of these designated entities functions in turn as the immediate scope of predication for other body-part terms defined on a smaller scale, for example, *hand, elbow,* and *forearm* in the case of *arm. Hand* then furnishes the immediate scope of predication for *palm, thumb,* and *finger,* on a still smaller scale, and *finger* for *knuckle, fingertip,* and *fingernail.* This hierarchical organization has structural consequences. For example, sentences like those in (3), where *have* pertains to part–whole relationships, are most felicitous (other things being equal) when the subject designates the immediate scope of predication for the object (cf. Bever & Rosenbaum, 1970; Cruse, 1979).

(3) (a) A finger has 3 knuckles and I nail.
(b) ?? An arm has 14 knuckles and 5 nails.
(c) ?? A body has 56 knuckles and 20 nails.

A similar restriction can be observed with noun compounds. We find numerous terms like *fingertip, fingernail, toenail, eyelash,* and *eyelid,* where the first element of the compound constitutes the immediate scope of predication for the second.[2] Compare this to the nonexistence and oddity of expressions like **bodytip, *armnail, *footnail, *facelash,* and **headlid* to designate the same entities.

In certain grammatical constructions the scope of predication plays a specific structural role. A case in point is the 'nested locative' construction exemplified in (4).

(4) (a) The quilt is upstairs in the bedroom in the closet on the top shelf behind the boxes.
(b) The rake is in the yard by the back fence near the gate.

Each locative expression confines the subject to a specific 'search domain,' which then constitutes the scope of predication for the locative that follows. Thus in (4)(a) the locative *upstairs* confines the quilt to an upper story, and *in the bedroom* is construed relative to this restricted region – only an upstairs bedroom need be considered. The search domain imposed by this second locative functions in turn as the scope of predication for *in the closet,* and so on. Formally, these relationships are handled by positing a correspondence between the search domain of each locative and the scope of predication of its successor. Apart from the abstractness of the entities concerned, this correspondence is just like that found in any instance of grammatical combination (e.g., between the landmark of *drop* and the profile of *cup* in *drop the cup).*

The relative salience of a predication's substructures constitutes a fourth dimension of imagery. Salience is of course a very general notion, so its descriptive significance depends on our ability to sort out the various contributing factors. One factor is the special prominence associated with profiling, considered previously. A number of others can be discerned, but only two will be discussed: the relative prominence of relational participants, and the enhanced salience of elements that are explicitly mentioned.

Relational predications invariably manifest an asymmetry in their portrayal of the relational participants. This asymmetry is not strictly dependent on the content of the predication, and is consequently observable even for expressions designating symmetrical relationships, for example, *resemble.* I maintain that *X resembles Y* and *Y resembles X* are semantically distinct (even granting their truth value equivalence): The former characterizes X with reference to Y, and the latter describes Y with reference to X. We can similarly employ either *X is above Y* or *Y is below* X to describe precisely the same conceived situation, but they differ in how they construe this situation; in the former, Y functions as a point of reference – a kind of landmark – for locating X, whereas the latter reverses these roles. The subtlety of the contrast with predications like these hardly diminishes its significance for linguistic semantics and grammatical structure. The asymmetry is more apparent in cases like *go, hit, enter,* and *approach,* where one participant moves in relation to another (which is stationary so far as the verb itself is concerned), but its characterization must accommodate the full range of relational predications.

I attribute this inherent asymmetry to figure/ground organization (for discussion, see Langacker, in press, Ch. 6). Every relational predication elevates one of its participants to the status of figure. I refer to this participant as its 'trajector'; other salient participants are referred to as 'landmarks.' This terminology is inspired by prototypical action verbs, where the trajector is generally the primary mover, but the definitions make no specific reference to motion and are therefore applicable to any relational expression. The trajector/landmark asymmetry underlies the subject/object distinction, but the former notions have considerably broader application. In particular, a schematic trajector and landmark are imputed to a relational predication's internal structure, regardless of whether these entities receive (or are capable of receiving) separate expression. The verb *read* consequently has a trajector and a landmark in all the sentences of (5), despite the fact that both are made explicit (by elaborative noun phrases) only in (5)(a):

(5) (a) David read a new book.
(b) David is reading.
(c) The best way to learn is to read.

The terms subject and object are generally reserved for overt noun phrases that elaborate a relational trajector and primary landmark at the clausal level. By contrast, trajector/landmark asymmetry is characteristic of relational predications at any level of organization, even if left implicit.

The enhanced salience of explicitly mentioned elements can be illustrated by the semantic contrast between pairs of expressions like the following: *father* versus *male parent; pork* versus *pig meat; oak* versus *oak tree; triangle* versus *three-sided polygon;* and *sink versus passively descend through a medium under the force of gravity.* I am not concerned here with differences in connotation or information content – for sake of discussion, let us accept the members of each pair as equivalent in these respects. My claim is that the paired expressions nevertheless contrast semantically because the second expression in each case explicitly mentions certain semantic components and thereby renders them more prominent than they would otherwise be. Even for a speaker who knows perfectly well that pork comes from pigs, the expression *pig meat* renders this provenience more salient than does *pork,* simply because the former incorporates a symbolic unit that specifically symbolizes this source. In similar fashion, the inclusion of the designated entity in a broader class of geometrical figures is highlighted by *three-sided polygon,* but remains latent in the case of *triangle.*

A linguistically appropriate characterization of meaning should accommodate such differences. Cognitive grammar defines the meaning of a composite expression as including not only the semantic structure that represents its composite sense, but also its 'compositional path': the hierarchy of semantic structures reflecting its progressive assembly from the meanings of component expressions. Let us assume, for example, that the composite semantic values of *pork* and *pig meat* are identical. As an unanalyzable morpheme, *pork* symbolizes this notion directly, so its compositional path consists of the single semantic structure [PORK]. However *pig meat* is 'analyzable,' that is, speakers recognize the semantic contribution of its component morphemes. The meaning of *pig meat* therefore incorporates not only the composite structure [PORK], but also the individually symbolized components [PIG] and [MEAT], together with the relationship that each of them bears to the composite value. The two expressions arrive at the same composite value through different compositional paths (a degenerate path in the case of *pork),* with the consequence that they differ in meaning.

Besides accounting for the semantic contrast between simple and composite expressions, this conception of meaning has the advantage of resolving a classic problem of truth-value semantics. The problem is posed by semantically anomalous expressions, for example, **perspicacious neutrino* and **truculent spoon,* which lack truth conditions and thus ought to be meaningless and semantically equivalent. Not only is this counterintuitive, but it also predicts – quite incorrectly – the semantic anomaly of sentences like those in (6), which contain anomalous constituents.

(6) (a) There is no such thing as a perspicacious neutrino.
(b) It is meaningless to speak of a truculent spoon.

In the present framework, anomalous expressions are indeed both meaningful and nonsynonymous. Though a coherent composite conceptualization fails to emerge for **perspicacious neutrino,* it has a semantic value, consisting of the meanings of its components together with their specified mode of combination (as determined by the grammatical construction). The same is true for **truculent spoon,* and because its components are different from those of **perspicacious neutrino,* so is its semantic value. Lacking a coherent composite sense, these meanings are defective, but they are meanings nonetheless. Sentences like (6) are semantically well-formed precisely because they comment on the anomaly of a constituent.

I will mention two more dimensions of imagery only in passing, though each is multifaceted and merits extended discussion. One is the construal of a situation relative to different background assumptions and expectations. To take just one example, either (7)(a) or (b) might be used to describe the same state of affairs:

(7) (a) He has few friends in high places.
(b) He has a few friends in high places.
(c) Few people have any friends in high places.
(d) *A few people have any friends in high places.

Intuitively, the difference between *few* and *a few* is that the former is somehow negative, and the latter more positive. This is corroborated by (7)(c) and (d): *any,* which requires a negative context (cf. Klima, 1964), is compatible with few, but not with *a few.* Analytically, I suggest that *few* construes the specified quantity as being less than some implicit norm, whereas *a few* construes the quantity relative to a baseline of zero. These respective predications therefore indicate departure from an implicit reference point in a negative versus a positive direction.

The final dimension of imagery is perspective, which subsumes a number of more specific factors: orientation, assumed vantage point, directionality, and how objectively an entity is construed. Orientation and vantage point are well known from the ambiguity of sentences like (8)(a). The contrast between (8)(b) and (c) shows the importance of directionality, even for situations that appear to involve no motion.

(8) (a) Brian is sitting to the left of Sally.
(b) The hill falls gently to the bank of the river.
(c) The hill rises gently from the bank of the river.
(d) The balloon rose swiftly.

I suggest, though, that (8)(b) – (d) all involve motion in an abstract sense of the term. Described in (8)(d) is physical motion on the part of a mover construed 'objectively,' by which I mean that it is solely an object of conceptualization, maximally differentiated from the conceptualizer (i.e., the speaker and/or hearer). Motion along a similar trajectory is implied in (8)(c), but in this case the movement is abstract and the mover is construed 'subjectively:' the mover is none other than the conceptualizer, in his role as the agent (rather than the object) of conceptualization. Gradations between physical and abstract motion on the one hand, and between the objective and subjective construal of conceived entities on the other, are important to the analysis of numerous linguistic phenomena.[3]

3 Grammar as image

Lexicon and grammar form a continuum of symbolic elements. Like lexicon, grammar provides for the structuring and symbolization of conceptual content, and is thus imagic in character. When we use a particular construction or grammatical morpheme, we thereby select a particular image to structure the conceived situation for communicative purposes. Because languages differ in their grammatical structure, they differ in the imagery that speakers employ when conforming to linguistic convention. This relativistic view does not per se imply that lexico-grammatical structure imposes any significant constraints on our thought processes – in fact I suspect its impact to be rather superficial (cf. Langacker, 1976). The symbolic resources of a language generally provide an array of alternative images for describing a given scene, and we shift from one to another with great facility, often within the confines of a single sentence. The conventional imagery invoked for linguistic expression is a fleeting thing that neither defines nor constrains the contents of our thoughts.

The most obvious contribution of grammar to the construal of a scene pertains to designation. Grammatical constructions have the effect of imposing a particular profile on their composite semantic value. When a head combines with a modifier, for example, it is the profile of the head that prevails at the composite-structure level. Consider a simple situation in which a lamp is suspended over a table. Starting from such simple expressions as *the lamp, the table, above,* and *below,* we can combine them in alternate ways to form composite expressions that profile different facets of the scene. *The lamp above the table* naturally designates the lamp. By choosing *the table* for the head, and appropriately adjusting the prepositional-phrase modifier, we obtain instead *the table below the lamp,* which profiles the table. Another option is to add the proper form of *be* to the prepositional phrase, converting it into a process predication designating the extension of the locative relationship through a span of conceived time, for example, *is above the table.* When a subject is then supplied, the resulting sentence *The lamp is above the table* also profiles the temporally extended locative relationship.

Let us further explore the sense in which grammar embodies conventional imagery by considering the semantic contrast between (9)(a) and (b).

(9) (a) Bill sent a walrus to Joyce.
    (b) Bill sent Joyce a walrus.

The standard transformational analysis of these sentences treats them as synonymous and derives them from a common deep structure; depending on the particular choice of deep structure, *to* is either deleted or inserted transformationally, and the nonsubject nominals are permuted in the course of deriving the surface form of either (a) or (b). Cognitive grammar does not posit abstract deep structures, and neither sentence type is derived from the other – they are claimed instead to represent alternate construals of the profiled event. (9)(a) and (b) differ in meaning because they employ subtly different images to structure the same conceived situation.

The essentials of the analysis are sketched in Figure 6, where the small circles represent Bill, Joyce, and the walrus; the large circles stand for the regions over which Bill and Joyce exercise dominion; and boldface indicates a certain degree of relative prominence. Up to a certain point the sentences are semantically equivalent. Each symbolizes a conception in which a walrus originates in the domain under Bill's control and – at Bill's instigation – follows a path that results in its eventual location within the region under Joyce's control. The semantic contrast resides in the relative salience of certain facets of this complex scene. ln (9)(a), the 'grammatical' morpheme *to* specifically designates the path followed by the walrus, thereby rendering this aspect of the conceptualization more prominent than it would otherwise be, as indicated in Figure 6(a). In (9)(b), on the other hand, *to* is absent, but the juxtaposition of two unmarked nominals *(Joyce* and *a walrus)* after the verb symbolizes a possessive relationship between the first nominal and the second. Consequently (9)(b) lends added prominence to the configuration that results when the walrus completes its trajectory, namely that which finds it in Joyce's possession, as indicated in 6(b).

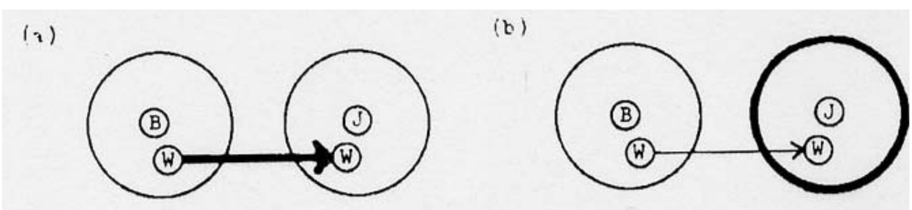

Figure 6

All of the 'content' present in one conception may be presumed to figure in the other as well – what differs is the relative salience of substructures. This subtle difference in imagery has an impact on the felicity of using *to* or the double-object construction for certain types of situations.[4] Consider the data in (10):

(l0) (a) I sent a walrus to Antarctica.
(b) ?I sent Antarctica a walrus.
(c) I sent the zoo a walrus.

(l0)(a) is fully acceptable because *to* emphasizes the path traversed by the walrus, and a continent can perfectly well be construed as the endpoint of a path. However it is harder to construe a continent as a possessor exercising control over other entities, so (l0)(b), which specifically places Antarctica in a possessor role, is felt to be marginal. The status of (l0)(c) depends on the construal of *zoo.* If the zoo is simply construed as a place, it is difficult to view it as a possessor, and (l0)(c) is questionable for the same reason as (10)(b). But a zoo is also an institution, and it is conventional in English to treat institutions as being analogous to people, which allows them to function linguistically as agents, possessors, and so forth. (l0)(c) is consequently well formed to the extent that this second construal prevails. As viewed in the present framework, then, judgments of well-formedness often hinge on the interplay and compatibility of images, and are influenced by subtle shifts in context, intended meaning, or how a speaker chooses to structure and interpret a situation.

The examples in (11) – (13) provide further illustration.

(11) (a) I gave the fence a new coat of paint.
(b) ?I gave a new coat of paint to the fence.

(12) (a) I cleared the floor for Bill.
(b) ?I cleared Bill the floor.
(c) I cleared Bill a place to sleep on the floor.

(13) (a) I baked her a cake.
(b) ?I mowed her the lawn.

It is conventional in English to employ possessive locutions for part–whole relations, so construing a fence as the possessor of a new coat of paint, in the manner of (1l)(a), is quite natural. It is more difficult to envisage a coat of paint moving along a path to the fence; (11)(b) is thus a bit less natural, because *to* renders the path more prominent than the eventual possessive relationship.[5] The sentences in (12) – (13) bring out another consequence of the analysis. Because the two constructions are claimed to be parallel (i.e., neither is derived from the other) and semantically distinct, it is to be expected that the double-object construction – having no intrinsic connection with *to* – might serve as an alternative to other prepositions as well. It is well known from transformational studies (where the fact has long been problematic) that the double-object construction alternates with *for* as well as *to.* With *for* also the double-object construction is restricted to instances where the first object is plausibly construed as winding up in possession of the second. In (12), for example, Bill does not come to possess the floor just because I clear it for him, so (12)(b) is peculiar; (12)(c) is perfectly acceptable, however, since the additional context provided by the second nominal (a *place to sleep on the floor)* makes it apparent that the spot in question effectively comes under Bill's control and lies at his disposal by virtue of the action of clearing it. The data in (13) is similarly explained. Baking someone a cake puts the cake at that person's disposal, but mowing a lawn can hardly have a comparable effect under normal circumstances.

4 Grammatical organization

The ultimate goal of linguistic description is to characterize, in a cognitively realistic fashion, those structures and abilities that constitute a speaker's grasp of linguistic convention. A speaker's linguistic 'knowledge' is procedural rather than declarative, and the internalized 'grammar' representing this knowledge is simply a 'structured inventory of conventional linguistic units.' The term 'unit' is employed in a technical sense to indicate a thoroughly mastered structure, that is, one that a speaker can activate as a preassembled whole without attending to the specifics of its internal composition. A unit can therefore be regarded as a cognitive routine. The inventory of conventional units is 'structured' in the sense that some units function as components of others (i.e., they constitute subroutines).

I speak of an 'inventory' of conventional units to indicate that a grammar is non-generative and nonconstructive. That is, I reject the standard notion that a grammar is properly conceived as an algorithmic device giving a well-defined class of expressions ('all and only the grammatical sentences of a language') as output. This conception is viable only if one imposes arbitrary restrictions on the scope of linguistic structure and makes gratuitous assumptions about its character. It is commonly assumed, for example, that judgments of grammaticality are categorical rather than a matter of degree; that semantics is fully compositional; that figurative language is properly excluded from the domain of linguistic description; and that a motivated distinction can be made between semantics and pragmatics. Although assumptions like these support the notion that language is self-contained and cognitively autonomous, there is little factual basis for their adoption.

Instead, I conceive the grammar of a language as merely providing the speaker with an inventory of symbolic resources, among them schematic templates representing established patterns in the assembly of complex symbolic structures. Speakers employ these symbolic units as standards of comparison in assessing the conventionality of novel expressions and usages, whether of their own creation or supplied by other speakers. The novel symbolic structures evaluated in this fashion are not a well-defined set and cannot be algorithmically derived by the limited mechanisms of an autonomous grammar. Rather their construction is attributed to problem-solving activity on the part of the language user, who brings to bear in this task not only his grasp of linguistic convention, but also his appreciation of the context, his communicative objectives, his esthetic sensibilities, and any aspect of his general knowledge that might prove relevant. The resulting symbolic structures are generally more specific than anything computable from linguistic units alone, and often conflict with conventional expectations (e.g., in metaphor and semantic extension). Assessing their conventionality (or 'well-formedness') is a matter of categorization: Categorizing judgments either sanction them as elaborations of schematic units or recognize them as departing from linguistic convention as currently established.

Only three basic types of units are posited: semantic, phonological, and symbolic. A symbolic unit is said to be 'bipolar,' consisting of a semantic unit defining one pole and a phonological unit defining the other: [[SEM]/[PHON]]. That lexical units have this bipolar character is uncontroversial; *pencil,* for example, has the form [[PENCIL]/[pencil]], where capital letters abbreviate a semantic structure (of indefinite internal complexity), and a phonological structure is represented orthographically. A pivotal claim of cognitive grammar is that grammatical units are also intrinsically symbolic. I maintain, in other words, that grammatical morphemes, categories, and constructions all take the form of symbolic units, and that nothing else is required for the description of grammatical structure.

Symbolic units vary along the parameters of complexity and specificity. With respect to the former, a unit is minimal (a 'morpheme') if it contains no other symbolic units as components. For instance, despite its internal complexity at both the semantic and the phonological pole, the morpheme *sharp* is minimal from the symbolic standpoint, whereas *sharpen, sharpener,* and *pencil sharpener* are progressively more complex. With respect to the second parameter, symbolic units run the gamut from the highly specific to the maximally schematic. Each sense of *ring* depicted in Figure 1, for example, combines with the phonological unit [ring] to constitute a symbolic unit. Some of these senses are schematic relative to others, so the symbolic units in question vary in their level of specificity at the semantic pole. Basic grammatical categories (e.g., noun, verb, adjective, adverb) are represented in the grammar by symbolic units that are maximally schematic at both the semantic and the phonological pole. A noun, for instance, is claimed to instantiate the schema [[THING]/[X]], and a verb the schema [[PROCESS]/[Y]], where [THING] and [PROCESS] are abstract notions to be described later, and [X] and [Y] are highly schematic phonological structures (i.e., they specify little more than the presence of 'some phonological content').

A grammatical rule or construction is represented in the grammar by a symbolic unit that is both complex and schematic. For example, the morphological rule illustrated by the deverbal nominalizations *teacher, helper, hiker, thinker, diver,* and so on consists in a complex unit that incorporates as components the verb schema [[PROCESS]/[Y]] and the grammatical morpheme [[ER]/[er]] (i.e., the suffix *-er,* which is attributed substantial though schematic semantic content). This unit further specifies how the component structures are integrated – conceptually and phonologically – to form a composite symbolic structure. Using '-' to indicate this integration (to be examined later), we can write the constructional schema as follows: [[[PROCESS]/[Y]]-[[ER]/[er]]]. Its internal structure is exactly parallel to that of an instantiating expression, for example, [[[TEACH]/[teach]]-[[ER]/[er]]], except that in lieu of a specific verb stem it contains the schema for the verb-stem category.

One constructional schema can be incorporated as a component of another. In the top portion of Figure 7(a), the schema just described combines with the noun schema [[THING]/[X]] to form a higher order constructional schema, which speakers presumably extract to represent the commonality of *pencil sharpener, lawn mower, mountain climber, back scratcher, taxi driver,* and so on. The lower portion of 7(a) represents the lexical unit *pencil sharpener,* which conforms to the specifications of this schema but elaborates it greatly. The arrow labeled (a) indicates that the upper structure as a whole is judged schematic for the overall expression; this categorizing relationship is what specifies the membership of the expression in the class that the schema characterizes. This global categorizing relationship is based on local categorizations between component structures: relationship (b) identifies *pencil* as a member of the noun class; (c) categorizes *sharpener* as a deverbal nominalization derived by *-er;* and (d) classes *sharpen* as a verb.[6] The full set of categorizing relationships of this sort constitutes the expression's 'structural description.' Observe that *pencil sharpener* has a conventional meaning which is considerably more specific than anything derivable compositionally from the meanings of its parts – a pencil sharpener is not simply 'something that sharpens pencils'. Given the nonconstructive nature of the present model, we can nevertheless accept the expression as a valid instantiation of the construction in question, without relegating the unpredictable semantic specifications to the realm of 'extra-linguistic' knowledge. The constructional schema is not responsible for assembling the expression, but only for its categorization.

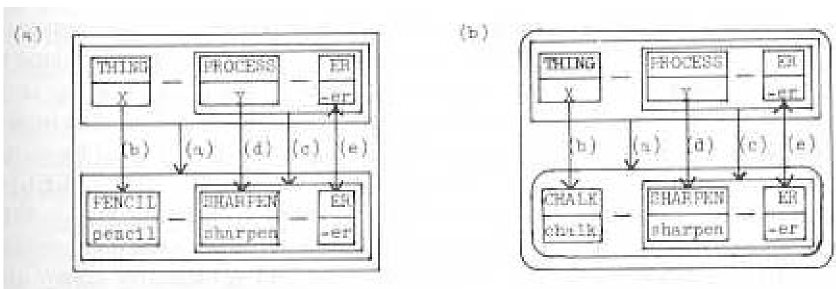

Figure 7

All of the structures and categorizing relationships in Figure 7(a) have the status of units, which I indicate by enclosing them in boxes or square brackets. What about a novel expression on the same model, for example, *chalk sharpener*? Its organization is sketched in Figure 7(b), where a closed curve (as opposed to a box) indicates a structure that does not yet constitute a unit. The assembly of this novel symbolic structure is largely prefigured by existing units, including the constructional schema, the components *chalk* and *sharpener*, and the categorization of *chalk* as a noun. Taken as a whole, however, neither the full expression *chalk sharpener* nor its categorization by the constructional schema (relationship (a)) has unit status. It does not matter for our purposes whether a speaker employs the existing units to construct or simply to understand the novel expression – in either case, all of the structures and relationships in 7(b) figure in its composition and structural description, and in either case its contextual meaning may incorporate specifications that are obvious from the situation being described (which functions as the domain for the composite expression) but are not supplied by the conventional meanings of its components. Despite this lack of full compositionality, the expression may well recur with sufficient frequency to become established as a conventional unit parallel to *pencil sharpener*, *lawn mower*, and so on. If so, its contextual meaning (in an appropriately schematized form) becomes the conventional meaning of the new lexical unit. Full semantic compositionality is therefore not a hallmark of either novel expressions as they are actually understood or the fixed expressions which result from their conventionalization.

This conception of grammar makes it possible to impose the following restriction on linguistic analyses: The only units permitted in the grammar of a language are (i) semantic, phonological, and symbolic structures that occur overtly in linguistic expressions; (ii) structures that are schematic for those in (i); and (iii) categorizing relationships involving the structures in (i) and (ii). I call this the 'content requirement,' and consider it to be intrinsically more restrictive (at least in a certain, possibly non-technical sense) than the constraints generally imposed on algorithmic models. What it does, essentially, is rule out arbitrary descriptive devices, that is, those with no direct grounding in phonetic or semantic reality. Among the devices excluded are syntactic 'dummies' with neither semantic nor phonological content, introduced solely to drive the formal machinery of autonomous syntax (cf. Perlmutter, 1978); arbitrary diacritics or contentless 'features'; and the derivation of overt structures from abstract, 'underlying' structures of a substantially different character (e.g., the derivation of passives from actives – see Langacker, 1982a, for an alternative account).

5 Grammatical classes

The content requirement proscribes the use of diacritic features. How, then, does a grammar indicate the behavior and class membership of conventional units? Some classes are characterized on the basis of intrinsic semantic and/or phonological content. In this event, a schematic unit is extracted to represent the shared content, and class membership is indicated by categorizing units reflecting the judgment that individual members instantiate the schema. The vowel [i], for example, is classed as a high vowel by virtue of the categorizing unit [[HIGH VOWEL]→[i]], where [HIGH VOWEL] is a schematic phonological structure which neutralizes the properties that distinguish one high vowel from another. Similarly, among the categorizing units depicted in Figure 7(a), relationships (b) and (c) identify *pencil* and *sharpen* as a noun and a verb respectively, whereas relationship (a) identifies *pencil sharpener* as an instance of the grammatical construction characterized by the overall schema. Only symbolic structures with actual semantic and phonological content figure in these relationships.

Obviously, though, the membership of many grammatical classes is not fully predictable on the basis of semantic or phonological properties, for example, the class of nouns that voice *f* to *v* in the plural *(leaf/leaves,* but *reef/reefs),* or the class of verbs that conventionally occur in the double-object construction described earlier (cf. Green, 1974; Oehrle, 1977). The fact that morphological and syntactic behavior is often not fully predictable is generally taken as establishing the independence of grammar as a distinct aspect of linguistic structure. However this conclusion does not actually follow from the observation – the tacit reasoning behind it confounds two issues that are in principle distinct: (i) what 'kinds' of structures there are; and (ii) the 'predictability' of their behavior. The present framework accommodates unpredictable behavior without positing arbitrary diacritics or 'rule features'. To say that leaf (but not *reef)* voices *f* to *v* in the plural is simply to say that the composite symbolic structure *leaves* (but not *reeves)* is included among the conventional units of the grammar. Similarly, to say that *send* participates in the double-object construction amounts to positing the constructional schema [send NP NP], where the verb is specific but the two noun phrases are characterized only schematically. The nonoccurrence of *transfer* in this construction is reflected in the grammar by the nonexistence of the parallel symbolic unit [transfer NP NP].[7]

Crucial to the claim that grammatical structure resides in symbolic units alone is the possibility of providing a notional characterization of basic grammatical categories, nouns and verbs in particular. The impossibility of such a characterization is a fundamental dogma of modern linguistics, but the standard arguments that appear to support it are not immune to criticism. For one thing, they presuppose an objectivist view of meaning, and thus fail to acknowledge sufficiently our capacity to construe a conceived situation in alternate ways. Consider the argument based on noun/verb pairs which refer to the same process, for example, *extract* and *extraction.* Such pairs demonstrate the impossibility of a notional definition only if one assumes that they are semantically identical, yet this is not a necessary assumption when meaning is treated as a subjective phenomenon. It is perfectly coherent to suggest that the nominalization of *extract* involves a conceptual 'reification' of the designated process, that is, the noun and verb construe it by means of contrasting images. Another type of argument against a notional characterization pivots on the confusion of 'prototypes' and 'abstract schemas.' In the case of nouns, for instance, discussions of notional definitions generally focus on physical objects (or perhaps 'persons, places, and things'), which are clearly prototypical; the existence of nouns like *extraction,* which do not conform to this prototype, is then taken as demonstrating that nouns are not a semantic class. Obviously, a schematic characterization of the class – one compatible with the specifications of all class members – cannot be identified with the category prototype representing typical instances. If a schematic characterization is possible at all, it must be quite abstract, accommodating both physical objects and many other sorts of entities as special cases.

Cognitive grammar posits a number of basic classes that differ in the nature of their profile. As previously indicated, a noun is a symbolic structure that designates a thing, where 'thing' is a technical term explicated below. Contrasting with nouns are relational expressions, which profile either an 'atemporal relation' or a 'process.' Symbolic structures designating processes are equated with the class of verbs. Adjectives, adverbs, prepositions, and certain other classes profile various types of atemporal relations.

A thing is defined as a 'region in some domain'; in the case of count nouns, the profiled region is further specified as being 'bounded.' Because physical objects occupy bounded regions in three-dimensional space, expressions which designate such objects qualify as count nouns, but the definition does not specifically refer to them or to the spatial domain in particular. In fact, the term 'bounded region' must be interpreted abstractly enough to overcome the limitations of its spatial origin. Here, though, I will simply illustrate its applicability in some representative cases where its import is intuitively obvious.

With respect to basic domains, *moment, instant,* and *period* designate bounded regions in time; *point, line,* and *circle* in two-dimensional space;[8] and *sphere, cone,* and *cylinder* in three-dimensional space. When used as a noun, a color term like *red* profiles a bounded region in color space, whereas count nouns like *spot, streak,* and *stripe* designate sensations of limited expanse within the visual field. A *beep* occupies the pitch domain and is bounded in time. A *blip* and a *flash* occupy both the visual and the temporal domains, but differ in their domain of bounding: a *blip* must be bounded in the visual field, whereas a *flash* need not be (it can totally suffuse the visual field), but is sharply bounded in time.

Most nominal predications are characterized relative to nonbasic domains, that is, other, more fundamental conceptualizations. *Arc, hypotenuse,* and *great circle* presuppose the conception of a geometrical figure and profile a bounded region within it. *Arm, leg,* and *torso* designate bounded regions within a body, whereas *elbow, forearm,* and *hand* in turn take for their domain the conception of an arm. For nouns like *January, Tuesday, hour,* and *second* the domain is not time, but rather an abstract frame of reference devised to track and measure its passage; in similar fashion, the basic domain of pitch figures only indirectly in the meaning of expressions like *C-sharp, B-flat,* and *F,* which invoke a musical scale for their domain and profile specific points along it. Terms like *prolog, act, scene,* and *intermission* designate bounded portions of a stage performance, and for segments of athletic events we have nouns like *inning, quarter, half, round,* and *period.*

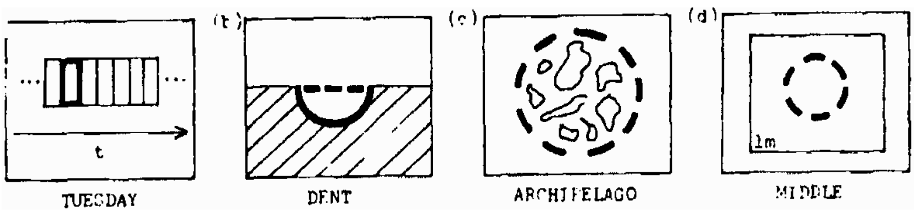

Figure 8

The bounding that characterizes count nouns is not always determined by objective or perceptual factors. Such factors are irrelevant for nouns whose domain is abstract, for example, *Tuesday*, sketched in Figure 8(a); the conception of a recurrent cycle of 7 days functions as its domain, and its profile – outlined in boldface – is one of the segments in this abstract construct. With more concrete examples, the boundary is often imposed rather than objectively given. In the case of *dent*, diagrammed in 8(b), one segment of the imputed boundary (indicated with a dashed boldface line) is 'virtual,' obtained by extrapolating along the canonical or expected surface of an object. The boundary of an *archipelago* (Figure 8(c)) can be considered virtual in its entirety, though its approximate position is marked out by the location of peripheral islands. The *middle* of a floor or a rug is conceived as a bounded region even if there is no perceptual basis for distinguishing the designated area from other portions of the reference object. The virtual boundary indicated in 8(d) is free to vary in size so long as it is more or less centered within the landmark object and does not extend to its margins.

In short, the existence of a region and its possible bounding reflect the occurrence of particular sorts of cognitive events, and are to some degree independent of objective factors. The importance of cognitive processing is more evident still when we turn from nominal to relational predications and seek to distinguish their subtypes. A relational predication is one that profiles the 'interconnections' among conceived entities. The term 'entity' is employed in a maximally general way, and subsumes anything we might have occasion to refer to for analytic purposes: things, relations, boundaries, points on a scale, and so on. Interconnections can be regarded as cognitive operations that assess the relative position of entities within the scope of predication. It is speculated that only four basic types of assessment are necessary, provided that cognitive domains have been properly described: inclusion (INCL), coincidence (COINC), separation (SEP), and proximity (PROX). Significantly, the interconnecting operations defining a relational conception commonly associate entities other than the major relational participants (trajector and primary landmark), or associate selected facets of these participants rather than treating them as undifferentiated wholes.

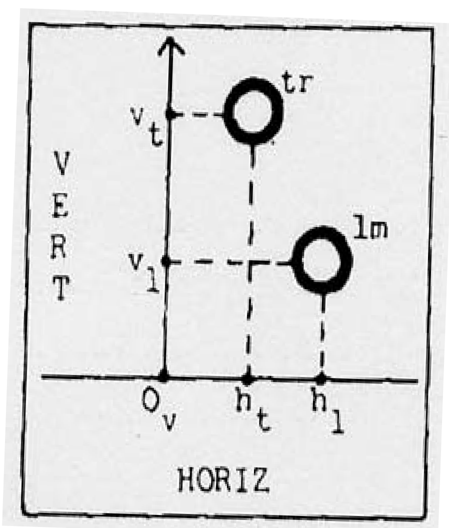

Figure 9

By way of illustration, consider the predicate [ABOVE], sketched in Figure 9. Its domain is space organized into horizontal and vertical dimensions, including an implicit reference point Ov (the vertical origin). The major relational participants are both things, characterized only schematically; one is further identified as the trajector (relational figure).[9] Among the entities invoked by specifications of this predicate are the horizontal and vertical projections of the trajector (h_t, v_t) and the landmark (h_l, v_l). The expression above is optimally employed when the horizontal projections of the trajector and landmark coincide, that is, (h_t, COINC h_l,], but is tolerated so long as they remain in proximity to one another: [h_t PROX h_l]. With respect to the vertical dimension, on the other hand, their projections must not coincide – the specification [v_t SEP v_l] is obligatory. The pivotal specification of [above] is provided by an operation interconnecting two entities that are still more abstract. Let $(Ov > v_t]$ be the operation which registers the displacement of the trajector from the vertical origin, and $[Ov > v_l]$ that of the landmark. The specification in question resides in a higher order operation assessing the relative magnitudes of the component operations: $[(Ov > v_t)$ incl $(Ov > v_l)]$.

Interconnecting operations of roughly this sort must somehow figure in the cognitive representation of a relational notion (though I take no position on the specifics of their implementation). [ABOVE] is a 'simple atemporal relation' (or 'stative' relation), in the sense that its specifications portray a single, internally consistent configuration. We must also recognize 'complex' atemporal relations, where such is not the case. Consider the contrast between (14)(a) and (b).

(14) (a) There is a tree across the river.
(b) A hiker waded across the river.

Three conventionally established senses of *across* are illustrated. (14)(a) is ambiguous between the senses sketched in Figures 10(a) and (b). In 10(a), the trajector (in this case the tree) simultaneously occupies all the points on a path leading from one side of the primary landmark (the river) to the other. In 10(b), on the other hand, the trajector occupies only one endpoint of such a path; the other endpoint is occupied by a secondary landmark of lesser prominence that functions as a reference point. The predications depicted in 10(a) and (b) are both simple atemporal relations, for the profiled relationship reduces to a single configuration. This is not the case in 10(c), corresponding to (14)(b). Here the trajector occupies all the points on the path leading from one side of the landmark to the other, but does so only successively through time. The profiled relationship involves indefinitely many distinct configurations (or states), of which only a few are represented diagrammatically. This sense of *across* is consequently a 'complex atemporal relation.'[10]

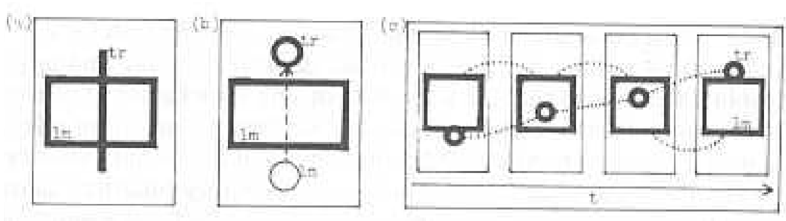

Figure 10

Atemporal relations contrast with processes, which define the class of verbs. What, precisely, is the nature of this contrast? Let us consider the conceptual factors that might set verbs apart from other relational predications. We might expect a verb to profile not just one but a sequence of relational configurations (cf. Figure 4), but this does not distinguish verbs from complex atemporal relations. Time is clearly a relevant factor, but many nonverbal elements also make crucial reference to time, for example, the noun tuesday (Figure 8(a)) and relational expressions like before and after. Nor is it sufficient to combine these two specifications and characterize a verb as profiling a series of relational configurations conceived as being distributed through a continuous span of time: this definition is fully compatible with the sense of across exemplified in (14)(b) and Figure 10(c). Thus, if verbs are notionally definable, they must have some additional property we have not yet identified. What is it that distinguishes the verb *cross* from the preposition *across* under the third interpretation?

I propose that the distinction between a process and a complex atemporal relation involves the contrast between 'sequential' and 'summary scanning.' Sequential scanning is the mode of processing we employ when watching a motion picture or observing a ball as it flies through the air. The successive states of the conceived event are activated serially and more or less instantaneously, so that the activation of one state begins to decline as that of its successor is initiated; essentially, we follow along from one state to the next as the event unfolds.[11] On the other hand, summary scanning is what we employ in mentally reconstructing the trajectory a ball has followed (e.g., in identifying a pitch as a curve, slider, or fastball and diagramming its degree of curvature). The component states are activated successively but cumulatively (i.e., once activated they remain active throughout), so that eventually they are all coactivated as a simultaneously accessible whole. The difference between a complex atemporal relation (like *across)* and the corresponding verb *(cross)* is therefore attributed not to their intrinsic content, but rather to the mode of scanning employed in their activation – it is a matter of conventional imagery. Figure 10(c) is thus appropriate for either *across* or *cross,* depending on whether summary or sequential scanning is invoked for its construal. Moreover, the sense in which a process is 'temporal,' while other relations (even those referring to time) are 'atemporal,' can now be clarified: The terminology does not pertain to the role of time within the predication (i.e., 'conceived' time), but rather to 'processing' time, and specifically to whether the component states are activated only sequentially with the passage of processing time or are also available as a simultaneously active whole.

Though I cannot prove that verbs are characterized by sequential scanning, this analysis is natural and leads to a coherent account of otherwise problematic linguistic phenomena. It is natural in the sense that the difference between summary and sequential scanning is established on non-linguistic grounds, and also because it helps explain the common intuition that verbs are more 'dynamic' than other elements. Linguistically, it enables us to make the necessary distinctions among basic grammatical classes, to explicate their similarities and differences, and to capture revealing generalizations about their behavior. For example, both simple and complex atemporal relations are distinguished from verbs by their mode of scanning. At the same time, a complex atemporal relation like *across* in (14)(b) is very similar to the corresponding verb in content, so it is hardly surprising that there are languages in which the same form can be used in either fashion – merely by changing the mode of scanning, an expression meaning 'across' can be extended to mean 'cross/go across' (or conversely). We can also account for the distinct but nonetheless verb-like character of nonfinite forms such as infinitives and participles. They are verb-like because they derive from verbs, with the process designated by the verb stem functioning as their base. However the 'grammatical morpheme' serving to derive the participle or infinitive has the effect of suspending the sequential scanning of the stem, hence the composite expression is classed as an atemporal relation. This shift from sequential to summary scanning is the only semantic contribution of the infinitival *to* (e.g., *to go).* The present- and past-participle morphemes have aspectual import in addition.[12]

We can now state certain generalizations about grammatical structure and explicate a variety of distributional facts with reference to them. One generalization is that 'a finite clause always profiles a process.' As implemented in English, this requirement demands the presence of a verb which contributes the processual profile to the clause as a whole. Construed as finite clauses (or simple sentences), the expressions in (15) are consequently ungrammatical because the relational predications following the subject are atemporal (hence nonprocessual).

(15) (a) *That boy tall(s).
(b) *The lamp above(s) the table.
(c) *The dog running along the beach.
(d) *A traveler attacked by bandits.
(e) *Alice seen the results.

(16) (a) The boy is tall.
(b) The lamp is above the table.
(c) The dog is running along the beach.
(d) A traveler was attacked by bandits.
(e) Alice has seen the results.

(17) (a) Rachel appreciates flattery.
(b) *Rachel is appreciate(s) flattery.

The corresponding sentences in (16) are grammatical, however, because an auxiliary verb, either *have* or *be,* combines with the atemporal predication and contributes the requisite sequential scanning. I analyze auxiliary verbs semantically as highly schematic processes, that is, they have little content beyond a specification of their processual character. Though slight from the standpoint of information or truth conditions, their semantic contribution is significant with respect to the grammatical generalization stated above. Note further that an auxiliary verb is not required to satisfy the restriction when a less schematic verb is available, so the distribution illustrated in (17) is quite natural.

A second generalization is that 'noun modifiers are always atemporal.'[13] Construed as noun phrases (not as clauses or sentences), the expressions in (18) are consequently well-formed:

(l8) (a) the tall boy
(b) the lamp above the table
(c) the dog running along the beach

(d) a traveler attacked by bandits
(e) the person to see about that

(19) (a) *the be tall boy
(b) *the lamp be above the table
(c) *the dog be running along the beach
(d) *a traveler be attacked by bandits
(e) *the person to be see about that

(20) (a) That woman resembles my cousin.
(b) *that woman resemble my cousin
(c) that woman resembling my cousin

The noun phrases in (19) are however ungrammatical, as expected, because the addition of *be* converts the modifiers into processual predications, in violation of the restriction. The distribution in (20) provides further illustration: the verb *resemble* furnishes the processual predication needed for a finite clause, as in (20)(a), but its processual character makes it inappropriate as a noun modifier unless some other element, such as *-ing,* suspends its sequential scanning and converts it into an atemporal relation, as we see in (b) – (c).

By way of summary, let me introduce for the basic classes of predications the abbreviatory notations presented in Figure 11. A circle is the natural choice to represent a thing. A simple atemporal (or stative) relation profiles the interconnections between two or more conceived entities, where an entity can be either a thing or another relation. A complex atemporal relation consists of a sequence of stative relations scanned in summary fashion. A process is comparable to a complex atemporal relation in profiling a sequence of relational configurations, but has certain other properties as well: (i) the component states are conceived as being distributed through time; (ii) these states are scanned in sequential fashion; and (iii) the trajector is always a thing (never a relation). The arrow in Figure 11(e) stands for conceived time, and the boldface bar along this arrow indicates that the component states are scanned sequentially through processing time.

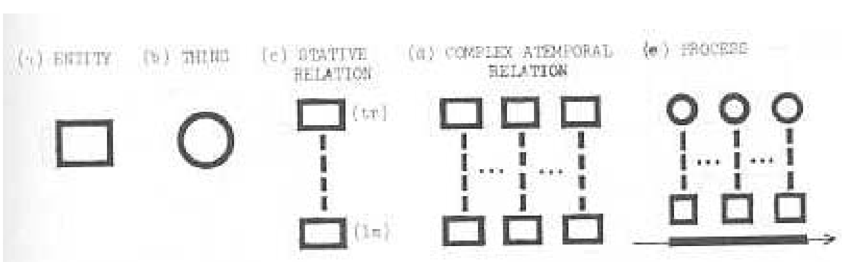

Figure 11

Apart from restriction (iii), we can note that relational predications allow any combination of things and relations for their trajector and primary landmark:

(21) (a) The plane is above the clouds.
(b) She left home before I arrived.
(c) The children played in the park.
(d) The milk finally turned sour.

In (2l)(a), *above* has a thing for both its trajector and its landmark. The trajector and landmark of *before* are both relations (specifically, processes) in (21)(b). The trajector of *in* is processual in (c), but its landmark is nominal. Finally, the trajector of *turn* in (d) is nominal, but its landmark is a stative relation.

6 Grammatical constructions

Grammar resides in patterns for the successive combination of symbolic structures to form more and more elaborate symbolic expressions. It is described by a structured inventory of 'grammatical constructions,' each of which specifies the relation between two or more 'component' structures and the 'composite' structure resulting from their integration. The essential structures and relationships in a grammatical construction are spelled out in Figure 12, where [SEM_3/$PHON_3$] is the composite structure formed by integrating the component expressions [SEM_1/$PHON_1$] and [SEM_2/ $PHON_2$]. The two diagrams are notational variants: 12(b) is an 'exploded' version of 12(a) and shows the component and composite structures separately at each pole.

Four symbolic relationships are indicated in Figure 12. The ones labeled s_1 and s_2 are those which hold between the semantic and the phonological pole of each component expression, whereas s_3 indicates that the composite phonological structure symbolizes the composite semantic structure. The fourth relationship, s_i, reveals an important sense in which grammar is said to be inherently symbolic: The integration of component structures at the phonological pole serves to symbolize the integration of the corresponding component structures at the semantic pole. Consider the plural noun *walls.* At the phonological pole, the component structures are integrated by the suffixation of *-s* to *wall,* which involves the appropriate temporal sequencing, syllabic organization, and minor phonetic adjustments. It is precisely the fact that *-s* suffixes to *wall* (and not to some other noun stem) which symbolizes the fact that the plurality it expresses is being predicated of [WALL] in particular (rather than the thing designated by some other noun in the sentence). Or to put it in other terms, the symbolic association s_i does not hold between a semantic and a phonological structure per se – instead it associates the 'relationships' between two semantic and two phonological structures.

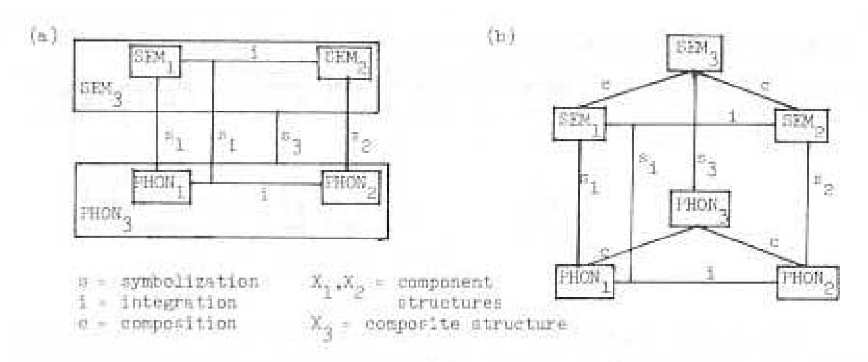

Figure 12

Integration and composition work in essentially the same way at the phonological and at the semantic pole, but we will confine our attention to the latter. I suggest that the integration of two component structures always involves 'correspondences' being established between certain of their substructures. The corresponding substructures provide points of overlap between the component predications, which are necessary if a coherent composite conception is to emerge. The composite structure is obtained by superimposing the specifications of corresponding substructures. In those instances where there is some conflict in their specifications, a fully consistent composite notion cannot be formed, and the result is what we perceive as semantic anomaly (or the violation of 'selectional restrictions').

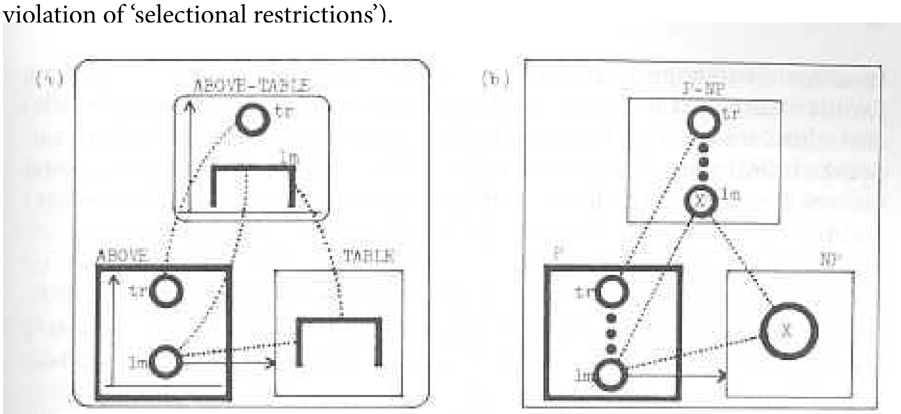

Figure 13

The semantic pole of a typical construction is sketched in Figure 13(a), which diagrams the integration of *above* and *the table* to form the prepositional phrase *above the table* (I will ignore the semantic contribution of the definite article). [ABOVE] profiles a stative relation in oriented space between two things, each characterized only schematically; [TABLE] profiles a thing characterized in far greater detail with respect to numerous domains – purely for sake of diagrammatic convenience, it is represented by a mnemonic shape specification. The integration or these component predications is effected by a correspondence established between the landmark of [ABOVE] and the profile of [TABLE] (correspondences are represented by dotted lines). By superimposing the specifications of these corresponding substructures, and adopting the relational profile of [ABOVE], we obtain the composite predication (ABOVE-TABLE), which designates a stative relation involving a schematic trajector and a specific landmark. Note that the compositional process results in 'vertical' correspondences between elements of the component and composite structures, in addition to the 'horizontal' correspondence(s) linking the components.[14]

Semantics is not fully compositional. When first assembled, an expression's composite structure may incorporate specifications (e.g., the orientation of the table) that are not predictable from conventional units. Because such specifications are part of how the expression is actually understood in context, and may well be included in its conventional semantic value should the expression become established as a unit, it is arbitrary to exclude them from the domain of semantic analysis. There are nevertheless conventional patterns of composition that determine central aspects of the composite structure's organization. These are represented in the grammar by constructional schemas, whose internal structure is parallel to that of the specific expressions which instantiate them. For example, the grammar of English includes a schema for the prepositional-phrase construction. Its phonological pole specifies the contiguity and linear ordering of the preposition and its noun-phrase object; its semantic pole, given in Figure 13(b), is precisely analogous to 13(a) except that the component and composite structures are schematic rather than specific. The first component is schematic for the class of prepositions. Basically, it is identified only as a stative relation whose trajector and primary landmark are both things. The other component is the noun-phrase schema: It profiles a thing, and implies additional content (labeled X), but it does not itself specify the nature of this content. As in the specific structure 13(a), a correspondence holds between the landmark of P and the profile of NP, and the composite structure is formed by superimposing the specifications of these correspondents (and adopting the relational profile of P). Speakers can employ this constructional schema in the computation and evaluation of novel expressions. It serves as the structural description of any expression which it categorizes when so employed.

The constructions in Figure 13 have various properties that are probably to be regarded as prototypical. There are just two component structures, one of them relational and the other nominal. A correspondence holds between two highly prominent substructures: the profile of the nominal predication, and the primary landmark (one facet of the profile) of the relational predication. Moreover, there is a substantial asymmetry in the degree of specificity at which the predications characterize the corresponding elements – the landmark of [ABOVE] is quite schematic, whereas by comparison the profile of [TABLE] is specified in considerable detail. I have indicated this diagrammatically by means of an arrow (standing for a relationship of schematicity) between the landmark of [ABOVE] and the other predication as a whole. Finally, it is the relational predication which lends its profile to the composite structure (i.e., *above the table* designates a stative relation, not a thing). I thus refer to [ABOVE] in 13(a) as the 'profile determinant' in the construction, and make this role explicit by putting the box enclosing this predication in boldface.

None of the properties just cited is invariant except the existence of at least one correspondence between substructures of the components. By recognizing these properties as prototypical rather than imposing them as absolute requirements, we obtain the flexibility needed to accommodate the full range of attested construction types. It is probably necessary, for example, to allow more than just two component structures at a particular level of constituency (e.g., for coordinate expressions such as *X, Y, and Z).* It need not be the case that one component is relational and the other nominal – in fact, there need be no relational component at all. Appositional constructions involving two nominal predications, for instance *my good friend Geraldine Ferraro,* are straightforwardly accommodated in this framework by means of a correspondence established between the nominal profiles. In all the examples cited so far, the corresponding elements have been things that either constitute or are included within the profile of the component structure. Often, however, the correspondents are relational substructures, and they need not be in profile. Consider once more the sense of *gone* diagrammed in Figure 4(c). The component structures are [GO], which designates a process, and one particular semantic variant of the past-participial morpheme. This particular predication profiles the final state of an otherwise unprofiled process that constitutes its base. The participial morpheme itself characterizes this process quite schematically; only in combination with a verb stem is the nature of the process made specific. The integration is effected by a correspondence between the specific process profiled by [GO] and the schematic process functioning as the base within the participial predication. By superimposing their specifications, and adopting the profile contributed by the 'grammatical' morpheme, we obtain a composite structure that profiles just the final state of the process [GO].

A factor we have not yet considered is 'constituency,' which pertains to the order in which symbolic expressions are progressively assembled into larger and larger composite expressions. Clearly, the composite structure resulting from the integration of component structures at one level of organization can itself be employed as a component structure at the next higher level, and so on indefinitely. In Figure 14, for example, the composite structure (ABOVE-TABLE) from 13(a) functions as a component structure, combining with [LAMP] to derive the composite semantic value of the noun phrase *the lamp above the table.* At this second level of organization, it is the schematic trajector of the relational predication that is put in correspondence with the profile of the nominal predication – moreover it is this latter which functions as the profile determinant in the construction. The composite structure (LAMP-ABOVE-TABLE) consequently designates the lamp, not its locative relationship vis-à-vis the table, though this relationship is included as a prominent facet of its base.

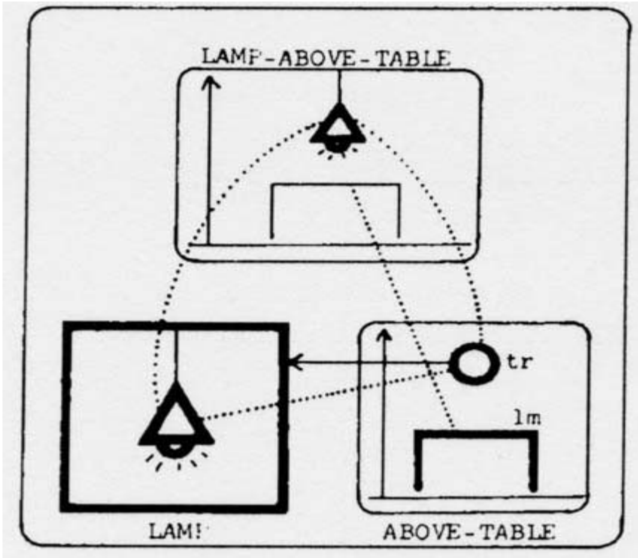

Figure 14

Some grammatically significant observations can be made on the basis of these examples. For one thing, we see that either a relational or a nominal predication is capable of serving as the profile determinant in a construction. In Figure 13, it is the relation [ABOVE] which contributes the profile of the composite expression, whereas in Figure 14 it is the nominal [LAMP]. Moreover, the constructs now at our disposal permit workable and revealing characterizations of certain fundamental grammatical notions that have long been problematic, namely 'head,' 'modifier,' and 'complement.' At a given level of organization, the head of a construction can be identified with its profile determinant. *Above* is thus the head within the prepositional phrase *above the table*, whereas *lamp* is the head within the noun phrase *the lamp above the table*. In appositional expressions like *my good friend Geraldine Ferraro* there is no real basis for singling out either component noun phrase as the head – but that is precisely what we expect: because their profiles correspond, and each corresponds to the profile of the composite structure, it is arbitrary to say that the latter inherits its profile from either one of the component structures (as opposed to the other).

To the extent that one component structure, taken as a whole, serves to elaborate a salient substructure within the other, I will speak of the elaborating component as being 'conceptually autonomous,' and the elaborated component as 'conceptually dependent.' In Figure 13(a), then, [TABLE] is conceptually autonomous with respect to [ABOVE] because it elaborates the latter's schematic landmark. In Figure 14, similarly, [LAMP] is autonomous by virtue of elaborating the schematic trajector of the dependent predication (ABOVE-TABLE). The notions modifier and complement can now be characterized explicitly in a way that reconstructs the normal usage of these traditional terms: A modifier is a conceptually dependent predication that combines with a head, whereas a complement is a conceptually autonomous predication that combines with a head. *The table* is consequently a complement (or argument) of *above* in *above the table,* and this entire prepositional phrase functions as a modifier of *lamp* in *the lamp above the table.* What about appositional constructions? Because there is no basis for recognizing either component structure as the head (and often no autonomous/dependent asymmetry), the definitions are correctly found to be inapplicable. In *my good friend Geraldine Ferraro,* neither *my good friend* nor *Geraldine Ferraro* is considered a modifier or a complement of the other.

This conception of grammatical structure has numerous descriptive advantages, only a few of which will be noted by way of conclusion. One advantage is that it readily accommodates variability of constituency, which is in fact quite common. The present framework does not posit phrase trees of the sort familiar from transformational studies, nor does it rely on phrase-structure configurations for the definition of grammatical relations. Constituency is simply the sequence in which component symbolic structures are progressively assembled into more and more elaborate composite expressions. Though a specific order of assembly commonly becomes conventionalized as the sole or default-case sequence, the choice is not inherently critical in this model because alternate constituencies commonly permit the same composite structure to be derived. Moreover, because grammatical relations are not defined in configurational terms, a unique constituency is not essential. What identifies *the table* as the object of *above* in *above the table,* for example, is the fact that the noun phrase elaborates the preposition's landmark. Though constituency happens to be invariant in this case, the critical factor in defining the prepositional-object relation is the correspondence established between the landmark of the preposition and the profile of the noun phrase.

We can better appreciate these points with regard to sentences like the ones in (22):

(22) (a) Alice likes liver.
(b) Liver Alice likes.
(c) Alice likes, but most people really hate, braised liver.

(22)(a) exhibits the normal, default-case NP + VP constituency of English clauses: *Liver* elaborates the schematic landmark of *likes* at the first level of constituency, yielding a processual predication with a specified landmark and schematic trajector; *Alice* then elaborates the trajector of *likes liver* at the second level to derive a process predication whose trajector and landmark are both specific. It should be apparent, however, that the same composite structure will result if the constituents combine in the opposite order, with *Alice* elaborating the schematic trajector of *likes,* and then *liver* the schematic landmark of *Alice likes.* This alternative constituency is available for exploitation, with no effect on grammatical relations, whenever special factors motivate departure from the default-case arrangement. Two such factors are illustrated here. In (22)(b) we observe the topicalization of the direct object noun phrase, normally described as a movement transformation. There is no need in this framework to derive this sentence type by transformation – it can be assembled directly through the alternate compositional path. The second type of situation arises in conjoined structures when two verbs have different subjects but share the same object, as in (22)(c). In lieu of the transformational process of 'right node raising', which supposedly derives this type of sentence from conjoined clauses of normal NP + VP constituency, we can once again assemble the overt structure directly. The two subject – verb constituents are put together first and then combined in a coordinate structure. A direct-object NP is subsequently added, being integrated simultaneously with each conjunct through a correspondence between its profile and the conjunct's relational landmark.

Also eliminable in this framework is the raising rule needed in certain transformational accounts (e.g., Keyser & Postal, 1976) to handle agreement between a subject and auxiliary verb, as in (23).

(23) The lamp is above the table.

The rationale for a raising rule goes something like this: (i) A verb is assumed to agree with its own subject; (ii) *the lamp* is not the logical subject of *be,* which – if anything – has a clause for its underlying subject; (iii) hence, to account for agreement, some rule must raise *the lamp* from its position as subject of *above* and make it the subject of *be.* However the need for such a rule is obviated given a proper analysis of *be* and a suitably flexible conception of grammatical constructions.

The semantic pole of (23) is outlined in Figure 15.[15] Pivotal to the analysis is the semantic value attributed to *be,* of which three main features are relevant. First, *be* is a true verb, that is, a symbolic expression that profiles a process. Second, all the component states of the designated process are construed as being identical; this is indicated by the dotted correspondence lines internal to [BE] that link the three states which are explicitly represented (additional correspondence lines specify that the trajector is the same from one state to the next, as is the landmark). Third, apart from this specification of identity, the profiled process is maximally schematic. *Be* is one of numerous verbs in English which designate a process consisting of the extension through time of a stable situation (cf. Langacker, 1982b; Smith, 1983) – others include *have, resemble, like, know, contain, slope, exist,* and so on – but it abstracts away from the specific content that distinguishes these predications from one another. In summary, [BE] follows through time, by means of sequential scanning, the evolution of a situation that is construed as being stable but not further specified (except for its relational character).

Any single component state of [BE] constitutes a schematic stative relation. At the first level of constituency in Figure 15, the more specific stative relation (ABOVE-TABLE) is put in correspondence with a representative state of [BE], the latter serving as profile determinant. The result is the composite predication (BE-ABOVE-TABLE), which is like [BE] except that all the specifications inherited from (ABOVE-TABLE) are attributed to the situation followed sequentially through time. Observe that the landmark of (BE-ABOVE-TABLE) is now specific, whereas its trajector remains schematic. At the second level of constituency, this schematic trajector is elaborated by [LAMP] to derive the composite structure (LAMP-BE-ABOVE-TABLE), which represents the composite meaning of the full sentence. It profiles the extension through time of a stable situation in which the lamp and the table participate in a particular locative relationship.

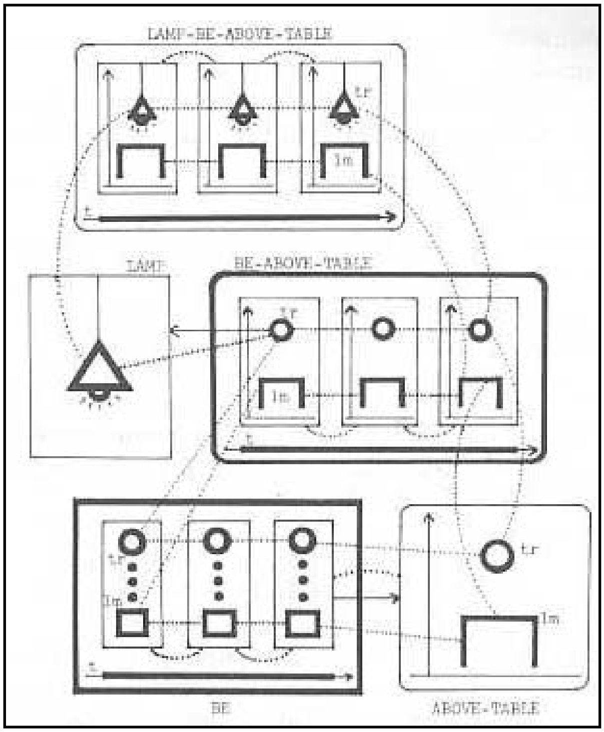

Figure 15

Observe that the sentence is assembled directly, in accordance with its surface constituency. In particular, there is no 'raising' rule which derives it from a hypothetical underlying structure by changing the grammatical relation of the subject NP. But does the *lamp* function as the subject of *be*, as their agreement presumably requires? It certainly does, given the way grammatical relations are defined in this framework. A subject NP is one which elaborates the schematic trajector of a relational predication by virtue of a correspondence established between that trajector and its own profile. With respect to Figure 15, note first that [BE] does in fact have a schematic trajector, characterized as both a thing (not a clause) and a relational participant. Moreover, [BE]'s trajector does correspond to the profile of the *lamp*, when both 'horizontal' and 'vertical' correspondences are taken into account: the profile of [LAMP] corresponds to the trajector of (BE-ABOVE-TABLE), which in turn corresponds vertically to the trajector of [BE]. It is simply incorrect, in this analysis, to claim that *be* has no nonclausal subject, or that the *lamp* is not its 'logical' subject in (23). With no special apparatus, the analysis establishes a relationship between the *lamp* and *be* which is perfectly adequate as a basis for agreement.

Finally, the analysis permits a simple and natural account of sentences like (24)(b), in which an auxiliary verb functions as a pro form:

(24) (a) Q: What is above the table?
(b) A: The lamp is.

As highly schematic process predications, auxiliary verbs are perfectly suited to this role, and sentences of this type are derivable without any deletion operation. Because constituency is potentially variable in this framework, we can derive (24)(b) simply by combining *the lamp* and *be* directly. A correspondence is established between the profile of the former and the schematic trajector of the latter. *Be* is the profile determinant, so the composite structure designates a process involving the evolution of a stable situation through time. Apart from its trajector, identified as the lamp, this situation is characterized only schematically.

7 Conclusion

Due to space limitations, this presentation of cognitive grammar has itself been quite schematic. I cannot claim to have established its validity in these few pages, or to have provided a definitive analysis of any specific range of data. I do however hope to have shown that currently predominant linguistic theories do not represent the only possible way of conceiving the nature of language structure and linguistic investigation. By taking a radically different perspective on questions of meaning and grammar, it is possible to formulate a coherent descriptive framework which promises to be not only adequate and revealing from the purely linguistic standpoint, but also quite compatible with the findings and constructs of cognitive science.

Notes

1 Observe that designation, in my technical sense of the term, does not pertain to the relation between a linguistic expression and the world – rather it is a relationship holding between a cognitive domain as a whole and certain of its subparts. I do not know whether profiling reduces to any independently established cognitive phenomenon. Possibly it constitutes one level of figure/ground organization, but not every figure is a designatum.

2 In these expressions *eye* is evidently construed as the eye region, not the eyeball itself.

3 The constructs needed to make this notion of subjectivity/objectivity precise are introduced in Langacker (to appear) and (in press, Chs. 3 and 7). For vantage point and orientation, see Vandeloise (1984) and Casad and Langacker (in press).

4 Goldsmith (1980) presents a very similar analysis.

5 The importance of conventionality should be emphasized. Often a speaker is led to employ a particular image simply because an alternative construction, which might seem more appropriate, happens not to be conventionally established. For instance,

many verbs of transfer (e.g., *transfer* itself) are not employed in the double-object construction; the *to*-construction represents the speaker's only option with such verbs.

6 At this level of organization, we can ignore the fact that *sharpen* is morphemically complex. The double-headed arrow labeled (e) in Figure 7 indicates identity of the associated structures.

7 Fuller discussion is provided in Chapter 11 of Langacker (in press). Chapters 5–7 greatly elaborate the following discussion of basic grammatical categories.

8 A count-noun referent need not be bounded in all domains or dimensions; a line is sharply bounded in one axis of two-dimensional space, but not necessarily along the other. The bounded region profiled by a term like *circle* may be just a line, but can also be construed as the entire enclosed area.

9 By reversing the trajectory/landmark assignation, we obtain the predicate [BELOW].

10 I omit the dashed line standing for the profiled interconnections, because the nature of these interconnections is implicit in the position of the major participants within the diagrams. Note that I regard these diagrams as heuristic in character, not as formal objects. They are analogous to the sketch a biologist might draw to illustrate the major components of a cell and their relative positions within it.

11 Only for convenience do I speak of discrete states – a process is more accurately viewed as continuous.

12 Besides suspending sequential scanning, the present-participial morpheme *-ing* construes the component states of the base process as effectively homogeneous and imposes an immediate scope of predication confined to a limited internal sequence of such states. The past-participial morpheme has several semantic variants (cf. Langacker, 1982a), one of which confines the profile to the final state of the base process (e.g., *gone* in Figure 4(c)).

13 Specifically excluded from this statement are finite-clause modifiers (i.e., 'unreduced' relative clauses), which require separate treatment precisely because finite clauses have special semantic and grammatical status (the reasons lie beyond the scope of this paper).

14 The component structures are enclosed in boxes, to indicate that *above* and *the table* have the status of units. Closed curves surround the composite structure and the construction as a whole on the presumption that *above the table* is a novel expression (in the text, parentheses serve this purpose).

15 Omitted are the semantic contributions of the definite article and the verb inflection on *be*. Note that our concern is not the nature of agreement, but rather the issue of whether *the lamp* can be considered the subject of *be* in accordance with assumption (i).

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16 The relation of grammar to cognition

Len Talmy

1 Introduction

A fundamental design feature of language is that it has two subsystems, which can be designated as the *grammatical* and the *lexical* (as these are characterized below). Why is there this universal bifurcation when, in principle, a language could be conceived having only a single system, the lexical? The explanation in this chapter is that the two subsystems have distinct semantic functions, ones that are indispensable and complementary.[1] To develop this account further, we must first note that we take a sentence (or other portion of discourse) to evoke in the listener a particular kind of experiential complex, here termed a **cognitive representation** or **CR**.[2] The grammatical and lexical subsystems in a sentence seem generally to specify different portions of a CR. Together, the grammatical elements of a sentence determine the majority of the *structure* of the CR, while the lexical elements together contribute the majority of its *content.* The grammatical specifications in a sentence, thus, provide a conceptual framework or, imagistically, a skeletal structure or scaffolding for the conceptual material that is lexically specified.

More generally, across the spectrum of languages, the grammatical elements that are encountered, taken together, specify a crucial set of concepts. This set is highly restricted: only certain concepts appear in it, and not others, as seen later. The present chapter advances the position that this set of grammatically specified notions collectively constitutes the fundamental conceptual structuring system of language. That is, this crosslinguistically select set of grammatically specified concepts provides the basic schematic framework for conceptual organization within the cognitive system of language.

Thus, grammar, broadly conceived, is the determinant of conceptual structure within one cognitive system, language, and as such is the main object of this chapter's study. But such a study directly opens out into a wider investigation across other cognitive systems, such as those of visual perception and reasoning, and some of the broader structural parallels that then become evident are addressed in other chapters of the present volume and its companion. Hence, the greater issue, toward which the present study ultimately aims, is the general character of conceptual structure in human cognition.

As to its type, the present study can be designated as the **semantics of grammar** or as **closed-class semantics**. Its scope follows in a progression from previous types of study. Such studies have largely been an in-depth semantic analysis of a selected grammatical element (or class of elements) of particular interest within a single language, for example, the Turkish evidential suffix *-mis* (Slobin and Aksu 1982); or an exposition of the meanings and functions of all the grammatical elements of a single language, say, as in a grammar of Dyirbal (Dixon 1972); or a cross linguistic typology of the different kinds of grammatical devices used for a single semantic function, say, to indicate the interrogative (Ultan 1978). And much previous work has also treated broader issues of grammatical meaning (Sapir 1921, Boas 1938, Whorf 1956, Jakobson 1971). But the line of research reported on in this chapter is perhaps the first to address grammatical expression in language at the superordinate level, with the aim of determining the semantic and cognitive properties and functions of this structural component of language as a whole.[3]

The terms **lexical** and **grammatical** as employed here require elaboration. The distinction between the two is made formally – that is, without reference to meaning – in terms of the traditional linguistic distinction between 'open-class' and 'closed-class.' A class of morphemes is considered open if it is quite large and readily augmentable relative to other classes. A class is considered closed if it is relatively small and fixed in membership.

We next look at the particular classes belonging to these two types. The open classes of elements – that is, the lexical classes – that are most commonly encountered in languages are the roots of nouns, of verbs, and of adjectives. The extensive systems of idiophones, or 'expressive forms' found, for example, in a number of Asian and African languages, might also be included as a type of open class. Also to be included, at a level above that of basic elements, are **lexical complexes** – that is, collocations – like English *spill the beans* ('unwittingly reveal a jointly held secret') or *have it in for* ('bear a vengeful grudge against'). Not included are regular adverbs, which seem in all languages to be derived, as from nouns, verbs, or adjectives (as in English from adjectives by the addition of *-ly),* rather than to comprise in their own right an open class of intrinsically adverbial roots. Outside of the class of lexical complexes, the types of open classes identified here are not obligatorily present in every language but rather form a universally available set from which each language draws a subset. That is, while all languages apparently have lexical complexes as an open class, they can lack one or more of the other listed classes – the ones consisting of intrinsically diaphonic, adjectival, verbal, or nominal roots.

Apart from such open-class forms, all other linguistic forms are closed-class – and are considered here to be, quite generally, 'grammatical.' Such grammatical forms include both an overt type and an abstract, or implicit, type. Forms of the overt type can be bound or free. Overt bound forms are inflections, derivations, and clitics. Overt free forms can include, for example, determiners, prepositions, conjunctions, and particles (among which we would include forms like English *even* and *again,* which otherwise are often loosely termed 'adverbs'). Perhaps also to be included in the overt type are such suprasegmental forms as intonation patterns, if intonation in a language is in fact found to resolve into distinct patterns that are relatively few in number and difficult to augment.

The abstract or implicit type of closed-class forms – ones without phonological substance – can include major grammatical categories (e.g., 'noun', 'verb'), grammatical subcategories (e.g., 'count noun', 'mass noun'), grammatical relations (e.g., 'subject,' 'direct object'), word order patterns, and perhaps also 'zero' forms.[4] The fact that grammatical categories, as well as the other types of abstract forms just listed, constitute closed classes is an observable design feature of language, not something to be taken for granted. In principle, a language could conceivably have, say, an open class of grammatical categories that included hundreds of distinct highly particularized members. Indeed, in one analysis, a language can have more grammatical categories than is typically reckoned, including for example, each distinct position class in a polysynthetic verb. Nevertheless, the set of grammatical categories in any language is relatively small and resistant to new additions.

Finally, perhaps also to be included among closed classes are certain categories of **grammatical complexes** including for instance grammatical constructions, syntactic structures, and complement structures. Such complexes consist of specific combinations of simplex closed-class forms, whether these are all abstract, all overt, or a mixture of both (and sometimes in further combination with particular open-class forms). Typically, each grammatical complex resembles a simplex closed-class form in that it represents an abstract schema with a structuring function. However, the inclusion of such complexes here involves certain difficulties. First, it may not always be a determinate matter as to which collection of simplex forms are to be taken as cohering together to constitute a single distinct complex. Second, there is some doubt whether the totality of constructional complexes in a language would in any case constitute a closed-class set – their number might rather be quite large and perhaps even relatively easy to extend (cf. the Construction Grammar approach, e.g., in Fillmore and Kay, forthcoming). To avoid such problems, the present analysis does not depend on the use of grammatical complexes. A complex is cited only if its semantic function is equivalent to that of some simplex closed-class form that otherwise occurs in some language.

2 The nature of grammatically specified concepts

In this section, we elaborate on two of the foundational property differences between the grammatical and the lexical subsystems mentioned earlier. These are the fact that grammatical forms are semantically constrained while lexical forms basically are not, and the fact that the basic function of grammatical forms is to structure conception while that of lexical forms is to provide conceptual content.

2.1 Constraints on grammatical meaning

We begin with a simple demonstration that the concepts specified by grammatical forms are constrained in two ways: as to their categories and as to the member notions within these categories. With respect to the first kind of constraint, many languages have closed-class forms in construction with the noun, such as nominal inflections, that specify the "number" of the object referred to by the noun, for example its 'singularity' or 'plurality', like the English Ø and *-s*. By contrast, no languages appear to have inflections that specify the "color" of the object referred to by a noun – for instance, its 'redness' or 'blueness'. Of course, the "color" category is readily found specified by open-class forms, as in the case of English *red* and *blue*. (Here, double quotes enclose conceptual categories, while single quotes enclose member notions within those categories.)

With respect to the second kind of constraint, even within a conceptual category acceptable for grammatical expression, there are great restrictions on the particular notions that can be specified. Thus, "number" notions expressed by bound closed-class forms include little more than 'singular', 'dual', 'trial', 'plural', 'paucal', and 'singulative'. Free closed-class forms can, as in English, express a few further notions, such as 'no', 'some', 'many', 'most', and 'all'. But the "number" category apparently never includes closed-class expression of such notions as 'even', 'odd', 'dozen', or 'numerable'. By contrast, such notions, again, *can* be specified by open-class forms, as is shown by the words just used.

2.1.1 Constraints permitting topological but not Euclidean reference

Given the existence of such constraints on grammatically specifiable notions, we can seek more general principles that determine a number of constraints at once. By one such principle that emerges, grammatical referents generally have a topological rather than a Euclidean character. To begin with one of the topological properties exhibited, consider a deictic like the English *this* or *that* as in *This/That chair is broken.* A closed-class element of this type specifies the location of an indicated object as being, in effect, on the speaker side or the non-speaker side of a conceptual partition drawn through space (or time or other qualitative domain). This integral specification can be analyzed as containing the component notions enclosed by single quotes in (1).

(1) (a,b) a 'partition' that divides a space into 'regions'/'sides'
(c,d,e) the 'locatedness' (a particular relation) of a 'point' (or object idealizable as a point) 'within' a region
(f,g) (a side that is the) 'same as' or 'different from'
(h,i) a 'currently indicated' object and a 'currently communicating' entity

Other notions that might at first be ascribed to such deictics, such as of distance or perhaps size, prove not to apply, on the evidence of sentence pairs like (2).

(2) a. This speck is smaller than that speck.
b. This planet is smaller than that planet.

The scenes referred to by (2a) and (2b) differ greatly, involving tiny objects millimeters apart or huge objects parsecs apart. But the sentences differ only lexically, not grammatically. Hence, the scenes' differences as to the magnitude of size or distance must arise from the open-class elements; they cannot be traced to the deictics (or other closed-class elements) in the sentences. Thus, the notions specified by a *this* or a *that* are abstracted away from any particularities of magnitude and so, to this extent, are genuinely topological. Their schematic representation of a conceptual partition remains constant, but this partition's distance can – by the characterization of topology as 'rubber-sheet geometry' – be 'stretched' indefinitely without challenge to any semantic constraints of the deictics. These deictics thus appear to have the topological property of being **magnitude neutral**.

Another closed-class form that exhibits this topological property in space is the English preposition *across*. This form can be used to refer to a path of any length, whether one of inches, as in *The ant crawled across my palm,* or one of thousands of miles, as in *The bus drove across the country.* Once again, what this closed-class form is dedicated to representing is a schema – in idealized form, that of a point describing a path that goes perpendicularly from one to the other of two parallel lines – and it is neutral with respect to the magnitude of that schema. Further, the same topological property can be exhibited by a closed-class form with respect to time. Thus, the English past tense inflection *-ed* can be used in the sentence *Alexander died, with dignity* with equal felicity whether the time referred to was last year, in speaking of an acquaintance, or over two millennia ago, in speaking of Alexander the Great. As before, this closed-class form refers to a particular schematic arrangement in time – in idealized form, that of a point event located within the period leading up to the point of the present moment – and is neutral with respect to temporal magnitude. These findings about an English deictic pair, preposition, and tense inflection alert us to noticing whether any grammatical elements make specifications about magnitude. A brief survey through more of English and through various other languages suggests that – while there are grammatical specifications for *relative* magnitude[5] – there are possibly never any for absolute or quantified magnitude, whether of size, distance, interval, or other parameters. We can provisionally conclude that the referents of closed-class forms do generally have the topological property of magnitude neutrality.

Another topological property is exhibited by the type of adposition that specifies, for a moving object, certain characteristics of path and of reference point or reference frame. An example of this type is English *through* as used, for instance, in *I walked through the woods.* In this usage, *through* specifies, broadly, 'motion along a line that is within a medium'. The component notions contained here include those in (3).

(3) (a) 'motion'
(b – e) which can be thought of as 'one-to-one correspondences' between 'adjacent' points of 'space' and adjacent points of 'time'
(f) motion that describes a 'line' (i.e., a 'linear extent')
(g) the locatedness of a line within a 'medium'
(h,i) a medium – that is, a region of three-dimensional space set apart by the locatedness within it of 'material' in a 'pattern of distribution' with properties and a range of variation still to be determined

It can be observed, from a sentence pair like (4), that the concept specified by *through* is indifferent to particulars of shape or contour in the linear path described by the moving object. This is evident here because, as before, the two sentences differ only lexically, not grammatically – they both use *through* while referring to different path contours. Another cross-linguistic survey of closed-class elements suggests that they largely have this further topological property of being shape neutral.[6]

(4) a. I zigzagged through the woods.
b. I circled through the woods.

The same English preposition *across* seen above to be magnitude neutral can now also be seen to be shape neutral. For it can be used in a sentence like *I swam across the lake* when referring to a case in which the lake's perimeter and the swim path I followed are greatly irregular. Here, relative to the idealized schema described above for *across,* the two parallel lines have bent and joined to form an irregular loop, while the perpendicular path between them has itself angled and bent.[7]

In the aim of ascertaining any properties common to grammatically specified notions, the notions examined in detail earlier are gathered together in (5). For heuristic purposes, the notions are provisionally divided into two groups on the basis of their relation to topology. Group (a) includes the notions that properly belong to the specific mathematical system of topology, as well as the intuitively comparable notions that ought belong to a language-based system of topology – one that perhaps could serve as the model for the construction of a new topology-like mathematical system. In group (b) are the notions that fall outside any usual conception of topological properties. The first group has fourteen notions, while the second has six – an indication of a substantial propensity for grammatical elements to specify quasi-topological notions. The ratio in this direction is improved if we consider that even several notions in group (b) – the bottom three – resemble topological notions in the sense of involving relativistic relationships between quantities rather than absolutely fixed quantities.

(5) *Some notions found to be specified by grammatical elements*

a. *Topological or topology-like*		b. *Nontopological*
point	singularity	material
linear extent	plurality	space
locatedness	same	time
within	different	motion
region	'adjacency' of points	medium
side	one-to-one correspondence	entity currently
partition	pattern of distribution	indicated/
		communicating

In the complementary aim of ascertaining any properties excluded from grammatical specification, the categories of notions found above *not* to be specified by the elements investigated are listed in (6). Rather than being topological, topology-like, or relativistic, these notions involve Euclidean geometric concepts – for example, fixed distance, size, contour, and angle – as well as quantified measure and various particularities of a quantity: in sum, characteristics that are absolute or fixed.

(6) *Some categories of notions seemingly rarely or never specified by grammatical elements*
absolute/quantified magnitude (of distance, size, etc.)
shape/contour of line
color

The provisional conclusion to be drawn from these findings is that, if grammatical specifications generally correspond to (linguistic-) cognitive structuring, then the nature of that structure is largely relativistic, topological, qualitative, or approximative rather than absolute, Euclidean, quantitative, or precisional.

This preponderant requirement for conceptual neutralities among closed-class elements is in sharp contrast to the referential freedom of lexical items, which can express not only structural abstractions but also wide ranging specificities. For example, specificity as to magnitude is seen in nouns like *inch, yard, mile, pint, gallon, hour, month,* and *year;* and as to shape, in nouns like *square,* adjectives like *straight,* and verbs like *ricochet.*

The significance of these findings can be brought into greater relief. Consider again the earlier example in which the ant crawled across my palm and the bus drove across the country. It is clear that we have a number of cognitive systems that would register and process the differences between these two situations. Thus, we would register the fact that the ant event takes place within a single span of attention, while the bus event extends over days and must be reconstructed in memory. We would process the fact that the ant event occurs within a single scope of perception, while the bus event extends well beyond any such scope and, again, can be pieced together only in memory. We have the cognitive capacity to recognize that the ant event involves a single scene, whereas the bus event involves a continuous succession of shifting scenes. We would cognize the difference in the manner of progression between the ant's alternating six-footed steps and the bus's four-wheeled rotary gliding. We would appreciate the sensor motor differences between standing still while watching the ant's progress, and sitting through bumps and lurches while executing the progression oneself in the bus. Yet, out of all of this rich processing by various cognitive systems, none of it enters the closed-class form *across.* All that such a grammatical form is designed to represent is a spare schema abstracted away from the otherwise available cognitive representations in accordance with certain principles of abstraction, such as the topological principle. It might have been thought simple for a language at least to include two or more grammatical forms that referred to the same geometric schema but that differed in referring as well to different scales of magnitude – for example, one form for a demitasse-sized 'in' and another for an ocean basin – sized 'in'. But the remarkable finding is that, perhaps with only a few arguable exceptions, languages seem to avoid such distinctions in their closed-class subsystem. Thus, as part of its design, the language system includes a component, the closed-class subsystem, dedicated to representing solely a certain kind of abstracted conceptual structure.

As already noted, the specifically linguistic form of topology has somewhat different properties than mathematical topology. To examine such differences, consider the English preposition *in,* which in one main usage refers to a plane so curved as to define a volume of space. First, with respect to properties like those of mathematical topology, the referent of this morpheme is magnitude neutral: *in the thimble/volcano.* And it is shape neutral: *in the well/trench.*

But forms like *in* can also differ from mathematical topology either by being still more abstract or by being more specific. Thus, *in* is more abstract in that its referent is closure neutral – that is, indifferent to whether the curved plane leaves an opening or is wholly closed: *in the bowl/ball.* And it is discontinuity neutral – that is, indifferent to whether the curved plane is solid or gapped: *in the bell-jar/birdcage.* These last two properties would form a proper part of language's topological system, whereas they are strictly excluded from mathematical topology.

For the case where language exhibits greater specificity than mathematical topology, consider again the preposition *across,* as in *I swam across the lake.* This preposition is fully felicitous if I execute a straight swim path that more or less bisects the lake. But now, with the same starting point on the shore, consider a succession of swim paths located as if rotated ever further leftward. One of the later paths will not terminate on the diametrically opposite point of the shore, but at some point not too far along the shore from my starting point. Such a later path will divide the lake into two quite unequal portions, the small portion on the left of the path and the large one on the right. For such a later path, one can no longer say *I swam across the lake.* In terms of mathematical topology, there should be no difference. But here language has the following additional requirement for its schemas: The components of a schema must be of *comparable* magnitude. Thus, although a schema overall is magnitude neutral, the schema's components *are* sensitive to magnitude relative to each other and must in fact be comparably sized. Here, with respect to the idealized *across* schema, the areas on either side of the path running perpendicularly between the two parallel lines must be of comparable size.

For another example, imagine that I am standing at one end of a long narrow table that supports a glass of water 20 feet away from me and a glass of white wine 21 feet away. Although I can say *The closer glass is water and the farther glass is wine,* I can no longer use the deictics *this* and *that* to say *This glass is water and that glass is wine.* One explanation for this behavior is that the components of the *this* schema, as well as those of the *that* schema, are too internally disproportionate here. Thus, to consider just the *this* schema, it should locate its conceptual partition between the two glasses, because of the deictic contrast that the sentence sets up. But the distance from this partition to the schema's referent object, the water glass, is too much smaller than the distance from the partition to the speaker (myself) for the schema to be viable. Distances of more comparable magnitude are required.

In sum, given the general picture developed earlier, the topology-like properties exhibited by closed-class forms must be understood as part of the system of constraints on their meaning. What is important in their topological behavior is not that closed-class forms can vary freely with respect to factors like magnitude and shape – many open-class forms can do the same. It is rather that closed-class forms are constrained from expressing any Euclidean-type particulars of such factors – a constraint that does not apply to open-class forms, which, on the contrary, are free to range over both the topological and the Euclidean. In other words, the important finding is not that the character of closed-class meaning is topological, but rather that it is *only* that and *not* Euclidean as well.

2.1.2 Further neutralities

A constraint against specifying a factor has been represented here as a **neutrality** to that factor. While two such neutralities have resembled aspects of mathematical topology and, hence, been designated by that term, closed-class forms exhibit many further neutralities. In fact, they exhibit indefinitely many more, since closed-class forms cannot express most contentful concepts, such as food preparation, gymnastics, and folk medicine. But out of all such neutralities to particular factors, some have structural significance, either because a certain factor figures prominently in other cognitive systems, or because a closely related factor *can* be represented by closed-class forms. Several further neutralities with this kind of significance are presented next.

First, most closely related to the previous topological properties is the fact that the referents of closed-class forms are also generally **bulk neutral**. That is, the delineations of a closed-class schema represent geometric idealizations abstracted away from the bulk of bodies in space (as well as from the extensions of entities in other domains). Alternatively conceived, such bulk becomes cognitively reduced, or 'boiled down,' to points, lines, planes, and the like. Thus, the schema of the English preposition *along* pertains only to a path moving parallel to and next to a line and is indifferent to the bulk character of that line. This property is evident in the fact that *along* can be used with equal felicity in reference to linear objects with quite different radial extensions, as in: *The caterpillar crawled up along the filament/the flagpole/the redwood tree.* As discussed in chapter I-2, the significance of bulk neutrality as a property in the closed-class system of language is that it seems akin to an apparent structural property of visual perception, namely, the sensing of interior structure within bulk.

Another constraint on closed-class reference is that it is **token neutral**. That is, while closed-class forms regularly refer to types or categories of phenomena, they cannot refer to any particular tokens thereof. A token can be characterized as a specific spatiotemporally bounded phenomenon. By contrast, nouns are free to be either token neutral or token sensitive. In traditional terminology, these are, respectively, common nouns like *cat* and proper nouns like *Shakespeare* or *Manhattan*. Thus, while a language can have proper nouns, it cannot have, say, 'proper prepositions.' What such a proper preposition would be like can be readily envisaged, though. It could, for example, refer to a particular path understood as being executed only once, hence, as being a unique spatiotemporally bounded phenomenon. For an idea of what such forms might look like, each sentence in (7) is given an invented preposition – capitalized to show its status as proper – that purports to refer to a historically unique path-taking. However, constrained by token neutrality, such forms are apparently never found.[8]

(7) a. Jesus walked Astation the hill named Calvary.
b. Moses walked Amatzah the Red Sea.

A final constraint we can observe here is that closed-class meanings are **substance neutral** – that is, they generally cannot be specific as to particular kinds of materials. Thus, the English preposition *through* applies equally well to the different substances named in the sentence: *A bubble passed through the water/milk/mercury.* This constraint would not seem worth singling out except that closed-class forms *can* be sensitive to a closely related factor, namely, phase of matter. Thus, the closed class of directional morphemes in Atsugewi (see chapter 1–3) has a set of forms that together more finely subdivide the conceptual domain covered by English *into,* and these forms mark such phase-of-matter distinctions as 'into solid substance', 'into liquid', 'into fire', and 'into empty space (the air)'.

2.2 Two venues in which the grammatical and lexical subsystems show their structure/content contrast

We have proposed that language, as a design feature of its construction, has two subsystems with complementary functions. The open-class, or lexical, subsystem represents conceptual content, while the closed-class, or grammatical, subsystem represents conceptual structure. We now further treat the fact that these two complementary functions appear in two venues: in any specific portion of discourse, such as a sentence, and within the language system generally or within any particular language.

2.2.1 Within a portion of discourse

We start with the first venue, a portion of discourse. To examine the functional contrast between the closed-class and the open-class type of specification in this venue, consider the full complement of both element-types in a single whole sentence, namely, that selected in (8).

(8) A rustler lassoed the steers.

We first list the closed-class elements present in the sentence and the notions that they specify in (9).

(9) a. -ed 'occurring at a time before that of the present communication'
b. the 'the speaker infers that the addressee can readily identify the referent'

c.	a	'the speaker infers that the addressee cannot readily identify the referent'
d.	-s	'multiple instantiation of object'
e.	a…Ø	'unitary instantiation of object'
f.	-er	'performer of the specified action'
g.	grammatical category "verb" for *lasso*	'eventhood'
h.	grammatical category 'noun' for *rustler/steer*	'objecthood' (for one possibility)
i.	grammatical relations 'subject'/'object' for *rustler/steer*	'agent'/'patient' (among the possibilities)
j.	active voice	'point of view at the agent'
k.	intonation, word order, character of auxiliaries	'the speaker 'knows' the situation to be true and asserts it to the addressee'

The open-class forms in the sentence have specifications that can be characterized as in (10).

(10)	a.	rustle	property ownership, illegality, theft, livestock particular mode of activity
	b.	lasso	a rope configured into a loop and a tail gripped by the hand the loop twirled, cast over the neck of an animal, tautened, and drawn accompanying cognitive intending, directing, monitoring
	c.	steer	object of particular appearance, physical makeup, and so on relation to animal kingdom castration institution of breeding for human consumption

In surveying the two lists, we can see these differences emerge: the grammatical elements are more numerous, and their specifications seem more spare and simpler, and more structural in function. Together, their specifications seem to establish the main delineations of the scene organization and of the communicative setting of the CR evoked by the sentence. The lexical elements are fewer in number, but their specifications are greater in quantity and complexity, and they function more to contribute content than structure. The lexical specifications are greater in three ways: compared to a grammatical specification, each has (1) more total information, (2) greater intricacy of information, and (3) more different types of information together. Taken together, their specifications comprise most of the conceptual content of the CR scene evoked by the sentence.

These grammatical-lexical differences can be set into further relief by in turn varying each element type while keeping the other constant. Thus, varying only the closed-class forms of (8), as is done in (11), seems to alter the scene organization and discourse properties of the referent event but to leave its basic contents intact: we are still on a Western cowboy landscape with the same kinds of participants and activities.

(11) Will the lassoers rustle a steer?

By contrast, varying only (8)'s open-class forms, as in (12), shifts us to a new scene altogether, perhaps to a modern office building, and yet the basic breakup of the scene and of its communicative setting seem to remain the same.

(12) A machine stamped the envelopes.

Continuing with the functional differences between the lexical and grammatical subsystems within a portion of discourse, we observe that open-class forms and closed-class forms *can* incorporate each other's type of references, but that in doing so they tend to assimilate such references to their native type. First, to highlight the contrast between the two types of representation, consider a case where essentially the same concept can be represented by both a closed-class form and an open-class form. Thus, English tense is typically represented for a verb in a finite clause by a closed-class form, either an inflection or a modal, as in (13a) with an *-ed* for the past and an *-s* or *will* for the future. But a nominal in a prepositional phrase cannot indicate tense in that way. If relative time is to be indicated here, one must resort to open-class forms, as in (13b) with the adjectives *previous* to mark the past and *upcoming* to mark the future.

(13) a. i When he arriv*ed*,…
ii When he arrive*s*/*will* arrive,…
b. i. On his *previous* arrival,…
iii On his *upcoming* arrival,...

The cognitive tendency here, it seems, is to treat the concepts of 'past' and 'future' as performing a concept-structuring function when they are expressed by the closed-class forms in (13a), but as constituting additional contributions to conceptual content when they are expressed by the open-class forms in (13b).

Next, consider the case where an open-class form incorporates a semantic component of a seemingly structural type that is otherwise characteristically represented by a closed-class form. Thus, the open-class adjective *pregnant,* in addition to having semantic components pertaining to a gestating condition, incorporates an 'all-or-none' component indicating that this condition is to be understood as being in effect either wholly or not at all – in traditional terms, constituting an 'upgradeable' adjective. But, as in the sentence *She is somewhat pregnant,* this adjective can be put in construction with a closed-class form, *somewhat,* which refers to a 'moderate degree along a gradient'. A semantic conflict thus exists here between the 'all-or-none' component of *pregnant* and the 'gradient' component of *somewhat.* One cognitive process that a hearer can apply to such a semantic conflict is to actively maintain the incompatible concepts in an equipollent status – a process termed 'juxtaposition' in chapter 5 of Talmy 2000, volume II. This process generates an 'incongruity effect' such as humor. Relevant here, though, is another cognitive process that can be applied, one that shifts the conflicting semantic component in one of the items so that it comes into accord with that in the other item. In such a resolution – termed a process of 'shift' in the discussion of conflict resolutions – it is preponderantly the open-class form that gives way to the closed-class form. And indeed here, the 'all-or-none' component of the open-class adjective *pregnant* can shift to a 'gradient' sense to yield a new meaning for *pregnant:* 'a certain degree along in the gestation process'. But it is certain that the closed-class form *somewhat* will not give way to the adjective to wind up meaning something like 'wholly'. Thus, here, as in most semantic conflicts, it is the closed-class form that determines the final conceptual structure. But this is presumably so because setting conceptual structure is precisely the linguistic function of the closed-class subsystem. Correlatively, the otherwise seemingly structure-like component within the open-class form perhaps in actuality behaves cognitively more like an aspect of its content reference.

Finally, consider the complementary case where a closed-class form includes a semantic component of a seemingly content type that is otherwise characteristically represented by an open-class form. In this regard, compare the sentences in (14a) and (14b), which formally differ only in their prepositions. Semantically, though, (14b) differs from (14a) not only in the path schema that it represents, but also by including a rather more content type of concept, that of 'attack', so that the *them* in this sentence is understood as referring to some sort of enemy.

(14) a. We marched/rode/sailed/advanced/ ... toward/past them.
b. We marched/rode/sailed/advanced/ ... upon them.
c. We attacked them.

Since it is the only different form, it must be the preposition *upon* that is responsible for the 'attack' notion. Yet this notion behaves differently there than it typically would if expressed by an open-class form. First, although English speakers readily identify the presence of an 'attack' notion in (14b), they typically do not attribute this notion to *upon,* often thinking instead that it is due to one of the verb choices, say, *march,* even though no 'attack' notion appears with those verbs when used with a different preposition. Second, the 'attack' notion is relatively more attentionally backgrounded than when it is expressed by an open-class form, such as by the verb *attack* itself, as in (14c). Third, perhaps one might deem that the 'attack' notion when expressed by *upon* loses some of what would otherwise be a fully content character and instead becomes assimilated to the path notion that *upon* more foregroundedly expresses, as if the 'attack' notion here somehow becomes 'spatialized.' Thus, when expressed by a closed-class form, a concept that might otherwise be thought to be more one of the content type tends to become obscured, backgrounded, and structuralized. In sum, then, the formal fact of a concept's expression in an open- as against a closed-class form tends to set the function it serves as being either contentful or structural.

2.2.2 Within language or within a language

We turn now to the venue of language as a cognitive system with general properties and constraints. Observations of the kind discussed at the outset have led to the hypothesis that the closed-class forms found in all languages – or that could occur in all possible languages – are semantically a special set, limited to representing only certain conceptual categories and, within those categories, only certain member concepts. To put this another way, language may have a universally available, limited **inventory** of concepts categories represented grammatically. Such an inventory is of course understood here not to be absolutely fixed in its boundaries and membership. As with every structural and substantive aspect of language – or, for that matter, of cognition – it appears that virtually nothing is rigidly absolute but rather that virtually everything is fuzzy or plastic to at least some degree. Nevertheless, we do posit a privileged inventory, albeit perhaps a partially approximate one, of grammatically expressible concepts. No comparable inventory for lexically expressible concepts exists because open-class forms can for the most part refer to anything within the whole range of the potential contents of consciousness.

At present, no single overarching principle can be adduced to account for the particular membership of the grammatically specifiable inventory. All that can as yet be discerned are several factors, each of which captures only one observable pattern of constraints – constraints that account for only a portion of the inclusions in and exclusions from the inventory. One such factor was already discussed: the constraint against Euclidean-type particulars and the allowance of topology-like neutralities for closed-class reference. Another factor is discussed in Talmy (2000) chapters I-5 and I-6: with a basis in Gestalt principles, a closed-class form may relate a Figure event to a Ground event, but it is constrained against relating a Ground event to a Figure event. More such factors of limited application can be adduced, but so far, they cannot be seen to fall out from one master principle.

The origin of the posited inventory remains to be understood. One strong possibility is that at least parts of it are innate. In terms of major cognitive systems, the language system and the culture system (see Talmy 2000 chapter II-7) were the last to evolve. In forming, they may have copied, or developed connections to, mechanisms of cognitive structuring already present for other major cognitive systems, ones long in place, such as those of visual perception, motor control, and reasoning/inferencing. In that case, the language system would have incorporated some of those extant structuring mechanisms. But it would not have incorporated them all, and the pattern of selection may have been neither wholly systematic nor wholly functional (i.e., on a basis describable by a functionalist view). This possibility could account for any lack of an overall principle governing the inclusions within the inventory.

The posited universally available inventory has the further property of being **graduated**. Its member concepts and categories range along a cline with respect to the extent of their representation across languages. Thus, it may well be that some of the top-of-the-cline entries in the inventory in fact *are* universally realized. Likely candidates for this status include the category of "polarity" with the member notions 'positive' and 'negative', and the category of "speaker-to-hearer stance" with the member notions 'assertion' and 'question'. Other entries in the inventory may be widespread but not universal. The category of "number" may be an example. Still other entries might be rare but not wholly absent. Thus, some, but only a few, languages have closed-class representation for the category "rate" with member notions 'fast' and 'slow'. Finally, some conceptual categories or individual concepts are altogether off the inventory. As discussed at the outset, the category 'color' may well be one of these, but, if not, then certainly the category of 'gymnastics' is missing from closed-class representation in the inventory.

Among its other ramifications, the hierarchical inventory posited here has implications for theories of grammaticization. Such theories have typically devoted much attention to the starting points of a grammaticization process – that is, to the particular instances and types of lexical forms whose original meanings become progressively bleached. But these theories typically lack any account of the ending points of such a process – in other words, of the instances and types of grammatical meanings that result from the bleaching. The gap in such theories can be filled by the present idea of a universally available inventory of grammatically specifiable concepts. Put succinctly, the process of bleaching can lead only to a member of the inventory.

To illustrate, consider the two regular English verbs *keep* and *hate,* as in *I keep skiing* and *I hate skiing.* It will perhaps be generally agreed that if one or the other of these two verbs were to become grammaticized, say, to auxiliary status, while retaining its central sense, it would be *keep* and not *hate.* The explanation that can now be given is that the central meaning of *keep,* which pertains to temporal structure, specifically, to an iteration, fits the category of "aspect", as well as its member notion 'habitual', which are high in the graduated inventory. By contrast, the category that *hate* would fit, that of "affect", as it happens, is relatively low in the graduated inventory. Thus, perhaps no language includes a closed set of grammatical forms that subdivide the category of "affect" in a systematic manner, in the way that, say, English prepositions systematically subdivide the category of "paths executed with respect to reference objects", or that English modals subdivide the category of "force dynamics". Rather, languages exhibit only sporadic grammatical marking of instances of the "affect" category. Perhaps the most widespread of these are diminutive inflections that mark a feeling of 'affection' and pejorative inflections marking a feeling of 'dislike'. Other cases are desideratives marking 'wish' and optatives marking 'hope', undergoer constructions (as in the English *My plants all died on me)* marking 'unpleasantness', and individual forms like the English conjunction *lest* marking 'concern'. Moreover, within this already poorly represented "affect" category, the specific notion of 'hate' is perhaps still more rarely or never represented grammatically. Accordingly, the English verb *hate* is unlikely to grammaticize into an auxiliary that means 'hate'. Thus, it is the universally available inventory of grammatically expressible concepts with its particular content and hierarchy that seems to govern the possible courses of a process of bleaching toward grammaticization.

From the role of the structure and content subsystems within language in general, we turn briefly to their role within individual languages. The posited inventory of grammatically specifiable categories and concepts has been characterized as universally available, not as universally realized, because, within each language, the extant set of closed-class forms constitutes only a selection from the inventory. We have held that, within the overall language system, the inventory of concepts potentially expressed by closed-class forms functions as the conceptual structuring subsystem of language, relative to the content-providing function of its open-class subsystem. Within each language, comparably, the closed-class portion of its lexicon functions as the conceptual structuring subsystem of that language, while the open-class portion of the lexicon functions as its contentful subsystem. It remains to determine whatever principles may govern the nature of the selection from the overall inventory for occurrence within a given language. Such principles would presumably include ones concerning the size and representativeness of the selection.

In sum, then, it is proposed that language as a cognitive system has two subsystems that perform complementary functions: providing conceptual content and determining conceptual structure. The structuring subsystem is an approximately closed graduated inventory of conceptual categories and member concepts. In each language, a portion of the lexicon consists of closed-class forms expressing concepts selected from the universal inventory, while the remainder of the lexicon consists of conceptually unrestricted open-class forms. And within any portion of discourse expressed in a particular language, the closed-class forms largely determine the structure of the conceptual complex evoked by the discourse, while the open-class forms contribute the majority of its content. Given this role in discourse, particular languages, and language in general, the closed-class subsystem has accordingly been held to be the fundamental concept-structuring system of language.

3 Categories of grammatically specified notions

The preceding sampling of grammatical elements has yielded a set of notions helpful toward discovering common semantic properties. But the set has been small and unstructured. With a broader and more systematic investigation, patterns of organization among the notions become evident. Grammatically specified notions can be seen to pattern in certain conceptual categories. These will be termed **schematic categories**. In turn, such categories group together within extensive integrated concept structuring systems. These will be termed **schematic systems** (formerly called 'imaging systems').

These schematic systems are relatively independent of each other in content, with each adding a distinct conceptual dimension to those of the others, but their contributions can be coordinated and linked, at times by individual grammatical forms. Three schematic systems are presented in this chapter: configurational structure, perspective, and distribution of attention. Several additional schematic systems can be recognized, including those of force dynamics (which includes causation) and cognitive state. Parts 2, 3, and 4 of Talmy (2000) are, in fact, set up with respect to such schematic systems. These parts include chapters that pertain, respectively, to configurational structure, to attention, and to force.

The notional patterns that appear within these schematic categories and systems exhibit certain organizing principles. Among the principles of this sort that will be detailed below are the following. One principle is an extensive homology between the representation of space and that of time. The first schematic category presented, that of **domain**, includes the space-time distinction, and largely crosscuts the subsequently presented categories. These categories will, in the majority, apply to both space and time, and parallel examples from each domain will be presented side by side.

Another organizing principle is the following: Of the member notions of any schematic category represented in a language, often each notion will be incorporated in at least some lexical items. Correlatively, the language will often contain grammatical forms that interact with each lexicalization type in a way that yields the expression of another notion of the category. Each such type of interaction can be regarded as a type of cognitive operation that converts the indication of one notion to that of another within the same category. This principle can be termed that of **intracategorial conversion**.

A corollary principle is that a language with grammatical forms for converting from notion A to notion B frequently has forms as well for conversion in the reverse direction – that is, it can also trigger the reverse cognitive operation. This principle is termed **reverse convertibility**. In many cases, a language favors only one such direction, having much lexicalization with notion A and simple grammatical means for reaching notion B, but in the reverse direction having only little lexicalization and complex grammatical forms. Languages differ typologically in the directions they favor. This issue will not be taken up here but is treated at length in Talmy (2000, chapter II-1).

Some of the grammatical forms in a language function specifically to perform a particular conversion operation. Others simply make structural specifications that can come into conflict with the specification of a neighboring lexical item. In the latter case, as discussed in the preceding section, the basic pattern is that the grammatical form's specification takes precedence and triggers a kind of operation, a 'shift,' in the lexical item's referent that brings it into accord. Such shifts are actually one member of a set of 'reconciliation processes' – including blends, juxtapositions, schema juggling, and blockage – that can be triggered by the association of a grammatical and a lexical form with incompatible structural specifications. In the nonshift processes, the grammatical specification does not take precedence over the lexical one but plays an equal role with it. Of all these processes, this chapter treats mostly shifts, but others are discussed in Talmy (2000, chapter II-5).

4 Domain

The schematic category of **domain** has two principal member notions, 'space' and 'time'. As the terms will be used below, the kind of quantity that exists in space is, generically, 'matter', and, in respectively continuous or discrete form, is 'mass' or 'objects'. The kind of quantity existing in time is, generically, 'action' and, in continuous or discrete form, is 'activity' and 'acts' – terms here used neutrally as to whether the action is static or changing, autonomous or agentive. These notions thus relate as in (15).

(15) Domain	*Continuous*	*Discrete*
space:	mass	objects
time:	activity	acts

The domain category can be thought to correlate with a putatively further distinct category, state of progression, or simply to incorporate its characteristics. **State of progression** has the two main member notions, **progression** and **stativity**. The concept of progression involves a continuum of successiveness where not all the elements of a referent either exist or are cognized at once. The concept of stativity involves an unchanging fixity where all the elements of a referent are co-present in their pattern of interrelationships and are cognized concurrently. The domain of time, uniquely among the domains, has a fundamental association with progression. All other domains are basically associated with stativity. But operations that shift a referent from one of the member notions of the progression category to the other readily occur, and many are described in Talmy (2000; for example, the fictive motion and the fictive stationariness of chapter I-2). Next, though, we describe shifts within the domain category per se.

4.1 Conceptual conversions between the 'space' and 'time' members of the 'domain' category

Homologies between the linguistic structuring of space and of time will be addressed in the categories that follow. But here we address operations of conversion between these two main members of the domain category. That is, we demonstrate the intracategorial convertibility of 'domain'. Thus, a verb root that lexicalizes expression of an act or activity as a temporal quantity can be associated with grammatical forms, including nominalizations, that signal a cognitive operation of **reification**. By the semantic effect of this operation, the referent becomes conceptualized as an object or a mass, one that can participate in many of the same actions – such as being given or gotten – as a physical quantity, as exemplified in (16).

(16) *An act* | *Rejfied as an object*

An act	*Rejfied as an object*
John called me.	John gave me a call.
I was called by John.	I got a call from John.
Activity	*Reified as mass*
John helped me.	John gave me some help.
I was helped by John.	I got some help from John.

The semantic effect observable in these sentences can be given the following elaboration – here phrased for the discrete type of the upper examples, but applying as well to the continuous type of the lower examples. The original construction represents an 'act' in terms of an Agent affecting a Patient, where the verb represents this act and carries the core notion of affecting. In the new construction, this sense becomes reconceptualized in terms of the transfer through space of a focal condensation of the action from the Agent as Source to the Patient as Goal, where the deverbal noun now represents this condensate as a kind of 'object'.[9]

It can be observed, moreover, that the paradigm of this act-to-object reconceptualization has a further member. Within the original action conceptualization, not only can the Agent affect the Patient and the Patient be affected by the Agent in the execution of an act, but the Patient can also execute the act independently. Correlatively, in the reconceptualization under reification, not only can the Agent give the reified act to the Patient and the Patient get it from the Agent, but the Patient can also 'have' the reified act independently. To represent this 'middle' form, British English in fact uses the verb *have* with the deverbal noun, while American English, perhaps anomalously, prefers the use of *take.* The paradigmatic parallelism is shown in (17).

(17)

An act	*Reified as an object*
She bathed the child.	She gave the child a bath.
The child was bathed by her.	The child got a bath from her.
The child bathed (himself).	The child had/took a bath.

Once reified, the notion of an action is amenable to many more of the conceptions of spatial pathways and manipulations typically associated with a physical object or mass than just the simple transfer from a giver to a receiver. This is seen in such English formulations as *She transferred/redirected/rerouted/forwarded John's call to me,* or *I returned his call,* or *We exchanged calls.* Further, the concept of a reified action is amenable to many of the same cognitive operations as the concept of a physical quantity, as these are represented by such grammatical processes as pluralization, modification, and quantification – for example, in *He gave me three business calls.*

A still greater range of conceptual manipulations is available for some notions. Thus, when the concept of 'attending' is conceptualized as an action through representation by a verb, English grammar affords little more expressive leeway than that found in sentences like *I attended to the music* and *She had me attend to the music.* But when conceptually reified as an entity through expression by the noun *attention,* much more is possible. Thus, the reified entity can behave like a stationary or moving Figure that surfaces as sentence subject, as in: *My attention was fixed on the music; My attention gradually wandered away from the music and on to the events of the day.* Or it can function as a Figure that surfaces as a direct object of a sentence, as in: *The story caught/riveted my attention; The noise attracted/drew my attention away from the book I was reading; I directed/redirected my attention toward/away from the statue, She directed/ drew/called my attention to the painting on the far wall.* And the reified entity can function as a Ground appearing as an oblique object, as in: *The sound was now (squarely/firmly) in (the center of) my attention; The matter was (well) out of my attention; The report eventually came to my attention.*

Even with such increased expressive range, the conceptual reification of action still has limitations, as well as action-based challenges. As an example of limitation, our reified concept of phone calling has not extended all the way to that of a fully physical object, so that English includes no expressions like **John threw/pushed/thrust/slid a call to me.* Moreover, a language with a system of path satellites and prepositions like English is able to express a number of spatial paths even with a verb representing the original action concept. Some of these have reified counterparts. Thus, *We called back and forth to each other* has such a counterpart in *We exchanged calls.* But some constructions of this kind do not. Thus, *I called around to set up the meeting* has no counterpart like **I circulated calls to set up the meeting,* and *I called ahead to let them know we were coming* has no counterpart like **I sent a call to let them know we were coming.* Nevertheless, the reified representation of an action would seem overall to permit a greater range of conceptual manipulations. The reason is that it employs the open class of verbs to represent such manipulations. By contrast, the representation of an action *as* an action with a verb tends to depend on such closed classes as satellites and prepositions to represent further conceptual manipulations, and such closed classes contain fewer options of expression.[10]

A reconceptualization that is the reverse of reification also occurs. A noun referring to an object or mass can be associated with grammatical forms, including verb-forming derivations, that signal a cognitive operation of **actionalizing**. By this operation, the physical referent is melded together with some of the activity in which it participates, with the semantic effect that much of the referent's tangible concrete character is backgrounded, subordinated to a conceptualization in terms of a process of occurrence, as illustrated in (18).

(18)		*Object(s)/mass*	*Actionalized as*
	a.	Hail(stones) came in through the window.	It hailed in through the window
	b.	Ice is forming over the windshield.	It is icing up over the windshield.
	c.	I removed the pit from the cherry.	I pitted the cherry.
	d.	He has blood coming from his nose.	He is bleeding from his nose.
	e.	She ejected spit into the cuspidor.	She spat into the cuspidor.
	f.	Crowds of people went to the fair.	People thronged to the fair.

This analysis of the space and time members of the domain category and of conversions between them points to a possible typology. Languages appear to fall into two main typological categories on the basis of the most characteristic form of lexicalization they use to refer to physical objects and substances. Those that favor nouns – presumably the majority type – are **object-dominant** languages, while those that favor verbs are **action-dominant** languages. English is clearly an object-dominant language, preferring to refer to physical entities in terms of their tangible materiality through the use of nouns. But, as seen in the preceding example set, it also has the capacity to actionalize such reference through the use of verbs, conceptually incorporating the materiality into the dynamics of an occurrence. It does this mainly with denominal verb derivation but, in some measure, it also has simplex verbs already lexicalized to incorporate reference to physical entities. An example is *(to) flow,* which refers to a fluid substance moving along a path.

By contrast, Atsugewi, a Hokan language of northern California, is an action-dominant language. Its most characteristic way to refer to physical objects and substances is with verb roots (as well as with certain affixes to the verb root), which include such examples as: -*swal*- 'for a flexible linear object to move/be located' and –*qput* 'for loose dry dirt to move/be located' (see Talmy 2000 chapters II-1 and II-2). For example, in a situation where English might say *There's a rope lying on the ground,* Atsugewi might use the single polysynthetic verb form *ẃoswalak·a.* This form contains the verb root -*swal*- followed by the Path + Ground suffix -*ak·* 'on the ground', and preceded by the Cause prefix *uh*- 'as a result of gravity/an object's own weight acting on it'. The verb form begins and ends with a set of inflections that together indicate a third-person subject and the factual mode. As a whole, the verb form can thus be glossed as 'a-flexible-linear-object-is-located on-the-ground because-of-gravity-acting-on-it'. But to suggest its nounless flavor, the Atsugewi form can perhaps be fancifully rendered in English as: 'it gravitically-linearizes aground'. In this example, then, Atsugewi refers to two physical entities, a ropelike object and the ground underfoot, without any nouns. In a pattern complementary to that of English, Atsugewi in some measure does have simplex nouns referring directly to a physical object or substance – for instance, *naha* 'head'. But most nominal forms in Atsugewi, even ones that we might think refer to some of the most basic physical entities, are nominalizations derived from verbs. For example, the noun for 'sun/moon', *ćnehẃu*, is a nominalization of the verb root -*hẃ*^{u}- which means 'to describe an arc across the background of the sky' and which could be used by someone looking up to observe a child leaping from one tree across to another.[11]

4.2 Further members of the 'domain' category

We can note that the category of domain includes other member notions than just space and time. For an example, recall from section 2 that *this* and *that* specify a partition drawn through space – and can do so through time as well – and indicate that a referent entity is on the same or the other side of the partition as the speaker. Now consider the English pronouns *you* and *they* in their indefinite usage (akin to German *man* or

French *on*). These also specify a partition, but one drawn through **identificational space**, understood as a new conceptual domain. They indicate, respectively, that 'the average person' is or is not identified with the speaker in some relevant respect – that is, is on the same or the other side of the identificational partition as the speaker.

Thus, a consumer of organic food that is visiting a new neighborhood can ask a passerby about the purchase of organic food with *you,* but about the sale of organic food with *they.*

(19) a. Where can you buy organic food around here?
b. Where do they sell organic food around here?

But a person looking for a location to open an organic grocery would ask a business consultant in the neighborhood about purchases and sales with the reverse assignment of *you* and *they.*

(20) a. Where can you sell organic food around here?
b. Where do they buy organic food around here?

5 Configurational structure

The first schematic system we treat is that of **configurational structure**. This system comprises the schematic structuring or geometric delineations in space or time or other qualitative domain that closed-class forms can specify. Closed-class forms can ascribe such structure to the whole of a referent scene, thus partitioning that scene into entities in particular relationships, or to any of those entities themselves, or to the paths described by such entities when their interrelationships change through time. With respect to closed-class forms, the configurational system thus encompasses most aspects of the schemas specified by spatial or temporal adpositions, subordinating conjunctions, deictics, aspect/tense markers, number markers, and the like.

Seven schematic categories within the configurational system are presented in this section, together with an analysis of the way the first three of these categories interact. In addition, further properties of the configurational system are treated by the chapters in part 2 of Talmy (2000). In particular, chapter I-3 (this volume) examines the type of spatial relations characteristically represented by a system of adpositions, such as the closed class of English prepositions, which the present section does not directly address.

5.1 Plexity

The category here to be termed **plexity** is a quantity's state of articulation into equivalent elements. Where the quantity consists of only one such element, it is **uniplex**, and where it consists of more than one, it is **multiplex**. When the quantity involved is matter, plexity is, of course, equivalent to the traditional linguistic category of “number” with its component notions ‘singular’ and ‘plural’. But the present notions are intended to capture the generalization from matter over to action, which the traditional terms do not do. It is true that there are the traditional terms ‘semelfactive’ and ‘iterative’ referring, respectively, to one and more than one instantiation of an event. But there is no real temporal equivalent to “number”. “Aspect” includes too much else about the temporal structure of action. And in any case, none of the traditional terms refers generically to both the spatial and temporal domains.

Specifications as to plexity are made by both lexical items and grammatical elements, and there is interplay between the two when they are both in association. Example English lexical items that basically specify a uniplex referent are – for matter and action, respectively – *bird* and *(to) sigh*. They can occur with grammatical elements that themselves specify a uniplexity, like those italicized in (21a) (many languages have here a more regular, overt system of markers than English). But they can also occur with grammatical elements that specify a multiplexity, as in (21b). In this association, such elements can be thought to trigger a particular cognitive operation, one of **multiplexing**. By this operation, an original solo referent is, in effect, copied onto various points of space or time.

(21)		*Matter*	*Action*
a.	*Uniplex*	*A* bird flew in.	He sighed *(once)*.
b.	*Multiplex*	Bird*s* flew in.	He *kept* sigh*ing*.

The operation of multiplexing triggered by the grammatical forms shown here yields a multiplex referent that is unbounded (see section 5.2). But apart from elements signaling dual formation or the like, it is not clear whether there are any grammatical forms (in any language) that directly yield a bounded multiplexity. Such forms might, for example, act on nominal referents to convert ‘a bird’ into ‘a flock’, ‘a tree’ into ‘a grove’, and ‘a kinsperson’ into ‘a family’, or act on verbal referents to convert ‘to sigh’ into ‘to produce a spate of sighs’.

The reverse of the preceding pattern is also found in language. First, there are lexical items that intrinsically specify a multiplexity. English examples are *furniture* or *timber* (i.e., ‘standing trees’) for matter and *breathe* for action, as used in (22a). And, too, there are grammatical forms that can appear in association with these, as in (22b), signaling an operation the reverse of multiplexing – one that can be called **unit excerpting**. By this operation, a single instance of the specified equivalent units is taken and set in the foreground of attention.

(22)		*Matter*	*Action*
a.	*Multiplex*	Furniture overturned in the earthquake.	She breathed with full concentration.
b.	*Uniplex*	A *piece of* furniture overturned in the earthquake	She *took a* breath/ breathed *in* with full concentration

The English grammatical forms seen above that signaled multiplexing – *-s* and *keep -ing* – consisted solely of explicit morphemes. On the other hand, the forms that signaled unit excerpting also included abstract elements: particular grammatical categories that require the insertion of one out of a certain set of lexical items, as represented in (23c,d). The forms can, moreover, contain two or more independent elements. These forms are considered here to be **grammatical complexes**, comparable to other grammatical constructions or indeed to lexical complexes (collocations): they combine distinct elements within a structural whole serving a single overall semantic function.

Actually, though, by one analysis, all grammatical forms are complexes, merely ranked along a cline of elaborateness. Under this analysis, a grammatical form includes not only any explicit and generic elements, but also the semantic and syntactic category memberships of its input and output forms, as represented throughout (23). Thus, the English multiplexing forms, in (23a,b), are merely at the simpler end of a continuum.

(23) a. [[___] N_{upx}+-*s*] N_{mpx}
e.g., *bird: birds*

b. [*keep* + [___]V_{uxp} + *-ing*] V_{mpx}
e.g., *sigh: keep sighing*

c. [N_{unit} of +[___] N_{mpx}]N_{upx}
e.g., *furniture: a piece of furniture*

d. [V_{dummy} + [[___]V_{mpx} + DERIV]N_{upx}]V_{upx}
e.g., *breathe: take a breath*

e. [[___] V_{mpx} +PTC]V_{upx}
e.g., *breathe: breathe in*

Support is lent to the thesis that a more elaborate grammatical complex can have a semantic unity by the existence, within the same or another language, of a simpler form with the same semantic function. As an example of just this circumstance, the English unit-excerpting complex for nouns, which is rather elaborate, is paralleled in function by a simple suffix in Yiddish, either -¨*l* or -¨*ele* (otherwise indicating diminutives), as illustrated in (24).

(24) zamd 'sand': zemdl 'grain of sand'
groz 'grass': grezl 'blade of grass'
shney 'snow': shneyele 'snowflake'

And the English unit-excerpting complex for verbs, also elaborate, has a simplex counterpart in the Russian verb suffix *-n(u)-*, which, for example, can be added to the infinitive *čix-at'*, the unmarked imperfective form that means 'to sneeze a multiplex number of times', to yield *čix-nu-t'* 'to sneeze once'.

5.2 State of boundedness

Another category within the system of configurational structure is **state of boundedness**, which has two principal member notions, that of **unboundedness** and that of **boundedness**. When a quantity is understood as **unbounded**, it is conceived as continuing on indefinitely with no necessary characteristic of finiteness intrinsic to it. When a quantity is understood as **bounded**, it is conceived to be demarcated as an individuated unit entity. Entailed by the boundedness category, but conceptually isolable from it, is the notion of a **boundary**. In the prototypical conceptualization, a boundary touches or constitutes the outermost portion of a bounded quantity, so that the boundary 'encloses' the bounded quantity, and the bounded quantity lies 'within' the boundary. Where applicable, as with objects in space or actions in time, a boundary is prototypically of a dimensionality one lower than that of the bounded quantity, so that a plane bounds a volume, a line bounds a plane, and a pair of points bounds a line. The concept of a partially bounded quantity – for example, a line with only one end point as a boundary – also figures prominently in linguistic structuring but is not treated here (see the 'Motion-aspect formulas' in Talmy 2000 chapter I-3/this volume, section 2.8). An unbounded quantity, correlatively, is conceptualized as having no outer boundary.

In application to nouns, state of boundedness largely corresponds to the traditional linguistic distinction between 'mass' and 'count,' and in application to verbs it can correspond to the distinction between 'imperfective' and 'perfective,' among other terms (the closeness of these correspondences varies with different usages of the traditional terms). However, as with plexity, the concepts designated by the new terms are intended to capture the commonality across the space and time domains and to generalize over their usually separate analyses.

Among English examples of lexical items, *water* and *(to) sleep* basically specify unbounded quantities, whereas *sea* and *(to) dress* basically specify bounded ones. These specifications are demonstrated by the fact that these words are, respectively, unacceptable and acceptable in construction with the grammatical complex '*in* $\mathrm{NP}_{\text{extent-of-time}}$,' which itself specifies boundedness, as seen in (25).

(25)		*Matter*	*Action*
a.	*Unbounded*	*We flew over water in one hour.	*She slept in eight hours.
b.	*Bounded*	We flew over a sea in one hour.	She dressed in eight minutes.

As with plexity, grammatical elements exist that can, in construction with a lexical item, shift its basic specification for state of boundedness to the opposite value. Those acting in this way on an unbounded-type lexical item, in effect, trigger a cognitive operation of **bounding**, or **portion excerpting**. By this operation, a portion of the specified unbounded quantity is demarcated and placed in the foreground of attention. Examples of such grammatical elements in English are shown in (26). Note that while simplex grammatical forms for unit excerpting were lacking in English and had to be cited in other languages, English does have a simplex grammatical form, *some,* which can signal portion excerpting for both spatial and temporal entities.

(26) a. *matter*
[$N_{\text{bounded quantity}}$ of +[___]N_{unbd}]
e.g., *water: body of water*
another form: *some water*

b. *action*
[[___]V_{unbd} +for $N_{\text{extent of time}}$]$V_{\text{bd}}$
e.g., *sleep: sleep for an hour*
other forms: *sleep from 3:00 a. m. to 4:00 a. m., sleep for a while/ sleep some*

When semantically unbounded nouns are grammatically operated on in this way, the resulting forms with their newly bounded referents now *can* appear acceptably with the '*in* $NP_{\text{extent-of-time}}$' constituent, as seen in *We flew over a body of/some water in 1 hour.*

The reverse of the preceding pattern also exists. The English nouns *shrub* and *panel* each refer intrinsically to a bounded entity. But the grammatical elements *-ery* and *-ing* can be added to them, yielding *shrubbery* and *paneling,* forms that now refer to unbounded quantities. In effect, the grammatical elements have triggered a cognitive operation of **debounding** whereby the quantity formerly within bounds is now conceptualized in a form with indefinite extension.

In English, however, such elements are not productive. They cannot, for example, be used with *sea* to yield the meaning 'pelagic water', nor with *(a) tear* to yield 'lachrymal fluid'. One mechanism resorted to in many such cases, including that of *tear,* is the use of the plural, as in (27).

(27) Tears flowed through that channel in Hades.

There seems to be a sequence of cognitive operations here in getting from a bounded to an unbounded quantity. Speculatively, the bounded quantity is first treated as a uniplex entity, it is then multiplexed, the resultant entities are conceived as spatially juxtaposed, and their boundaries are finally effaced, creating an unbounded continuum.

Another debounding mechanism available for a noun is to shift the grammatical category of the noun from count to mass. One construction with this mechanism – seen in the well-known example *There is cat all over the driveway* – includes the deformation of the original referent. But in another type of construction, the physical integrity of the original bounded object is maintained. Further, this construction, which may include a measure term of a particular dimensionality, can trigger debounding solely along one or two dimensions of the original object. Thus, in the sentence *There are probably (10) miles of pencil in that stationery store,* which includes the one-dimensional measure term *mile,* the concept of a pencil is maintained physically intact, is debounded solely along its long axis, and might typically evoke an image of a series of pencils aligned end to end (although the same sentence with *(10) miles' worth of pencil* might simply evoke an image of successive or summary measurement). Comparably, in accord with the two-dimensional term *acre* in the sentence *There are probably (10) acres of movie screen in that old film studio,* the concept of the screen is debounded over its plane.

The preceding series of constructions shows that the concept of debounding covers several conceptual subtypes. Under debounding, the original bounded entity is extended through deformation in the 'cat'-type construction. In the 'shrubbery' type of construction, it has its outer boundary effaced, and it is extended outward by the addition of like material. In the 'tears'-type of construction, it is extended by contiguous multiplexing, with perhaps only a partial conceptual effacement of the boundaries. And in the 'pencil' type of construction, it is extended by multiplexing and the instantiations are maintained intact, but they are aligned and considered over the extent of the alignment.

Though it is not clear why, languages seem to have scant grammatical means for use with a verb to debound a reference to a bounded action. But such debounding can be readily imagined. Thus, if the verb *(to) dress* basically refers to the bounded action 'put on a full complement of clothing', then the debounded counterpart should mean 'put on more and more/ever more clothing'. This last locution can in fact represent the debounded sense, as in *As punishment through eternity, the demon had to put on more and more/ever more clothing.* But to represent this debounded sense, the verb *dress* itself can enter into constructions that range from being only moderately to just barely acceptable, as in *?As punishment through eternity, the demon had to keep dressing/dress on and on/dress and dress.* Perhaps the best forms for representing the debounded sense are *dress without end/without a stop,* but these rely on lexical rather than grammatical means.

To examine the state-of-boundedness category further, with respect to an action in time, as has been seen, our concept of boundedness involves both a boundary at the initial point of the action and a boundary at its terminal point. Thus, the action is understood as occupying a finite quantity of time and hence as consonant with the aspectual *in* phrase, which also indicates a finite temporal quantity bounded at both ends. Note that for this reason, we here use the term 'bounded' instead of 'telic,' since the latter term has largely been used in other linguistic work to invoke only a terminating boundary on an event. In general, boundedness of action involves the concept of a finite entity of which progressively more becomes affected by the action until all of it has become affected. Such cumulatively total affectedness can, among other possibilities, consist of exhaustion, as in the nonagentive sentence *The log burned up in 10 minutes* and in the agentive *I ate the popcorn up in 10 minutes,* or of a notion of completion, as in the nonagentive *Water filled the tub in 10 minutes* and the agentive *I dressed in 10 minutes.* (The last example relies on the notion of a canonic complement of clothing over one's body that can be progressively built up to until reached.) Correlatively, unboundedness requires no notion of any finite entity, and if there is some entity getting progressively affected by an action, it is conceived of as nonfinite.

It is noteworthy that the bounded/unbounded distinction pertains only to the entity affected by the action. The action itself and the time during which the action occurs are both bounded quantities, equally so in the unbounded and in the bounded situation. Thus, in the aspectually unbounded sentence *I ate popcorn for 10 minutes,* it is the popcorn – the entity affected by the action – that is conceptualized as having no specific bounds. The action of eating itself, however, is a finite bounded quantity and the amount of time this action occupies is the finite bounded amount of 10 minutes.

These concepts have a particular realization when applying to a spatial path undertaken with respect to a reference object. Here, the bounded/unbounded distinction pertains only to the reference object (relative to the way the path engages it); the path itself and the time taken to execute it are both finite bounded quantities. In particular, a motion sentence with either an *in* or a *for* type of temporal phrase indicates that a finite extent of time with a beginning point and an ending point has been expended on motion, that this motion occurs over a finite extent of space with a beginning point and an ending point (the path), and that the time period and the path correspond at their beginning points, at their ending points, and progressively along their lengths. This is seen, for example, both in the aspectually bounded sentence *I walked through the tunnel in 10 minutes* and in the aspectually unbounded sentence *I walked along the shore for 10 minutes.* In both sentences, the time period is the same, 10 minutes, the traversed path is bounded and finite, (perhaps even the same length), and the progression of the cited time period is coextensively linked with the traversal of the path. The main difference between the two boundedness types is that a sentence with the *in* type of temporal phrase indicates that the reference object with respect to which the path of motion occurs has a physical or conceptual boundary coincident with the beginning and ending points of the path, while a sentence with the *for* type of phrase indicates that there is no such coincidence and, in fact, that the reference object extends beyond the path's end points. This can be termed the principle of **boundary coincidence** for determining state of boundedness. As is usual in language, these two types of indications are conceptualizations that can be imputed to a referent, so that the same referent can be depicted in either way. Thus, both *I walked through the tunnel for 10 minutes* and *I walked through a portion of the tunnel in 10 minutes* can refer to the same event of a finite path located wholly inside a tunnel. But the former foregrounds the tunnel's extension outside the path, while the latter specifies a conceptual entity, a 'portion' of the tunnel, which now does have (fictive) boundaries that coincide with the path's boundaries.

5.3 State of dividedness

The category of **state of dividedness** refers to a quantity's internal segmentation. A quantity is **composite** or (internally) **discrete** if it is conceptualized as having breaks, or interruptions, through its composition. Otherwise, the quantity is conceptualized as (internally) **continuous**.

The present category may be prone to confusion with the preceding one. Contributing to this confusion is the normal meaning range of *continuous,* which as easily covers 'boundlessness' as it does 'internal seamlessness'. However, the two categories can vary independently. Thus, in the preceding section, the lexical examples given for unboundedness, *water* and *sleep,* happened also to be internally continuous.

But the same demonstration of unboundedness could have been made with internally discrete examples like *timber* and *breathe.*

Both lexical and grammatical elements are sensitive, in their specifications, to the distinctions of this category. But there appear to be no grammatical elements that solely specify discreteness or continuity for a quantity, nor any that signal an operation for reversing a quantity's lexically specified state of dividedness. If forms of the latter type existed, we can describe how they would behave. A grammatical form for a continuous-type lexical item would signal an operation of **discretizing**, whereby the originally continuous referent would become conceptualized as a particulate aggregation. Conversely, a grammatical form for a discrete-type lexical item would trigger an operation of **melding**, whereby the separate elements of the original referent would be conceptualized as having fused together into a continuum.

Although such grammatical forms seem lacking, certain indirect or inexplicit mechanisms for these same operations do exist. Thus, the internal continuity specified by the noun *water* can be reconceptualized as internally discrete with the complex form *particles of,* as in: *Water/ Particles of water filled the vessel.* However, this complex form does not directly specify the shift but again governs a several-stage sequence of other cognitive operations. In particular, a lexical form (*particle*) that invokes the concept of a discretized unit of the continuum is pluralized, thus multiplexing that unit concept, and the resulting multiplicity is understood as internally juxtaposed and coextensive with the original continuum. But this construction capitalizes on the independently existing capacity of a plural count noun to designate a composite. Here, no simplex grammatical form directly designates a reconceptualization in terms of interior compositeness, and such forms might be universally absent.

In the reverse direction, there may also be no simplex grammatical forms that directly evoke the reconceptualization of an originally composite referent as internally continuous. In English, it is even difficult to identify complex forms that might yield this effect. Perhaps among the closer candidates for such forms are *a mass of* or *masses of,* as in *a mass/ masses of leaves.* The problems here, though, are that the former expression has a bounded referent, the latter expression is plural, and both expressions indicate great quantity.

On the other hand, there appears to be a general conceptual tendency for a basically composite-type referent of a lexical root to undergo at least some degree of spontaneous melding, without the addition of any explicit grammatical forms. Thus, lexical items with an internally discrete referent – for example, singular multiplex nouns like *foliage, timber,* and *furniture* – tend to evoke a conceptualization of their referents with a degree of blurring and fusion across their component elements. This contrasts with the counterpart plural uniplex nominals *leaves, trees,* and *pieces of furniture,* which maintain the conceptualization in terms of an individuated composite. Spontaneous melding can also be seen in the referents of verbal forms. Thus, if we can take the verb *walk* to refer to an iterated multiplexity of component steps and the verb *step* to refer to just one of these components, *walk* then seems to evoke a greater melding across those components than does the form *keep stepping,* which overtly marks the iteration of the individual component. Comparably, the verb *breathe* suggests greater fusion across its inhalation-exhalation cycles than does the locution *take breaths.*

The two different degrees of melding just seen to be available in referring to a multiplexity might actually be best regarded as just two points along a gradient of conceptual melding from the most individuated to the most fused. Thus, evoking a point toward the most individuated end are constructions in which the elements of a multiplexity are separately indicated, as in *This tree and that tree and that tree are mature.* Indicating a multiplexity with somewhat greater melding, then, is the ordinary plural, as in *Those trees are mature.* Perhaps a still greater degree of melding is evoked by a noun with plural agreement but singular form, like that in *Those cattle are mature.* Finally, the greatest degree of melding across a multiplexity may be shown by nouns with singular agreement and singular form, like that in *That timber is mature.* Of course, beyond the melding of a multiplexity is a referent taken to be fully continuous in the first instance, like that of the noun in *This wine is mature.* Again, a similar gradient might apply to verbally specified actions. Thus, the components of action are more individuated in *The shaman stepped once, stepped again, and stepped once more across the coals,* more melded in *The shaman continued stepping across the coals,* and still more melded in *The shaman walked across the coals,* while the action in *I slid across the patch of ice* is taken to be internally continuous in the first instance. If the gradient notion proposed here holds, the term for this section's category might best be changed to '*degree* of dividedness.'

In general, more grammatical phenomena in language are sensitive to the distinctions of the boundedness category than to those of the dividedness category. For one case, forms with unbounded referents share many grammatical properties, whether these referents are continuous or composite. Thus, in the domain of matter, two types of forms with unbounded referents – mass nouns, whose referents are either continuous or composite, and plural count nouns, whose resultant referents are generally composite – share many syntactic characteristics distinct from those possessed by singular count nouns, whose referents are bounded. For example, most determiners occur either with singular count nouns alone or only with mass or plural count nouns.

(28) a. ____ book/*ink/*books:
a/each/every/either/neither

b. ____ ink/books/*book:
all/a lot of/more/most/*unstressed* some/*unstressed* any
Ø 'generic' *(In my work, I use ink/books/* book.)*
Ø 'progressively more' *(For an hour, the machine consumed ink/books/* book.)*

Correspondingly, in the domain of action, forms with unbounded referents, whether continuous (durative) or discrete (iterative), share syntactic properties not possessed by forms with bounded referents, as seen, for example, in: *He slept/kept sneezing/*sneezed once/*arrived... for hours/ until midnight.*

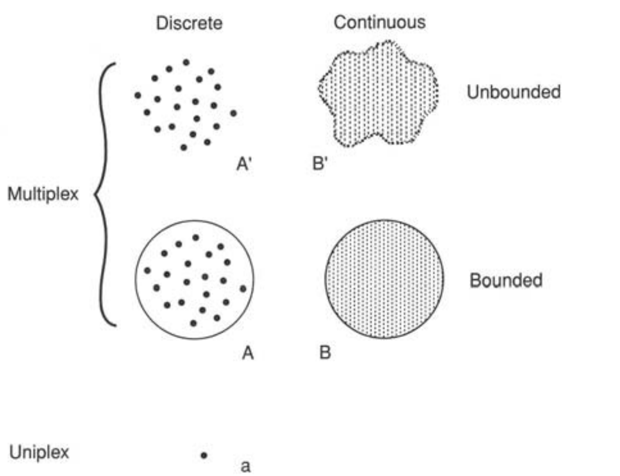
In either space or time, the general explanation for this pattern seems to be that, whether internally continuous or discrete, referents without an outer boundary accommodate syntactic forms that involve a conceptualization of quantity in partitive terms, whereas referents with an outer boundary accommodate syntactic forms that involve a conceptualization of quantity in terms of unit blocks.

Because the category of dividedness has limited realization by itself, further treatment of it will be deferred until the next section, where it can be seen in interaction with the other categories.

5.4 The disposition of a quantity: an intersection of categories

The preceding four categories of attributes – domain, plexity, state of boundedness, and state of dividedness – all pertain to a quantity simultaneously. Taken together, they can be considered to constitute a complex of attributes that may be termed a quantity's **disposition**. The intersections of these categories form an array that can be schematized as in (29).

(29)



+ the distinction between *matter* and *action*, which crosscuts all of the above

To specifically schematize action along the one-dimensional time axis, the two-dimensional format of (29) can be adapted to a one-dimensional format, with modified conventions for indicating the directional progression of the domain of time.

Each intersection of attributes indicated in (29) is specified by various lexical items (although one, a bounded multiplexity for action, is quite minimally represented in English). An example or two (most were seen earlier) is given for each intersection in (30).[12]

(30)	A′:	timber/furniture	B′:	water
		(to) breathe		(to) sleep
	A:	(a) grove/family	B:	(a) sea/panel
		(to) molt		(to) empty
		(The bird molted.)		(The tank emptied.)
	a:	(a) tree/bird		
		(to) sigh		

Now if the particular contentful referent for which one chooses a lexical item happens to be wedded, by that lexical item, to an unwanted set of structural specifications, there generally are grammatical means available for converting this to a desired set. Such means range in directness from specifying the single relevant operation to involving a circuitous sequence of operations (see section 8 on nesting). A number of starting and ending points for such conversions, and the means for accomplishing them, are indicated in (31).

(31)	A′ → A	a stand of/some timber	B′ → B	a body of/some water
		breathe for a while/some		sleep for a while/some
	A′ → a	a piece of furniture		———
		take a breath/breathe in		
	A′ → B′	?masses of leaves	B′ → A′	particles of water
	A → a	a member of a family		———
		?molt a single feather		
	A → A′	members of a family	B → B′	paneling
		(A → a → A′)		
		molt and molt		empty and empty
	a → A′	trees ———		
		keep sighing		
	a → A	a stand of trees ———		
		(a → A′ → A)		
		sigh for a while		

As noted, the table in (31) shows that in some cases, a conversion from one structural disposition to another cannot be accomplished directly by a single simplex closed-class form in English, but rather requires a series of nested operations. Thus, for uniplex *tree* to be converted into a bounded multiplexity, it must first be multiplexed into the unbounded multiplexity *trees,* and that in turn must undergo portion excerption to yield *a stand of trees.* The dispositional structure that this resulting form has acquired is the same as that already lexicalized in the open-class noun *grove* or *copse.*

Returning to the diagram in (29) for further consideration, we note that the two columns in the diagram reflect the dichotomy into which the state-of-dividedness category was analyzed in section *5.3.* But that section also suggested relabeling this category as 'degree of dividedness' since the internally discrete referents of nouns *like foliage* and verbs like *breathe* exhibit some partial degree of spontaneous melding. In a diagram based on this idea, the top row might place fully on the left such entries as *trees, leaves, pieces of furniture,* and *take breaths,* while placing part way toward the right such counterpart entries as *timber, foliage, furniture,* and *breathe.*

The asymmetry in the diagram in (29) – the third row having an entry only in the left column – reflects the fact that a composite quantity can yield one of its components for separate consideration, whereas an internally continuous quantity cannot do so. One might think to make the diagram symmetric by having a 'b' entry in the right column of the bottom row represent a portion excerpted from the 'B" unbounded continuity. This would parallel the unit in 'a' excerpted from the unbounded multiplexity in 'A'. Such an excerpted portion might be represented by a circle filled in with gray. But just such a circle is already represented as the 'B' entry for a bounded continuity. Since no principled distinction holds between two such entries, the diagram has been left asymmetric.

5.5 Degree of extension

Implicit in the vertical dimension of the schematic arrangement in (29) is a further schematic category that can be called **degree of extension**. This category has three principal member notions, terms for which are given in (32) together with schematic representations of the notions for the linear case. Lexical items referring to either matter or action may be taken to incorporate specifications as to their referent's basic degree of extension, and three examples of these for the linear spatial case are also shown in (32).

(32) Point Bounded extent Unbounded extent

speck ladder river

Now a lexical referent that is perhaps most basically conceived as of one particular degree of extension can, by various grammatical specifications that induce a shift, be reconceptualized as of some other degree of extension. For a first example, consider the event referent of *climb a ladder,* which seems basically of bounded linear extent in the temporal dimension, as is in fact manifested in (33) in conjunction with the grammatical element '*in* + $\mathrm{NP}_{\text{extent-of-time}}$'.

(33) She climbed up the fire ladder in five minutes.

With a different accompanying grammatical form, like the '*at* + $NP_{point\text{-}of\text{-}time}$' in (34) (as well as different contextual specifications), the event referent of the preceding can be shifted toward a conceptual schematization as a point of time – that is, as being point durational.

(34) Moving along on the training course, she climbed the fire ladder at exactly midday.

This shift in the cognized extension of the event can be thought to involve a cognitive operation of **reduction** or, alternatively, **adoption of a distal perspective**. This shift can also go in the other direction. The event referent can be conceptually schematized as an unbounded extent by the effect of grammatical forms like '*keep -ing*', '*-er and -er*', and '*as + S*', as in (35).

(35) She kept climbing higher and higher up the fire ladder as we watched.

Here a cognitive operation of **magnification**, or **adoption of a proximal** perspective, would seem to have taken place. By this operation, a perspective point is established from which the existence of any exterior bounds falls outside of view and attention – or, at most, are asymptotically approachable.

The preceding event referent was continuous, but a discrete case can exhibit the same shifts in extension. One such case, perhaps to be considered as most basically of bounded extent, is shown with that degree of extension in (36a). But the referent can also be idealized as a point, as in (36b). Here, clearly, the cows would not all have died at the same moment, yet the spread of their death times is conceptually collapsed into such a single moment. Or the referent can be schematized as an unbounded extent, as in (36c).

(36) a. The cows all died in a month.
b. When the cows all died, we sold our farm.
c. The cows kept dying (and dying) until they were all gone.

The alternative schematizations of extension just seen as specifiable for an event referent are generally also available for an object referent. Thus, for instance, the referent of *(a) box* can be specified for idealization as a point or as a bounded extent (of area or volume). Some grammatical elements making such specifications are illustrated in (37). Also set forth here are the homologies between these and the event-specific elements.

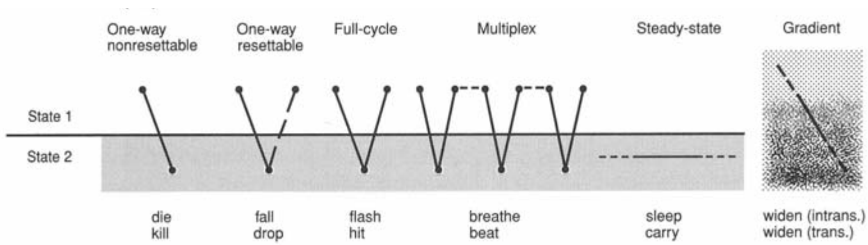
(37) a.	*Point*	The box is 20 feet away from the wall.
		I read the book 20 years ago.
b.	*Bounded extent*	The box is 2 feet across
		I read the book in 2 hours.

5.6 Pattern of distribution

The pattern of distribution of matter through space or of action through time is a further category of notions that can be both grammatically and lexically specified.[14] For action through time – the only dimension we will be looking at here – this category together with the preceding one largely constitute the traditional category of "aspect".

Several of the main patterns of distribution for action through time are shown schematically in (38) (the dots here, which represent situatedness in complementary states, should really be adjacent, but they are sketched apart with a connecting line to show the crossing of state interfaces). Also shown are illustrative English verbs, both nonagentive and agentive, that incorporate these patterns.

(38)

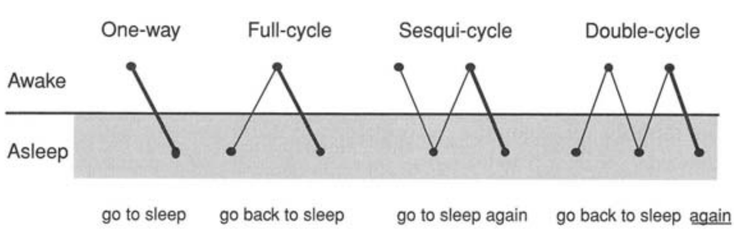


One can determine that these verbs incorporate the specifications indicated by noting the grammatical forms with which they can and cannot occur (or, to put the latter case in our terms: grammatical forms toward whose specifications they will not [readily] shift). A full demonstration is not in order here, but a few examples will show the principle.

The resettable type of a one-way event is distinguished from the nonresettable type by its compatibility with iterative expressions, as in: *He fell three times;* the nonresettable type cannot occur here: **He died three times.* This same one-way form is distinguished from a full-cycle form by its ability to appear in sentences like: *He fell and then got up,* which the latter cannot do: * *The beacon flashed and then went off* A gradient type can appear with adverbs of augmentation, as in *The river progressively widened,* unlike a steady-state type: **She progressively slept.* And so on.

Grammatical elements can, of course, also specify different patterns of temporal distribution, and the present form of diagramming can readily reveal some of their distinctions. Thus, the closed-class elements *back* and *again,* singly and in combination, can indicate versions of full-cycle, sesqui-cycle, and double-cycle patterns, as shown in (39).

(39)



Now consider the circumstance where a verb of one distribution type appears with grammatical forms of another type. The outcome seems invariably to be that the verb shifts its specifications into conformity with those of the grammatical forms. For an example we again take *die,* whose basic specifications can be adjudged as point-durational one-way nonresettable. This verb is used with its basic specifications in a sentence like (40a). But in a sentence like (40b), the grammatical form *'be + -ing'* induces a shift. In effect, the infinitesimal interval between the two states involved for die – that is, 'aliveness' and 'deadness' – is spread out, with the resulting creation of an extent-durational gradient. This is the shift in the distribution pattern's structural type. But concomitantly, a shift in the basic contentful referent is engendered. Instead of 'dying', the new gradient refers to 'moribundity'. The distinction becomes clear in noting that, as the conception is structured linguistically, one can have been dying without having died, and, correlatively, one can have died without having been dying.[15]

(40) a. He died as she looked on.
b. He was (slowly) dying as she looked on.

5.7 Axiality

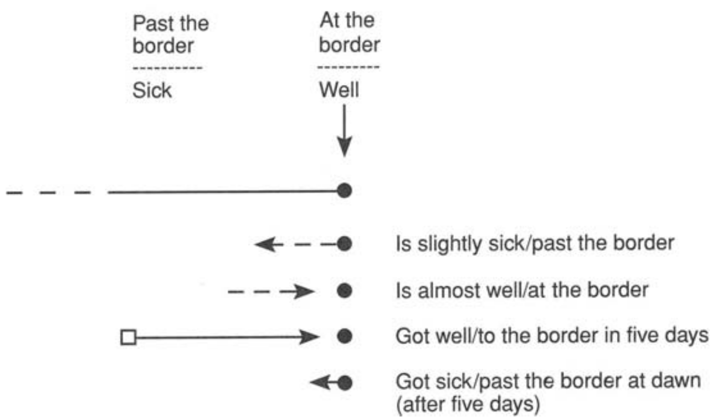
The adjectives in a pair like *well/sick* behave contrarily when in association with grammatical forms specifying degree like *slightly* and *almost,* as seen in (41a), and they select for different readings of temporal forms like '*in* + $NP_{\text{extent-of-time}}$', as seen in (41b). In these respects, perhaps surprisingly, they parallel the behavior of certain kinds of expressions that specify spatial relations – for example, *at the border/past the border.*

(41) a. i. He's slightly sick/past the border.
*well/*at the border.
ii. He's almost well/at the border.
?sick/?past the border.

b. i. He got well/to the border in five days. (i.e., in the course of five days)
ii. He got sick/past the border in five days. (i.e., after five days had elapsed)

This behavior can be accounted for by positing that such adjectives, in referring to a more generic notional parameter, such as that of 'health', are not simply 'opposites' but rather presuppose a schematic axis that is structured and directed in a particular way. Each adjective, then, labels a different portion of that axis. The adjectives here seem in particular to presuppose a directed line bounded at one end; *well* refers to the end point while *sick* refers to the remainder of the line, correlating greater degree with greater distance along the line. These are the **axial properties**, or axiality, of the lexical items – that is, the specific relations each has to a particular conceptual axis and to other lexical items with referents along the same axis. It is the lexicalization of such axiality that can align adjectives with expressions of spatial relation. Grammatical forms like the ones just given also have axial properties, and these can function in consonance with those of a lexical item, as in the acceptable cases of (41), now schematized as to axiality in (42).

(42)



In other cases, though, the axiality of a grammatical form can conflict with that of a lexical item and, accordingly, can cause the latter to shift in a process of resolution to the conflict (see Talmy 2000, chapter II-5). Thus, *sick* in (43) – now associated with grammatical forms that refer to an end point – shifts from its basic 'directed shaft' type of axiality, and indeed from its reference to an axis of 'health'. It now specifies the end point of an axis pertaining to 'feeling poorly'. The addition of the grammatical forms here can be thought to trigger two concurrent cognitive operations. The first is an operation of **punctifying**, whereby a linear extent is conceptually collapsed into a point, as here where the original referent of *sick* reduces from an extended range covering degrees of poor health to a point notion of definitive illness. The second operation is one of **terminalizing**, in which a gradient directed away from an initiating point, as the original referent of *sick* leads away from that of *well,* is converted into the terminating boundary of a gradient that leads toward it, as the new referent of *sick* terminates the gradient *of feeling poorly.*

(43) (After exposure to the virus, he felt worse and worse and) he was almost sick at one point. / he finally got sick in three days.

5.8 Scene partitioning

The system of configurational structure includes the schematic delineations not only of an individual quantity such as an object, an action, or a quality, as dealt with so far, but also of a whole referent scene. Here, the system involves the conceptualization of a particular scene partitioning – that is, a principal division of a referent scene into parts and participants.

A lexical item can specify – in other words, can incorporate or lexicalize within itself – a particular scene partitioning of the event to which it refers. For example, the referent of the English verb *serve* partitions the full situation to which it refers into four main parts: an action, an item served, and a social dyad comprising the two roles of 'host' and 'guest'. The portion of a scene partitioning that constitutes its participant structure – generally, the sentient actor or actors that take part in the scene-can be separately termed the **personation** type for which the verb is lexicalized (as treated in Talmy 2000, chapter II-1). This schematic category, personation type, has two main member notions, the **monadic** type that involves one participant and the **dyadic** type that involves two interacting participants. Thus, while *serve* may have a four-part scene partitioning and a three-part argument structure, it is of the dyadic personation type.

But closed-class forms can also have scene partitioning or personation properties. Thus, the grammatical complex consisting of a singular subject – plus – reflexive object has the semantic specification of a single participant. When such a grammatical form occurs with a dyadic verb like *serve,* it triggers a cognitive operation of **monad formation**. The verb's referent is thereby shifted from its original dyadic personation, illustrated in (44a), to one with monadic personation, as in (44b). In this shifted state, its referent is equivalent to that of an intrinsically monadic expression, like that in (44c).

(44) a. The host served me some dessert from the kitchen.
b. I served myself some dessert from the kitchen.
c. I went and got some dessert from the kitchen.

It must be observed that though the grammatical complex in (44b) is determinative in setting the role number as monadic, a trace of the verb's original dyadic personation type does remain. In the cognitive representation evoked by sentence (44b), the connotation of a dyad is blended in with the denotation of a monad, as if both 'host' and 'guest' are together present in the single person of the 'I.' The construction suggests that the self contains two complementarily functioning subparts, where one subpart acts with hostlike characteristics, such as responsibility and indulgence toward the other subpart, while the other subpart acts with guestlike characteristics, such as receiverhood and a feeling of being looked after by the first subpart.

At work here is a metaphoric process that maps a binary source domain onto a unary target domain in a cognitive operation that can be termed **introjection** (see Talmy 2000, chapter 11–5). Because of this metaphoric introjection of a dyad onto the monad of sentence (44b), that sentence is (aside from other differences of reference due to the different lexical items chosen) not the full semantic equivalent of sentence (44c). The reason is that while this latter sentence also refers to a monad, it does so without any metaphoric impress of a dyad.

While introjection as an operation accompanying monad formation is well represented across languages, its reverse, a putative cognitive operation of **extrajection** that would accompany a process of **dyad formation**, appears to be represented minimally at best. Extrajection would entail that a verb basically lexicalized in the monadic personation type is used in a grammatical context with dyadic meaning, and that a metaphoric impress of the verb's unary character is mapped onto the binary referent. Perhaps the sentence in (45b) does indeed manifest something of this operation. But to be the full complement of the (44b) example, this sentence would have to suggest a metaphoric impress of unarism that encompassed the actions of the two participants in a way felt to be lacking in the simply dyadic sentence of (44c), and this is not at all clear.

(45) a. One twin sang.
b. Both twins sang together (/?jointly).
c. The twins duetted/ harmonized.

6 Perspective

The first schematic system consisted of the configurational structure that closed-class forms can specify for a referent entity. The present schematic system consists of the **perspective** that one can have on such an entity, as this is specified by closed-class forms. This system thus establishes a conceptual perspective point from which the entity is cognitively regarded. While this schematic system is presumably neutral to particular sensory modalities, it is most readily characterized in visual terms as, in effect, pertaining to where one places one's 'mental eyes' to 'look out' upon a referent structure.

The perspective system covers several schematic categories. Included among these categories are ones pertaining to: a perspective point's spatial or temporal positioning within a larger frame, its distance away from the referent entity, its change or lack of change of location in the course of time and the path it follows with change, and the viewing direction from the perspective point to the regarded entity. These categories are treated below.

6.1 Perspectival location

Grammatical forms – as well as lexical forms – can specify the location that a perspective point is to occupy within a referent scene or its speech-event setting. The linguistic literature includes much work on this issue, especially with respect to deixis. In its basic form, deixis sets the position of the perspective point at the speaker's current location. For example, a Figure object's path with respect to some Ground object can be additionally characterized as moving toward or not toward the speaker's viewpoint by such closed-class forms as German *her* and *hin,* as well as by such open-class forms as English *come* and *go.*

The notion of a 'deictic center' extends this basic concept to cover any location within a referent scene to which an addressee is directed to project his imaginal perspective point by linguistic forms (see Zubin and Hewitt 1995*).* Consider, for example, the following bit of narrative: 'She sat in the rocker near her bed and looked out the window. How lovely the sky was!' In the first sentence, the use of a third-person pronoun together with the objective scene description invites the listener to place his perspective point somewhere in the depicted room looking at the sitting woman. But in the second sentence, the exclamatory *how*-construction, together with the expression of subjective experience, induces the listener to relocate his perspective point to the location of the sitting woman, in effect, looking out through her eyes.

To treat a further example with more explanatory detail, consider the sentences in (46) (adapted from a Fillmore example used for another purpose). The first sentence induces the listener to locate her perspective point inside the room, whereas the second sentence inclines toward an external perspectival location (or perhaps to a nonspecific one). How is this accomplished? The cognitive calculations at work appear to combine a rule of English with geometric knowledge. Though often breached, an apparent general rule in English is that if the initiator of an event is visible, it must be included in the clause expressing the event, but if not visible, it must be omitted. Thus, if a glass I am holding slips from my hand, I can felicitously say to a bystander *I dropped the glass,* but not *The glass fell.* Accordingly, in (46a), no initiator of the door's opening is mentioned, hence none must have been visible. But the second clause indicates that the apparent initiator, the two men, moved from outside to inside the lunchroom. Assuming opaque walls and door, the only way that an entering initiator could not be visible to an observer during the door's opening is if that observer were located inside the lunchroom. In (46b), by contrast, the initiator is mentioned, hence must be visible. The only way a door-opening initiator who moves from the outside to the inside can be visible to an observational perspective point is if that perspective point is outside. An index of the capability of our cognitive processing is the rapidity with which a hearer of, say, sentence (46) can combine an English visibility principle, geometric understanding, and real-world knowledge to yield a clear sense of interior perspectived location.

(46) *Position of perspective point*
a. Interior: The lunchroom door slowly opened and two men walked in.
b. Exterior: Two men slowly opened the lunchroom door and walked in.

6.2 Perspectival distance

A second schematic category that closed-class forms can specify for a perspective point is that of **perspectival distance**. The main member notions of this category are a perspective point's being **distal**, **medial**, or **proximal** in its relative distance away from a regarded entity. Perspectival distance was shown in section *5.5* to correlate with the schematic category of degree of extension. There it was seen that typically a distal perspective correlates with a reduced degree of extension, a medial perspective with a median degree of extension, and a proximal perspective with a magnified degree of extension. It is not clear whether perspectival distance *necessarily* correlates with degree of extension, or with certain other categories. But it seems to be a frequent concomitant and, in any case, it can, on the basis of the visual analogy, function as an organizing aegis to coordinate conceptual phenomena pertaining to the scope, size, and granularity of a referent. Thus, *as with* a distal perspective, there occurs a conceptual correlation of larger scope of attention, apparent reduced size of entities, coarser structuring, and less detail, while *as with* a proximal perspective, there occurs a conceptual correlation of smaller scope of attention, apparent magnified size, finer structuring, and greater detail.

6.3 Perspectival mode

A third schematic category pertaining to perspective point is **perspectival motility** – that is, whether a perspective point is **stationary** or **moving**. Rather than treating this category in isolation, we observe that its members generally function together with members of the category of perspectival distance. The member notions of these two categories tend to align thus: the stationary with the distal and the moving with the proximal. In addition, these conceptual alignments are generally further linked to two different scopes of attention – that is, with a factor from the next schematic system – respectively, with a global scope of attention and with a local scope of attention. Finally, these two associational complexes can be deemed to make up a larger schematic category, that of **perspectival mode**, whose two main members can be termed the **synoptic** mode and the **sequential** mode, as summarized in (47).

(47) *Perspectival mode*

a. Synoptic mode: the adoption of a stationary distal perspective point with global scope of attention
b. Sequential mode: the adoption of a moving proximal perspective point with local scope of attention

Different types of referent situations may tend to correlate with one or the other perspectival mode. In particular, a basic association may tend to exist on the one hand between a static situation and the synoptic mode of cognizing it, and on the other hand between a progressional situation and the sequential mode of cognizing it, and realizations of such correlations with appropriate closed-class forms are readily evident. In addition, though, often an alternative set of closed-class forms can direct the cognizing of a referent situation with the opposite perspectival mode.

6.3.1 Sequentializing

For illustration, consider first an example with a static referent, one of objects in location – in particular, a scene with a few houses dispersed over a valley. This single scene can be alternatively represented by the two perspectival modes. The synoptic (47a) type of perspectival mode – the one more congruent with such a referent – is invoked in (48a). It is multiply specified there by the set of grammatical forms shown underlined, namely, plural number and agreement, the determiner *some* indicating a moderate total quantity, and the locative preposition *in*. But these forms can be replaced by other grammatical forms coding for the sequential (47b) perspectival mode – as in (48b) with singular number and agreement, an adverbial expression of moderate temporal dispersion, and the motion preposition *through*. As a result of these changes, the evoked cognitive representation is converted to one where one's perspective point and attention – or one's own projected location – shift in turn from object to object. In effect, a static multiplexity of objects has been converted into a sequential multiplexity of events consisting of conceptualized encounters with each of the objects in turn. Here, a cognitive operation of **sequentializing** has been carried out.

(48) a. There are some houses in the valley.
b. There is a house every now and then through the valley.

The sentences in (49) exemplify the same contrast between the synoptic and the sequential perspectival modes, but now with the use of partially different grammatical forms.

(49) a. All the soldiers in the circle differed greatly from each other.
b. Each soldier around the circle differed greatly from the last/next.

For representing certain static spatial configurations, the sequential perspectival mode, though noncongruent in character, is nevertheless preponderantly favored over the synoptic mode. Thus, the ready colloquial formulation of (50b) with a moving perspective point is matched in the static global mode of (50a) only by a stilted scientific style.

(50) a. The wells' depths form a gradient that correlates with their locations on the road.
b. The wells get deeper the further down the road they are.

6.3.2 Synopticizing

The reverse of the preceding circumstances also exists. A referent that most basically is in fact sequential – for example, a multiplex sequence of occurrences – can be represented in association with the more congruent mode for cognizing it, the sequential perspectival mode, as in (51a). The sequential mode is triggered by the presence of certain closed-class forms: singular number, an adverbial of iteration, and a preposition (or prepositional complex) expressing temporal progression. But essentially the same referent can also be presented as the object of a fixed global perspective point, that is, of the synoptic perspectival mode, as in (51b). The conceptual effect is that the entirety of the sequence is regarded together simultaneously for an integrated or summational assessment, as if the sense of progression that is associated with the temporal dimension were converted into a static presence. Here, a cognitive operation of **synopticizing** has been carried out. The closed-class forms in the present example that trigger this operation are: the perfect auxiliary, a quantifier complex indicating aggregation, plural number, and a preposition of static containment.[16]

(51) a. I took an aspirin time after time during/in the course of the last hour.
b. I have taken a number of aspirins in the last hour.

6.4 Direction of viewing

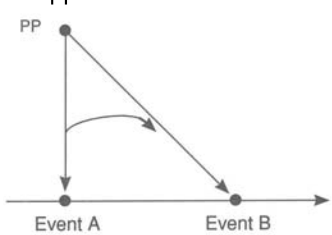
The sequential perspectival mode has an additional application within the temporal domain to a succession of events or to the continuation of a single event. In this application, location of perspective point joins with another factor from the system of attentional distribution – that is, with **focus of attention** – to characterize a new schematic category, **direction of viewing**. This category is based on the conceptual possibility of 'sighting' in a particular direction from an established perspective point, thereby attending to one or another particular portion of the temporal configuration in reference, and of shifting the direction of this sighting to another portion of the temporal configuration.

To illustrate, consider as a referent the temporal complex consisting of two events occurring in succession. Closed-class forms can direct that any of a set of different perspectival modes and directions of viewing be applied to essentially this same complex. Thus, as in (52a), closed-class forms can establish a perspective point that is temporally positioned at event A and from which a line of viewing can be directed first at event A itself, a direct viewing, and then, in a **prospective** direction, ahead to event B. Alternatively, as in (52b), a perspective point can be positioned at event B and a line of viewing aimed first in a **retrospective** direction back to event A, and then directly at event B itself. In these two cases, what moves is not, as before, the location of one's perspective point, but the direction of one's viewing.

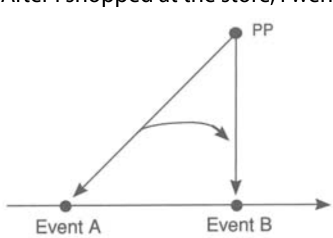
Further, the location of the perspective point can itself also move, with a direct viewing at each location, in the manner of the original sequential perspectival mode seen in (51). Thus, in (52c), a perspective point is first established at event A, which is viewed directly, and then the perspective point moves to a location at event B, now in turn viewed directly.

(52) *Consequential perspectival mode*

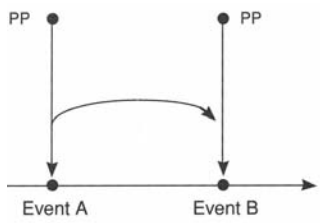
a. direct → prospective
I shopped at the store before I went home.



b. retrospective → direct
After I shopped at the store, I went home.



c. direct$_A$ → direct$_B$
I shopped at the store, and then I went home.

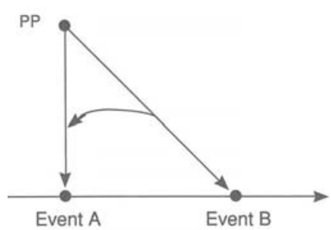


The diagrams in (52) schematize the perspective of these examples. Here, the arrowhead on the timeline represents the progression of time for the referent events, but the upper arrow indicates the progression of time pertaining to the sequence in which the viewings are conceived to be carried out.

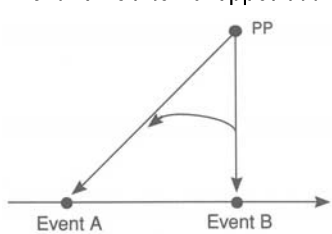
In the earlier examples for the sequential mode and so far here, the temporal direction of the viewings has corresponded to the temporal direction of the referent events, and with respect to this relationship can be termed **cosequential**. In addition, however, the perspectival system in language often permits the opposite correlation – that is, where successive viewings are of progressively earlier events, in what can be termed an **antisequential** correlation. The antisequential counterparts to the examples in (52) appear in (53), and the accompanying diagrams now show the viewing arrow pointing backward relative to the referent-time arrow.[17]

(53) *Antisequential perspectival mode*

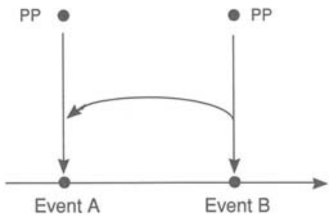
a. prospective → direct
Before I went home, I shopped in the store.



b. direct → retrospective
I went home after I shopped at the store.

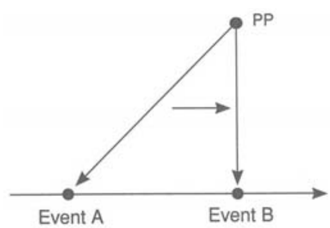


c. $\text{direct}_B \rightarrow \text{direct}_A$
I went home, but first I shopped at the store.

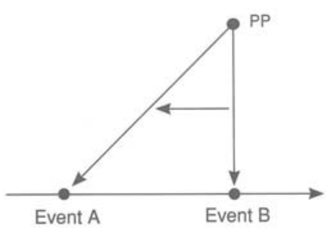


These same perspectival parameters can apply not only to a temporal complex of separate events but also to a single extent-durational event. The event represented in (54) illustrates this. This event is given a retrospective direction of viewing to its onset in the past and a direct viewing at its present. Here, the line of viewing does not make a discrete jump from one event to another (as indicated in the earlier diagrams by a curved arrow), but executes a continuous sweep along the body of the event between the retrospective orientation and the direct one (as indicated in the present diagrams by a straight arrow). As before, the line of viewing can move either cosequentially or antisequentially – seen, respectively, in (54a) and (54b) – relative to the referent event's progression.

(54) a. This festival dates from 1630 A.D.



b. This festival dates back to 1630 A.D.



7 Distribution of attention

The third of the schematic systems to be treated in this chapter is the **distribution of attention**. This system consists of the various patterns of different strengths with which one's attention is directed over a referent object or scene in accordance with the specifications of closed-class forms. Thus, while the first two schematic systems together ascribe a configurational structure to a referent and establish a perspective point from which to regard it, the present schematic system directs the distribution of one's attention over the given structure from the given perspective point.

Three factors in the attentional system govern the distribution of attention over a referent scene. The first factor is the **strength of attention**, which can range from **faint** to **intense**. Closed-class forms can set attentional strength with respect to either of two scales. They can set it at some value from low to high on an absolute, or zero-based, scale – a cognitive operation for which, of the terms in current linguistic use, **salience** or **prominence** seems the most apt. Or they can set it comparatively lower or higher than some reference value on a relative, or norm-based, scale – a cognitive process for which the terms **backgrounding** and **foregrounding** are apt.

The second factor is **pattern of attention**, by which attentions of different strengths are combined and arranged in particular patterns. We can identify a number of patterns that closed-class forms designate. One such pattern is **focus of attention** – a center-periphery pattern in which greater attentional strength is placed in a central region and lesser attentional strength is placed in a surrounding region. This focusing pattern is treated with respect to figure-ground organization in Talmy (2000, chapter I-5), as well as elsewhere in this volume. Another pattern is **window of attention**, in which one or more (discontinuous) regions within a referent scene are allocated greater attention, while the remainder of the scene receives lesser attention. This windowing pattern is the subject of Talmy (2000, chapter I-4). In a third pattern, **level of attention**, either greater attention is assigned to a higher level of organization within a referent scene, while lesser attention goes to a lower organizational level, or the reverse allocation occurs. The subsections that follow all treat this pattern for setting the level of attention.

The third factor is **mapping of attention**, by which the particular parts of an attentional pattern are mapped onto particular regions of the referent scene. By the operation of this factor, a single attentional pattern can be overlaid in different ways onto the same referent scene. To illustrate with the center-periphery pattern applied variously to a single commercial scene, focal attention can either be mapped onto the seller, with lesser attention on the remainder, as in *The clerk sold the vase to the customer,* or focal attention can be mapped onto the buyer, with lesser attention on the remainder, as in *The customer bought the vase from the clerk.* Note in this regard that, in this volume, all the examples demonstrating the attentional system keep a particular referent scene constant while showing solely how a certain attentional pattern can be mapped onto it in different ways. That is, we demonstrate that closed-class forms can govern the distribution of attention without changing the contents. As with the schematic system of perspective above, that of attention readily shows how the overall concept structuring system of language is relatively distinct from the conceptual content system and can function apart from it to set or shift the latter's schematization – in the present instance, its attentional schematization.

As noted, all the following subsections pertain to the pattern for level of attention – demonstrating four different types of this pattern-which directs greater attention either to the more integral or general characteristics of a referent, or to its more compositional or particular characteristics.

7.1 Level of synthesis

The schematic category to be considered now pertains to bounded quantities, like those schematized in the A/B row in (29). One form of locution already seen to specify such quantities is the particular type of 'NP *of* NP' construction illustrated in (55a). Here the second NP specifies the *Identity* of the quantity involved, itself conceptualized as without intrinsic bounds, while the first NP specifies (to use the terms introduced earlier) the **bounding**, or **portion excerpting**, per se of the quantity. Moreover, in addition to such a pure operation of bounding, the first NP can further specify the particular **form** – the shape, size, and possibly other properties – that the excerpted portion exhibits, as in (55b).[18]

(55) a. a set of trees a quantity of water
b. a cluster of trees a puddle/drop of water

The two NPs here can be seen as coding for two different **levels of synthesis**. Describing this for the internally composite case, such as *a cluster of trees,* we can say that the second NP by itself specifies an unsynthesized multiplexity of independent elements, while the first NP specifies a particular Gestalt synthesized out of that multiplexity. These two levels can thus appropriately be termed the **componential** level of synthesis and the **Gestalt** level of synthesis.

Furthermore, language can mark an additional cognitive distinction here. Either level of synthesis can be placed in the foreground of attention while the other level is placed in the background. One grammatical device for marking such distribution of attention is the placement of the foregrounded NP at the head of the larger nominal construction (in the present English construction, placing it first). Thus, either of the two NPs we have just been looking at can appear as the head, as shown in (56a). With the use of this device, moreover, predications can be made that pertain solely to one level of synthesis or to the other, as seen in (56b).

(56) a. the cluster of trees/the trees in the cluster
b. That cluster of trees is small. / The trees in that cluster are small.

There are certain open- or closed-class forms, furthermore, whose referents are keyed to applying to only one or the other level of synthesis. Thus, *together* (in the sense of 'toward each other') tends to correlate with multiple objects at large, while *in upon -self* tends to correlate with a Gestalt formed from such a multiplexity, as seen in (57).

(57) a. The bricks in the pyramid came crashing together/*in upon themselves.
b. The pyramid of bricks came crashing in upon itself/*together.

In addition, there are closed-class forms that specifically represent a particular level of synthesis. Thus, in English, a cardinal numeral, 'Num [NP]-s', as in (58ai) tends to evoke a conceptualization of its referent at the composite level of synthesis. But the closed-class suffix *-some,* or more specifically the grammatical construction '[Num]-some of [NP]-s', as in (58aii), tends to evoke the Gestalt level of synthesis, calling for the conceptualization of a numbered multiplexity as constituting an abstract higher-order unitary entity.

A comparable distinction can be made by verb forms for events involving objects. Thus, the closed-class Russian verb prefix *s-*, taking the accusative of a plural direct object – 's-[V] [NP-pl]-ACC' – translates well as English *together,* directing attention to the composite level synthesis, as in (58bi). But the prefix *na-* taking the genitive – 'na-[V] [NP-pl]-GEN] – calls for the conceptualization that a process of gathering has created a higher-level entity, an *accumulation,* out of the objects gathered, as in (58bii).

(58) a. *In space: … with English CC, numeral suffix* -some
i. four cooks
ii. a foursome of cooks

b. *Over time: … with Russian CC, verb prefix* na- [GEN]
i. Ona s-grebla orexy v fartuk.
'She scraped nuts together into her apron.'
ii. Ona na-grebla orexov v fartuk.
'She scraped up an accumulation of nuts into her apron.' (By scraping them together in her apron, she accumulated (a heap/pile of) nuts.)

The preceding phenomena have involved the shift of attention from multiplexity to a Gestalt that it can constitute, a cognitive operation that can be called **Gestalt formation**. But also encountered in language are means for specifying the reverse: shifting attention from a Gestalt to components seen as constituting it, in an operation of **componentializing**. This operation can occur when the starting lexical item specifies an entity taken to be already at the more synthetic level, as is the case with *iceberg* in (59a). By grammatical devices like those in (59b), such an entity can be analytically converted from conceptualization as a coherent whole to that of component parts and their interrelations. Again we encounter a surface form – *in two* – that correlates with only one level of synthesis, the Gestalt level, and not with the other.

(59) a. *Gestalt level of synthesis*
The iceberg broke in two.

b. *Componential level of synthesis*
The two halves of the iceberg broke apart (*in two).

The two levels of synthesis with the two directions of conceptual shift applicable to them define four notional types, as indicated in (60). The 'Figure' terms here are used as described in Talmy (2000, Chapter I-5).

(60)

Example	*Type*	*Operation*
cluster of trees	'composite Figure'	Gestalt formation
trees	'multiple Figures'	↑
iceberg	'meta-Figure'	↓
two halves of iceberg	'component Figures'	componentialization

7.2 Level of exemplarity

A second schematic category pertaining to level of attention can be observed for a multiplexity of objects. This category does not pertain to the basic reference to all the members of the multiplexity, but addresses how attention is directed and distributed within that multiplexity. By the first alternative, the **full complement** of the multiplexity is placed in the foreground of attention, all the elements of the multiplexity manifesting the indicated behavior en masse, with perhaps individual items here and there singled out in the background of attention and instantiating the indicated behavior individually. By the second alternative, a **single exemplar** out of the multiplexity is placed in the foreground of attention, representative of any of the elements that could be comparably focused in upon and seen to manifest the same behavior, with the remaining items as a group perhaps more dimly conceived in the background of attention. These alternative patterns of attentional distribution comprise the schematic category **level of exemplarity**. Perhaps most languages possess grammatical devices for evoking either level of this category. But English stands out in the extensiveness of its specifications: it has separate pairs of grammatical forms that mark the distinction for a number of different types of multiplexity. A rather full list of these pairs is indicated in (61), with examples showing first the full-complement form and then the counterpart exemplar form.

(61) a. Oysters have siphons/a siphon.
An oyster has siphons/a siphon.[19]

b. All oysters have siphons/a siphon.
Every oyster has siphons/a siphon.

c. All the members raised their hand(s).
Each member raised his hand(s).[20]

d. Many members raised their hand(s).
Many a member raised his hand(s).

e. Some members here and there raised their hand(s).
A member here and there raised his hand(s).

f. Members one after another raised their hand(s).
One member after another raised his hand(s).

g. Hardly any members raised their hand(s).
Hardly a member raised his hand(s).

h. No members raised their hand(s).
No member (Not/Nary a member) raised his hand(s).

i. On both sides of the room stood tables/a table.
On either side of the room stood tables/a table.

English has several further unpaired forms. The exemplar form *neither,* as in *Neither member raised his hand(s),* has no full-complement counterpart. In a complementary way, the full-complement form *some,* as in *Some members raised their hand(s),* has no exemplar counterpart. This last quantifier might be added to the list of paired forms, though, since Italian, for one language, does have both full-complement and exemplar forms for it.

(62) a. Alcuni membri hanno alzato la mano/le mani.
some members have raised the hand/the hands.

b. Qualche membro ha alzato la mano/le mani.
'some – a' member has raised the hand/the hands

7.3 Level of baseline within a hierarchy

In the linguistic representation of a complex of referents that are related to each other across hierarchical levels, attention can be directed to one or another of these levels for treatment as a **baseline** – that is, as the principal reference level with respect to which the other levels will be related. This schematic category will be termed **level of baseline within a hierarchy**. As with the categories of synthesis and exemplarity, the distinctions of the present category leave the basic substantive referent intact and only specify the pattern in which attention is distributed over that referent.

One type of hierarchy amenable to the present category is a hierarchy of partitive inclusion – for example, one with three levels, in which a Whole has particular Parts that, in turn, have particular Features. This type of hierarchy is illustrated by the sentences in (63), which refer to a conceptual complex containing one entity from each of the three levels-respectively, a boy, a face, and freckles. While all three sentences in (63) equally identify the particular entities at the three hierarchical levels and their partitive relations, they differ as to which level they establish as the baseline. The baseline is placed at the level of minimal scope, that of Featural details, by (63a); at the mid-scope level, that of Parts, by (63b); and at the level of greatest scope, the Whole, by (63c). The grammatical means for setting the baseline here is the assignment of subject status in conjunction with the *have* + PP construction available in English.

(63) a. There are freckles on the boy's face.
b. The boy's face has freckles on it.
c. The boy has freckles on his face.

Since the present hierarchy is of the inclusional type, the cognitive effect of establishing one of the larger-scoped levels as baseline is to set it up as the **framing level**. Thus, (63c) sets up the large-scope Whole (the boy) as the framing level – in effect, as the 'aperture' through which the other two levels (the face and the freckles) are viewed. By contrast, (63b) sets up the mid-scope Part (the face) as the framing level – that is, as the most salient aperture onto the scene through which one views the Featural level (the freckles) as well as the level of the whole (the boy), now somewhat more background in attention.

7.4 Level of particularity

Alternative linguistic expressions can refer to essentially the same entity-that is, can evoke in a hearer's cognitive representation an entity of essentially the same identity – with greater or lesser exact particularity. This **level of particularity** ranges over a cline from greater **specificity** to greater **genericity**. With respect to their allocation of attention, alternative expressions accordingly can, by degrees along the cline, foreground more particulars of a referent while backgrounding its more abstract generalities, or they can background the particulars while foregrounding the generalities. In a given context, linguistic specifications made at either end of the particularity cline are often effectively equivalent in the information they convey, since more abstract structure is generally implicit in a detailed reference, while details can be inferred in context from a more generic reference. The difference is that the linguistic setting of the level of particularity draws primary attention to that level, and this cognitive process in turn generally engenders still further cognitive effects. The brunt of the present category's realization seems generally borne by the *selection* of a particular open- or closed-class form that already directly expresses its referent at the desired level of particularity. There appear to be no grammatical forms whose function is solely to indicate that a referent is to be conceptualized at one or another level of particularity, nor any grammatical forms that trigger a cognitive operation of converting a lexical element's reference from one to another level of particularity. (In this respect, level of particularity is like state of dividedness, treated in section 5.3.)

To illustrate such a selection among alternative closed-class forms, consider that I can say to a person who alone has been balancing a ledger, either *You have made a mistake here* or *Someone has made a mistake here. You* identifies the particular agent involved, while *someone,* pitched at a more generic level, solely marks the participation of some agent. Given the context, the use of *someone* does not cause the loss of any inferable information, but it does background, or draw attention away from, the level of specific particularity.

There appears to be a general cognitive linguistic principle that the lack of any explicit naming of some factor makes available cognitive space for the contemplation of alternatives to that factor and, hence, for the deniability of that factor. (This principle is presumably the linguistic counterpart of general defensive psychological processes that provide relief from an unpleasant factor by one or another form of avoidance direct conscious apprehension of that factor.) With the use of *someone,* this 'wiggle room' permits the cognitive illusion that the speaker is not squarely directing culpability at the addressee. On this basis, a succession of cognitive effects can build, one upon the other. The distraction of attention away from particularity is the initial cognitive effect. As its concomitant, deniability can be reckoned as a secondary cognitive effect. A tertiary effect of considerateness on the part of the speaker can then enter that allows the addressee a graceful exit off the hook. And, on top of this, a quaternary effect of sarcasm or irony can be intended by the speaker.

For a related example, consider the Yiddish sentences in (64). Taken from a song, (64a) is uttered by a young woman begging off from a young man's invitation to the woods. This sentence is understood in context to refer to a situation that is more specifically spelled out in (64b), though, in another context, it could also refer to the more particularized situation spelled out in (64c). These latter two sentences identify the particular participants in their respective roles. By contrast, (64a) abstracts away from the situation enough to report only the interparticipant relationship, that one unidentified participant will act on another. Again, given the context, (64a) loses few particulars of information, but it draws attention away from them. Their explicit indication could engender an effect of too starkly calling a spade a spade; their absence has the effect of suggesting delicacy.

(64)	a.	Me	vet	zick	veln	kushn.
		One	will-3S	REFL	want-INF	kiss-INF
		'One will want to kiss another.'				
	b.	Du	vest	mir	veln	kushn.
		you-S	will-2S	me	want-INF	kiss-INF
		'You will want to kiss me.'				
	c.	Mir	veln	zikh	veln	kushn.
		we	will-lP	REFL	want-INF	kiss-INF
		'We will want to kiss each other.'				

8 Nesting

We have seen that grammatically specified concepts largely follow certain organizing principles, namely, spatiotemporal homology, intracategorial conversion, and reverse convertibility. Another such organizing principle is focused on here, that of **nesting**. To a large extent, one grammatically specified concept can occur embedded within another, and that within a third. Alternatively, by an interpretation of nesting that can be called chaining, the output of one grammatically specified cognitive operation can serve as the input to another, and the output of that as the input to a third. Discussion of such nesting or chaining is presented separately below for each of the three schematic systems treated earlier.

8.1 Nesting of configurational structure

Examples of the nesting of configurational structures have already been presented in connection with (27) and (30). To add to this set, consider now, first for the temporal dimension, the particularly elaborate embedding shown built up layer by layer in *(65)*.

(65) a. The beacon flashed (as I glanced over).
 b. The beacon kept flashing.
 c. The beacon flashed five times in a row.
 d. The' beacon kept flashing five times at a stretch.
 e. The beacon flashed five times at a stretch for three hours.

To describe these forms in terms of sequenced operations, in (65a), the lexical verb *flash* appears with its basic structural specification as a point-durational full-cycle uniplex event. This undergoes the cognitive operation of multiplexing, to yield the unbounded multiplexity in (65b). This structure then undergoes bounding in (65c). This bounded multiplexity then first goes through the operation of reduction to become schematized as a new pointlike uniplex quantity, and this in turn is multiplexed afresh, yielding (65d). This new unbounded multiplexity is then finally bounded in (65e). The progressive nesting of structural specifications in these five stages can be represented schematically as in (66).

(66) a. !
 b. …!!!!!!!!!…
 c. [!!!!!]
 d. …[!!!!!]-[!!!!!]…
 e. [[!!!!!]-[!!!!!]…[!!!!!]-[!!!!!]]

Analogous to this temporal nesting is the spatial example in (67).

(67) a. I saw a duck [... in the valley.]
b. I saw ducks'
c. I saw a group of five ducks
d. I saw groups of five ducks each
e. I saw three ponds full of groups of five ducks each

With respect to the introductory discussion, note that configurational nesting can be thought of in these two ways: as a dynamic sequential process in which the output of one cognitive operation becomes the input to another, or as a static hierarchical structural complex in which all the conceptual components are concurrently present in their specific interrelations as in a schema. Among the cognitive possibilities, it might be that a conceptual complex like that of (65e) is understood solely in terms of a sequence of operations, as first presented above; or that it involves both this type of dynamic process and the static schematic structure that cumulatively results, like that shown in (66); or that it is understood solely in terms of such a static structure, holistically determined by the co-occurrence of the relevant closed-class forms in the sentence.

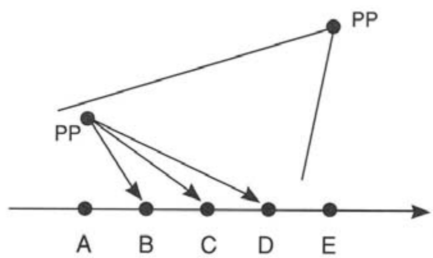
Certain correspondences hold between the dynamic and the static interpretations of configurational nesting. The basic element in the dynamic process model – that is, the initial element that acts as input to the first operation, such as the uniplex point-duration event 'flash' in (65e)-corresponds in the static structure model to the hierarchically lowest (smallest) element, here, any vertical stroke in the schema in (66).

8.2 Nesting of perspectives

The schematic system of perspective can also exhibit forms of nesting. Consider the case of temporal perspectives, as exemplified in (68) and as diagrammed in (69).

(68) At the punchbowl, John was about to meet his first wife-to-be.

(69)



In this sentence, we can identify a number of distinct perspective points and directions of viewing, both for the speaker and perhaps also for the referent actor, John. Established by the expression *be about to,* the earliest perspective point is that of the speaker – whether personally present or as a fictive projection. This perspective point is located at a point of time ('A' in the diagram) shortly before the point at which John will encounter a particular woman ('B' in the diagram). And the speaker's direction of viewing from that earlier perspective point is prospectively aimed toward that time of encounter. Next, the expression (wife-) *to-be* establishes a second prospective viewing that looks ahead to the time when the woman whom John encounters will be his wife ('C' in the diagram). The originating point of this viewing can be taken either as again that of the speaker, hence coinciding with the earliest perspective point, or as that of John at the time of encounter. Then, triggered by the word first, a further prospective viewing, or family of viewings, again most likely originating with the speaker at the earliest perspective point, though possibly otherwise, points ahead to a subsequent wife or wives following John's marriage with the woman at the punchbowl ('D' in the diagram). Finally, a perspective point of the speaker at the present moment of speech ('E' in the diagram) is established by the past tense of the main verb *was*. It is this perspective point at which the speaker's cumulative knowledge of the reported sequence of events is stored as memory and, in turn, which functions as the origin of a retrospective direction of viewing over the earlier sequence. Thus, nesting in this case involves the inclusion of the earlier perspective points within the scope of the viewing from the current perspective point.

Further, this current perspective point serves as the source of knowledge that is projected back to the earlier perspective points for their seemingly prospective reports. Thus, this case of nesting additionally involves a new cognitive factor, **projection of knowledge**. By this factor, the conceptual content that accrues to one perspective point is projected into the locus of another perspective point to be redirected as if originating from that second perspective point. The main evidence that such a projection from a later to an earlier perspective is conceptually valid is that, in its basic meaning, the sentence in (68) is not understood as making *predictions* but rather as asserting *facts*, ones presented from before-hand but necessarily taken from post facto knowledge.

8.3 Nesting of attention

Within the schematic system of attention, the category of attentional focus can be used to illustrate nesting. Consider the sentences in which can both refer to the same event of commercial transfer but do so with different forms of focus.

(70) a. The clerk sold the customer a vase.
b. The customer bought a vase from the clerk.

With respect to what holds in common across these sentences, their referents both include two volitional agents, a seller and a buyer, each performing certain actions intentionally. The seller performs such intentional actions as describing, packaging, presenting, and taking payment for a object, while the buyer performs such intentional actions as choosing, requesting, taking possession of, and giving payment for the transferred object. Though these two sets of actions dovetail with each other and, indeed, could scarcely occur alone as sets without their counterpart, still the focus of one's greatest attention may be directed to extend over only one or the other of the two complexes.

Lexical forms can signal this distinction. Thus, the English verb pairs *sell* and *buy* are differentially for invoking one or the other of these two locations of focal attention. In addition, the grammatical voice forms 'active' and 'passive' are devices in language for directing focal attention to one or the other pole of a transfer. Now consider the sentences in (71). Both place primary attention on the buyer, which is expressed as the subject. Yet in certain respects these two sentences differ from each other semantically.

(71) a. The customer bought a vase.
b. The customer was sold a vase.

With its lexical selection of *buy,* (71a) locates focal attention on the buyer in a direct fashion. Accordingly, the buyer's complex of intentional actions seems strongly active, while the seller's role is quite back-grounded. By contrast, with its use of the verb *sell* together with the passive voice, the semantic effect of (71b) seems more complex and indirect, with a primary focus on the buyer but also with secondary attention directed toward the seller. More specifically, though we are in effect 'looking at' the buyer and the seller is, as it were, 'off stage,' it is the seller's complex of intentional actions that seems more strongly active, while the buyer seems more of an inactive recipient. Paralleling the syntactic structure, this semantic effect can be seen as a conceptually nested formation in which focal attention is first directed to the seller by the lexical choice of *sell* but is then redirected to the buyer by the passive voice. If this redirection of attention were total, (71b) would be semantically indistinguishable from (71a), but in fact it is not. Rather, the redirection of attention is only partial: it leaves intact the foregrounding of the seller's active intentional role, but it shifts the main circle of viewing onto the buyer as target. Altogether, then, it can be said that attention on the seller is hierarchically embedded within a more dominant attention on the buyer.

9 Further cognitive connections

Grammatically specified structuring in language appears to correspond, in certain of its functions and characteristics, to the structuring in other major cognitive systems, such as those of visual perception and reasoning. In particular, perhaps the principal overarching function of the structuring common across cognitive systems is that of providing conceptual **coherence** – that is, acting as a means for integrating and unifying a body of otherwise disparate conceptual material. In language and, as suggested later, in vision, this fundamental function has two main global forms of realization: coherence over a scene and coherence through time.

Providing coherence over a cognized scene was the function of grammatical structuring that was originally indicated in the introduction. There it was put forward that the grammatical elements of any particular sentence together specify the structure of the cognitive representation evoked by that sentence. Their specifications act as a scaffolding or framework across which contentful material can, in effect, be splayed or draped. It can be posited that such structuring is necessary for a disparate quantity of contentful material to be able to cohere in any sensible way and hence to be amenable to simultaneous cognizing as a Gestalt. That is, without such structuring, any selection of lexically specified concepts concurrently juxtaposed by a sentence would tend to be only a collection of elements, rather than elements assembled so as to convey an integrated idea or thought complex.

In addition, in the course of discourse, a great welter of notions are expressed in rapid succession, posing the potential problem of an unconnected sequence of ideational elements. But grammatically specified structuring is a principal contributor to the conceptual coherence through time that is requisite here. Through such structuring, a cognitive continuity is maintained through this flux and a coherent Gestalt is summated over time. A language can have a great stock of closed-class elements participating in this function – for example, such English forms as *'yes, but,' moreover, nevertheless, besides, instead, also.* Such forms direct the illocutionary flow, specify the 'logical tissue' of the discourse, and limn out its rhetorical framework. That is, these grammatical forms establish a structure that extends over a span of time and thus provides a conceptual level with temporal constancy amidst more fleeting aspects of content.

The preceding two global forms of grammatically specified structuring apply over the scope of any single language but – to amplify here on certain observations of section 2 – a further form must also be recognized that holds for language in general. While each language has to some extent a different set of grammatical specifications, there is great commonality across languages, so one can posit that each set is drawn from an inventory of concepts available for serving a structuring function in language.

Further, a qualifying property of this inventory can be adduced. It can be observed that grammatically specified concepts range crosslinguistically from ones extremely widespread – perhaps universal – and of broad application within a language, down to ones appearing in only a few languages with minimal application. Thus, the inventory of available structuring notions that is posited here appears to be graduated with respect to their significance for the language faculty (see the tabular listing of grammatical notions in Talmy 2000, chapter II-2). For example, the notions 'entity' and 'occurrence' as expressed by the grammatical categories 'noun' and 'verb' are probably universal and, within any language, of broad application. On the other hand, the conceptual categories of "tense" and "number" (apart from "person") seem to be of mid to high ranking, but not universal. And notions like 'in the morning' and 'in the evening' are expressed inflectionally on the verb in just a few languages.

Perhaps surprisingly, compared to spatiotemporal structuring, the conceptual category of "affect" is rather low in the graduated inventory of concepts that language draws on for structuring purposes. This fact is unexpected, considering the importance of the cognitive system for affect within human psychological functioning. The affect category does have scattered representation, for example 'affection' expressed by diminutive affixes, 'scorn' by pejoratives, 'concern' by a conjunction like *lest,* and 'hurt' by the 'adversive' construction (as in the English: *My plants all died on me.)*. But seemingly no language has a system of closed-class forms marking major affect distinctions in the way that, say, the modal system in English specifies distinctions of force opposition (Talmy 2000, chapter I-7/this volume).

Such an affect system can easily be imagined, however. Consider a parent addressing a child in danger near an open window. Grammatical systems readily allow the parent to refer to the spatial structure in this situational complex – *Get away from the window!* – leaving the affective component to be inferred. But there is no closed-class form – comparable, say, to a Path satellite like *away* (see Talmy 2000, chapter II-1)-that expresses 'fear', one that could, for example, be represented by the form *afear* in *Act afear the window!* that would allow the parent to refer to the affective component of the complex and leave the spatial component to be inferred. Comparably, to a child near a freshly painted wall and about to harm it, a parent would likely again express the spatial structure – *Get away from the wall*! – leaving the affect to be inferred. There is no closed-class affect form for 'like/be nice to', which could be represented as *afavor,* that the parent could use instead – Act *aFAVOR the* wall! – thereby leaving the spatial component for inference.

Parallels can now be drawn between the structuring system operating in language and that in visual perception (see Jackendoff 1987a and Talmy 2000, chapter I-2).[21] The principal function of structure to provide coherence appears common across the two cognitive systems, and the two global forms of such coherence outlined above for language correspond to comparable forms in the operation of vision.

First, there is a parallel between the linguistic coherence over a *referent* scene and the visual coherence over a *perceptual* scene. The welter of optical sensations registered at any one moment from some whole visual scene is rendered coherent by the perception of structural delineations running through it. For example, one looking at, say, the interior of a restaurant from one corner of the room does not see simply a pastiche of color daubs and curves but, rather, perceives a structured whole that includes the framework of the room, the spatial pattern of tables and people, and the individual tables and people themselves. And seeing a person in some posture involves perceiving a structural framework in the human figure, along the lines of the abstracted 'axes of elongation' described by Marr (1982). Children's line drawings of scenes and stick-figure sketches of people, animals, and objects (Kellogg 1970) demonstrate our early capacity to abstract structure from visual scenes and scene parts.

Second, one can observe a parallel between the coherence through time in linguistic discourse and that in visual perception. If the viewer in the illustrative restaurant now walks through the room, the patterns in which visual stimuli and the perception of structure change give rise in turn to the perception of a coherent continuity of path and view occurring within an overall 'scene-structure constancy.'

It is reasonable to assume that, in addition to these language-vision parallels in global structuring, a number of particular structuring devices match across the two cognitive systems. Perhaps most of the grammatically specified schematic categories treated in this chapter – including, for example, state of boundedness and level of exemplarity-correspond to structuring factors in visual perception. Further, the three schematic systems seen to apply broadly to cognitive organization in language-configurational structure, perspective, and distribution of attention – seem to correspond, as whole systems, to counterparts in visual perception.

Still further parallels can be seen between language and vision in the properties of their structuring. Thus, the topology-like character of grammatical specifications may have some parallel in the character of the perceived delineations of a scene, or the internal structure of a figure, or the plan of a path to be followed through obstacles. Such perceptions of structure seem in certain respects to abstract away from Euclidean particularities of exact magnitude, shape, or angle, and more to involve qualitative or approximate spatial relationships (see Talmy 2000, chapter I-2).

As a further parallel, the capacity of grammatical specifications to nest, one within another, and form embedded structuring seems to correspond to embedded structuring within a visual scene. Thus, the structure of the restaurant scene above involved a multiple embedding. This consisted of an overall framework, the pattern comprised by all the tables and people, the individual tables and people, and perhaps further the skeletal structure sensed within each table and person.

All of the preceding has outlined a set of structural parallels between language and vision. But, significantly, each of these two cognitive systems has prominent structuring devices that play little or no role in the other system. Thus, in visual perception, three major parameters that structure (parts of) a scene are bilateral symmetry, rotation, and dilation (expansion or contraction) (Gibson 1966, Palmer 1983) and, if color can be treated as structural, it is a fourth. In language, by contrast, grammatical specification of symmetry is minimal, perhaps limited entirely to the notion 'reciprocal'. Closed-class indication of rotation is limited in English to the prepositions or verb satellites *around* and *over (The pole spun around/toppled over),* and it is barely augmented in other languages. Dilation is grammatically expressed in English by the verb satellites *in* and *out* when referring to radial motion *(spread out/shrink in)* and, again, such notions are not particularly elaborated in other languages. And color, of course, was this chapter's original example of a conceptual category *not* grammatically specified.

In the other direction, there are several prominent linguistic categories of seemingly little structural function in visual perception. Examples are 'status of reality,' as expressed, for example, by inflections for mood, 'status of knowledge,' as expressed by evidentials, and 'comparison of alternatives,' as expressed by a category of particles that includes *instead, only,* and *also.* Further possible examples are 'relative temporal location,' as expressed by tense markings, 'degree,' as expressed by adjective inflections and modifiers (for example, English *-er, -est, almost, too),* and 'force dynamics,' as expressed by modals (see Talmy 2000, chapter 1–7).

While language may not share these conceptual structuring categories with visual perception, it may well share some of them with other cognitive systems. Consider again any language's closed-class category of evidentials representing a schematic category of 'status of knowledge' with such member notions as: 'known from personal experience as factual', 'accepted as factual through generally shared knowledge', 'inferred from accompanying evidence', 'inferred from temporal regularity', 'entertained as possible because of having been reported', and judged as probable'. This linguistic category is very likely related to a category of comparable structural factors in our cognitive system for reasoning and inferencing.

Generalizing from these and related findings, the possibility is that each major cognitive system has some conceptual structuring properties that are uniquely its own, some properties that it shares with some cognitive systems but not with others, and some properties that run in common through all the systems. This is the overlapping systems model of cognitive organization described in the introduction to this volume. Determining the overall and particular character of conceptual structure is the aim of the research advanced in the present chapter, one requiring a cooperative venture among the cognitive disciplines.

Notes

1 This chapter is a substantially revised and expanded version of Talmy 1988b. That paper, in turn, was a greatly revised and expanded version of Talmy 1978c. Talmy 1977 was a precursor to the 1978 paper.

2 The word 'evoke' is used because the relationship is not direct. The CR is an emergent, compounded by various cognitive processes out of the referential meanings of the sentence elements, understanding of the present situation, general knowledge, and so on.

3 More recently, research on different aspects of this broader scope has included work by Jackendoff (1983), Bybee (1985), Morrow (1986), Langacker (1987), and Slobin (1997).

4 A few notes on our terminology are in order. Below, the terms 'lexical' and 'open-class' are used interchangeably, as are the terms 'grammatical' and 'closed-class.' For consistency, accordingly, the term 'grammatical category' has been used here instead of the more usual 'lexical category.' The grammatical category of, say, 'noun,' of course refers not to any collection of particular nouns, but to the abstracted status of 'nounhood' per se.

5 For example, augmentative and diminutive elements, insofar as they refer to size, rather than, say, affective qualities, seem to specify size relatively greater or lesser than the norm for the particular object in reference. And closed-class elements specifying distance – like English *just* or *way,* as in *just/way up there*-specify notions of 'near' and 'far' relativized to the referent situation.

6 The property at issue here is that of 'manifested Euclidean shape,' distinguished from that of 'intrinsic topological form' because, although closed-class forms are largely neutral to the former, they can be sensitive to the latter. For example, the Korean numeral classifier *chang* refers to an object whose intrinsic form is planar, regardless of its currently manifested shape. Thus, the classifier can be used in referring not only to a flat sheet of paper, but also to one that has been crumpled into a wad, if the speaker wishes to attend to the object's intrinsic planar form rather than to its current spheroidal shape. (See Oh 1994.)

7 If the so-called idealized form of the schema is understood simply as one alternative within a family of shapes for that schema, the term 'shape-neutral' remains appropriate as the name for the schema's property. But if that idealized form is taken as being some-

how basic, or unmarked, it might be preferable to say that the schema is *deformable* and exhibits the property of *plasticity* in accommodating to a referent's shape.

8 It is apparently also the case that no 'proper verbs' or 'proper adjectives' exist. Thus, it seems there could never be a verb like 'to Deluge' referring uniquely to the so-conceived spatiotemporally bounded event of the biblical flood, as in some sentence like: *After it Deluged, Noah landed the ark.* And it seems there could never be an adjective like 'Awareawake' conceived to refer uniquely to the quality of Buddha's enlightenment at its specific time and place, as in some sentence like: *Buddha became Awareawake under the Bodhi tree.* Note that although a verb like *Manhattanize* and an adjective like *Shakespearean* do include reference to a specific spatiotemporal entity, their reference as a whole is not unique, since an act of Manhattanizing can be performed many times, and many actors and/or plays of a certain style can be called Shakespearean. Thus, while such observations show that token sensitivity is not available for all open-class types, it is at least available to nouns, and it is certainly excluded from closed-class forms.

9 Perhaps this reconceptualization together with the syntactic reformulations that correspond to it – has functioned as the model for such features as the English passive marked with *get,* as well as for the marking in Italian of the Agent in a passive with *da* 'from'.

10 In some cases, a reified deverbal noun is frozen in construction with only one verb or permits extension to just a few further verbs. Such a form can exhibit the usual grammatically marked cognitive operations but not the wide range of spatial manipulations. An example is the action-specifying verb *(to) bow,* whose deverbal noun *(a) bow* constructs mainly with *take.* Thus, one can observe such grammatical parallels as *I bowed (once)/I took a bow; I quickly bowed several times/ I took several quick bows; I bowed time after time/I took one bow after another.* A slight degree of spatial manipulation can be seen in sentences like *I directed a bow at the chair of the funding committee.* But wider spatial manipulation is not seen. Thus, there is no **I spread/swept bows across the front row of the audience,* or

**I distributed bows to select members of the audience.*

11 As a possible counterpart to the preceding typology for reference to physical entities, there may be a two-category typology for the most characteristic form of lexicalization that a language uses to refer to actions. The predominant language type characteristically uses verbs to refer to actions. But some languages – including many of those in New Guinea and Australia – refer to most actions with a nonverb class of forms, forms that merely enter into construction with the true verbs of a small closed set.

12 The lexical types for several of these intersections, it should be noted, do have traditional terms. Thus, nominal forms of the a, A or A', and B' types, respectively, have been called count nouns, collective nouns, and mass nouns. Verbal forms of the a, A or A', and B' types, respectively, have been called punctual, iterative, and durative verbs. The matrix presented here augments, systematizes, and generalizes the traditional notions.

13 This category can be considered a generalization over the earlier category of **state of boundedness** by the inclusion of the **uniplexity** notion. It can in turn itself be generalized – becoming the category *pattern* of **extension** – by the further inclusion of such notions as a quantity bounded at one end but unbounded at the other (see Talmy 2000, chapter I-3/this volume).

14 This category clearly patterns with the preceding five within a single system of notions, one that would be an expansion or generalization over **disposition of a quantity**.

15 Our main purpose here is to note the shift in structural distribution type. The shift in content will doubtless prove part of a larger pattern as well, but this is not yet worked out.

16 The use of the perfect in the synopticized (46b) form is noteworthy, pointing to a principal function of perfect forms in general. This is to indicate temporal containment – that is, the collective inclusion of action or events within a bounded extent of time (indeed, the perfect in general seems to involve a temporal span bounded at both ends). In this respect, the perfect semantically parallels the concept of spatial containment: the collective inclusion of matter or objects within a bounded extent of space. The frequent crosslinguistic occurrence of a 'have'-type verb marking the perfect may evidence a metaphorization of containment from space to time. Thus, spatial containment forms like those in (i) seem paralleled by a perfect construction like that in (ii), for which certain paraphrases, like those in (iii), suggest the parallelism more directly.

(i) a. There were five aspirins in the box.

b. The box had five aspirins in it.

(ii) I have taken five aspirins in the last hour.

(iii) a. There were five aspirin-takings in the last hour.

b. The last hour had five aspirin-takings in it.

17 Langacker (1987) distinguishes a pair of temporal factors comparable to the 'referent time' and 'viewing time' described here, but he identifies this second type as that of processing sequence. It seems preferable, however, to identify viewing time as one further schematic category, first because it can be directly specified by closed-class forms, and second because little is known of how the neural processing relevant to this linguistic category might actually proceed.

18 The two semantic functions conflated within the first NP can also appear separately in two different NPs. That is to say, all three of the semantic function indicated here-(a) the identity of a quantity, (b) a portion-excerpting of that quantity, (c) the form of that portion – can be separately represented by three distinct NPs together in a construction, as in (i) a clustering (c) of a set (b) of trees (a).

Many lexical items conflate the specification of two or all of these functions at once. Thus, conflating (c) and (b) is a *cluster,* 'a clustering form of a set', and a *drop,* 'a small globular form of an amount [of a liquid]. A lexical item conflating all three types of notions is a *grove:* 'clustering form of a set [= cluster] of trees', and another such lexical item is a *tear:* 'small globular form of an amount [= drop] of lachrymal fluid'.

Container-contained expressions like *a can of nuts* or *a cup of coffee* that resemble the original construction can be incorporated into the present analysis by adding to the preceding series a fourth (d) term for the container. Then the third term for the form of the portion of material must be understood to correspond to the shape of the container. For example, the expression *a cup of coffee* with two nominals and one apparent relation can more analytically be understood to designate the expression in (ii) with four nominals and three relations.

(ii) a cup (d) containing a cup-interior-shaped form (c) of an amount (b) of coffee (a)

19 A pattern involving the presence or absence of ambiguity as to quantification holds throughout the list and can be illustrated with the (a) forms. For the plural form *oysters,* the plural form *siphons* is ambiguous as to whether there are one or more siphons per

oyster. All the other combinations unambiguously indicate the number of siphons per oyster. Thus, with plural *oysters,* singular *siphon* indicates one siphon per oyster (though there is no comparable way to unambiguously indicate plural siphons per oyster). And, with singular *oyster,* the grammatical number of *siphon* unambiguously indicates the number of siphons per oyster. Thus, the exemplar form is always unambiguous in this regard – one of its advantages over the full-complement form.

20 The difference between *each* and *every* arising in this analysis can now be added to those observed elsewhere (for example, Vendler, 1968). *Each* is the exemplar counterpart of the full-complement expression *all the,* but not of *all* without *the.* Accordingly, **Each oyster has a siphon* cannot function as a generic assertion. *Every* is not as unilaterally aligned in this way but does serve more naturally as the exemplar counterpart of *all* without *the.*

21 Clearly, the language-related faculty of the brain evolved to its present character in the presence of other already existing cognitive domains, including that of vision, and no doubt developed in interaction with their mechanisms of functioning, perhaps incorporating some of these.

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17 Regularity and idiomaticity in grammatical constructions: the case of *let alone*

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1 Background

This paper advocates an approach to grammar that differs from most current approaches in several ways. The overarching claim is that the proper units of a grammar are more similar to the notion of construction in traditional and pedagogical grammars than to that of rule in most versions of generative grammar. This is not to say that the generative ideal of explicitness is foregone; nor is the necessity of providing for recursive production of large structures from smaller ones set aside. Constructions on our view are much like the nuclear family (mother plus daughters) subtrees admitted by phrase structure rules, EXCEPT that (1) constructions need not be limited to a mother and her daughters, but may span wider ranges of the sentential tree; (2) constructions may specify, not only syntactic, but also lexical, semantic, and pragmatic information; (3) lexical items, being mentionable in syntactic constructions, may be viewed, in many cases at least, as constructions themselves; and (4) constructions may be idiomatic in the sense that a large construction may specify a semantics (and/or pragmatics) that is distinct from what might be calculated from the associated semantics of the set of smaller constructions that could be used to build the same morphosyntactic object.

Not all current approaches to grammar in the broad generative tradition, in which the current effort situates itself, differ from Construction Grammar in each of the respects detailed above; for example, various forms of phrase structure grammar take as their basic unit a syntactic-semantic rule pair, thus integrating semantic and syntactic modeling. But no framework in this tradition, so far as we are aware, agrees with the approach advocated here in all of these details. For instance, no current formal approach to grammar countenances direct pragmatic interpretation of syntactic structures, not mediated by the proposition expressed.

All of the many competing accounts of the workings of language draw a distinction in one way or another between what it is that speakers know outright about their language and what it is that they have to be able to figure out. For example, speakers of English have to know what *red* means and that it is an adjective, and they have to know what *ball* means and that it is a noun. They have to know that adjectives can co-occur with nouns in a modification structure (as in a phrase like *red ball),* and they have to know the proper strategies for giving a semantic interpretation to such adjective-noun combinations. But they do not have to know separately, or to be told, what the phrase *red ball* means. That is something which what they already know enables them to figure out.

Current formal models of grammar take a severe view of the distinction between knowing and figuring out: they assign as much work as possible to the computing or figuring out part of knowing how to use a language, and they attempt to keep at a minimum those aspects of linguistic competence that have to be represented as stored or known. Briefly, the standard idealization of the workings of a grammar goes something like this:

(a) The speakers of a language have, first of all, knowledge of the WORDS in their language. This knowledge comprises information about what kinds of words they are, in what environments they can appear and how they function in the language's phrases and sentences, what they mean, and how they are pronounced.

(b) Secondly, speakers know one or more sorts of fairly elementary GRAMMATICAL RULES in their language, rules by which simple phrases are constructed, by which these are combined into larger and more complex structures, and by which they are selected or modified according to their position in the larger structures.

(c) Thirdly, they know the basic SEMANTIC INTERPRETATION PRINCIPLES by which the meanings of phrases and sentences can be constructed out of the meanings of their constituent words and phrases. These principles of compositional semantics are such that speakers do not in general need to know in advance the meanings of complex structures (i.e. phrases and sentences); rather, the meanings of such larger structures simply follow from the knowledge of forms and rules that speakers have to know independently.

(d) Fourthly, in knowing how to use their language, speakers know how to create and recognize associations between semantically interpreted sentences and particular types of situations. Such PRAGMATIC knowledge uses but does not contribute to semantic interpretation. The notion of the 'literal meaning' of an expression does not, in short, incorporate information about the uses to which the expression can be put, beyond (perhaps) the pairing of conventional speech act forces with particular sentence types, such as the imperative and the interrogative.

There is vast disagreement in matters of detail, but most current formal models of grammar assume a limited categorial base and a limited set of configuration types upon which the rules of semantic interpretation are allowed to do their work. A commonly accepted categorial base is confined to the categories Sentence, Noun, Verb, Adjective, Adverb, Adpositon (i.e. Preposition or Postposition), their phrasal projections (the categories for which the named elements are heads), and a small number of associated trappings of these, such as complementizers. In general, the permitted primary set of configuration types is limited to what in phrase-structural terms can be spoken of as the nuclear family: a configuration consisting of a structural category, the mother node, and its immediate constituents, the daughter nodes.

The picture just sketched gives us an atomistic view of complex linguistic objects: generative syntax and compositional semantics provide the principles by which words whose meanings we know, arranged according to grammatical structuring principles whose semantic force we know, figure in the construction of an unlimitedly large set of possible meanings. Under the idealization just discussed, any sentence in a language can be resolved into configurations containing only constituents of the designated types, arranged according to the standard rules, and yielding interpretations which follow from regular principles of compositional semantics.

It should be noticed that the natural and intuitively simple notion of grammatical construction plays a limited part in the workings of this model. Traditional grammars are likely to have descriptions of the use and meaning of, say, negative questions, under the supposition that such structures might have certain properties of their own, as wholes. (An utterance of *Didn't you like the salad?* does more than ask a yes/no question.) In the atomistic view, which would not provide for a separate negative question construction, there is no way to treat the distinct semantic and pragmatic properties that emerge when negative and interrogative syntax are combined in an English sentence. (Moreover, there is evidence from the domain of negative contraction that negative questions are syntactically, as well as semantically and pragmatically, distinct from other inverted negative structures; see Green, 1985; Kay, 1987, p. 33).[1]

1.1 Idiomaticity and its dimensions

As useful and powerful as the atomistic schema is for the description of linguistic competence, it doesn't allow the grammarian to account for absolutely everything in its terms. As anyone knows who has worked with practical grammar-writing or with detailed text analysis, the descriptive linguist needs to append to this maximally general machinery certain kinds of special knowledge – knowledge that will account for speakers' ability to construct and understand phrases and expressions in their language which are not covered by the grammar, the lexicon, and the principles of compositional semantics, as these are familiarly conceived. Such a list of exceptional phenomena contains things which are larger than words, which are like words in that they have to be learned separately as individual whole facts about pieces of the language, but which also have grammatical structure, structure of the kind that we ordinarily interpret by appealing to the operation of the general grammatical rules. This list is not merely a supplement to the lexicon: it contains information about fully productive grammatical patterns, including what have been variously referred to as 'minor sentence types', 'special constructions', and the like.

This 'Appendix to the Grammar' can be thought of as the repository of what is IDIOMATIC in the language. One of our purposes in this paper is to suggest that this repository is very large. A second is to show that it must include descriptions of important and systematic bodies of phenomena which interact in important ways with the rest of the grammar, phenomena whose proper understanding will lead us to significant insights into the workings of language in general. A third is to make the case for a model of linguistic competence in which phenomena of the sort we have in mind are not out of place.

At this point we offer a brief survey of concepts from the domain of idiomaticity. We think of a locution or manner of speaking as idiomatic if it is assigned an interpretation by the speech community but if somebody who merely knew the grammar and the vocabulary of the language could not, by virtue of that knowledge alone, know (i) how to say it, or (ii) what it means, or (iii) whether it is a conventional thing to say. Put differently, an idiomatic expression or construction is something a language user could fail to know while knowing everything else in the language.

1.1.1 Encoding versus decoding idioms

Following Makkai (1972), we begin by recognizing an important distinction between IDIOMS OF ENCODING and IDIOMS OF DECODING.[2] A decoding idiom is an expression which the language users couldn't interpret with complete confidence if they hadn't learned it separately. With an encoding idiom, by contrast, we have an expression which language users might or might not understand without prior experience, but concerning which they would not know that it is a conventional way of saying what it says. (Anything which is a decoding idiom is also an encoding idiom, by these definitions, but there are encoding idioms which are not decoding idioms.) The expressions *kick the bucket* and *pull a fast one* are examples of both decoding and encoding idioms; expressions like *answer the door, wide awake,* and *bright red* are examples of encoding idioms only. That is, while it is likely that each expression of the latter group could be understood perfectly on first hearing, someone who did not know that they were conventional ways of saying what they say would not be able to predict their usability in these ways.[3]

1.1.2 Grammatical versus extragrammatical idioms

Idioms can further be divided into those which have words filling proper and familiar grammatical structures, and those which have words occurring in constructions which the rest of the grammar cannot account for. The so-called GRAMMATICAL IDIOMS include *kick the bucket, spill the beans, blow one's nose,* etc., where verbs and noun phrases show up just where you would expect them. But expressions like *first off, sight unseen, all of a sudden, by and large, so far so good,* etc., have anomalous structures. Nothing we know about the rest of the grammar of English would enable us to predict that these expressions are sayable in our language. Such expressions have grammatical structure, to be sure, but the structures they have are not made intelligible by knowledge of the familiar rules of the grammar and how those rules are most generally applied. These, then, are the EXTRAGRAMMATICAL IDIOMS.

1.1.3 Substantive versus formal idioms

Yet another distinction that we need to make is that between SUBSTANTIVE OR LEXICALLY FILLED IDIOMS and FORMAL OR LEXICALLY OPEN IDIOMS. The examples of idioms given so far have all been substantive idioms: their lexical make-up is (more or less) fully specified. Formal idioms, by contrast, are syntactic patterns dedicated to semantic and pragmatic purposes not knowable from their form alone. It is the formal idioms which raise the most serious theoretical issues, and which hold our main interest in this paper.

A fact which sometimes obscures the difference between substantive and formal idioms is that formal idioms can serve as host to substantive idioms. For example, there is a general syntactic pattern illustrated by such sentences as 1:

(1) The more carefully you do your work, the easier it will get.

While 1 may be a novel creation using the syntactic pattern in question, 2 is a set expression that uses the same form.

(2) The bigger they come, the harder they fall.

1.1.4 Idioms with and without pragmatic point

We find that in many cases idiomatic expressions have special pragmatic purposes associated with them. A large number of substantive idioms have obvious associated pragmatic practices (e.g. *Good morning, How do you do?, once upon a time),* but there are many more which serve more contextually neutral purposes (as with *all of a sudden, by and large,* and the like). In the case of formal idioms, we find the *the X-er the Y-er* type to be more or less free of pragmatic commitments, while others, like the type exemplified in *Him be a doctor?* (Akmajian, 1984), appear to exist in the service of specific pragmatic or rhetorical purposes.

1.2 Typology of idiomatic expressions

The contrasts and distinctions we have just named provide us with the means for constructing a typology of idiomatic expressions. The difference between encoding and decoding idioms will not figure in the classification (though it is important for other reasons), since the question of whether an interpreter could figure out what an expression meant on first encountering it cannot be established on general grounds. We will include examples of substantive idioms in each of the three categories we develop, but our major interest will be in the formal idioms. In the end the formal idioms will be absorbed into the category of grammatical constructions.

1.2.1 Unfamiliar pieces unfamiliarly arranged

As our first category, we consider the case of idioms which contain unfamiliar pieces which are (necessarily) unfamiliarly combined – 'necessarily' because, if the pieces are themselves unfamiliar or unique, there can be no standard principles for arranging them in larger patterns. In the case of lexical idioms, the unfamiliar pieces are words which appear only in the idiom in question, as in *kith and kin, with might and main,* and the like.

As an example of a formal idiom, or grammatical construction, which fits this category, we can return to our *the X-er the Y-er* construction seen in 1 and 2 above. This structure is used for expressing a correlation between an independent variable and a dependent variable. The propositions participating in the statement of correlation can be derived from the lexico-syntactic form of the sentence's two main components. In a syntactic representation of ex. 1, shown in Figure 1, we see that the degree expression *the more carefully* is linked with the gap in *you do your work* [__] and the degree expression *the easier* is linked with the gap in *it will get* [__]. The interpretation, then, is paraphrasable as something like 'The degree to which you do your work carefully will determine the degree to which your work gets easy'.

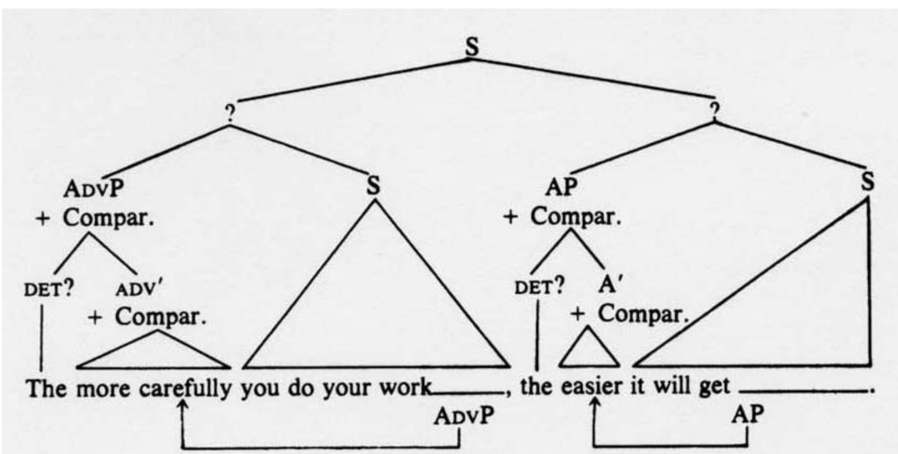


Figure 1

This use of the comparative construction is unique; the use of the definite article that we find in this construction is not, so far as we can tell, found generally elsewhere in the language;[4] nor is the two-part structure uniting the two atypical *the*-phrases found in any of the standard syntactic forms in English.

In spite of the fact that it is host to a large number of fixed expressions, the form has to be recognized as fully productive. Its member expressions are in principle not listable: unlimitedly many new expressions can be constructed within its pattern, their meanings constructed by means of semantic principles specifically tied to this construction.

With respect to the question of whether the expressions that instantiate this construction can be handled by the regular grammar, it is hard enough to believe that the familiar rules of English can so much as provide us the terms needed for describing the construction and labeling its parts. Do we, indeed, have the right to describe the *the* here as the definite article? Combined in what way with what? What is the constituent structure of either half of the construction? Is the antecedent of the first gap *the more carefully* (as indicated) *more carefully* or simply *carefully?* Once we decide on one or another constituent structure grouping of the elements, to what syntactic categories can we assign each of these constituents? If the whole sentence is made up of the two parts, what syntactic category is represented by each of the parts? If we ever decide what syntactic category each of the paired *the*-phrases belongs to, can we be satisfied to say that the only grammatical rule in which the category figures is one which allows the construction of a sentence by juxtaposing exactly two of these?

In describing the pieces as unfamiliar we must recognize that they are not all completely unfamiliar: for example, the portions which follow the comparative phrase have some of the ellipsis properties of the complements of true comparative phrases. But they differ from ordinary comparative constructions in a number of ways. For example, these do not occur with the complementizer *than,* but can sometimes occur with *that (the more that I eat,* ...). The level at which the structure is most clearly unfamiliar (in the sense of not being represented elsewhere in the language) is the level of the paired *the*-phrases and their mode of combination.

1.2.2 Familiar pieces unfamiliarly arranged

The second type of idiomatic expression includes those which are made up of familiar pieces which are unfamiliarly combined. Here, too, the semantic interpretation is necessarily novel, since the principles of combination used for general semantic interpretations cannot serve us here. Substantive idioms which fit this category include phrases like *all of a sudden* and *in point of fact.* Some idioms in this category are of the 'encoding only' type. That is, they require special syntactic and semantic rules, but the hearer of an expression embodying these rules who was not familiar with them might nonetheless guess the meaning successfully. An example is the occurrence of the bare noun *home* in contexts calling for locative or directional complements.

(3) She went/called/stayed/is/*has/*loves home.

An interesting formal idiom of this kind is the one which allows us to construct cousin terms, as in *second cousin three times removed.* We consider now some of the properties of this construction.

The regular grammar of English provides for plural noun phrases lacking determiners, and when the head nouns or N-bars of these phrases denote symmetrical predicates, it provides an appropriate and general syntax and semantics for sentences with conjoined subjects and copular verbs, such as exx. 4 – 6:

(4) Jane and Mary are *best friends.*

(5) Harry and Joe are *acquaintances of long standing.*

(6) Marge and Sue are *bitter enemies.*

Expressions for kinship relations are standard examples of noun phrases that may fill this role and other NP roles in the regular grammar:

(7) Jane and Sue are *sisters.*

(8) Harry and Sue are *cousins.*

(9) Jane is Sue's *sister.*

(10) Harry is Sue's *cousin.*

Many kinship expressions that can fill such slots are not lexical (like *cousin* and *sister),* but phrasal. Moreover, neither the morphosyntactic rules required to generate these phrases nor the semantic rules required to interpret them are predictable from knowledge of the general grammar; they have to be learned separately for the construction and interpretation of these particular phrases by the learner of English. Some subsets of these kinship phrases are of finite cardinality and so could be listed in the lexicon, although in so doing the grammarian would pass up an opportunity to extract a generalization. The expressions *mother-in-law, father-in-law, sister-in-law, brother-in-law, son-in-law,* and *daughter-in-law* exemplify such a finite set. But there are other sets of kinship expressions that are in principle of non-finite cardinality and hence unlistable, for example the series exemplified in 11 – 12:

(11) grandmother, great grandmother, great great grandmother, **...;** grandfather, great grandfather, great great grandfather, **...;** grandson,

(12) first cousin once removed, first cousin twice removed; **...;** second cousin once removed, second cousin twice removed

The morphosyntactic properties of the infinite set of phrases indicated in 12 may be summarized by the formula

(13) *n*th cousin *m* times removed,

where *n* is a positive integer and *m* is a non-negative integer. (The expression '*n*th' in the formula is intended to abbreviate 'the English word for the ordinal number corresponding to the positive integer *n*'.) Note that *nth cousin* has the grammatical structure of *fourth chapter,* that *m times* has the grammatical structure of *two ways,* and that *removed* has that of *rewritten.* The regular syntactic machinery does not, however, provide us with the resources to assemble a nominal expression of the type *fourth chapter three ways rewritten.* This is the kind of situation we have in mind when, in speaking of *nth cousin m times removed,* we talk about familiar pieces unfamiliarly combined.

Standard morphological rules operate within these expressions to reduce *one times* to *once* and *two times* to *twice.* A morphosyntactic rule special to this construction realizes 'zero times removed' as the phonetically null string. The semantic rule associated with this phrasal construction produces a semantic form whose properties may be described as follows: Two distinct people X and Y are nth cousins m times removed iff (1) X and Y have a common ancestor, (2) the common ancestor closest to either X or Y is $n - 1$ generations removed from that person and (3) either X or Y is m generations further removed from the closest common ancestor than the other is. This semantic rule is illustrated in Figure 2 for the expression *second cousin four times removed;* the downward arrow represents the relation 'parent-of'. As we have indicated, the internal syntax and semantics of such phrases require a special mini-grammar embedded within the general grammar, whose properties are not deducible from those of the larger grammar. Externally, such expressions behave as normal syntactic and semantic objects in the sentences in which they occur.

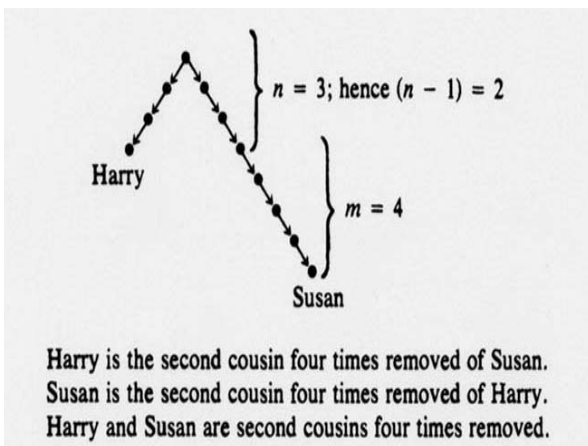


Figure 2

1.2.3 Familiar pieces familiarly arranged

The third type of formal idiom is made up of familiar pieces combined according to familiar combinatorial principles, but to which idiomatic interpretations are assigned. Substantive idioms meeting these conditions include *hang/tie one on* (in the sense of 'get drunk'), *pull someone's leg,* and *tickle the ivories.* Formal idioms in this category include fate-tempting expressions of the kind seen in *now watch me drop it* said by someone who has just picked up a tray of drinks, as well as rhetorical questions that convey negative messages: *Who's gonna make me?, Am I invisible?, When did I say you could do that?,* and so on.

2 Formal idioms: the case of *let alone*

We are interested in investigating formal idioms. The formal idioms which interest us are of both the grammatical and the extragrammatical kinds, and of both the encoding and the decoding varieties. They include the *the X-er the Y-er* case mentioned earlier, but also the constructions underlying such expressions as those in 14:

(14) a. There goes Charlie again, ranting and raving about his cooking.
b. Look who's here!
c. what with the kids off to school and all
d. Why not fix it yourself?
e. He's not half the doctor you are.
f. Much as I like Ronnie, I don't approve of anything he does.
g. He may be a professor, but he's an idiot.
h. Him be a doctor?
i. What do you say we stop here?
j. It's time you brushed your teeth.
k. One more and I'll leave.
l. No writing on the walls!
m. That's not big enough of a box.
n. It satisfied my every wish.

In claiming that each of these expressions exemplifies a special grammatical construction or formal idiom, we claim that for each of them both of the following questions can be answered in the negative. (1) Does the expression exhibit properties that are fully predictable from independently known properties of its lexical makeup and its grammatical structure? (2) Does the expression deserve to be listed in a general phrasal lexicon of the language, and treated as a fixed expression? It is probably unnecessary to point out that it's sometimes difficult to know how to answer these two questions.

Consider ex. 14h, illustrating what we may refer to as the Incredulity Response Construction. This particular sentence exemplifies an indefinitely large set of English sentences *(Your brother help me? Her write a novel about the Spanish Inquisition?*, ...), discussed at length in Akmajian (1984), which consist of a main clause sentence whose subject is in the objective case and whose verb is in the bare-stem form. If a person spoke English perfectly except for never having encountered a sentence from this indefinitely large set, he could obviously not acquire its members one by one but would have to learn a general rule pairing a particular syntactic form (notably featuring a non-nominative subject and a non-finite main verb) with a specific pragmatic force. (Roughly, such sentences must be used to challenge or question a proposition just posed by an interlocutor.) No finite number of additions to the lexicon or phrasicon would do the trick. It is this sort of rule that we refer to as a 'formal idiom' or 'special grammatical construction'.

2.1 Preliminaries

Our central goal in this paper is to illustrate the analysis of grammatical constructions in their pragmatic, semantic, and syntactic aspects, using that grammatical device in English that incorporates the phrase *let alone*. Our aim in exploring the properties of the *let alone* construction is, of course, to discover whether they comprise a good example of the kind of semi-autonomous grammatical construction that interests us. *Let alone* expressions have properties shared by many other construction types and lexical items in the language, so the argument about whether they can be seen as instantiating an autonomous grammatical construction needs to be conducted with care. It is our impression that *let alone* sentences possess a collection of properties that is unique to this particular family of expressions, and that they must therefore be given treatment as the kind of formal idiom or special construction we have been discussing.

Examples of sentences exhibiting the *let alone* construction, with preceding context provided, include the following:[5]

(15) a. Did the kids get their breakfast on time this morning?
b. I barely got up in time to EAT LUNCH, let alone COOK BREAKFAST.

(16) a. I know that Louise is a picky eater, but I bought the kids some squid for dinner.
b. I doubt you could get FRED to eat SHRIMP, let alone LOUISE SQUID.

(17) a. You remember the battle of Verdun, don't you?
b. I was too young to serve in World War TWO, let alone World War ONE.

(18) a. Do you think anyone will mind if I take my clothes off before I jump into this quaint little water hazard?
b. Look, around here you can get arrested for going BAREFOOT, let alone for walking around NAKED.

(19) a. For Janey's birthday party I'm thinking of serving Coca Cola, but I'm afraid little Seymour's parents will be annoyed. They seem like health-oriented types.
b. Don't worry. Little Seymour's parents let him drink WHISKEY, let alone COKE.

As a first approximation we can talk about *let alone* as a coordinating conjunction, each of whose conjuncts contains a focused element. To provide a notation for developing the arguments offered below, we propose analyzing any *let alone* sentence as a syntactic structure of either of the following two types:

(20) a. F ⟨X A Y let alone B⟩
'I doubt you could get FRED to eat squid, let alone LOUISE.'
b. F ⟨X A let alone B Y⟩
'I doubt you could get FRED, let alone LOUISE, to eat squid.'

Here A and B are coordinated, prosodically focused, and contrasting constituents. X and Y are the neighboring, non-contrasting parts of the clause in which the coordination occurs. The type of coordination is that by which the phrase *let alone B* is seen as parenthetical (to be discussed further below). As we will discuss at length below, *let alone* appears to be a negative polarity item, and F at this point can be loosely designated as a negative polarity trigger which has the rest of the sentence in its scope. (The entire construction, F ⟨X A Y *let alone* X B Y⟩, can of course occur embedded within a larger structure, the contents of which are not relevant to this analysis, e.g.: *My observations warrant the inference that [Fred will not eat shrimp, let alone squid].)*

In demonstrating the division just named, we can examine sentence 21:

(21) [I doubt [he made COLONEL in World War II],

F X A Y

let alone [GENERAL.]]

B

In 21, F is *I doubt,* X is *he made,* Y is *in World War II,* A is *Colonel,* and B is *General.*

We will have more to say about the operator F below. Here we will simply point out that this element may be external (in surface structure) to the portion of the sentence yielding the ⟨X A Y *let alone* B⟩ element, but that it may also occur clause-internally, as the simple negative does in 22:

(22) He doesn't like SHRIMP, let alone SQUID.

In fact, the element F must be understood abstractly enough to correspond in certain sentences to a grammatical property distributed throughout a sentence, such as the semantico-grammatical property of being a rhetorical question:

(23) Who could IMAGINE such a thing, let alone DO it?

The syntactic schemata given in 20 and 21 can be taken as corresponding to the semantic schema in 24, where F' is a semantic predicate derived from the syntactic element F.

(24) F'⟨X A Y⟩ and F'⟨X B Y⟩

A second semantic requirement of a *let alone* sentence is that the two semantic structures of the schema above represent points on a scale, in a way to be described below. This background affects the illocutionary strength of the two clauses, so that F' ⟨X B Y⟩ is being posed with greater force than F' ⟨X A Y⟩ and for the very reason that the latter is posed. If I doubt that he made colonel, I doubt all the more that he made general.

The pragmatic function of a *let alone* sentence is to enable the speaker to respond to a situation in which an expression of the meaning F' ⟨X B Y⟩ is RELEVANT, but in which expression of the meaning F' ⟨X A Y⟩ is more INFORMATIVE. The construction, in other words, is pragmatically sensitive to a conflict between two Gricean maxims, the maxim of informativeness (or Quantity) and the maxim of relevance (or Relation). It presents the more informative proposition first.

As the examples above illustrate, the use of the *let alone* construction allows the speaker to simultaneously address a previously posed proposition,[6] and to redirect the addressee to a new proposition which will be more informative.

The context proposition plays an important role in our understanding of the construction, since it is the denial of the informativeness of this context proposition that determines what can and what cannot count as the syntactic operator F and its semantic projection F'.

2.2 The syntax of *let alone*

Syntactically, *let alone* can be characterized as follows: it is a kind of conjunction; constructions containing it are examples of PAIRED FOCUS CONSTRUCTIONS; the post-*let alone* part of a sentence of this type is a particular type of sentence fragment; *let alone* appears to be a negative polarity item of a particularly tolerant type, which permits under certain contextual conditions (to be discussed below) utterances of sentences such as 18 – 19; and the construction creates special syntactic problems from the fact that it permits multiple paired foci in a single sentence. Each of these points will be taken up in turn.

2.2.1 Let alone as a coordinate conjunction

The expression *let alone* (generally) pairs two grammatically equivalent constituents. The interpretation of the sentence as a whole depends on constructing two sentences, each of which needs to be given an evaluation. (That is, if the sentence is an assertion, both the version containing A and the version containing B need to be true.) Its conjuncts comprise (at least) two paired foci, elements by which the two sentences being compared differ from each other.

The phrase *let alone* functions like a coordinating conjunction, in that it occurs in a wide variety of sentential environments where ordinary coordinating conjunctions occur. Consider exx. 25 – 30:

(25) a. I don't even want to read an article ABOUT, let alone a book written BY, that swine.
b. I don't want to read an article about, or a book written by, that swine.

(26) a. You couldn't get JOHN to TOUCH it, let alone LUCILLE to EAT it.
b. I want John to write it and Lucille to recite it.

(27) a. Max won't eat SHRIMP, let alone SQUID.
b. We'll need shrimp and squid.

(28) a. Max won't TOUCH the SHRIMP, let alone CLEAN the SQUID.
b. I want you to cook the shrimp and clean the squid.

(29) a. They couldn't make JOHN eat the SHRIMP, let alone LUCILLE the SQUID.
b. They made John eat the shrimp and Lucille the squid.

(30) a. He wouldn't give A NICKEL to his MOTHER, let alone TEN DOLLARS to a COMPLETE STRANGER.
b. He gave a nickel to me and a dollar to my sister.

We find in these examples many of the properties associated with coordinating conjunctions: coordinating conjunctions join like categories (illustrated above with VPs, clauses, and NPs), and they permit right node raising, gapping, stripping, conjunction reduction, various sorts of nonconstituent conjunction, etc. Yet we also find in these and other *let alone* sentences some properties that are not found in proper coordinate conjunction.[7]

For example, there is little reason to believe that the entire sequence *A let alone B* is a constituent. The following examples might lead us to assume that *let alone* does not conjoin phrases. Consider the asymmetry between true phrasal coordination and a *let alone* phrase with respect to topicalization:

(31) a. Shrimp and squid Moishe won't eat.
b. *Shrimp let alone squid Moishe won't eat.
c. *Shrimp Moishe won't eat and squid.
d. Shrimp Moishe won't eat, let alone squid.[8]

WH-extraction from one side of a *let alone* phrase is also sometimes easier than similar extraction from a coordination containing *and.* Although 32b is not unexceptionably grammatical, it seems better to us than 32a.[9]

(32) a. *a man who Mary hasn't met or ridden in his car
b. ?a man who Mary hasn't met, let alone ridden in his car

IT-clefting is possible with the full constituent of a coordinate construction, but not with *let alone.* Notice 33 and 34:

(33) *It's shrimp let alone squid that Max won't eat.

(34) It's shrimp and squid that Max won't eat.

Some properties of the kinds of sentence fragments available in the second conjunct of a *let alone* sentence show them to be similar to the than-clause of a comparative construction, as seen in 35 – 38:

(35) Max won't eat shrimp, let alone Rabbi Feldstein.

(36) Max ate more shrimp than Rabbi Feldstein.

(37) Minnie wasn't born by 1941, let alone Meg.

(38) Minnie was born much earlier than Meg.

VP ellipsis, possible with coordinated constructions and comparative clauses, is not possible with *let alone*.

(39) Max will eat shrimp more willingly than Minnie will.

(40) Max won't eat shrimp but Minnie will.

(41) *Max won't eat shrimp let alone Minnie will.

In many of its uses, the *let alone* conjunction has much in common with what we might speak of as parenthetically used conjunctions. These form a constituent with their second conjunct, appearing either next to their first conjunct with parenthesis intonation, or extraposed to the end of their clause. Examples of such parenthetical conjunctions can be seen in 42 – 46:

(42) a. John'll do it for you, or maybe Bill.
b. John won't do it for you, let alone Bill.

(43) a. John was there, and Louise (too).
b. John wasn't there, let alone Louise.

(44) a. I wanted Fred to do it, rather than Sue.
b. I didn't want Fred to do it, let alone Sue.

(45) a. Louise surely understood it, if not Susan.
b. Louise surely didn't understand it, let alone Susan.

(46) a. I bet Louise, not to mention Susan, could pass that test.
b. I bet Louise, let alone Susan, couldn't pass that test.

2.2.2 *Let alone* as a paired focus construction

The *let alone* construction has several features in common with what are sometimes called FOCUS CONSTRUCTIONS (see Prince, 1981, for a review of the unique aspects of each construction). Pseudoclefts, clefts, leftward movement constructions like Topicalization, and Yiddish Movement are commonly held to have the function of foregrounding a particular element, the Focus constituent. Each of these has its own prosodic and syntactic characteristics which, together with its particular semantics and pragmatics, differentiate it from the others in its class. Similarly, in the class of constructions we describe here, each has idiosyncrasies and particularities which distinguish it from the others. However, just as the constructions cited above can be characterized as a group by the appearance of some phrasal constituent at the left-most point of an English sentence, so these can be grouped on the basis of several structural features. Some examples:

(47) He doesn't get up for LUNCH, let alone BREAKFAST.

(48) He doesn't get up for LUNCH, much less BREAKFAST.

(49) She didn't eat a BITE, never mind a WHOLE MEAL.

(50) She didn't eat a MEAL, just a SNACK.

(51) She beat SMITH at chess, not to mention JONES.

Each of these examples contains a complete clause, followed by a connective of some sort, followed by a fragment.[10] The fragment bears a certain relationship to some part of what we have called the context sentence. The fragment and the constituent that it corresponds to are both in focus (in a way to be discussed below at length), as is shown by the prosody typically associated with them, and their pragmatic status (also to be discussed below). In these double focus constructions, the unmarked prosodic shape consists of prominence on both the first and the second focused elements. Thus:

(52) She doesn't get up for LUNCH, let alone BREAKFAST.

All of these constructions allow the speaker (1) to make an assertion or contradict some proposition implied or asserted by another speaker, by focussing on a particular constituent of that proposition; and (2) to reset the value of that constituent, as it were.[11]

2.2.3 Sentence fragments and the complement of let alone

A full account of the syntax of *let alone* would ideally be embedded within a comprehensive theory of the syntax and semantics of sentence fragments. That is, the syntax (and semantics) of a sentence like 53 would form part of a general formulation of the syntax and semantics of sentences like 54 – 57, which contain what we might call fragment-taking conjunctions and whose semantic interpretation requires the reconstruction from the fragment of a full semantic clause.

(53) John hardly speaks RUSSIAN let alone BULGARIAN.

(54) John speaks Russian, if not Bulgarian.

(55) John speaks Russian, in fact Bulgarian (too).

(56) John doesn't speak Bulgarian, just Russian.

(57) John killed a shark, and with his bare hands.

Most approaches to fragment-creating phenomena to date have been rather piecemeal, involving, for example, separate and unrelated rules of gapping, conjunction reduction, right node raising, stripping, and the like, and containing little if any analysis of constructions containing conjunctions like *if not, in fact, but only, just,* and so on. We also are not prepared to present an integrated account. In §2.3.1, however, we say enough about the constraints which the particular case of *let alone* would place on any unified and encompassing account of fragment-creating phenomena to permit us to present the semantic analysis of *let alone* without equivocation.

It was noted above that *let alone* does not permit VP ellipsis. This follows from a more general property of the *let alone* construction. In stating this principle we will refer to the INFL-complex, by which we intend to denote the surface constituent that contains a tensed auxiliary and negation when these are present: in a *let alone* sentence, the INFL-complex is part (or all) of the F element whenever the F element receives surface expression.

Note the contrast between 58 and *59.*

(58) Louis won't eat shrimp and (Sarah) will/won't eat squid.

(59) *Louis won't eat shrimp let alone (Sarah) will/won't eat squid.

This does not, of course, amount to a GENERAL prohibition on tense and negation in the fragment. When the F element is external to the ⟨X A Y⟩ clause, a tensed or negated element may appear in the fragment since the INFL-Complex/F-element principle is, so to speak, already satisfied.

(60) I doubt the party criticized him at all, let alone told him not to run for office.

As suggested in note 8, tense and negation may also appear in the fragment when there is no F element – that is, when the F' element is purely pragmatic.

(61) a. Did the most recent research confirm the Macro-Penutian hypothesis?
b. The latest results dissolved PENUTIAN let alone didn't support MACRO-PENUTIAN.

2.2.4 Let alone as a negative polarity item

In earlier versions of this paper we were convinced that *let alone* was a straightforward negative polarity item, believing that it was welcome only in sentences which provide 'affective' (Klima, 1964) contexts for it. The set of possible F's included simple negation, *too* complementation, comparison of inequality, *only* as determiner of the subject, and various minimal attainment qualifiers, these and more illustrated in examples 62 – 70:

(62) He didn't reach DENVER, let alone CHICAGO.

(63) I'm too tired to GET UP, let alone GO RUNNING with you.

(64) She gave me more candy than I could CARRY, let alone EAT.

(65) Only a linguist would BUY that book, let alone READ it.

(66) I barely got up in time for LUNCH, let alone BREAKFAST.

(67) I had all I could do to get out of BED, let alone do my morning CALISTHENICS.

(68) It would surprise me if JOHN could pass the test, let alone BILL.

(69) He failed to reach the sixth GRADE, let alone get a B.A.

(70) Anyone who'd been to HIGH SCHOOL, let alone GRADUATE students in MATH, should be able to solve that problem.

Since all of these are contexts welcoming *any* (one of the tests for a negative polarity environment), and since most of the *let alone* sentences we encountered in the first months of our inquiry were negative affect sentences, we concluded that negative polarity was one of the special properties of this construction.[12] However, attested sentences like 71 and 72 began to accumulate, forcing the conclusion that if *let alone* is in fact a negative polarity item, it is not simply and straightforwardly one.

(71) You've got enough material there for a whole SEMESTER, let alone a WEEK.

(72) PENUTIAN has been broken up, let alone MACRO-Penutian.

The troublesome facts of the matter are that (1) it is very hard to think up convincing examples of *let alone* sentences without the usual negative polarity triggers, and (2) we have come across incontrovertible cases of attested utterances of non-negative *let alone* sentences that seem perfectly natural and which there is no apparent justification to ignore as performance errors. Our explanatory speculation is as follows. Consider the sentences in 71 – 72. We have no record of the contexts in which they were uttered, but we imagine they may have been something like those provided by speaker A in 73:

(73) a. A: I doubt I have enough material here for a week.
B: You've got enough material there for a whole SEMESTER, let alone a WEEK.
b. A: Macro-Penutian is still a viable hypothesis, isn't it?
B: PENUTIAN has been broken up, let alone MACRO-Penutian.

Note that in both 73a and 73b the fragment clause of the *let alone* sentence uttered by B is the denial of the context sentence uttered just previously by A. That is, the first speaker suggests that there is not enough material for a week or that Macro-Penutian is still considered a serious hypothesis. In both cases the second speaker B offers as the contextually relevant part of his *let alone* response the negation of the context sentence. It appears that, given the strong pragmatic requirement of the *let alone* construction for a context sentence, for some speakers at least the DENIAL of the context sentence has enough negative affect to serve as a polarity trigger for *let alone.*[13]

2.2.5 Multiple paired foci: a syntactic puzzle

We have already observed that the A and B parts can be multiple. That is, there can be multiple matched foci in the two parts of the *let alone* sentence, as in 74.

(74) You'd never get a poor man to wash a car for $2 in bad times, let alone a rich man to wax a truck for $1 in prosperous times.

An important and puzzling characteristic of the multiple paired-focus versions is the possibility of multiple use of *let alone* in the same sentence, as is seen in 75.

(75) You'd never get a poor man, let alone a rich man, to wash, let alone wax, a car, let alone a truck, for $2, let alone $1, in bad times, let alone in prosperous times.

Multiple paired focus sentences of the type just illustrated provide evidence for the scalar semantic nature of the *let alone* construction. The details will be developed in §2.3. below. Here we limit our attention to the interesting syntactic problems which the existence of such sentences raises. We note the existence of two sentence forms with the same meaning, illustrated by 76 and 77:

(76) You couldn't get a poor man to wash your car for two dollars, let alone a rich man to wax your truck for one dollar.

(77) You couldn't get a poor man, let alone a rich man, to wash, let alone wax, your car, let alone your truck, for two dollars, let alone for one dollar.

The first thing to notice is that the second syntactic form, in which each pair of focus elements is linked by an instance of *let alone,* is possible only when the multiple prosodic foci represent multiple propositions in semantic interpretation. Thus, ex. 78a, with a single *let alone,* cannot be paraphrased as 78b, which contains multiple instances of *let alone.*

(78) a. You'll never get Gorbachev to denounce communism, let alone Reagan to denounce capitalism.
b. ??You'll never get Gorbachev, let alone Reagan, to denounce communism, let alone capitalism.

Leaving aside the problem of how to formalize this fact perspicuously, we turn to the problem of representing the varying syntactic forms of the multiple focus/multiple proposition sentences themselves. To describe the distributional facts, we must adopt some fairly precise idiom. The idiom we find convenient, without making any theoretical commitment to it, is that of an older form of transformational grammar, one which countenanced a wide variety of transformational rules converting structures of one specified type into structures of another specified type. In such a framework, we could posit an underlying structure for multiple focus/multiple proposition *let alone* sentences along the lines of 79:

(79) $X_1A_1X_2A_2 \ldots X_nA_nX_{n+1}$ let alone $X_1B_1X_2B_2 \ldots X_nB_nX_{n+1}$

Here the various Xs are syntactic variables and the As and Bs are the contrastively focused elements.

This underlying form would then be realized on the surface in sentences having only one instance of *let alone* by deleting some or all of the right-hand X variables. As our discussion of the status of *let alone* as a conjunction showed, exactly which combination of deletions would be possible, depending on the detailed constituent structure of the sentence, might be difficult to specify according to general principles. A substantial fraction of the constraints on deletions associated with *let alone* conjunction appear not to be deducible from knowledge of general rules that mention the syntactic category conjunction.

A more serious problem arises with respect to the syntax of sentences containing multiple tokens of *let alone.* In these sentences, any unbroken sequence of the right-hand focused elements (the Bs) can be moved to the left and conjoined with a preceding *let alone* to the corresponding A focused element sequence. For example, all of the following sentences are possible.

(80) A poor man, let alone a rich man, wouldn't wash your car for $2, let alone wax your truck for $1.

(81) A poor man wouldn't wash your car, let alone a rich man wax your truck, for $2, let alone for $1.

(82) A poor man wouldn't wash, let alone a rich man wax, your car for $2, let alone your truck for $1.

Note that each of the three preceding examples means the same as 83:

(83) A poor man wouldn't wash your car for $2, let alone a rich man wax your truck for $1.

What can be concluded from these sentences is, in effect, that to any stretch of the form $A_i \ldots A_j$ we can conjoin the stretch of the form *let alone* $B_i \ldots B_j$, removing this stretch from the right-hand side, as in *a poor man wash your car, let alone a rich man wax your truck,* or *a poor man, let alone a rich man, wash your car, let alone wax your truck.* Variables (non-focused elements) on the right get deleted if they are flanked by moved B elements.

To state this transformation, the indices on the A and B elements would have to be mentioned in both the structural description and the structural change. The ordinary language of expressing structural descriptions and structural changes would not, of course, permit this. It is unclear to us how dependencies of this type could be represented in traditional transformational grammar. In fact, it appears they could not, without a radical redefinition of transformation, making it a more powerful device. It would seem that the perspicuous representation of dependencies of this kind might pose an interesting problem in current syntactic frameworks as well.

We have been able to find only one other construction of English which has this peculiar syntactic property, though the semantics of this formal idiom differs considerably from the semantics of *let alone.* We have in mind the construction that employs the discontinuous conjunction *not...but...* Note the parallelism between 84 – 87 below and 80 – 83 above.

(84) Ivan sent, not an album to Albania for Anna on her anniversary, but a book to Bulgaria for Boris on his birthday.

(85) Ivan sent, not an album but a book, (and) not to Albania for Anna on her anniversary, but to Bulgaria for Boris on his birthday.

(86) Ivan sent, not an album to Albania for Anna, but a book to Bulgaria for Boris, (and) not on her anniversary but on his birthday.

(87) Ivan sent, not an album to Albania but a book to Bulgaria, not for Anna but for Boris, and not on her anniversary but on his birthday.

The syntax of *not...but...* is not in general identical to that of *let alone,* as the former exhibits some special constraints, particularly involving subject and verb foci. Nevertheless, as illustrated in 80 – 83 and 84 – 87, both constructions possess the property just discussed.[14] Failing our or someone else's success in accounting for these dependencies through some general principle of grammar, the most prudent conclusion would appear to be that the learner of English acquires such distributional constraints as a part of the learning of a small number of special constructions, perhaps exactly two. If no more general solution is to be found (and we will be pleased if some of our readers can find it and will tell us about it), we will be forced to conclude that a small class of lexical items may possess syntactic properties that require descriptive devices of surprising mathematical power, which are quite general within the sentences containing them, but which are apparently absent from general grammar.

2.3 The semantics of let alone

We saw that syntactically a *let alone* sentence allowed an initial analysis into the components F ⟨X A *let alone* B Y⟩**,** with the proper adjustments in case there is more than one pair of elements which the construction puts into contrast. The process of constructing a semantic interpretation of a *let alone* sentence begins with building (for each contrasting pair of As and Bs) two sentences, one with A and one with B, in which the syntactic F element is represented by the semantic F' element, in the formula F' ⟨X A Y⟩.

In the simplest case, the case in which the F constituent is simply grammatical negation, we can say that the sentence simply asserts both 'not(X A Y)' and 'not(X B Y)'. (That is, from *He didn't make colonel, let alone general* we derive two propositions – that he did not make colonel and that he did not make general.) The general effect of the construction is to assert the first and to suggest that the second necessarily follows, and so the relation between the two parts, 'not(X A Y)' and 'not(X B Y)', is one of entailment. ('He didn't make colonel; a fortiori, he didn't make general.') But it is not simply an entailment relation. In particular, the entailment in this case must be against the background of a presupposed semantic scale. The interpretation of any *let alone* sentence requires seeing the two derived propositions as points on a scale. A second and essential step in the interpretation of a *let alone* sentence, then, requires the construction of a scale in which the A proposition and the B proposition are distinct points.

The discussion in this section will concentrate on (1) the interpretation of the sentence fragment containing or constituting the B constituent; (2) the nature of the entailment relation that holds between the A part and the B part; (3) the dimensions and scalar relations presupposed by a use of the construction; (4) the special case of complex scales (corresponding to the use of the construction with multiple paired foci); and (5) the roles of negative and positive polarity in the interpretation of the entailment relationship.

2.3.1 The interpretation of sentence fragments

It is our job here to present the salient syntactic and semantic facts about the *let alone* construction and to suggest their relevance for grammatical theory generally. While among these suggestions will be a claim that some of these facts are not readily accommodated within existing grammatical theories, we do not attempt to present a new formal framework of our own. Consequently, it should not be surprising that we come upon facts whose certain designation as syntactic versus semantic is not intuitively given and must wait upon a fully explicit treatment that establishes this distinction formally, if such a formal distinction is justified. We will continue here to use the idiom of the older form of transformational grammar as a heuristic, descriptive device, without intending any theoretical commitment regarding the issue of whether the phenomena we consider are really syntactic or semantic.

It will be recalled that a *let alone* sentence containing *n* pairs of foci may contain any number of tokens of *let alone* between 1 and *n* (the interpretation of such an expansion being, however, contingent on the independence of the dimensions, as discussed with respect to ex. 78). In the simplest case, *n* of course equals 1. It will be further recalled that any sentence containing more than one token of *let alone,* such as 75, means the same as another *let alone* sentence that contains just one instance of *let alone,* such as 74. In general, given the restriction to independent dimensions, any *let alone* sentence containing *n* paired foci belongs to a set of $2^{n+1} - 1$ synonymous *let alone* sentences containing these same paired foci. The members of the set differ of course in the number and placement of tokens of *let alone* (as well as in semantically irrelevant details regarding whether various non-focused elements occur more than once on the surface or are deleted under identity after their initial occurrence). Thus, when we have specified the semantics of an *n*-focus *let alone* sentence containing a single token of *let alone,* we have specified the semantics of every other member of the set of sentences syntactically derivable from this one by the process described in §2.2.5. If we take the process of syntactic derivation described in §2.2.5 literally, we are accounting for the relations of intersentential synonymy thereby specified with a syntactic as against an interpretive process. Our need here, however, is merely to establish that these relations of synonymy exist, and we abjure any position on the issue whether a fully explicit theory should provide a syntactic or a semantic account of these relations. What we need to establish for present purposes is no more than the following: a semantic account of all the sentences containing a single token of *let alone* is a semantic account of all *let alone* sentences. Consequently, for the remainder of this section (2.3), we may use the expression '*let alone* sentence' as a shorthand for '*let alone* sentence containing a single token of *let alone*' without loss of generality.

The interpretation of a *let alone* sentence of the form in 88 proceeds first by restoration of any X element on the right of the *let alone* that may have been deleted, yielding the abstract form in 89:

(88) $F[X_1A_1...X_nA_nX_{n+1}$ *let alone* $(X_1)B_2\,(X_n)B_n(X_{n+1})]$

(89) $F[X_1A_1...X_nA_nX_{n+1}$ *let alone* $X_1B_1...X_n\,B_nX_{n+1}]$

For example, from an actual sentence such as 90 an abstract structure is reconstructed that can be represented by 91:

(90) You could never get Fred to eat SHRIMP at Jack-in-the-Box let alone SQUID.

(91) You could never get (Fred to eat shrimp at Jack-in-the-Box let alone Fred to eat squid at Jack-in-the-Box).

In the preceding example the abstract structure happens to correspond closely to an acceptable surface sentence, but in other cases this is not so, as when the F element is simple negation. For example, reconstruction of 92 yields 93.

(92) Fred won't eat shrimp at Jack-in-the-Box, let alone squid.

(93) Not (Fred will eat shrimp at Jack-in-the-Box let alone Fred will eat squid at Jack-in-the-Box).

Succeeding stages of the interpretation of a *let alone* sentence involve obtaining propositional interpretations P_1 and P_2 of the sentences of the form $X_1A_1 \ldots X_nA_nX_{n+1}$ and $X_1B_1 \ldots X_nB_nX_{n+1}$ respectively; and obtaining from F the semantic operator F' in such a way that the form of the meaning of the full sentence is as in 94:

(94) $F'(P_1); F'(P_2)$

We now proceed to a description of these processes and the constraints they exhibit.

2.3.2 The entailment relation: presupposed dimensions and scales

A sentence about the unlikelihood of *Fred eating shrimp let alone squid* is a sentence whose user presupposes (let us say) a dimension of distastefulness – recognizing that while a number of people find all sorts of seafood distasteful, more people are willing to eat shrimp than are willing to eat squid. A sentence about somebody being surprised at *Fred eating squid let alone Louise* is one whose user presupposes a dimension of squeamishness by which Louise is taken to be consistently more squeamish than Fred: there are things that Fred would eat which Louise would not eat, but not the other way round. And the sentence in 95 presupposes a complex two-dimensional scale combining the squeamishness of diners with the yuckiness of exotic food.

(95) You could never get *Fred* to eat *shrimp,* let alone *Louise squid.*

The semantic rules of English do not allow the interpreter to determine the nature of the scale from the form of a *let alone* sentence – the background for the cases just illustrated could easily involve the stinginess of the diners and the cost of the food – but they require that some scalar array of the compared variable pairs be automatically set up as an initial step in interpreting the sentence, the details being correctly or incorrectly filled in by the interpreter.

In many cases the required scale in question may be readily determined independently of the context in which a *let alone* sentence is used, but in other cases it might be quite specific to the context. Some of the range of variation is illustrated by the following examples.

(96) He's not even 18, let alone 21.

(97) He isn't heavy enough to play QUARTERBACK, let alone TACKLE.

(98) This water isn't hot enough to WASH DISHES, let alone MAKE TEA.

(99) A GROWN MAN couldn't LIFT this boulder, let alone a CHILD TOSS it SIX FEET.

(100) There's no chance she's even gonna LOOK at me, let alone REMEMBER my NAME.

(101) MEG wasn't born in 1941, let alone her DAUGHTER.

The possibility of absolute context specificity is illustrated by such cases as the following: if we hear someone say *She didn't get to* BERLIN *let alone* WARSAW, we infer that a journey from West to East is under discussion, while if what we heard had been *She didn't get to* WARSAW *let alone* BERLIN, we would have inferred a journey from East to West. To give another example, we have a ready-made scale to interpret a sentence like 102:

(102) She's not even in the $30,000 a year category, let alone the $60,000 a year category.

But in a context in which we are talking about eligibility for welfare benefits, it could make sense to say the following sentence of somebody:

(103) She's not even in the $6000 a year category, let alone the $3000 a year category.

The necessity of seeing the entailment relationship as one involving a scalar semantics can be shown by the out-of-context anomaly of a sentence like 104:

(104) Fred doesn't have an ODD NUMBER of books, let alone SEVENTY-FIVE.

Surely not having an odd number of books entails not having exactly seventy-five books; yet the sentence is bad, because the entailment is not within a scalar semantics. But if the possibilities can be reinterpreted, so that a genuine scale is involved, the relationship between 'being an odd number' and 'being the number 75' can provide the kind of scalar entailment we require. The situation you are asked to imagine is that in a particular lottery every holder of an odd number received a small prize, but the number 75 was the big winner. Now, in a context in which somebody asked whether Fred got the big prize in the lottery, we can say the following sentence:

(105) He didn't even have an ODD NUMBER, let alone SEVENTY-FIVE.

Returning to our military rank examples, we might point out that 'not being a commissioned officer' entails 'not being a second lieutenant' just as clearly as it entails 'not being a colonel'. If entailment alone were sufficient warrant for the use of the *let alone* construction, a sentence like 106 should not be better than a sentence like 107.

(106) He wasn't even a COMMISSIONED OFFICER, let alone a COLONEL.

(107) #He wasn't even a COMMISSIONED OFFICER, let alone a SECOND LIEUTENANT.

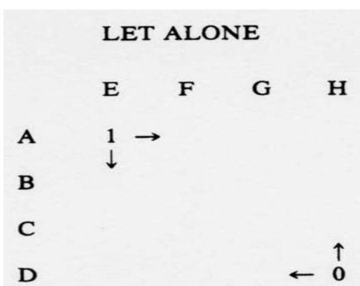
But 107 is odd, and precisely because the rank of second lieutenant is the lowest commissioned rank. Ex. 107, in other words, is to be understood as claiming that since we have reason to believe he never entered the scale, we have all the more reason to believe that he could not have reached some non-lowest point on the scale. But since second lieutenant IS the lowest point, the sentence is anomalous.

The preceding examples show that even where not-p unilaterally entails not-*q,* a sentence of the form *Not* p *let alone* q may still be unacceptable, that is, precisely when the entailment is not seen as holding within a scalar semantics. But what exactly do we mean by 'scalar semantics'?

A *let alone* sentence is interpreted in a SCALAR MODEL. A scalar model is a set of propositions with a certain structure; that structure can be thought of as a generalization to *n* dimensions of what is known in social psychology as a Guttman scale. We introduce the idea of a scalar model with a two-dimensional example. A more precise characterization is given in the Appendix.

Suppose we have four professors of Indo-European linguistics named Apotheosis, Brilliant, Competent and Dimm. Let us suppose that what we know about these four is that Apotheosis knows every language that Brilliant knows, Brilliant knows every language that Competent knows, and Competent knows every language that Dimm knows. The languages we are concerned with in this discourse are English, French, Greek, and Hittite. In the world of Indo-Europeanist scholars we are imagining, anyone who knows Hittite knows Greek, anyone who knows Greek knows French, and anyone who knows French knows English. If P is a variable over our four professors and L is a variable over our four languages, the propositional function *P can read L* together with the set of ordered pairs of the form {⟨Professor, Language⟩} determine a lattice of sixteen elementary propositions: *Apotheosis knows English, ..., Dimm knows Hittite.* Denoting truth 1 and falsity 0, the structure of this set of propositions can be diagrammed as in Table 1.

Table 1


LET ALONE

	E	F	G	H
A	1 →			
	↓			
B				
C				↑
D				← 0

The 1 in the upper left corner and the 0 in the lower right corner indicate respectively that if there is only one 1 cell in the lattice it must be the cell AE and if there is a unique cell with a 0 entry that cell must be DH. That is, if it is true for only one linguist/language pair that the linguist knows the language, that pair must match the most polyglot linguist, Apotheosis, with the most accessible language, English. Similarly, if it is true for only one linguist/language pair that the linguist does not know the language, then that pair must contain the most benighted linguist, Dimm, and the least attainable language, Hittite.

Let us call the corner of the lattice which must be 0 if any entry is 0 the Zero Corner, here DH. Similarly, we will call the corner of the lattice that must contain

1 if any entry is 1 the One Corner, here AE. The arrows extending to the right and downward from the 1-corner and to the left and upward from the 0-corner indicate, loosely, that in any particular state of affairs that fits this scalar model, the lattice is filled only by propagation of l's rightwards or downwards (or both) from the 1-corner and of 0's leftwards or upwards (or both) from the 0-corner. A little more precisely, if we know, for a given state of affairs, only that some entry in the lattice is 1, we automatically know that in that state of affairs, every entry above or to the left of the first entry is 1; similarly, if we know that some entry is 0, we know that every entry below or to the right of that entry is zero. The diagrams in Table 2 indicate a few of the states of affairs that conform to the scalar model sketched above for the linguist/language example.

Table 2

	E	F	G	H
A	0	0	0	0
B	0	0	0	0
C	0	0	0	0
D	0	0	0	0

a.

	E	F	G	H
A	1	0	0	0
B	0	0	0	0
C	0	0	0	0
D	0	0	0	0

b.

	E	F	G	H
A	1	1	0	0
B	1	0	0	0
C	0	0	0	0
D	0	0	0	0

c.

	E	F	G	H
A	1	1	1	1
B	1	1	1	1
C	1	1	1	1
D	1	1	1	1

d.

The general property of scalar models that we have been discussing motivates the notion of RELATIVE STRENGTH of two scalar propositions. The relative strength of the scalar propositions in turn plays a key role in determining the semantic constraints on the acceptability of *let alone* sentences. Intuitively, in our example it would be maximally informative to learn that Professor Dimm can read Hittite, since from this we could infer that every linguist can read every language; equally, it would be maximally informative to learn that Apotheosis can't read English, because from this we may conclude that none of our linguists can read any language. By the same token, learning that Apotheosis can read English is minimally informative, since from this we may deduce nothing about the value of any other proposition; in parallel fashion, knowledge that Dimm can't read Hittite is minimally informative, again telling us nothing about any other linguist/language pair. Roughly, then, the farther an α-polarity proposition is from the α-corner, the more informative it is. This is stated more precisely, where α is as usual a variable over polarity values, in 108:

(108) For two propositions *p*, *q* of α polarity, *p* is more informative (equivalently stronger) than *q* iff *p* is more distant from the α-corner than *q* on at least one dimension and no closer to the α-corner than *q* on any dimension.

Thus, of the following statements, all the (a) versions are more informative (stronger) than the (b) versions.

(109) a. Brilliant can read Hittite.

b. Brilliant can read French.

(110) a. Brilliant can't read French.
b. Brilliant can't read Hittite.

(111) a. Competent can read Hittite.
b. Brilliant can read French.

(112) a. Brilliant can't read French.
b. Competent can't read French.

The basic semantic conditions on *let alone* sentences are these: (1) the full clause preceding *let alone* and the reduced clause (or fragment) following *let alone* are interpreted as two propositions from the same scalar model; (2) the two propositions (represented by the full clause and the reduced clause) are of the same polarity; and (3) one of the two propositions, syntactically that expressed by the initial, full clause, is stronger than the other.

As we discuss elsewhere in this paper, the reduced (weaker) clause is interpreted as expressing a proposition that is the same as that expressed by the full (stronger) clause, EXCEPT that the interpretation(s) of the focused expression(s) on the right is(/are) substituted for the corresponding interpretation(s) on the left. Since the left proposition is, as we have seen, necessarily stronger than the right proposition, the whole *let alone* sentence has a meaning that can be represented as follows: stronger proposition *a fortiori* weaker proposition. That is, whatever reason we have to believe, state, impere, suggest, etc., the stronger proposition, we have even stronger reason to so express the weaker proposition.

2.3.3 Barely as the f element

Were one to attempt a purely semantic account of the distribution of *let alone,* one might note that the two points on the presupposed scale are such that failing to attain point A entails not reaching point B and minimally attaining point A also entails not reaching point B. There are, however, expressions indicating both failure to attain and minimal attainment which do not provide proper contexts for *let alone,* namely *almost* and non-subject *only.* Notice that we do not get either 113 or 114. It is perfectly clear, however, what these sentences would tell us if they were sayable.

(113) *He almost reached Denver let alone Chicago.[15]

(114) *He only reached Denver let alone Chicago.

Barely, of course, is a negative polarity item, which accounts for the difference in grammaticality between 113 – 14 on the one hand and 115 on the other:

(115) He barely reached Denver let alone Chicago.

That is, *let alone* is syntactically a negative polarity item, and so must appear in the scope of an appropriately affective trigger. Whatever this property of affectivity is, it is clear that *almost* and non subject *only* don't have it, as evidenced by 116 – 17.

(116) *He almost earned any money.

(117) *He only earned any money.

While the syntactic property of negative polarity seems ultimately to have a semantic basis – consider the fact that *be surprised, doubt, too* + ADJ, etc., are standard triggers – the reduction of the syntactic property of polarity to a semantic property is not a task that we can carry out here. For present purposes, it suffices to assign the difference in grammaticality between 113 – 114 on the one hand and 115 on the other to the fact that *barely* is syntactically a negative polarity trigger while *almost* and non subject *only* are not, despite the fact that the latter two items seem also to have a limiting semantics.

Nonetheless, *let alone* sentences with *barely* as trigger present a problem for our semantic analysis of *let alone,* because only the negative part of the meaning of *barely* is interpreted as obtaining in the second ⟨X B Y⟩ conjunct. That is, 115 means not 118 but 119.

(118) He *barely* reached Denver; a fortiori he *barely* reached Chicago.

(119) He *barely* reached Denver; a fortiori he did NOT reach Chicago.

There is independent evidence that *barely* may be analyzed semantically as 'almost not', but space does not permit reviewing it here. But even granting this analysis, an explanation would still be required why only the *not* part of this complex operator distributes semantically to the second, ⟨X B Y⟩, conjunct in *let alone* sentences. We are not at present able to offer such an explanation.

2.3.4 Complex scales

The discussion in §2.3.2 of the linguist/language example (and its formalization in the Appendix) provides the basis of the explanation of the semantics of a sentence like 120:

(120) You'd never get a poor man to wash a car for $2 in bad times, let alone a rich man to wax a truck for $1 in prosperous times.

In this case the corresponding scalar model contains five dimensions, invoked by the lexical contrasts poor/rich, wash/wax, car/truck, $1/$2, and bad times/ prosperous times. In purely notional terms it is clear that these contrasts do not necessarily have a dimensional character independently of each other. For example, it seems that the wash/wax and car/truck contrasts only take on a dimensional character within a context that they create mutually and with the assistance of the other dimensions and the F element *You'd never get...* That is, the sentence as a whole, together with some generally shared background knowledge, permits the hearer to construct a scalar model of five dimensions that satisfies the essential formal property of such structures: for two propositions *p*, *q*, if *p* exceeds *q* on at least one dimension and *q* does not exceed *p* on any dimension, then *p* unilaterally entails *q*. (That is, in the set of possible states of affairs imagined, the set of states in which *p* is true is a proper subset of the set of states in which *q* is true.) In effect, the concept of scalar model which we are using here, and which is defined in the Appendix, is an *n*-dimensional generalization of the one-dimensional structures described more or less formally under the heading 'semantic scale' or 'argumentative scale' by Horn (1972), Fauconnier (1976), Ducrot (1973), Anscombre & Ducrot (1983), Gazdar (1979), and others.

With respect to the substantive interpretation of scales, there are two traditions, which may be very roughly characterized as semantic and pragmatic, according to whether the scales are taken as part of the meanings of sentences or of utterances. The semantic approach was taken by Horn (1972) and followed by Gazdar (1979), although Gazdar states that he finds Fauconnier's empirical demonstration of the pragmatic nature of scales convincing (p. 55). Our interpretation of scales is generally of the pragmatic variety and thus similar to that of Fauconnier and Ducrot, with one additional proviso. Not only do certain lexical items have as part of their inherent (non-context-dependent) semantic value that utterances of sentences which contain them will (that is, must) be contextually interpreted in a scalar model, but also there will commonly be conditions that relate the syntactic form of the sentence to the scalar model used in its interpretation. For example, in a *let alone* sentence the proposition of the scalar model expressed by the ⟨X A Y⟩ syntactic portion must unilaterally entail the proposition expressed by the ⟨X B Y⟩ portion. The lexical entry *let alone* thus implies an entire grammatical construction in which syntactic, semantic, and pragmatic information are interrelated. *Let alone* is but one such item among many; other examples include *even, almost, few, merely,* and many more.

Considering examples like 120 now from the point of view of the formal scalar property, we note a prediction that is immediately verifiable. In a multiple-focus *let alone* sentence, if one permutes any pair of foci, the resulting sentence will normally be semantically/pragmatically anomalous. Thus while 121 is good, 122a – c, each of which permutes one pair of foci, are bad.

(121) You couldn't get a poor man to wash your car for $2, let alone a rich man to wax your truck for $1.

(122) a. #You couldn't get a RICH man to wash your car for $2 let alone a POOR man to wax your truck for $1.

b. # You couldn't get a poor man to WAX your car for $2 let alone a rich man to WASH your truck for $1.

c. # You couldn't get a poor man to wash your car for ONE dollar let alone a rich man to wax your truck for TWO dollars.

We had to enter the qualification 'normally' above because there is always the possibility that the scalar model requirement may be satisfied by a different set of contextual assumptions. Thus, in a context in which it is more distasteful to wash a vehicle than to wax one (say the water has to be carried a long way), ex. 122b becomes readily acceptable; but of course in this context 121 itself becomes anomalous. That is, the basic scalar property puts constraints on pairs of sentences with respect to their interpretation in the same scalar model. If we change our background assumptions, then different scalar models fit the context. The semantic/pragmatic behavior of multiple-focus, multiple-proposition *let alone* sentences, such as 120 – 122, thus provides further evidence for both the scalar and the contextual nature of the kind of unilateral entailment their semantics requires.

Interestingly enough, some *let alone* sentences that have the syntactic property of multiple prosodic focus do not have the semantic property just noted This occurs when the sentence does not (in context) permit an interpretation in which each pair of focused elements corresponds to two points on a semantic dimension of a scalar model. An example of such a multiply-focused *let alone* sentence is 123:

(123) I didn't have time to FEED the CHILDREN, let alone PREPARE my LECTURE.

Here there seems to be no natural interpretation in which feeding and preparing can be imagined to represent points on one dimension and children and lectures as points on another dimension in such a way that the propositions expressed in 124 – 127 are not only sensible but presupposed.

(124) That I feed the children entails that I prepare the children.

(125) That I feed my lecture entails that I prepare my lecture.

(126) That I feed the children entails that I feed my lecture.

(127) That I prepare the children entails that I prepare my lecture.

In this case, feeding the children is just considered, as a whole, to be something one will necessarily have time for if one has time to prepare one's lecture (and not conversely). In the case of 123 we cannot test to see if the kind of anomaly found in 122a – c goes away, since talk of 'feeding lectures' or 'preparing children' (in this sense of *prepare*) is anomalous anyway. However, let us consider a sentence like 128:

(128) I didn't get up in time to EAT my LUNCH, let alone COOK my BREAKFAST.

For 128 there is a perfectly sensible interpretation in which cooking breakfast and eating lunch are also viewed as non-decomposed events (like feeding the children and preparing one's lecture), but where it also is not incoherent to talk about cooking lunch and eating breakfast. In this case we see that permuting a pair of corresponding foci does not necessarily lead either to anomaly or to a change of interpretive scalar model:

(129) I didn't get up in time to COOK my LUNCH, let alone EAT my BREAKFAST.

Ex. 129 is acceptable, unlike exx. 122a – c, because it is easy to imagine a dimension of a scalar model containing, perhaps as a proper subset, the ordered set *(cooking breakfast, eating breakfast, cooking lunch, eating lunch)* such that one who gets up in time to do some member of the list necessarily gets up in time to do any earlier member (and not conversely).

2.4 The pragmatics of let alone

A description of the pragmatic conventions associated with the *let alone* construction must mention the two speech acts which utterance of a *let alone* sentence confronts – namely, the stronger A part F' ⟨X A Y⟩ and the weaker B part F' ⟨X B Y⟩ and their separate evaluations as informative (satisfying the Gricean Quantity maxim) and relevant (satisfying the Relevance maxim), respectively. In addition, a pragmatic description must mention the manner in which the utterance of a *let alone* sentence fits its conversational context. Briefly, the essential pragmatic conditions on the felicitous utterance of a *let alone* sentence are the following:

(a) By way of the raising of what we may call the CONTEXT PROPOSITION, the immediately preceding context has created conditions under which a speech act represented by the weaker B clause is an appropriate or relevant response.

(b) The weaker B clause of the *let alone* sentence specifically accepts or rejects the context proposition.

(c) In either case, the speaker, while committing himself emphatically to the B clause, indicates that limiting himself to it would not be cooperative, since there is something even more informative to be said: the stronger A clause.

Thus the *let alone* construction, with its two parts, can be seen as having the function of meeting simultaneous and conflicting demands of Relevance and Quantity. The weaker clause answers to the demands of Relevance, either reasserting or denying the context sentence, according to the dictates of Quality. In either case, the stronger clause satisfies the demands of Quantity by saying the most informative thing the speaker of the *let alone* sentence knows to be true. The effect of the whole, of course, is to emphasize the strength of the speaker's commitment to the B part.

It is important to notice a potential confusion regarding the notion of strength. When we say that the A clause is stronger, we mean that it is more informative, in the sense that it asymmetrically entails the B clause; but the speaker's and hearer's attitude to the B clause can be said to be stronger in the sense that it is uttered in greater confidence, being supported by the A clause. The A clause (given the presupposed background) is more informative; the speech act performed through the B clause is more certain, more emphatic.

It is not surprising that the word *even* fits comfortably into the A clause of a *let alone* sentence, since *even* is used fittingly with expressions of propositions which are stronger than some contextually present or imagined proposition. Thus sentences like *He even made general* and *He didn't even make colonel* are usable in contexts in which, respectively, a lesser or greater achievement may be presumed. The word *even* appears to have the function of indicating that the sentence in which it occurs is somehow stronger than another sentence with which it can be compared. (See Karttunen & Peters, 1979, and the literature cited therein. The Appendix to the present paper gives a formal definition of informativeness in terms of the wider concept 'scalar model'.)

As we have noticed, the expression *let alone* belongs to a family of phrasal conjunctions with somewhat similar functions, these including *if not, in fact, much less, not to mention, never mind,* and others. While constructions built around these conjunctions differ from each other in a number of ways, what is common to them all is the presupposition that the two propositions which they confront identify distinct points on a scale. If we see the two points F' ⟨X A Y⟩ and F' ⟨X B Y⟩ as points on a scale of certainty, the intent of the construction can be described as claiming that since some quantity has reached the point represented by F' ⟨X A Y⟩, then it has, ipso facto and a fortiori, reached the point represented by F' ⟨X B Y⟩. Expressed informally, we find that *let alone* sentences can be paraphrased, this time with the clauses in the order B-A, as in these three examples: *I wouldn't pay five dollars for it, let alone ten dollars.* ('You want to know whether I'd pay ten dollars for it? Well, I'll have you know that I wouldn't even pay five dollars for it'); *I don't let my children drink beer, let alone whiskey.* ('You ask if I permit my children to drink whiskey? Well, I don't even permit my children to drink beer'); *He could persuade people that he's a duke, let alone a baron.* ('Could he persuade them that he's a baron? Why, he could persuade them that he's a duke'). There are of course conjunctive constructions which present the conflicting elements in the more 'natural' order. That is, while *let alone,* together with *much less* and *not to mention,* presents the stronger statement first, such conjunctions as *in fact* and *if not* present the stronger point second.

(130) He didn't make general; in fact, he didn't even make colonel.

(131) He did make colonel; in fact, he even made general.

(132) I believe he made colonel, if not general.

As with many lexical items and grammatical constructions having pragmatic presuppositions, here too the presupposed scale underlying the construction's felicitous use does not need to be part of the speaker's world, but can be attributed to the source of reported speech or thought. Thus, we might be representing General Shotwell's feelings more faithfully than our own in 133:

(133) General Shotwell said that in the Grenada affair not enough Cubans were wiped out to make it worthwhile to open a bottle of champagne, let alone put on a proper banquet for the Joint Chiefs of Staff.

3 Conclusion

We hope to have demonstrated in the preceding pages that, in the construction of a grammar, more is needed than a system of general grammatical rules and a lexicon of fixed words and phrases. Those linguistic processes that are thought of as irregular cannot be accounted for by constructing lists of exceptions: the realm of idiomaticity in a language includes a great deal that is productive, highly structured, and worthy of serious grammatical investigation. It has come to seem clear to us that certain views of the layering of grammatical operations are wrong. We have in mind that view of the interaction of syntax and semantics by which the semantic composition of a syntactically complex phrase or sentence is always accomplished by the iteration of atomistic local operations, and that view of pragmatics by which semantically interpreted objects are invariably first situated in contexts and then given their contextualized construals. It has seemed to us that a large part of a language user's competence is to be described as a repertory of clusters of information including, simultaneously, morphosyntactic patterns, semantic interpretation principles to which these are dedicated, and, in many cases, specific pragmatic functions in whose service they exist. The notion of literal meaning should perhaps be anchored in what is common to the understanding of expressions whose meaning is under consideration; and that might necessarily bring in information that goes beyond considerations of truth conditions. Further, certain lexical items and constructions, such as *let alone,* may have literal meanings that determine (in part) truth conditions on the utterances of sentences in which they occur, but not on the sentences themselves. A language can associate semantic information with structures larger than elementary lexical items and can associate semantic interpretation principles with syntactic configurations larger and more complex than those definable by means of single phrase structure rules.

It appears to us that the machinery needed for describing the so-called minor or peripheral constructions of the sort which has occupied us here will have to be powerful enough to be generalized to more familiar structures, in particular those represented by individual phrase structure rules. A phrase structure rule characterizes a structure whose external category is identified with the category indicated on the left-hand side of an arrow (in the traditional notation) and whose constituent categories are those indicated on the right-hand side of the arrow; the semantic interpretation of such a construction is the semantic rule associated with that phrase structure rule. (In general, such constructions do not have associated pragmatic rules.) It can be hoped that the structure-building principles of the so-called core and the machinery for building the phraseological units of the kind discussed in this paper may be of a uniform type, the former being a degenerate instance of the latter.

Appendix: Scalar models

In this Appendix we present the ideas on which our semantic analysis of *let alone* sentences is based in a more precise way than in the preceding text. The exposition will be illustrated throughout with the example about linguists and languages given in the text. For the reader's convenience, Tables 1 and 2 are reproduced below. It should be borne in mind that while the examples deal with two semantic dimensions (linguists and languages), each of which is finite, in the general case there may be any finite number of semantic dimensions, and a dimension need not be restricted to a finite number of values.

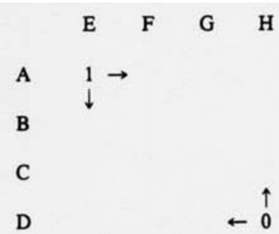


TABLE 3.

	E	F	G	H
A	0	0	0	0
B	0	0	0	0
C	0	0	0	0
D	0	0	0	0

a.

	E	F	G	H
A	1	0	0	0
B	0	0	0	0
C	0	0	0	0
D	0	0	0	0

b.

	E	F	G	H
A	1	1	0	0
B	1	0	0	0
C	0	0	0	0
D	0	0	0	0

c.

	E	F	G	H
A	1	1	1	1
B	1	1	1	1
C	1	1	1	1
D	1	1	1	1

d.

Every *let alone* sentence is interpreted in terms of a SCALAR MODEL. In order to develop the idea of a scalar model, some preliminary assumptions and definitions are necessary. Assume a finite set $D = \{D^1, ..., D^n\}$ ($n > 1$) whose members, D^i, are denumerable sets, and assume a simple order on the elements of each set.[16] The members D^i of D will be interpreted as semantic dimensions. In our example there are two semantic dimensions: linguists and languages. The simple orders on the members of each dimension D' will be interpreted as specifying that each dimension is an ordinal dimension. Thus the linguists Apotheosis, Brilliant, Competent and Dimm constitute, in that order, a dimension of, let us say, erudition, and the languages English, French, Greek, and Hittite, in that order, constitute a dimension of accessibility, or something of the sort.

We will be concerned with the set of all n-tuples made up of selecting one value from each dimension, that is, with the Cartesian product of the semantic dimensions. Since in our example there are just two dimensions, this comes down to the set of ordered pairs {⟨Apotheosis, English⟩, ⟨Apotheosis, French⟩, …, ⟨Dimm, Hittite⟩}. In the general case, we call the set of all n-tuples that contain as their ith component some member of the ith dimension an ARGUMENT SPACE. In the example, we see that the set {⟨Apotheosis, English⟩, ⟨Apotheosis, French⟩, …, ⟨Dimm, Hittite⟩} furnishes the full array of possible arguments for the propositional function *(Some linguist) can read (some language);* this illustrates our reason for selecting the appellation 'argument space'. Thus, a finite set D of simply ordered denumerable sets D^i determines an argument space as follows:

(Al) $D^x = D^1 \text{ x} \ldots \text{x } D^n$

That is, argument space D^x determined by a set D of dimensions D^i, is the set of all n-tuples that can be formed by filling the first position with a member of the first dimension, the second position with a member of the second dimension, and so on. We will sometimes have occasion to call the individual members of the argument space D^x ARGUMENT POINTS.

As noted, D^x is called an argument space because together with a propositional function (to be defined) this space will determine a set of propositions. That set of propositions will in turn constitute our scalar model. Viewing a proposition as a function from states of affairs to truth values, the characteristic property of scalar models will be expressed as a constraint on the permitted relations between states of affairs and truth values, that is, as a constraint on the membership of the set of propositions constituting the scalar model.

One further preliminary is necessary before we define scalar model. We need to generalize the intuition expressed in the text with regard to Table 1 (here Table 3), which portrays a scalar model with exactly two dimensions. In connection with that diagram, we had the concepts 'nearer the 1-corner' and 'nearer the 0-corner'. In the general case, a scalar model comprises any finite number of dimensions, and furthermore, the dimensions need have a finite number of values. Hence there may not be any 'corners' for anything to be nearer. The idea expressed in the text in terms of closeness to the corners' in a two-dimensional argument space (with finite-valued dimensions) may be expressed in the general case as follows:

(A2) For distinct argument points d_i, d_j in an argument space D^x**,** d_i is LOWER than d_j iff no coordinate of d_i has a higher value than the corresponding coordinate of d_j and at least one coordinate of d_i has a lower value than the corresponding coordinate of d_j.

The intuitive idea of the kind of partial metric we want is easily conveyed with an example from elementary economics. Suppose we have two distinct bundles, each composed, say, of varying amounts of these four commodities: shoes, rice, steel, chicken soup. Suppose further that we have no common metric, such as money, for these four kinds of commodities. We can still say that one bundle is worth more than the other if the first contains as much of every commodity as the other and in addition contains more of at least one commodity than the other.

A scalar model may now be defined as the set of all propositions that can be formed by applying to each argument point of an argument space a propositional function which is subject to a condition that involves the notion of the relative distance from the origin of two argument points. We first give the abstract definition and then discuss and exemplify its parts. (Recall that we take a proposition to be a function from states of affairs to truth values. When we say that one proposition entails another we will mean that the set of states of affairs in which the first is true is a subset of the set of states of affairs in which the second is true.)

Assume a set S of states of affairs, the set of T truth values, an argument space D^x, and a function P from D^x to the set of functions from S to T. A scalar model is defined in terms of these four objects and a constraint on the function P, which expresses the notion of scalarity.

(A3) $\langle S, T, D^x, P\rangle$ is a SCALAR MODEL iff, for distinct d_i, d_j in D^x, $P(d_j)$ entails $P(d_i)$ just in case d_i is lower than d_j.

The following is an immediate consequence of definition A3.

(A4) $-P(d_i)$ entails $-P(d_j)$ just in case d_i is lower than d_j.

In our example, P is the propositional function *...can read...,* which yields for each argument point, e.g., ⟨Brilliant, English⟩ a proposition; in this case *Brilliant can read English.* Each such proposition is of course itself a function from the set S of states of affairs to the set T of truth values. In our example, the proposition *Brilliant can read English* is a proposition that assigns to the states of affairs labeled (a) and (b) in Table 4 the value False and to states of affairs (c) and (d) the value True. (Of course the four states of affairs pictured in Table 4 are not sufficient to distinguish all the propositions in our sample scalar model; but there are many relevant states of affairs not pictured.)

Definition A3 and its consequence A4 express generally our restricted and informal remarks regarding the intent of Table 4. The idea of ones propagating outward and downward from the origin to form a solid block and zeros forming a solid block around the zero corner is expressed equivalently in A3 and A4, except that now, of course, we have nothing corresponding to the corners because the model is no longer finite.

Illustrating the notion scalar model just defined with our running example, consider the propositions *Brilliant can read English* and *Brilliant can read Greek.* Looking at the states of affairs pictured in Table 4, we note that the latter assigns the value True only in state of affairs (d), while the former, as previously noted, assigns the value True in states of affairs (c) and (d). Since the argument point ⟨B, E⟩ is lower than the argument point ⟨B, G⟩ (i.e., the former has the same coordinates as the latter on the linguist dimension and a lower coordinate on the language dimension), the proposition built on the latter, *Brilliant can read Greek,* should entail the proposition built on the former, *Brilliant can read English.* The fact that the set of states of affairs in which the latter is true, {d}, is a subset of the set of states of affairs in which the former is true, {c,d}, illustrates (with respect to the arbitrarily selected states of affairs in Table 4) that the required entailment holds.

The informal and partial characterization of informativeness (strength) proposed in 108 can now be given a more satisfactory, and simpler, form.

(A5) A proposition *p* is more INFORMATIVE (STRONGER) than a proposition *q* relative to a scalar model SM iff *p* entails *q* in SM and *q* does not entail *p* in SM.

Note that the definition of informativeness is relativized to a scalar model and further that the empirical interpretation of scalar models requires the situation of a sentence in a context of discourse. That is, according to our approach, the empirical phenomena which give rise to the theoretical notion 'scalarity' cannot be modeled in terms of the truth conditional semantics of sentences taken as semantic types. This conclusion agrees with that of Fauconnier (1975a, b, 1976) and Ducrot (1973). Gazdar (1979, p. 55ff.), who reformulates Horn's (1972, p. 112) narrowly semantic characterization of scalarity, acknowledges the correctness of Fauconnier's observation and for this and other reasons is forced, along with Horn, to consider 'semantic scales' as somehow 'given to us' (1979, p. 56). Further, Gazdar must content himself with offering only a necessary condition on such objects rather than a definition. This less than satisfactory formulation, which Gazdar forthrightly acknowledges as such, appears to us to have been necessitated by his strict adherence to the Gricean program, which insists that truth conditions be fixed at the level of semantic types, in particular at the level of sentences and not utterances.[17] But as we have shown repeatedly in the text, *let alone* sentences acquire their truth conditions only in context. In the view advanced here, pragmatic force is frequently part of literal meaning.

Notes

* We would like to acknowledge the good, if not always heeded, advice of Farrell Ackerman, Daniel Andler, George Bergman, Joan Bresnan, Claudia Brugman, Regina Bustamante, Linda Coleman, Amy Dahlstrom, Michelle Emanatian, Pierre Encrever, Gilles Fauconnier, Michel de Fornel, Mark Gawron, James Greeno, Jacqueline Guéron, Ron Kaplan, Ed Keenan, Paul Kube, George Lakoff, Tom Larsen, Monica Macaulay, Jim McCawley, Kiki Nikiforidou, Peter Norvig, Eric Pederson, Franois Recanati, Ivan Sag, Paul Schachter, Manny Schegloff, Barry Schein, Dan Sperber, Donca Steriade, Eve Sweetser, Len Talmy, James Watters, Bob Wilensky, Karl Zimmer, and three anonymous referees for *Language.* The work reported here was supported in part by a grant from the Alfred P. Sloan Foundation to the University of California at Berkeley.

1 Our purpose here was not to give an accurate sketch of current frameworks, but to point up the absence of a place within most of them to deal with the complexities of the sort we are examining here – phenomena which we hold to be central to any grammar, not peripheral. In particular, we wish to emphasize that when constructions are interpreted as the products of maximally general rules, no place remains in the grammar for spell-

ing out the non-predictable semantics and pragmatics that is frequently conventionally associated with particular constructions such as those we will describe.

Our rather sweeping sketch of the atomistic model is of course more appropriate as a characterization of some current frameworks than others. There are a number of individuals who do not subscribe to the atomistic model and who have contributed to work in the vein we argue for here. These include Dwight Bolinger, George Lakoff, Anna Wierzbicka. Igor Mel'chuk, and others. With these people, we also maintain that pragmatics pervades grammar, i.e. is not confined to a few lexical items with associated conventional implicatures. Wierzbicka in particular has invested a great deal of time in spelling out in detail the range of implications or meanings of the patterns she describes, such as the tautological construction exemplified by the fixed phrase *Boys will be boys* (see Wierzbicka, 1987).

One particularly important focus illuminated by Wierzbicka's work in this area is the question of derivation: are the semantico-pragmatic forces associated with particular constructions to be thought of as arbitrary? Or are they interpretable on the basis of universal maxims of conversational behavior, augmented by contextual factors? We feel that a unified answer to this question does not exist, and that some constructions will, in a process similar to the semantic drift and freezing of certain lexical items, become non-transparent and apparently arbitrary. In any case, important as this issue is, our emphasis is somewhat different. We wish to call attention particularly to the range of ways in which constructions may have obligatory pragmatic and semantic attachments.

2 The distinction between decoding and encoding idioms is an important one, since a frequent objection to our claims about the extent of idiomaticity in the productive apparatus of the language is the suggestion that speakers should be able to interpret the intent of the expressions we discuss by making use of analogies from their linguistic knowledge or by depending on cognitive abilities not properly a part of the language faculty. It needs to be emphasized that linguistic competence is composed of two parts, not only the part that enables us to figure out what other people have said to us, but also the part that enables us to talk to them.

3 What we have here is actually a gradient or cline rather than a simple two-way distinction. At one extreme we find idioms in which every element is fixed, such as *It takes one to know one.* Close to that extreme are idiomatic expressions in which everything is specified except what Pawley and Syder, 1983, refer to as inflection: In *trip the light fantastic,* the actual form of *trip* can vary (*trips, tripping,* etc.); in *blow one's nose,* the nose possessor' can vary (*I blow my nose, you blow your nose*); and so on. The best examples of formal idioms are special syntactic patterns whose use is not predictable from the 'regular' grammatical rules, as in expressions fitting the pattern *Him, be a doctor?* But even here we find lexically limited means of 'expansion' (Pawley & Syder, 1983), allowing, say, *What? Him, be a doctor?*

4 Historically, the definite article in this construction has an instrumental demonstrative (Old English θ*y)* as its source. The same definite article + comparative adjective sequence is found in a few other formulae (pointed out to us by L. Talmy); such as *The better to see you with; all the more reason to ...; so much the better;* etc.

It has been suggested to us that synchronically this use of the definite article is related to that found in superlative expressions: *the best, the brightest,* etc. Many aspects of this construction are suggestively similar to parts of other constructions. However, when the syntax and semantics of these are examined in detail, no predictable relationships emerge, at least nothing which speakers could use to encode these meanings if they were ignorant of the construction. The existence of a diachronic relationship or a partial synchronic similarity between two constructions does not release the language learner from the obligation to acquire the construction as such. The notion of encoding idiom is particularly important here. Suggestive partial similarities among constructions may help the decoder who is ignorant of a particular construction guess at what a token of it is intended to convey, but our notion of a construction is precisely what a speaker has to know, independent of whatever else he knows about the language, in order to encode correctly an utterance of this form, meaning and use.

One reviewer suggested that this construction could profitably be seen as an instance of a more general 'paired parallel phrases' construction, as exemplified by the proverbs *Cold hands, warm heart; Scratch a Russian. find a Tartar; Garbage in, garbage out;* etc. The more general construction could presumably be said to encode the implicational relationship between the two parallel phrases, thus providing an account of the implicational semantics in examples like *The more the merrier.* Such family resemblances may facilitate the decoding of such conventional structure/meaning pairings. However, this more general paired parallel phrase construction still must be listed as having a conventional pairing of structure and meaning.

5 Although these are a Paired Focus Constructions (about which more later), capital letters are not intended to indicate what is in focus. Rather, they are intended to indicate which constituents or elements sound most natural to us when rendered as prosodically prominent. Sometimes the prosaically focused element is a member of the focused constituent; sometimes it is the entire focus. For a discussion of the prosodic realization of focused VPs vs. NPs vs. Ss, and prosodic concomitants of paired foci, see Selkirk, 1984.

6 Of course, the posed proposition may simply be part of the unspoken, pragmatically given context. Uttering a *let alone* sentence in an 'out of the blue' fashion simply causes hearers to expand their shared base of presuppositions. If hearers don't already realize that the content of the second conjunct is somehow given by the non-linguistic context, they accommodate (Lewis, 1979) by adding it to their store of shared assumptions. An example of accommodation is readily available: in the context for ex. 17, readers who did not know that the Battle of Verdun took place in World War I will automatically have inferred that it did after they understand B's *let alone* utterance.

7 We are aware that the semantics, pragmatics, and syntax of proper coordinate conjunctions are themselves not perfectly understood, and so specifying in complete detail the departures of *let alone* from this norm would be well beyond the scope of the present work.

It may be that some of the syntactic peculiarities of *let alone* correlate with certain aspects of its semantics and pragmatics according to regularities that we have not yet discovered. To the extent that this is the case, the account given here of the *let alone* construction could be reduced as such discoveries were made and the more general properties discovered assigned to distinct, perhaps more abstract, constructions.

8 It has been suggested to us that 31b might be bad for a reason unrelated to the constituency or non-constituency of a sequence of the form *A let alone B,* namely that in 31b *let alone* occurs outside the scope of the entitling negation. This hypothesis can be checked by considering cases in which there is no entitling surface negative, the negative polarity trigger consisting only of the pragmatic denial of the context proposition. Under these circumstances the hypothesis according to which 31b is bad on account of *let alone* appearing outside the scope of negation predicts that topicalized *A let alone B* sequences

should be okay. But they are not. On this hypothesis, (iii) should be just as good as (ii) in a discourse context that permits (i).

(i) They've broken up Penutian, let alone Macro-Penutian.

(ii) Penutian they've broken up, let alone Macro-Penutian.

(iii) *Penutian, let alone Macro-Penutian, they've broken up.

9 On the other hand, there are cases in which extraction from a true coordinate structure is unexceptionable (cf. Lakoff, 1986, and the literature cited therein) while extraction from the corresponding *let alone* sentence is impossible. Compare (i) and (ii):

(i) That's the kind of adventure that you don't go home and tell your mother about.

(ii) *That's the kind of adventure that you don't go home let alone tell your mother about.

(iii) That's not the kind of movie that you get scared and have nightmares about.

(iv) ?That's not the kind of movie that you get scared let alone have nightmares about.

The difference in relative acceptability within the pair (i) – (ii) from that within the pair (iii) – (iv) has much to do with semantic differences between *and* and *let alone.* Lakoff's explanation of the constraint on non-across-the-board extraction with *and* hinges on the type of interpretative scenario evoked by the entire conjunction of verb phrases.

10 A classical transformational analysis would describe these fragments as having undergone deletion under identity with material in the preceding clause by some process that shares characteristics of Stripping (Hankamer, 1971). A nontransformational analysis could have recourse to a process that would copy the functional structure of the context sentence onto the fragment (Levin, 1982). Our analysis does not depend on the form of the solution.

11 The *let alone* construction shares certain prosodic and semantic properties with other paired focus constructions, such as Gapping and Comparative Subdeletion (Selkirk, 1984).

12 In addition, *let alone* seemed in many ways to be syntactically exactly like *much less,* which is a standard negative polarity item, and like the German equivalent of *let alone,* namely *geschweige denn,* which is described in German dictionaries as limited to occurrence in negative sentences.

13 In fact there are people who get pure positive *let alone* sentences like the following:

(i) A: He was pleased.

B: He was delighted, let alone pleased.

There are two distinct stories we can give regarding the grammar of *let alone* for such speakers. First story: *let alone* is a negative polarity item for such speakers, but B's disagreement with the level of informativeness of A's contribution carries for him sufficient negative affect that it can serve as a negative polarity trigger. For this same speaker, if the context had been as in (ii) we could say that *let alone* is also negative polarity, but here it is disagreement with the content of the context proposition (i.e. denial of it) which serves as the negative polarity trigger.

(ii) A: He wasn't pleased.

B: He was delighted, let alone pleased.

The second story is simply that *let alone* has no polarity requirement in this speaker's grammar. The one thing we know for certain is that it is much easier to make up and get agreement for negative polarity *let alone* sentences. This may or may not reflect an actual usage situation in which tokens of *let alone* occur more frequently in negative polarity contexts. If the acceptability judgements are an accurate reflection of usage, then we must conclude that the positive polarity dialects are rare. In the remainder of this paper we will continue to treat *let alone* as a (normal) negative polarity item which presents the stronger item first.

14 The *let alone* construction displays certain syntactic similarities to, and also marked syntactic differences from, the *respectively* and *vice versa* constructions. An extended comparison would take us too far afield. But briefly, *let alone* shares with *respectively* the unusual, though of course by no means unknown, phenomenon of crossed dependency.

(i) a. Fred and Louise hated their shrimp and squid respectively.

b. Fred, let alone Louise, wouldn't order shrimp, let alone squid, at Jack-In-The-Box.

The *let alone* construction shares with the *vice versa* construction the related and seemingly more general property of having dependencies which are based on linear order, regardless of constituent structure. For the *let alone* construction this property (and others) are illustrated by sentences 80 – 83. In the items in (ii) below, the sentence that is most likely to be implied by *vice versa* involves interchange of subject and object, subject and prepositional object, and object and prepositional object, respectively.

(ii) The chef always helps the owner with his problems and vice versa.
The chef always saves his best jokes for the owner and vice versa.
The chef always substitutes shrimp for squid and vice versa.

In the following sentence, some people get all three types of readings.

(iii) The chef always complains to the owner about the headwaiter and vice versa.

The point is that whatever impenetrable mysteries the *vice versa* construction may hold, it seems to operate on linear order in a manner that is impervious to constituency, as also can be true for the *let alone* construction as exemplified in 80 – 83. (For these and other facts about the *respectively* construction, see McCawley, 1976; for *vice versa* see Fraser, 1970.)

15 Ex. 113 could be well formed under a set of circumstances (discussed in §2.2.4) which allow *let alone* in non-negative polarity contexts. For example, if a context proposition contained the information that Joe was driving to LA from New York, and amazingly reached Chicago in two days, the interlocutor might counter with 113, pointing out that Joe's progress was even more amazing than first suggested. In this section we are discussing only negative polarity readings of *barely* and *almost.*

16 Intuitively a scalar model must contain at least two dimensions. We have no conceptual way to distinguish, say, two different degrees of height unless there are two (possible) people who could bear these distinct degrees (see Cresswell, 1976). If we were to allow one-dimensional scalar models, we would furthermore have no explanation of why ex. 104 is bad while 105 is good. In this case unilateral entailment would ensure for 104 a structure that conforms to everything we have to say about scalar models in this appendix EXCEPT the stipulation that the model have at least two dimensions. On the formal side, the explanation of why 105 is good while 104 is bad is that in the 105 context we can imagine a two-dimensional structure in which individual lottery participants form one dimension which is scaled by another dimension consisting of the size of prize they

receive (and conversely). In the 104 context no such second dimension is apparent. We are indebted to Jim Greeno and Paul Kube for discussion on this point.

17 In fact, Gazdar finds it necessary to postulate a level of 'semantic representation' intermediate between surface structure and truth conditions at which the scalar property holds, because, as he points out, sentences like (i) and (ii) (Gazdar's 18 – 19, p. 126) have the same truth conditions but distinct Quantity implicatures.

(i) John did it or Mary did it.

(ii) John did it or Mary did it or both of them did it.

Gazdar does not present motivation independent of the facts regarding quantity implicatures just noted for this level of representation.

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18 Constructions: a new theoretical approach to language

Adele E. Goldberg

Constructions – form and meaning pairings – have been the basis of major advances in the study of grammar since the days of Aristotle. Observations about specific linguistic constructions have shaped our understanding of both particular languages and the nature of language itself. But only recently has a new theoretical approach emerged that allows observations about constructions to be stated directly, providing long-standing traditions with a frame-work that allows both broad generalizations and more limited patterns to be analyzed and accounted for fully. This is in contrast to the mainstream 'generative' approach to language, which has held sway for the past several decades, beginning with Chomsky in 1957 [1]. Many linguists with varying backgrounds have recently converged on several key insights that have given rise to a new family of approaches, here referred to as 'constructionist' approaches [2 – 23]. Constructionist approaches share certain foundational ideas with the mainstream generative approach. Both approaches agree that it is essential to consider language as a cognitive (mental) system; both approaches acknowledge that there must be a way to combine structures to create novel utterances, and both approaches recognize that a non-trivial theory of language learning is needed. In other ways, constructionist approaches contrast sharply with the mainstream generative approach. The latter has held that the nature of language can best be revealed by studying formal structures independently of their semantic or discourse functions. Ever increasing layers of abstractness have characterized the formal representations. Meaning is claimed to derive from the mental dictionary of words, with functional differences between formal patterns being largely ignored. Semi-regular patterns and unusual patterns are viewed as 'peripheral,' with a narrow band of data seen as relevant to the 'core' of language. Mainstream generative theory argues further that the complexity of core language cannot be learned inductively by general cognitive mechanisms and therefore learners must be hard-wired with principles that are specific to language ('universal grammar').

1 Tenets of constructionist approaches

Each basic tenet outlined below is shared by most constructionist approaches. Each represents a major divergence from the mainstream generative approach and, in many ways, a return to a more traditional view of language.

Tenet 1. All levels of description are understood to involve pairings of form with semantic or discourse function, including morphemes or words, idioms, partially lexically filled and fully abstract phrasal patterns. (See Table 1)
Tenet 2. An emphasis is placed on subtle aspects of the way we conceive of events and states of affairs.
Tenet 3. A 'what you see is what you get' approach to syntactic form is adopted: no underlying levels of syntax or any phonologically empty elements are posited.
Tenet 4. Constructions are understood to be learned on the basis of the input and general cognitive mechanisms (they are constructed), and are expected to vary cross- linguistically.
Tenet 5. Cross-linguistic generalizations are explained by appeal to general cognitive constraints together with the functions of the constructions involved.
Tenet 6. Language-specific generalizations across constructions are captured via inheritance networks much like those that have long been posited to capture our non-linguistic knowledge.
Tenet 7. The totality of our knowledge of language is captured by a network of constructions: a 'constructicon.' Each of these tenets is explained in a subsequent section below.

2 Constructions: what they are

Constructions are stored pairings of form and function, including morphemes, words, idioms, partially lexically filled and fully general linguistic patterns. Examples are given in Table 1. Any linguistic pattern is recognized as a construction as long as some aspect of its form or function is not strictly predictable from its component parts or from other constructions recognized to exist. In addition, many constructionist approaches argue that patterns are stored even if they are fully predictable as long as they occur with sufficient frequency [24 – 29].

Table 1 Examples of constructions, varying in size and complexity; form and function are specified if not readily transparent

Construction	Form/Example	Function
Morpheme	e.g. *anti-, pre-, -ing*	
Word	e.g. *Avocado, anaconda, and*	
Complex word	e.g. *Daredevil, shoo-in*	
Idiom (filled)	e.g. *Going great guns*	
Idiom (partially filled)	e.g. *Jog* (someone's) *memory*	
Covariational-Conditional construction [10]	Form: The Xer the Yer (e.g. *The more you think about it, the less you understand*)	Meaning: linked independent and dependent variables
Ditransitive (double-object) construction	Form: Subj [V Obj1 Obj2] (e.g. *He gave her a Coke; He baked her a muffin*)	Meaning: transfer (intended or actual)
Passive	Form: Subj aux VPpp (PP_{by}) (e.g. *The armadillo was hit by a car*)	Discourse function: to make undergoer topical and/or actor non-topical

Unlike mainstream generative grammar, the constructionist framework emphasizes the semantics and distribution of particular words, grammatical morphemes, and cross-linguistically unusual phrasal patterns. The hypothesis behind this methodology is that an account of the rich semantic, pragmatic, and complex formal constraints on these patterns readily extends to more general, simple or regular patterns.

As an example of an unusual pattern, consider the Covariational Conditional construction in Table 1 (e.g. 'The more you think about it, the less you understand'). The construction is interpreted as involving an independent variable (identified by the first phrase) and a dependent variable (identified by the second phrase). The word *the* normally occurs at the beginning of a phrase headed by a noun. But in this construction it requires a comparative phrase. The two major phrases of the construction resist classification as either noun phrases or clauses. The requirement that two phrases of this type be juxtaposed without conjunction is another non-predictable aspect of the pattern. Because the pattern is not strictly predictable, a construction is posited that specifies the particular form and semantic function involved [10].

Other unusual constructions include those in Table 2. Although some of the patterns are primarily used colloquially, they are part of every native speaker's repertoire of English. (The stranded preposition construction is unusual not by virtue of its being prescriptively dispreferred, but in that it is found only in a few Germanic languages).

More common patterns such as passive, topicalization and relative clauses are understood to be learned pairings of form and (semantic or discourse) function – that is, they are also constructions. Each pairs certain formal properties with a certain communicative function.

Table 2 Productive or semi-productive constructions that are unusual across languages and must be learned on the basis of the input

time *away* construction	*Twistin the night away* [13]
What's X doing Y?	*What's that fly doing in my soup?* [30]
Nominal Extraposition construction	*It's amazing the difference!* [31]
Mad Magazine construction	*Him, a doctor?!* [32]
Noun–Pronoun–Noun (N P N) construction	*house by house; day after day* [12]
Stranded preposition construction	*Who did he give that to?*

Even basic sentence patterns of a language can be understood to involve constructions. That is, the main verb can be understood to combine with an argument-structure construction (e.g. transitive, intransitive, ditransitive constructions, etc.) [7]. The alternative is to assume that the form and general interpretation of basic sentence patterns are determined by semantic and/or syntactic information specified by the main verb. The sentence patterns given in (1) and (2) indeed appear to be determined by the specifications of give and put respectively:

(1) Chris gave Pat a ball.

(2) Pat put the ball on the table.

Give is a three-argument verb: an act of giving requires three characters: a giver (or agent), a recipient, and something given (or 'theme'). It is therefore expected to appear with three phrases corresponding to these three roles. In (1), for instances, Chris is agent, Pat is recipient, and a ball is theme. *Put*, another three-argument verb, requires an agent, a theme (object that undergoes the change of location) and a final location of the theme's motion. It appears with the corresponding three arguments in (2). However, whereas (1) and (2) represent perhaps the prototypical case, in general the interpretation and form of sentence patterns of a language are not reliably determined by independent specifications of the main verb. For example, it is implausible to claim that *sneeze* has a three-argument sense, and yet it can appear as such in (3). The patterns in (4) – (6) are likewise not naturally attributed to the main verbs:

(3) 'He sneezed his tooth right across town.' (Robert Munsch, Andrew's Loose Tooth)

(4) 'She smiled herself an upgrade.' (Douglas Adams, Hitchhiker's Guide to the Galaxy, Harmony Books)

(5) 'We laughed our conversation to an end.' (J. Hart. Sin Ivy Books, New York)

(6) 'They could easily co-pay a family to death.' (New York Times, 1/14/02)

Examples need not be particularly novel to make the point. Verbs typically appear with a wide array of complement configurations. Consider the verb *slice* and the various constructions in which it can appear (labeled in parentheses):

(7) a. He sliced the bread. (transitive)
b. Pat sliced the carrots into the salad. (caused motion)
c. Pat sliced Chris a piece of pie. (ditransitive)
d. Emeril sliced and diced his way to stardom. (way construction)
e. Pat sliced the box open. (resultative)

In all of these expressions *slice* means to cut with a sharp instrument. It is the argument-structure constructions that provide the direct link between surface form and general aspects of the interpretation, such as something acting on something else (7a), something causing something else to move (7b), someone intending to cause someone to receive something (7c), someone moving somewhere (7d), someone causing something to change state (7e) [7,33].

Thus constructions can be seen to be essential to an effective account of both unusual or especially complex patterns, and of the basic, regular patterns of language.

3 The functions of constructions

Different surface forms are typically associated with slightly different semantic or discourse functions. Take for example, the 'ditransitive' construction, which involves the form, Subject – Verb – Object1 – Object2, as in (1), (8b) and (9b).

(8) a. Liza bought a book for Zach.
    b. Liza bought Zach a book.

(9) a. Liza sent a book to storage.
    b. Liza sent Stan a book.
    c. ??Liza sent storage a book.

The ditransitive form evokes the notion of transfer or 'giving'. This is in contrast to possible paraphrases. For example, whereas (8a) can be used to mean that Liza bought a book for a third party because Zach was too busy to buy it himself, (8b) can only mean that Liza intended to give Zach the book. Similarly whereas (9a) can be used to entail caused motion to a location (the book is caused to go to storage), the ditransitive pattern requires that the goal argument be an animate being, capable of receiving the transferred item (cf. 9b, 9c). As is clear from considering the paraphrases, the implication of transfer is not an independent fact about the words involved. Rather the implication of transfer comes from the ditransitive construction itself.

Other interpretations for the ditransitive can also be systematically related to the notion of transfer, in that they imply that the transfer will occur if certain satisfaction conditions evoked by the main verb occur (10a), that transfer will *not* occur (10b), or that the antonymic relation of giving occurs – that of taking away (10c). Even examples such as 'Cry me a river' can be related to the notion of giving via a metaphorical extension [7].

(10) a. Liza guaranteed Zach a book. (If the guarantee is satisfied, Z. will receive a book)
     b. Liza refused Zach a book. (Liza caused Zach not to receive a book)
     c. Liza cost Zach his job. (Liza causes Zach to lose his job).

In addition to semantic generalizations there also exist generalizations about 'information structure' properties of the construction, or the way in which a speaker's assumptions about the hearer's state of knowledge and consciousness at the time of speaking is reflected in surface form. In particular, there is a statistically reliable tendency for the recipient argument to have already been mentioned in the discourse (often encoded by a pronoun) as compared with prepositional paraphrases [9,34,35]. Facts about the use of entire constructions, including register (e.g. formal or informal), dialect variation and so on, are stated as part of the construction as well. Because they specify a surface form and a corresponding function, constructionist approaches provide a direct way of accounting for these facts.

4 The form of constructions

To capture differences in meaning or discourse properties between surface forms, constructionist theories do not derive one construction from another, as is commonly done in mainstream generative theory. An actual expression or 'construct' typically involves the combination of at least half a dozen different constructions. For example, the construct in Fig. 1a involves the list of constructions given in Fig. 1b.

Note that 'surface form' need not specify a particular word order, nor even particular grammatical categories, although there are constructions that do specify these features. For example, the ditransitive construction (in Fig. 1 and discussed in the previous section) is characterized in terms of a set of argument types. The overt order of arguments in the ditransitive construction in Fig. 1 is determined by a combination of a Verb-Phrase (VP) construction with the Question construction, the latter allowing the 'theme' argument (represented by *What*) to appear in the sentence-initial position.

Constructions can be combined freely to form actual expressions as long as they are not in conflict. For example, the specification of the ditransitive construction that requires an animate recipient argument conflicts with the meaning of *storage* in (9c) resulting in unacceptability. The observation that language has an infinitely creative potential [1,36] is accounted for, then, by the free combination of constructions.

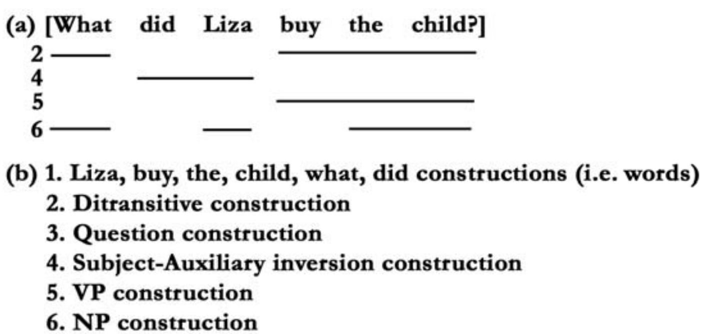

Figure 1 (a) An expression, or 'construct', that is a combination of the constructions shown in (b), labeled to indicate the appropriate parts of the expression (VP, Verb-Phrase; NP, Noun-Phrase). See text for discussion.

5 Learning constructions

The fourth tenet states that constructions are understood to be learned on the basis of positive input and to vary across languages. This idea highlights a major difference between most constructional approaches and most mainstream generative approaches, as the latter have argued that learners must be hard-wired with principles specific to a language faculty, that is, to possess a 'universal grammar' ([37]; see also [21]).

Crucially, all linguists recognize that a wide range of semi-idiosyncratic constructions exist in every language, constructions that cannot be accounted for by general, universal or innate principles or constraints (see examples in Table 2). Mainstream generative theory has taken the position that these constructions exist only on the 'periphery' of language, and that therefore they need not be the focus of linguistic or learning theorists [37]. Constructionist approaches, on the other hand, have zeroed in on these constructions, arguing that whatever means we use to learn these patterns can easily be extended to account for so-called 'core' phenomena. In fact, by definition, the core phenomena are more regular, and also tend to occur more frequently within a given language. Therefore if anything, they are likely to be easier to learn. Because every linguist would presumably agree that the 'peripheral', difficult cases must be learned inductively on the basis of the input, constructionist theories propose that there is no reason to assume that the more general, regular, frequent cases cannot possibly be learned in this way.

In fact, constructionist theories argue that language *must* be learnable from positive input together with fairly general cognitive abilities [18,29,38], because the diversity and complexity witnessed does not yield to accounts that assume that cross-linguistic variation can be characterized in terms of a finite set of parameters [37]. Research in this area is quickly gaining momentum. Several constructionists have made good on the promise to explain how particular constructions are learned [26,27]. It turns out that the input need not be nearly as impoverished as is sometimes assumed [39]; analogical processes can be seen to be viable once function as well as form is taken into account [40,41]; there is good reason to think that children's early grammar is quite conservative, with generalizations emerging only slowly [29,42,43]; and the ability to record transitional probabilities and statistical generalizations in the input has proven a powerful means by which to learn certain types of generalizations [44].

This approach takes a somewhat different view from mainstream generative theory of what is universal about language. Linguists talk of certain constructions as existing in many languages, for example, the passive construction, relative clause construction, question construction, and so forth. However, two constructions in different languages can be identified as instances of the same construction if and only if their form and function is *identical* once other constructions in the language that might differ are factored out. In fact, this rarely occurs except in cases of shared diachronic history or language contact [20,45,46]. What is truly remarkable is the degree to which human languages differ from one another, given that all languages need to express roughly the same types of messages. Constructionist approaches anticipate such fairly wide variability across languages [47,48].

We can understand what is actually intended by references to the 'same' construction in unrelated languages as *types* of constructions. Two constructions might be, for example, of the passive type in that they share certain functional and formal characteristics even if they are not identical. That is, two constructions in different languages can be identified as instances of the same type of construction if and only if they serve a closely related function and form.

6 Cross-linguistic generalizations

A driving question behind much of linguistic research is what is the typology of possible constructions and what constrains it? Constructionist approaches often turn to grammar-external explanations such as universal functional pressures, iconic principles, and processing and learning constraints to explain such empirically observable cross-linguistic generalizations. For example, certain generalizations about how form and meaning tend to be linked across languages can be explained by appeal to iconic and analogical processes [6,35,49–51]. Constraints on long-distance dependency constructions (traditional 'island constraints') appear to yield to processing explanations that take into account the function of the constructions involved [19,52 – 54]. Processing accounts have also been suggested to account for certain alternative word-order options [55,56]. Even among generative linguists there has been a trend towards the view that many constraints on language that have traditionally been seen as requiring recourse to innate stipulations specific to language can actually be explained by general cognitive mechanisms. For example, the fact that all languages appear to have noun and verb (and, possibly, adjective) categories may be explained by the existence of corresponding basic semantic categories [57]. In a recent paper, Hauser, Chomsky and Fitch go so far as to suggest that the only language-specific innate ability that is absolutely required is recursion, and they raise the point that even that might turn out not to be specific to language [58] (see also Box 1. Questions for Future Research).

7 Intra-language generalizations

Inheritance hierarchies have long been found useful for representing all types of knowledge, for example, our knowledge of concepts. The construction-based framework captures linguistic generalizations within a particular language via the same type of inheritance hierarchies [2,59,60]. Broad generalizations are captured by constructions that are inherited by many other constructions; more limited patterns are captured by positing constructions at various midpoints of the hierarchical network.

Box 1 Questions for Future Research

- Do there exist generalizations about form that do not have an abstract, family-resemblance or radial category type generalization about function associated with them?
- Does learning one construction facilitate learning other related constructions?
- What if the relationship between type and token frequencies in acquisition?
- If principles that are specific to language are not hardwired into our brains, how exactly do we differ from other primates who do not develop human-like languages?
- How great a role do general processing principles play in determining possible languages?

Exceptional patterns are captured by low-level constructions. For example, the 'What's X doing Y?' construction, which has a fixed form and connotes some sort of unexpectedness, captures a pattern in English grammar. It inherits properties from several other more general constructions, including the Left Isolation, the Subject-Auxiliary Inversion, the Subject-Predicate and the Verb-Phrase constructions [30].

8 Constructions all the way down

What makes a theory that allows for constructions a 'construction-based' theory is Tenet 7: the idea that the network of constructions captures our knowledge of language *in toto* – in other words, it's constructions all the way down.

9 Conclusion

Constructionist theories set out to account for all of our knowledge of language as patterns of form and function. That is, the constructionist approach does not assume that language should be divided up into 'core' grammar and the to-be-ignored 'periphery.' In identifying constructions, an emphasis is placed on subtle aspects of construal and on surface form. Cross-linguistic generalizations are explained by appeal to general cognitive constraints together with the functions of the constructions involved. Language-specific generalizations across constructions are captured via inheritance networks. The inventory of constructions, which includes morphemes or words, idioms, partially lexically filled and fully abstract phrasal patterns, is understood to be learned on the basis of the input together with general cognitive mechanisms.

Acknowledgements

I am grateful to Ray Jackendoff, Fritz Newmeyer, Devin Casenhiser, Mike Tomasello, Ali Yazdani and the anonymous referees for advice on an earlier draft. I am sure I will regret any I failed to heed.

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19 Embodied construction grammar in simulation-based language understanding*

Benjamin K. Bergen and Nancy Chang

1 Overview

This chapter introduces a construction grammar formalism that is designed specifically for integration into an embodied model of language understanding. We take as starting point for Embodied Construction Grammar many of the insights of mainstream Construction Grammar (Goldberg 1995; Fillmore 1988; Kay and Fillmore 1999; Lakoff 1987) and Cognitive Grammar (Langacker 1991). Foremost among these is the observation that linguistic knowledge at all levels, from morphemes to multi-word idioms, can be characterized as **constructions**, or pairings of form and meaning. Along with other construction grammarians, we assume that language users exploit constructions at these various levels to discern from a particular utterance a corresponding collection of interrelated conceptual structures.

We diverge from other construction grammar research in our concern with precisely how constructional knowledge facilitates conceptually deep language understanding.[1] Understanding an utterance in this broader sense involves not only determining the speaker's intended meaning but also inferring enough information to react appropriately, whether with language (e.g., by answering a question) or some other kind of action (e.g., by complying with an order or request). These processes involve subtle interactions with variable general knowledge and the current situational and discourse context; static associations between phonological and conceptual knowledge will not suffice. Our model addresses the need for a dynamic inferential semantics by viewing the conceptual understanding of an utterance as the internal activation of **embodied schemas** – cognitive structures generalized over recurrent perceptual and motor experiences – along with the mental **simulation** of these representations in context to produce a rich set of inferences.

An overview of the structures and processes in our model of language understanding is shown in Figure 1. The main source of linguistic knowledge is a large repository of constructions that express generalizations linking the domains of **form** (typically, phonological schemas) and **meaning** (conceptual schemas). We also distinguish two interacting processes (shown as wide arrows) that draw on these schematic structures to interpret an utterance appearing in a particular communicative context:

- The **analysis** process determines which constructions the utterance instantiates. The main product of analysis is the **semantic specification** (or **semspec**), which specifies the conceptual schemas evoked by the constructions involved and how they are related.

- The **simulation** process takes the semspec as input and exploits representations underlying action and perception to simulate (or enact) the specified events, actions, objects, relations, and states. The inferences resulting from simulation shape subsequent processing and provide the basis for the language user's response.

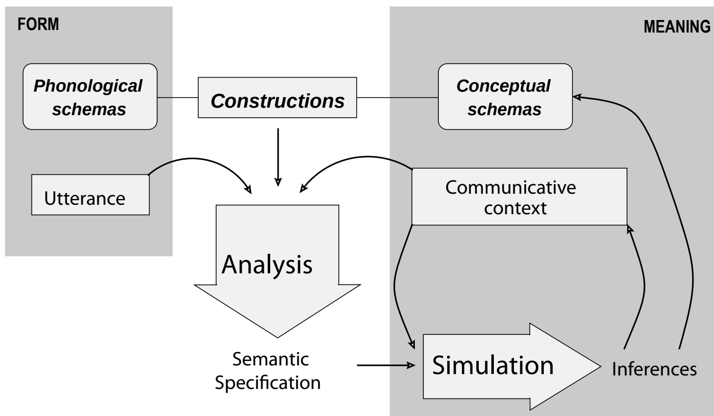

Figure 1: Overview of the simulation-based language understanding model, consisting of two primary processes: **analysis** and **simulation**. Constructions play a central role in this framework as the bridge between phonological and conceptual knowledge.

The embedding of construction grammar in a simulation-based language understanding framework has significant representational consequences. Constructions in ECG need specify only enough information to launch a simulation using more general sensorimotor and cognitive structures. This division of labor reflects a fundamental distinction between conventionalized, schematic meanings that are directly associated with linguistic constructions, and indirect, open-ended inferences that result from detailed simulation. In effect, constructions provide a limited means by which the discrete tools of symbolic language can approximate the multidimensional, continuous world of action and perception.

An adequate construction grammar formalism for our model must therefore provide a coherent interface between the disparate structures and processes needed in analysis and simulation; it must also be defined precisely enough to support a computational implementation. The remainder of this section provides an introductory tour of the ECG formalism – in particular, our representations of embodied schemas (Section 1.1) and constructions (Section 1.2) – using a simplified possible analysis of the phrase *into Rome*, as in *We drove into Rome on Tuesday*. We illustrate the formalism in greater detail with an extended analysis in Section 2, and address issues related to the overarching simulation-based framework in Section 3.

1.1 Embodied schemas

What does *into* mean, and how can we represent it? We take the central meaning of *into* to involve a dynamic spatial relation in which one entity moves from the exterior to the interior of another (as informally depicted in Figure 2). In the cognitive linguistics literature, such perceptually grounded concepts have been defined in terms of **image schemas** – schematic idealizations that capture recurrent patterns of sensorimotor experience (Johnson 1987; Lakoff and Johnson 1980). The relation captured by *into* can be seen as combining several image schemas, including the following:

- The ***Trajector-Landmark*** schema (Langacker 1987) captures an asymmetric spatial relationship involving a ***trajector***, whose orientation, location, or motion is defined relative to a ***landmark***.

- The ***Source-Path-Goal*** (or simply ***SPG***) schema (Johnson 1987) structures our understanding of directed motion, in which a ***trajector*** moves (via some ***means***) along a ***path*** from a ***source*** to a ***goal***.

- The ***Container*** schema (Johnson 1987) structures our knowledge of enclosed (or partially enclosed) regions. It consists of a ***boundary*** separating the ***interior*** of the container from its ***exterior***, and can also include a ***portal*** through which entities may pass.

Each image schema specifies structured relationships among a set of participants, often called **roles** (schema names and roles are shown in bold italic type); roles can be instantiated by particular values (or **fillers**). Bottles, houses, and cities, for example, differ in many salient respects, but at a structural level they can all be interpreted as instances of the ***Container*** schema; the other schemas likewise provide a level of structural abstraction over different situations. Roles within and across schemas may share their fillers, resulting in more complex composite structures like that associated with *into*. In our example phrase *into Rome*, the city of Rome serves as the landmark with respect to which a general locative event takes place; the destination of the motion; and the container within which the moving entity is ultimately located.

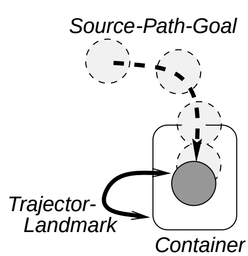

Figure 2: An iconic representation of some of the schemas involved in the meaning of *into*, including ***Container***, ***Trajector-Landmark***, and ***Source-Path-Goal***.

Image schemas are part of a long tradition in linguistic analysis of schematic structures associated, at least implicitly, with richer underlying structures; these include Fillmore's (1982) semantic **frames** (script-like structures relating sets of interdefined participants and props); Talmy's (1988) **force-dynamic** schemas (capturing interactions involving the application or exertion of force); and Langacker's (1987) **semantic schemas** (the basic unit for meaning representation in Cognitive Grammar). It appears to be this schematic level, and not the more detailed sensorimotor level, that is encoded crosslinguistically in grammatical systems (Talmy 2000). In ECG, we refer to such schematic structures as **embodied schemas** (or **schemas**). The simplest embodied schemas can, like their predecessors, be depicted as a list of roles, as shown in Figure 3. These roles allow external structures (including other schemas as well as constructions) to refer to the schema's key variable features, providing a convenient degree of abstraction for stating diverse linguistic generalizations. More importantly for our purposes, schema roles are also intended to serve as **parameters** to more detailed underyling structures that can drive active simulations; Section 3.2 describes how a broad range of embodied meanings can be simulated using a dynamic representation called **executing schemas** (Bailey 1997; Narayanan 1997).[2]

```
schema Trajector-Landmark
  roles
    trajector
    landmark
```

```
schema Container
  roles
    interior
    exterior
    portal
    boundary
```

```
schema SPG
  roles
    trajector
    source
    path
    goal
    means
```

Figure 3: ECG formalism for schemas involved in the meaning of ***into***. Keywords of the notation are shown in **bold**. The initial header line names the embodied **schema** being defined, followed by an indented **roles** block listing the schema role names.

```
schema Into
  subcase of Trajector-Landmark
  evokes
    SPG as s
  roles
    trajector : Entity
    landmark : Container
  constraints
    trajector ⟷ s.trajector
    s.source ⟷ landmark.exterior
    s.goal ⟷ landmark.interior
```

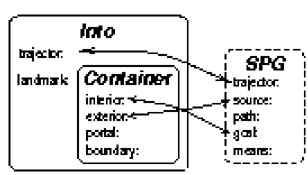

Figure 4: The ***Into*** schema, defined using the ECG formalism (left) and informally depicted as a set of linked schemas (right). ***Into*** is defined as a **subcase** of ***Trajector-Landmark*** that **evokes** an instance of the ***SPG*** schema (shown with a dashed boundary at right). Type constraints on roles require their fillers to be instances of the specified schemas, and identification bindings (↔) indicate which roles have common fillers.

More complex embodied schemas like ***Into*** involve the interaction of multiple schemas and their roles. Figure 4 draws on several additional representational devices to formalize our earlier prose description:

- The **subcase of** *x* tag asserts that the schema being defined is a specific case of a more general schema *x*; all of *x*'s roles are accessible and its constraints apply. In the example, ***Into*** is marked as a subcase of the asymmetric relation between two entities captured by the ***Trajector-Landmark*** schema.

- The **evokes** block allows the schema to be defined against the background of other schemas; each line *x* **as** *y* gives the evoked schema *x* a local name (or **alias**) *y* for internal reference.[3] Here, an instance of the ***SPG*** schema is evoked and labeled as *s*.

- **Type** constraints (indicated with a colon, as *x:y*) restrict role *x* to be filled by an instance of schema *y*. The fillers of the ***Into*** schema's ***trajector*** and ***landmark*** roles are required to be instances of the ***Entity*** (not shown) and ***Container*** schemas, respectively.[4,5]

- Slot-chain notation is used to refer to a role *y* of a structure *x* as *x.y*; thus ***landmark.exterior*** refers to the ***exterior*** role of the ***Into*** schema's ***landmark*** role (itself a ***Container*** instance).

- **Identification** constraints (indicated with a double-headed arrow, as *x*↔*y*) cause fillers to be shared between *x* and *y*. The **constraints** block **identifies** (or **binds**) the schema's inherited ***trajector*** role with the evoked ***SPG*** instance's trajector. The other identifications assert that the trajector's path takes it from the interior to the exterior of the container. (Note that the same evoked schemas with a different set of bindings would be needed to express the meaning of *out of*.) Other notational devices not illustrated by this example include:

- **Filler** constraints (expressed using a single-headed arrow, as *x*←*y*) indicate that the role *x* is filled by the element *y* (a constant value).

- The keyword **self** refers to the structure being defined. This self-reference capability allows constraints to be asserted at the level of the entire structure.

Overall, the ECG schema formalism provides precise but flexible means of expressing schematic meanings, ranging from individual schemas to structured scenarios in which multiple schemas interact. The notational devices also allow us to assert that various relations hold among schemas (subcase, evokes) and their roles (identification, filler). Some of these bear a resemblance to notions familiar from object-oriented programming languages and constraint-based grammars (Shieber 1986; Pollard and Sag 1994); these include features, inheritance, typing, and unification/coindexation. But, as suggested by some of our terminological choices,[6] the formal tools used for representing schemas must be viewed in light of their main function in the present context: providing means for external structures to set simulation parameters. These external structures include not just schemas but also, more importantly, constructions represented using similar mechanisms, as we describe in the next section.

1.2 A first look at constructions

Constructional approaches to grammar take the basic unit of linguistic knowledge to consist of form-meaning pairings, called **constructions**. This characterization crosscuts many traditional linguistic divisions, applying equally well to constructions of varying sizes (from morphological inflections to intonational contours) and levels of concreteness (from lexical items and idiomatic expressions to clausal units and argument structure patterns). In this section, we analyze our example *into Rome* as involving several such form-meaning mappings – including lexical constructions for *into* and *Rome* and a phrasal construction licensing their combination – and show how to represent them in the ECG construction formalism.

We begin with the simpler lexical constructions. The construction corresponding to *into* presumably links the ***Into*** schema described in Section 1.1 with some appropriate form representation. Although potential forms are not as open-ended as potential meanings, they nevertheless include such diverse elements as acoustic schemas, articulatory gestures, orthographic form(s), and stress or tone patterns. To ease exposition, we will rely here on a reduced notion of form including only phonological information, represented (as noted earlier) using the ECG schema formalism previously applied only to the meaning domain. Figure 5 shows the two form schemas used to define constructions in this chapter: a highly abstract ***Schematic-Form*** schema of which all other form schemas are subcases; and a ***Word*** schema with one role ***phon*** intended to contain specific phonological strings. (We assume that all words in spoken languages have this role.)

```
schema Schematic-Form
```

```
schema Word
  subcase of Schematic-Form
  roles
    phon
```

Figure 5: The ***Schematic-Form*** schema is the most general form schema; its (simplified) subcase ***Word*** schema has a ***phon*** role for specifying phonological strings.

```
construction SPATIAL-RELATION
  form : Schematic-Form
  meaning : Trajector-Landmark
```

```
construction INTO-CXN
  subcase of SPATIAL-RELATION
  form : Word
    phon ←— /ɪntuʷ/
  meaning : Into
```

Figure 6: The SPATIAL-RELATION pairs a ***Schematic-Form*** as its form pole with a ***Trajector-Landmark*** as its meaning pole; its subcase INTO-CXN further restricts these types. In particular, its form pole is constrained to be a ***Word*** whose ***phon*** role is filled with the specified phonological string.

Figure 6 shows how the relevant form-meaning associations for *into* are expressed in the ECG construction formalism. We define two constructions: a general SPATIAL-RELATION construction, and a more specific INTO-CXN construction for our example. The notation is similar in many respects to that in the schema formalism, with initial header lines naming the **construction**s being defined (shown in SMALL CAPS, both in the figure and in text), and a **subcase** tag in INTO-CXN relating the two constructions. In fact, the construction formalism includes all the representational devices introduced for schemas. But to fulfill their basic function, constructions also include two indented blocks, labeled **form** and **meaning**, which stand for their two linked domains, or **poles**. These poles list the elements and constraints (if any) within each domain, but they should also be considered special components of the construction that can be referred to and constrained, roughly analogous to schema roles. As shown in the figure, SPATIAL-RELATION's type constraints restrict its form pole to be an instance of ***Schematic-Form*** and its meaning to be an instance of ***Trajector-Landmark*** (from Figure 3). This constructional category is thus general enough to include a variety of spatial relations expressions that denote ***Trajector-Landmark*** relationships, including not just single words (like *into* and *over*) but also multiword expressions (like *out of* and *to the left of*). These type constraints apply to all subcases of the construction; INTO-CXN imposes even stricter requirements, linking an instance of ***Word*** (a subcase of ***Schematic-Form***) with an instance of ***Into*** (a subcase of ***Trajector-Landmark***). The form block also includes a filler constraint on its ***phon*** role, specifying /ɪntuʷ/ as the particular phonological string associated with the construction.

The other lexical construction in our example is similarly represented using a pair of related constructions, one a subcase of the other. The constructions shown in Figure 7 are intended to capture the basic intuition that the ROME construction is a specific referring expression (REF-EXPR) that picks out a known place in the world. Referring expressions will be discussed in more detail in Section 2.1. For now we need only stipulate that REF-EXPR's meaning pole, an instance of the ***Referent*** schema, includes a ***resolved-referent*** role whose filler is the entity picked out by the expression. In our example, ROME-CXN is defined as a subcase of the general construction that, besides specifying an appropriate phonological string, binds this role to the (conceptual schema) ***Rome***, a known entity in the understander's ontology.[7]

```
construction REF-EXPR
  form : Schematic-Form
  meaning : Referent
```

```
construction ROME-CXN
  subcase of REF-EXPR
  form : Word
    phon ⟵ /ro^w m/
  meaning
    resolved-referent ⟷ Rome
```

Figure 7: The Ref-Expr construction underlying all referring expressions pairs a schematic form with a ***Referent*** schema. Its subcase Rome-Expr identifies the resolved-referent role of its meaning pole with the known place specified by the ***Rome*** schema, and pairs this with the appropriate phonological string.

The final construction used in our example phrase illustrates how constructions may exhibit constituent structure. The phrase *into Rome* exemplifies a pattern in which a spatial relation with a particular landmark is associated with two expressions: a Spatial-Relation and a Ref-Expr in that order. Despite the relatively abstract nature of these elements, this pattern can be expressed using the same representational mechanisms as the more concrete constructions we have already seen, with one addition. As shown in Figure 8, we introduce a **constructional** block listing two constituent elements, ***sr*** and ***lm***, which are typed as instances of the Spatial-Relation and Ref-Expr constructions, respectively.[8] (Instances of constructions are also called **constructs**.) These constituents, and their form and meaning poles, may be referenced and constrained just like other accessible elements. In the formalism, a subscripted *f* (for form) or *m* (for meaning) on a construct's name refers to the appropriate pole. Moreover, since the **self** notation refers to the construction being defined, $\textbf{self}_f$ and $\textbf{self}_m$ can be used to refer to the form and meaning poles, respectively, of the construction in which they appear. We can thus assert relations that must hold among constituents, or between a construction and its constituents.

```
construction SPATIAL-PHRASE
  constructional
    sr : SPATIAL-RELATION
    lm : REF-EXPR
  form : Schematic-Form
    sr_f before lm_f
  meaning : Trajector-Landmark
    sr_m.landmark ⟷ lm_m
    self_m ⟷ sr_m
```

Figure 8: The Spatial-Phrase construction has two constituents specified in the **constructional** block. The form and meaning poles of these constituents are subject to both a word order constraint (in the form block) and an identification constraint (in the meaning block). The meaning of the overall construction is also bound to the meaning of its ***sr*** constituent.

The form and meaning blocks of the SPATIAL-PHRASE construction impose several such relational constraints. The single form constraint expresses the word order requirement mentioned earlier: the form pole of ***sr*** must precede that of ***lm***, though not necessarily immediately (since modifiers, for example, might intervene). We notate this constraint with the interval relation 'before', one of many possible binary relations between intervals set out in Allen's (1984) Interval Algebra. (Immediate precedence is expressed using the 'meets' relation.) The meaning block similarly relates the two constituents: the ***landmark*** role of the ***sr*** constituent's meaning pole (an instance of the ***Trajector-Landmark*** schema) is identified with the ***lm*** constituent's meaning pole. The other constraint uses the **self**$_m$ notation to identify the overall construction's meaning pole (also an instance of the ***Trajector-Landmark*** schema) with that of its ***sr*** constituent. In other words, the meaning of the entire construction is essentially the same spatial relation specified by its ***sr*** constituent, but with the particular landmark specified by its ***lm*** constituent.

For the SPATIAL-PHRASE construction to license our example phrase *into Rome*, instances of the lexical INTO-CXN and ROME-CXN constructions must satisfy all the relevant type, form, and meaning constraints on the ***sr*** and ***lm*** constituents. Note that the particular constructs involved may impose constraints not directly specified by SPATIAL-PHRASE. In this case, the ***Into*** schema constrains its ***landmark*** – identified by the first meaning constraint with the ***Rome*** schema – to be an instance of a ***Container***. Assuming, as suggested earlier (though not formally depicted), that cities and other geographical regions may serve at least abstractly as instances of the ***Container*** schema, the binding succeeds, resulting in a set of interrelated semantic structures resembling that depicted in Figure 4 with the ***Rome*** schema serving as the landmark container.

Our brief introduction to Embodied Construction Grammar has highlighted the formal representations of both schemas and constructions. Embodied schemas capture generalizations over experience in the domains of form or meaning; we represent them as role description structures that can parameterize simulations. Schemas may be subcases of more general schemas, or evoke and constrain instances of other schemas; their roles may be required to have fillers of specific types, or they may be identified with other roles or filled by particular values. Constructions are in some sense a special bipolar schematic structure that captures generalizations over form-meaning pairs; they thus employ a similar range of representational mechanisms. Constructions may also have internal constructional constituents upon which they may assert relational constraints. In the next section, we illustrate the interaction of these conceptual and linguistic representations in greater detail, deferring until the third section larger issues involved in the processes of constructional analysis and simulative inference.

2 A detailed analysis

This section shows our construction formalism at work in a more complex example. We present a collection of constructions that together license an analysis of the utterance in (1):

(1) Mary tossed me a drink.

Our analysis follows that of Goldberg (1995) in presuming that the ditransitive argument structure (in this example, the active ditransitive argument structure) imposes an interpretation in which one entity takes some action that causes another entity to receive something. Thus, although the verb *toss* appears with a variety of argument structures, its appearance in the example sentence is allowed only if its meaning pole can be understood as contributing to a transfer event of this kind.

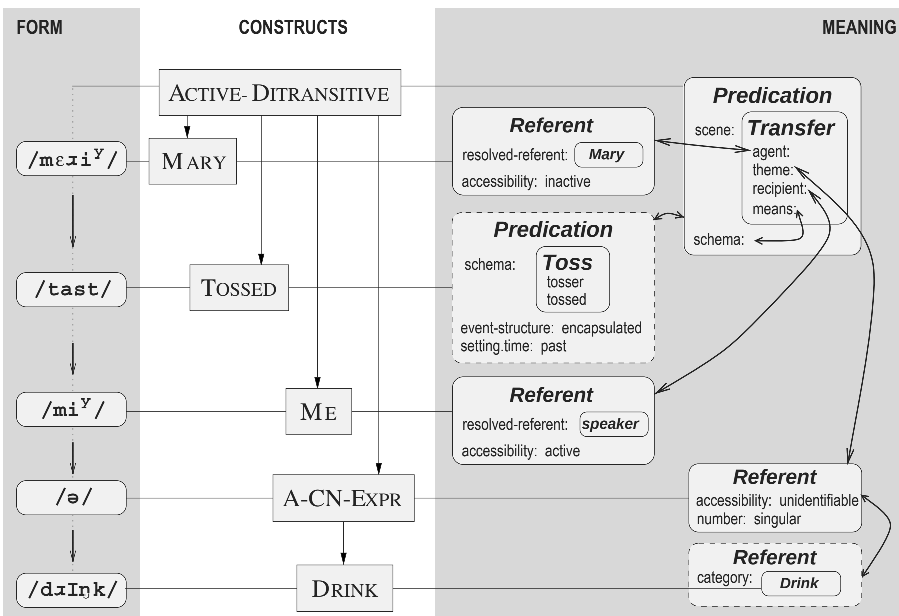

Figure 9: A depiction of a constructional analysis of *Mary tossed me a drink*. Constructs involved are shown in the center, linking elements and constraints in the domains of form and meaning; schemas are shown as rounded rectangles. (Some details not shown; see text.)

Figure 9 is a simplified depiction of the analysis we develop in this section. The form and meaning domains linked by constructional knowledge are shown as gray rectangles on either side of the figure. Form elements – including phonological schemas (shown simply as phonological strings in rounded rectangles) and word order relations (shown as arrows on a schematic time line) – appear in the form domain. Meaning elements – including schemas (shown as rounded rectangles) and bindings among their roles (shown as double-headed arrows) – appear in the meaning domain. The six rectangles lying between these domains correspond to the six constructs involved in the analysis. Each construct is labeled according to the construction it instantiates and is linked to other elements in the analysis in various ways. Horizontal lines link each construct with its form and meaning poles, while vertical arrows between the boxes express constructional constituency. For example, the box for the MARY construct has a (form) link to the phonological form /mEri^{y}/ (residing in the form domain) and a (meaning) link to ***Referent*** schema (residing in the meaning domain), which resolves to a ***Mary*** schema; in this analysis it is also a constructional constituent of the ACTIVE-DITRANSITIVE construct.

The constructions and schemas shown in the diagram (as well as several others not shown) are defined in this section using the ECG formalism. As will become clear, many of the details of the analysis – such as the specific constructions and schemas involved, as well as the subcase relations among them – are subject to considerable debate. Our current purpose, however, is not to offer the most general or elegant definition of any particular construction, but rather to demonstrate how the ECG formalism can express the choices we have made. The analysis also highlights the interaction between lexical and clausal semantics, suppressing details of how the formalism could represent sub-lexical constructions and more significant interactions with the discourse context; alternative analyses are mentioned where relevant.

We broadly divide the constructions to be defined in this section into those that allow the speaker to *refer* and those that allow the speaker to *predicate*. This division reflects the differing communicative functions of reference (typically associated with entities) and predication (typically associated with events). Following Croft (1990, 1991, 2001), we take reference and predication to be primary propositional acts that motivate many traditional grammatical categories and relations; they also have natural interpretations in our framework as the main schemas structuring the simulation (Section 3.1). We organize our analysis accordingly: the referring expressions in our example – *Mary*, *me*, and *a drink* – are defined in Section 2.1, followed by expressions involved in predication – both the main verb *tossed* and the ditransitive argument structure construction – in Section 2.2.

2.1 Referring expressions

The act of making **reference** (to some **referent** or set of referents) is a central function of linguistic communication. Speakers use language to evoke or direct attention to specific entities and events. A wide range of constructions is used for this function, including pronouns (*he*, *it*), proper names (*Harry*, *Paris*), and complex phrases with articles, modifiers, and complements (e.g., *a red ball*, *Harry's favorite picture of Paris*). But while the forms used in these constructions are highly variable, they all rely on the notion of reference as a core part of their meaning. The REF-EXPR (referring expression) construction defined in Section 1.2 and repeated here, is thus relatively schematic, linking a ***Schematic-Form*** with a ***Referent*** (Figure 2.1).

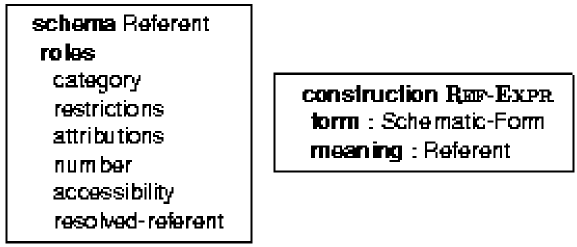

Figure 10: The ***Referent*** schema, the meaning pole of all referring expressions (REF-EXPR, repeated from Figure 7), contains information related to an active reference resolution process, including the number and accessibility of the intended referent.

The roles of the ***Referent*** schema correspond to information that a referring expression may convey about a referent. These include its ontological ***category*** (e.g., human, ball, picture); ***restrictions*** and ***attributions*** that apply to various open-class characteristics of the referent (e.g., size or color); the ***number*** of the referent (e.g. singular or plural), and its default level of ***accessibility*** (Lambrecht 1994) in the current discourse context (active, accessible, inactive, unidentifiable, etc.).[9,10] Specific subcases of REF-EXPR may place further constraints on these roles, which are used in a separate reference resolution procedure that finds the most likely referent in context (for example, a particular known individual or event); this actual referent, when determined, is the filler of the ***resolved-referent*** role. Some referring expressions, such as proper nouns (like *Rome*) and local deictic pronouns (like *I* and *me*) assert a direct binding on the ***resolved-referent*** role.

Our example includes three different referring expressions: *Mary*, *Me*, and *a drink*. We will analyze these as involving three constructions that are all subcases of the REF-EXPR construction – MARY, ME, and A-CN-EXPR – as well as COMMON-NOUN and its subcase DRINK-EXPR. Some constraints in the constructions we show could be expressed instead in more general constructions corresponding to proper nouns, pronouns, and determined phrases. To simplify the analysis, we have opted for more specific constructions that make fewer commitments with respect to subcase relations. Note, however, that the two approaches can be viewed as informationally equivalent with respect to the utterance under consideration.

We begin with the MARY and ME constructions (Figure 10). Both of these are specified as subcases of REF-EXPR, and have form and meaning poles that are structurally similar to the ROME construction from Section 1.2. Each form pole is an instance of the ***Word*** schema with the appropriate phonological string, and each meaning pole constrains the ***resolved-referent*** role and specifies the referent's level of ***accessibility***. The differences in meaning pole constraints reflect the differing functions of proper nouns and pronouns: proper nouns like *Mary* refer to known ontological entities (here, the ***Mary*** schema is intended to correspond to an individual conventionally named 'Mary') and thus can be used with no prior mention; they need only a minimal ***inactive*** level of accessibility. In contrast, pronouns like *me* and *you* identify referents for which the interlocutors have ***active*** representations in the current discourse; in this case, the Me construction makes deictic reference to the ***speaker*** role in the current context (notated here as ***current-space.speaker***; see Section 4 for discussion of how this role relates to work in *mental spaces*).

```
construction MARY
  subcase of REF-EXPR
  form : Word
    phon ⟵ /mɛɹiʸ/
  meaning
    resolved-referent ⟷ Mary
    accessibility ⟵ inactive
```

```
construction ME
  subcase of REF-EXPR
  constructional
    case ⟵ object
  form : Word
    phon ⟵ /miʸ/
  meaning
    resolved-referent ⟷ current-space.speaker
    accessibility ⟵ active
```

Figure 11: The Mary and Me constructions, both subcases of Ref-Expr bind the Referent schema's resolved-referent role to the ***Mary*** schema and the current speaker, respectively, and set different default levels of accessibility. The Me construction also constrains its ***case*** constructional feature.

The Me construction also differs from the Mary construction in having a **constructional** block, whose single ***case*** role is assigned the value ***object***. In the Spatial-Phrase construction, this block was used only to list constructional constituents. Here, however, we illustrate its more general function of specifying any elements or constraints applicable to the construction as a whole – that is, information residing in neither the form nor meaning domain alone. The ***case*** role (also termed a constructional **feature**) distinguishes the Me construction from the constructions for *I* (***subject*** case) and *my* (***possessive*** case) (as discussed further in Section 2.2.3). Note that in a more complete analysis of English, the ***case*** feature would be defined in a general Pronoun construction; for other languages with wider use of case, this feature might be defined in the more abstract Ref-Expr construction.

The final referring expression in our example, the phrase *a drink*, has more internal structure than the other ones we have considered. In traditional analyses, each word in the phrase – the article *a* and the common noun *drink* – corresponds to a constituent of the overall expression. But we elect here to treat the article as semantically and formally inseparable from the referring expression – that is, as tied to the context in which it precedes some category-denoting expression (traditionally called a *common noun*) and refers to an individual of the specified category. We formalize this analysis in Figure 11 with three constructions: a Common-Noun construction, its subcase Drink-Cxn construction, and the A-CN-Expr construction (or *a*-common noun expression, to contrast with a similar *the*-common noun expression, not shown). As usual, other alternatives are possible, but this analysis captures the constraints present in our example while demonstrating the flexibility of the ECG formalism as used for referring expressions.

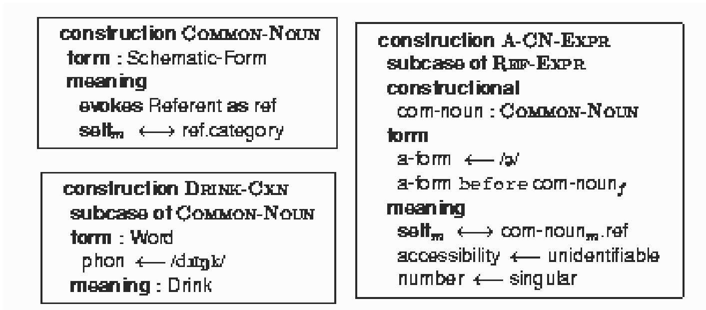

Figure 12: Constructions underlying *a drink*: COMMON-NOUN and its subcase DRINK-CXN supply a referent's category by binding its meaning pole (for DRINK-CXN, the ***Drink*** schema) to its evoked ***Referent*** schema's ***category*** slot. The A-CN-EXPR construction has one constructional constituent, typed as a COMMON-NOUN, which it constrains to follow the ***form*** element it introduces (the phonological schema corresponding to a). Its meaning pole, a ***Referent*** schema, is identified with the evoked Referent of its constituent and further constrained.

The overall intuition captured by the analysis is that common nouns provide categorical information about a referent, and expressions involving common nouns place further restrictions on the reference resolution process. The construction thus evokes a ***Referent***, whose ***category*** role is identified with the entire construction's meaning pole. Its subcase DRINK-CXN specializes both its form pole (with a particular phonological string) and its meaning pole (typed as a ***Drink***). In sum, these two constructions assert that the common noun *drink* has as its meaning pole the ***Drink*** schema, which is the category of the ***Referent*** schema it evokes by virtue of being a common noun (as depicted in Figure 9). The A-CN-EXPR construction unifies the ***Referent*** evoked by its ***com-noun*** constituent – which, as an instance of COMMON-NOUN, supplies categorical information – with its own ***Referent*** meaning pole. The form block introduces an internal form element ***a-form*** and constrains it to appear before the ***com-noun*** constituent. The meaning block imposes additional constraints on the overall ***Referent***, corresponding to the traditional functions of the indefinite singular determiner *a*: the ***accessibility*** is set as ***unidentifiable***, which among other effects may introduce a new referent into the discourse context; and its ***number*** is set as ***singular***.

Our treatment of reference, though preliminary, nevertheless suffices for the simple lexical and phrasal referring expressions in our example. Further research is necessary to account for the full range of referential phenomena, including modifiers, complements, and relative clauses. But we believe that even these complex referring expressions can be approached using the basic strategy of evoking and constraining a ***Referent*** schema that serves as input for reference resolution.

2.2 Predicating expressions

The act of **predication** can be considered the relational counterpart to reference. Speakers make attributions and assert relations as holding of particular entities; and they locate, or ground, these relations (in time and space) with respect to the current speech context. Central cases of constructions used to predicate include Goldberg's (1995) basic argument structure constructions and other clausal or multiclausal constructions. But many other kinds of construction – including the traditional notion of a *verb* as designating a relation between entities, as well as both morphological constructions and larger verb complexes that express tense, aspect, and modality – provide information relevant to making predications.

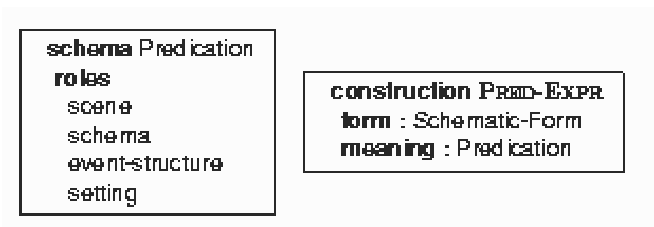

Figure 13: The ***Predication*** schema and PRED-EXPR construction are the analogs in the domain of predication to the ***Referent*** schema and REF-EXPR construction. The ***Predication*** schema captures major aspects of predicating, including the overall scene and the primary schema involved.

Figure 13 shows an ECG schema that organizes predicative content, the ***Predication*** schema. As usual, the roles given here are not intended to be exhaustive, but they suffice for describing a wide range of predications, including the one in our example, in precise enough terms to simulate. The schematic PRED-EXPR (predicating expression) construction is analogous to the REF-EXPR construction in covering a wide range of expressions that predicate; it pairs a ***Schematic-Form*** instance with a ***Predication*** instance. (Other predicative constructions, like the verbal constructions to be considered later, may simply evoke a ***Predication*** instance in their meaning poles.)

The first two roles of ***Predication*** together specify the main conceptual content and participant structure being asserted, in terms of both the overall ***scene*** (typically set by clausal constructions) and a main ***schema*** involved (typically set by verbal constructions). In general, the underlying semantics associated with these two roles must be understood as part of one coherent event. The ***scene*** role can be filled by a relatively limited set of schemas that describe basic patterns of interaction among a set of participants. These correspond roughly to what Goldberg (1995) refers to as 'humanly relevant scenes', as well as to the basic scenes associated with children's crosslinguistically earliest grammatical markings (Slobin 1985); examples include ***Force-Application*** (one participant exerting force on another), ***Self-Motion*** (a self-propelled motion by a single participant), ***Caused-Motion*** (one participant causing the motion of another), or, as in our example sentence, ***Transfer*** (a participant transfers an entity to a second participant). These overall scenes generalize over the particular concrete actions involved – whether, for example, the participant in an instance of ***Self-Motion*** sustains the motion by walking, hopping, or pushing through a crowd; the concrete schemas are bound instead to the ***schema*** role. As we shall see, the relation between ***scene*** and ***schema*** is at the crux of the analysis process, since many factors influence their interaction. Their separation in the ***Predication*** schema provides some useful representational flexibility: individual constructions may specify as much or as little as needed about these roles and how they are related.

The remaining roles of the ***Predication*** schema supply additional information about how the event is to be understood. The ***event-structure*** role constrains the shape of the event asserted in the predication or the particular stage it profiles; cross-linguistically, markers of linguistic *aspect* typically affect this role. The event may also be located in a particular ***setting*** in time or space; tense markings, for example, generally affect a substructure ***time*** of the ***setting*** role.

We analyze our example sentence as involving two main constructions that interact to define the overall predication: the verbal Tossed construction and the clausal Active-Ditransitive construction. These constructions exemplify the pattern mentioned above: the verbal construction binds a particular action schema (the ***Toss*** schema) to the ***schema*** role, while the clausal construction binds a ***Transfer*** schema to the ***scene*** role.[11] In the analysis we will develop, these separately contributed schemas are directly related in the final predication: the tossing action is understood as the *means* by which a transfer is effected.[12] We examine first the schemas needed to represent the meanings involved in our example sentence (Section 2.2.1) and then use these to define the relevant verbal (Section 2.2.2) and clausal (Section 2.2.3) constructions.

2.2.1 Representing scenes

In this section we consider some schemas needed to represent the meanings predicated by our example sentence, *Mary tossed me a drink*. We interpret the sentence as asserting that at some point before speech time, the referent of *Mary* applied a tossing action to the referent of *a drink*, which as a result is received by the referent of *me* (the speaker in the current context). Prototypically, the action of tossing is a low-energy hand action that causes an entity to move through the air; since it intrinsically causes motion, we will define it relative to the general ***Caused-Motion*** schema. Our example has the further implication that the referent of *a drink* is received by the speaker. That is, it depicts an overall scene of ***Transfer***, in which one entity acts to cause another to receive a third entity, irrespective of the particular action involved.

We follow Goldberg (1995) in attributing this ***Transfer*** semantics to the ditransitive clausal pattern, or argument structure construction, where the subject encodes the causer of transfer, the first postverbal object encodes the recipient of transfer, and the second postverbal object the transferred entity. We base this analysis on evidence such as that in (2):

(2) a. Mary spun/broomed me a drink. *(transfer)*
b. ?Mary tossed the floor a drink. *(?transfer)*
c. Mary tossed a drink to the floor. *(caused-motion)*

Sentence (2a) shows that ditransitive syntax can impose an intended transfer reading even on verbs not prototyically associated with transfer, including transitive verbs like *spin* as well as novel denominal verbs like *broom*. This transfer sense is distinct from the semantics associated with caused-motion clausal syntax, as demonstrated by the differing acceptability of the sentences in (2b) and (2c). The referent of the first object in a ditransitive sentence must serve as a recipient – that is, it must be categorized or construed as something that can receive the transferred object. Thus (2b) has an acceptable reading only under a (metaphorical, anthropomorphized) construal of *the floor* as a possible receiver and possessor of objects. This requirement does not apply to the caused-motion argument structure in (2c), which implies only that the agent causes motion of the entity along some path, without any entailment of receiving.[13]

These intuitions can be made concrete using the representational tools of ECG to define the two relevant scenes, ***Caused-Motion*** and ***Transfer*** (Figure 14), each defined in terms of several other schemas (Figure 15). The two scenes are structurally parallel: each involves a forceful action on the part of an ***agent*** entity, which causes some effect on a ***theme*** entity. The forceful action is captured by the ***Force-Application*** schema, which involves an ***energy-source*** that exerts force on an ***energy-sink*** via some ***means***, possibly through an ***instrument***; the type and amount of force may also be specified.[14] The causal structure is captured by the simple ***Cause-Effect*** schema, which lists only a ***cause*** and a resulting ***effect***. Each of the schemas in Figure 14 evokes both the ***Force-Application*** and ***Cause-Effect*** schemas and asserts constraints that identify the ***agent*** in each scene with the ***energy-source*** of the forceful action, the overall ***means*** of the scene with the ***means*** of the forceful action, and the forceful action itself with the ***Cause-Effect***'s ***cause***.

```
schema Caused-Motion
  evokes
    Force-Application as fa
    SPG as s
    Cause-Effect as ce
  roles
    agent ⟷ fa.energy-source
    theme ⟷ fa.energy-sink ⟷ s.trajector
    path ⟷ s
    means ⟷ fa.means
  constraints
    ce.cause ⟷ fa
    ce.effect ⟷ s
```

```
schema Transfer
  evokes
    Force-Application as fa
    Receive as rec
    Cause-Effect as ce
  roles
    agent ⟷ fa.energy-source
    theme ⟷ rec.received
    recipient ⟷ rec.receiver
    means ⟷ fa.means
  constraints
    ce.cause ⟷ fa
    ce.effect ⟷ rec
```

Figure 14: The structurally similar ***Caused-Motion*** (in which an ***agent*** acts on a ***theme*** via some ***means*** such that it moves along a ***path***) and ***Transfer*** (in which an ***agent*** acts on a ***theme*** via some ***means*** such that it is received by a ***recipient***) capture scenes relevant to the example.

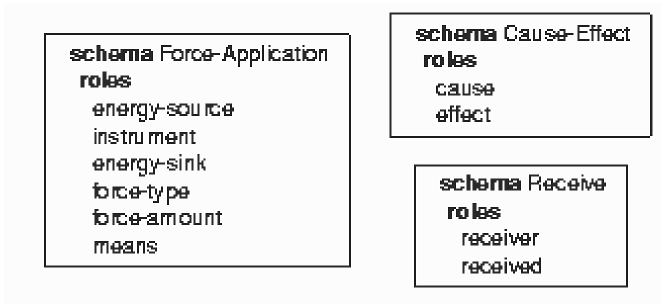

Figure 15: Embodied schemas contributing to the example sentence: ***Force-Application*** captures scenarios in which an ***energy-source*** exerts force on an ***energy-sink***; ***Cause-Effect*** captures causal relations; and the ***Receive*** schema has roles for a ***receiver*** and a ***received*** entity.

Where the two scenes differ is in their effects – that is, in the particular schemas bound to the ***effect*** role of their evoked ***Cause-Effect*** schemas. In the ***Caused-Motion*** scene, the result of the forceful action is the motion of the ***theme*** entity along a path; this is captured by an evoked ***SPG*** schema (defined earlier), whose ***trajector*** is bound to the ***theme***. (Note that the formalism allows multiple identifications to be expressed at once, in either the roles or constraints block.) In the ***Transfer*** scene, the ***effect*** is bound not to an ***SPG*** but rather to an evoked ***Receive*** schema, with the ***receiver*** and the ***received*** bound to the ***Transfer*** scene's ***recipient*** and ***theme*** roles, respectively.

Both scenes we have defined are abstract in that the particular action (or ***means***) involved is not specified; indirectly, however, they both require some action that is construable as applying force, and that the ***agent*** role's filler must be capable of performing. The concrete actions are typically supplied by specific verbs. These indirect constraints thus play a key role in determining how verbs interact with clausal constructions evoking these scenes, as we will show for the particular verb *tossed* in the remainder of this section.

2.2.2 Tossed as a verb

We first consider how the action of tossing can be represented using embodied schema's before defining the construction for the verb *tossed*. As noted earlier, the ***Toss*** schema needed for our example is semantically compatible with either of the scenes we have described, but it is intrinsically associated with caused motion and thus defined here against the backdrop of the ***Caused-Motion*** schema (Figure 16). Specifically, ***Toss*** evokes both a ***Caused-Motion*** schema and a ***Fly*** schema (not shown); it identifies itself with the ***means*** role of the evoked ***Caused-Motion***, as expressed by the first line in the constraints block. The remaining constraints straightforwardly identify the ***Toss*** schemas two roles, a ***tosser*** and a ***tossed*** object, with appropriate roles in the evoked schemas; restrict the degree of force used in the causal action to ***low***; and bind the ***means*** of the associated resulting motion to the evoked ***Fly*** action. In sum, the action of tossing is a (somewhat) forceful action on an entity that causes it to fly. (As usual, this schema should be viewed as summarizing the motor parameters for a more detailed representation of the tossing action schema, to be discussed in Section 3.2.1.)

```
schema Toss
  evokes
    Caused-Motion as cm
    Fly as f
  roles
    tosser  ⟷ cm.agent
    tossed  ⟷ cm.theme ⟷ f.flyer
  constraints
    cm.means  ⟷ self
    cm.fa.force-amount ⟵ low
    cm.path.means  ⟷ f
```

Figure 16: The ***Toss*** schema is identified with the ***means*** of its evoked ***Caused-Motion***. It also constrains the associated ***Force-Application*** to be a low-force action that results in a flying motion.

We now turn to the verb *tossed*, which is linked to the ***Toss*** schema described in the last section, but also carries aspect and tense information that applies to the larger predication associated with the overall sentence. Loosely following Langacker (1991), we define the Verb construction as a word that evokes a ***Predication*** instance, such that its subcases (including the construction) may assert further constraints (both constructions are shown in Figure 17). Specifically, the Tossed construction associates the phonological form /tast/ with a meaning pole typed as an instance of the ***Toss*** schema.

This entire meaning pole is bound to ***pred.schema***, indicating that it serves as the main schema of its evoked ***Predication***. The remaining constraints affect roles of ***Predicaton*** related to aspect and tense. First, as discussed further in Section 3.2.1, the English simple past tense can be modeled using executing schemas that suppress, or **encapsulate**, details of their internal structure during simulation; the ***Predication's event-structure*** is thus set as ***encapsulated***. Second, the constraint setting the ***pred.setting.time*** as ***past*** indicates that the time during which the relational predication holds, corresponding to Reichenbach's (1947) Event Time, must be prior to the (contextually specified) Speech Time.

2.2.3 The active-ditransitive construction

The only remaining construction to define is the argument structure construction spanning the entire utterance, the Active-Ditransitive construction. As suggested earlier, we analyze this construction (Figure 18), as well as other ditransitive constructions like Passive-Ditransitive and Imperative-Ditransitive, as a subcase of the Pred-Expr construction whose associated predication is based on a scene of ***Transfer***. The close relation between this clausal construction and the ***Transfer*** scene is reflected by its four constituents, which are deliberately given aliases parallel to those of the ***Transfer*** schema's roles.

```
construction VERB
  form : Word
  meaning
    evokes Predication as pred
```

```
construction TOSSED
  subcase of VERB
  form
    phon : /tast/
  meaning : Toss
    self_m ⟷ pred.schema
    pred.event-structure ⟵ encapsulated
    pred.setting.time ⟵ past
```

Figure 17: The VERB construction evokes a ***Predication*** schema. Its subcase TOSSED construction identifies its meaning pole, typed as a ***Toss*** schema, with the evoked ***Predication*** schema's main ***schema*** role and asserts aspect and tense constraints.

Constructional constraints enforce case restrictions on pronouns filling the ***agent***, ***theme***, and ***recipient*** constituents (discussed in Section 2.1), accounting for the judgments in (3):[15]

(3) a. * Mary tossed I/my a drink.
b. * Me/my tossed Mary a drink.

```
construction ACTIVE-DITRANSITIVE
  subcase of PRED-EXPR
  constructional
    agent : REF-EXPR
    action : VERB
    recipient : REF-EXPR
    theme : REF-EXPR
    recipient.case ⟵ object
    agent.case ⟵ subject
    theme.case ⟵ object
  form
    agent_f before action_f
    action_f meets recipient_f
    recipient_f meets theme_f
  meaning
    evokes Transfer as tr
    self_m.scene ⟷ tr
    tr.agent ⟷ agent_m
    tr.theme ⟷ theme_m
    tr.recipient ⟷ recipient_m
    tr.means ⟷ action_m
    self_m ⟷ action_m.pred
```

Figure 18: The ACTIVE-DITRANSITIVE construction has four constituents, including three referring expressions with specified case values. Besides imposing order constraints, the construction binds its meaning pole (a ***Predication***), with its verbal constituent's evoked predication; its evoked ***Transfer*** schema with its ***scene*** role; and the meaning poles of its constituents with roles of the ***Transfer*** schema.

The three order constraints reflect intuitions suggested by the examples in (4):

(4) a. Mary tossed me a drink.
 b. Mary happily tossed me a drink.
 c. * Mary tossed happily me a drink.
 d. * Mary tossed me happily a drink.
 e. Mary tossed me a drink happily.

That is, the ***agent*** must precede the ***action*** (though not necessarily immediately), and no intervening material is allowed between the ***action*** and ***recipient*** constituents, nor between the ***recipient*** and ***theme*** constituents.

The meaning constraints are more complicated. The entire meaning pole is a ***Predication***, as specified by the Pred-Expr construction, but it also evokes an instance of the ***Transfer*** schema. This schema is bound to $\mathbf{self}_m$.scene – that is, the ***scene*** role of the overall construction's meaning pole, which is itself an instance of ***Predication*** – and its roles are in turn bound to the meaning poles of the various constituents. A final complication is dealt with by the last meaning constraint, which identifies the entire meaning pole with the ***Predication*** evoked by the verbal ***action*** constituent. (This binding corresponds to the double-headed arrow linking the two ***Predication*** schemas in Figure 9.) This constraint allows the overall predication to incorporate any relevant constraints expressed by the verb.

We can now examine the interaction of verbal and clausal semantics in our example, in which the ***Active-Ditransitive*** construction's ***action*** constituent is filled by the verb *tossed*. The verbal and clausal constructions both assert constraints on the overall predication: Tossed supplies aspect and tense information and the main schema involved (***Toss***), while Active-Ditransitive specifies the scene (***Transfer***) and binds its roles. Crucially, the ***Toss*** schema provided by the verb is required to serve as a means of transfer (since it is bound to the ***Transfer*** schema's ***means*** role). This binding succeeds, since both ***Toss*** and the ***Transfer*** schema's ***means*** roles are bound to the ***means*** of a ***Force-Application*** schema (see Figure 14 and Figure 16). As a result, the forceful action involved in a transfer event is identified with the forceful action involved in a tossing action, which in turn causes the ***agent*** of transfer to be bound to the ***tosser***. Similar propagation of bindings also leads the ***tossed*** object to be identified with the ***theme*** of the transfer event, although we have not shown the relevant internal structure of the ***Receive*** schema.[16]

As just shown, the formalism permits the expression (and enforcement) of bidirectional constraints between verbal and clausal semantics – in this case, for example, a restriction on the ditransitive construction to verbs that entail some force-dynamic transfer (Langacker 1991). Failure to fulfill such restrictions can result in reduced acceptability and grammaticality of particular combinations of clausal constructions with particular verbs or referring expressions:

(5) * Mary slept me a drink. *(Her sleeping gave the speaker a drink.)*

In an attempted analysis of (5) as an instance of the ACTIVE-DITRANSITIVE construction, the construction filling the ***action*** constituent would be that corresponding to *slept*. The lack of the requisite force-dynamic semantics in the schema associated with sleeping accounts for the sentence's questionable acceptability. Section 3.3.1 discusses related phenomena arising during analysis that likewise depend on semantic compatibility.

We have now completed our extended tour through the constructions licensing one analysis of *Mary tossed me a drink*. As should be clear from the disclaimers along the way, some details have been simplified and complications avoided for ease of exposition. But while the resulting analysis may not capture all the linguistic insights we would like, we believe that issues related to the content of the construction are separable from our primary goal of demonstrating how a broad variety of constructional facts can be expressed in the Embodied Construction Grammar formalism. The next section situates the formalism in the broader context of language understanding, using the constructions and schemas we have defined to illustrate the analysis and simulation processes.

3 ECG in language understanding

Now that we have shown how constructions and schemas can be defined in the ECG formalism, we shift our attention to the dynamic processes that use the formalism for language understanding. Section 3.1 shows how the analysis process finds relevant constructions and produces a semantic specification, and Section 3.2 then shows how the simulation can use such a semspec, along with its associated embodied structures, to draw inferences that constitute part of the understanding of the utterance. In Section 3.3, we consider issues that arise in attempting to account for wider linguistic generalizations and sketch how they might be handled in our framework.

3.1 Constructional analysis

Constructional analysis is a complex undertaking that draws on diverse kinds of information to produce a semantic specification. In particular, since constructions carry both phonological and conceptual content, a construction **analyzer** – essentially, a parser for form-meaning constructions – must respect both kinds of constraint. Analysis consists of two interleaved procedures: the search for candidate constructions that may account for an utterance in context; and the unification of the structures evoked by those constructions in a coherent semspec. Bryant (2003) provides technical details of an implemented ECG analyzer along these lines; here we illustrate both procedures in the vastly simplified situation in which the known constructions consist *only* of the constructions defined in Section 2. The search space is thus extremely limited, and the unification constraints in the example are relatively straightforward.

A typical analysis begins with the phonological forms in an utterance triggering one or more constructions in which they are used. Given our reduced search space, this happens unambiguously in our example: the lexical constructions underlying the words *Mary*, *tossed*, *me*, and *drink* (ignoring the possible verb stem construction with the same form) each trigger exactly one construction; since no additional form constraints remain to be satisfied, the various schemas evoked by the constructions are added to the semspec. The word *a* similarly cues the A-CN-Expr construction (since the phonological form corresponding to *a* is part of its form pole). The cued construction has an additional ***com-noun*** constituent to fill; fortunately, the relevant form and meaning constraints are easily satisfied by the previously cued Drink construct. The Active-Ditransitive is triggered by the presence of the other analyzed constructs in the observed order; its constraints are then checked in context. As mentioned in Section 2.2.3, it is this step – in particular, ensuring that the construction's semantic requirements are compatible with those of its verbal constituent – that poses the main potential complication. In our example, however, the schemas as defined are enough to license the bindings in question, and the utterance is successfully analyzed.

We mention in passing some issues that arise when constructional analysis is not restricted to our carefully orchestrated example sentence. The search for candidate constructions grows much harder with larger sets of constructions and their attendant potential ambiguities. The number of constraints to be satisfied – and ways in which to satisfy them – may also make it difficult to choose among competing analyses. Approaches to these essentially computational problems vary in cognitive plausibility, but a few properties are worth noting as both cognitively and computationally attractive. As in our example, analysis should proceed in both bottom-up and top-down fashion, with surface features of the utterance providing bottom-up cues to the constructions involved, and cued constructions potentially supplying top-down constraints on their constituents. An equally important principle (not explicit in our example constructions) is that processing should reflect the graded nature of human categorization and language processing. That is, constructions and their constraints should be regarded not as deterministic, but as fitting a given utterance and context to some quantifiable degree; whether several competing analyses fit the utterance equally well, or whether no analysis fits an utterance very well, the result of processing is the *best-fitting* set of constructions.[17]

The semantic specification resulting from the unification process described above is shown in Figure 19. Predications and referents are shown in separate sections; in a coherent semspec, all schemas are eventually bound to some predication or referent structure. The depicted schemas and bindings illustrate the main ways in which the constructions instantiated in a successful analysis contribute to the semspec:

- Constructions may include schemas (and the bindings they specify) directly in their meaning poles, or they may evoke them. The three referents and single predication shown can each be traced to one or more constructions, and each schema effects various bindings and type constraints on its subparts and roles.

- Constructions may effect bindings on the roles of their schemas and constituents. Most of the bindings shown in the figure come from the Active-Ditransitive construction and its interaction with its constituents. Note also that the figure shows a single predication, the result of unifying the predications in the Tossed and the Active-Ditransitive constructions; the ***Drink*** category has likewise been unified into the appropriate referent schema.

- Constructions may set parameters of their schemas to specific values; these values have fixed interpretations with respect to the simulation. The Tossed construction, for example, sets its associated predication's ***setting.time*** to be ***past*** (shorthand for locating the entire event previous to speech time) and its ***event-structure*** to be ***encapsulated*** (shorthand for running the simulation with most details suppressed, to be discussed in the next section).

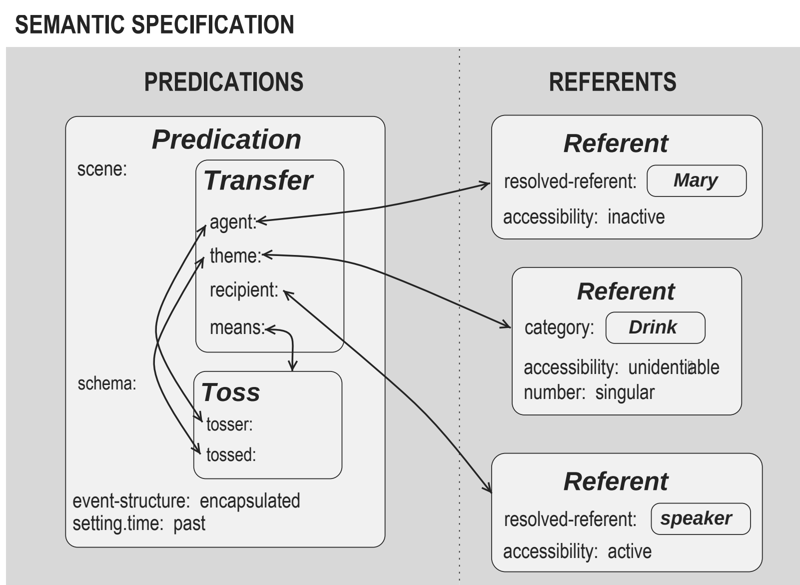

Figure 19: Semantic specification showing predications and referents produced by the analysis of *Mary tossed me a drink*. The overall predication has a ***Transfer*** schema as its scene, and a ***Toss*** schema (which is also the means of transfer) as its schema. The ***Transfer*** schema's ***agent*** is bound to the ***Mary*** schema, its ***recipient*** to the ***speaker***, and its ***theme*** to an ***unidentifiable***, ***singular*** referent of category ***Drink***.

The figure does not show other schemas evoked by several of the schemas, including the instances of ***Force-Application*** in both the ***Transfer*** and ***Toss*** actions that are unified during analysis. It also does not show how the semspec interacts with discourse context and the reference resolution process. Nevertheless, the semspec contains enough information for an appropriate simulation to be executed, based primarily on the ***Toss*** schema and the embodied motor schema it parameterizes. In Section 3.2 we describe how such dynamic knowledge is represented and simulated to produce the inferences associated with our example.

3.2 Simulative inference

We have claimed that constructional analysis is merely a crucial first step toward determining the meaning of an utterance, and that deeper understanding results from the simulation of grounded sensorimotor structures parameterized by the semspec. This section first describes active representations needed for the tossing action of our example (Section 3.2.1), and then discusses how these representations can be simulated to produce fine-grained inferences (Section 3.2.2).

3.2.1 An execution schema for tossing

Executing schemas, or **x-schemas**, are dynamic representations motivated in part by motor and perceptual systems (Bailey 1997; Narayanan 1997), on the assumption that the same underlying representations used for executing and perceiving an action are brought to bear in understanding language about that action. The x-schema formalism is an extension of Petri nets (Murata 1989) that can model sequential, concurrent, and asynchronous events; it also has natural ways of capturing features useful for describing actions, including parameterization, hierarchical control, and the consumption and production of resources. Its representation also reflects a basic division into primitives that correspond roughly to stative situations and dynamic actions.

We use tossing, the central action described by our example utterance, to illustrate the x-schema computational formalism. The ***Toss*** schema evoked by the Tossed construction parameterizes the ***Tossing-Execution*** schema, which is the explicit, grounded representation of the sensorimotor pattern used (by an implicit ***tosser***) to perform a tossing action, shown in Figure 20. Informally, the figure captures a sequence of actions that may be performed in tossing an object (the ***tossed*** parameter), including possible preparatory actions (grasping the object and moving it into a suitable starting position) and the main tossing action of launching the object (shown in the hexagon labeled ***nucleus***). This main event may include subsidiary actions that move the object along a suitable path before releasing the object, all with low force. A number of perceptual conditions (shown in the area labeled **percept vector**) must also hold at specific stages of the event: the ***tossed*** object must be in the hand (of the ***tosser***) before the action takes place, and afterward it will be flying toward some ***target***. (The ***target*** role was not shown in the ***Toss*** schema definition in Figure 16, but would be bound to its ***spg.goal***.)

The x-schema formalism provides a graphical means of representing the actions and conditions of the dynamic event described. An x-schema consists of a set of **places** (drawn as circles) and **transitions** (drawn as hexagons) connected by **arcs** (drawn as arrows). Places typically represent perceptual conditions or resources; they may be **marked** as containing one or more **tokens** (shown as black dots), which indicate that the condition is currently fulfilled or that the resource is available. In the stage depicted in the figure, for example, two places in the percept vector are marked, indicating that the object to be tossed is currently in the tosser's hand, and that the tosser currently has some energy. (The figure does not show incoming arcs from separate perceptual input mechanisms that detect whether the appropriate conditions hold.) The other places in the figure are control states for the action (e.g., ***enabled***, ***ready***, ***ongoing***, ***done***, which we discuss in Section 3.2.2). The overall state of the x-schema is defined as the distribution of tokens to places over the network; this assignment is also called a **marking** of the x-schema.

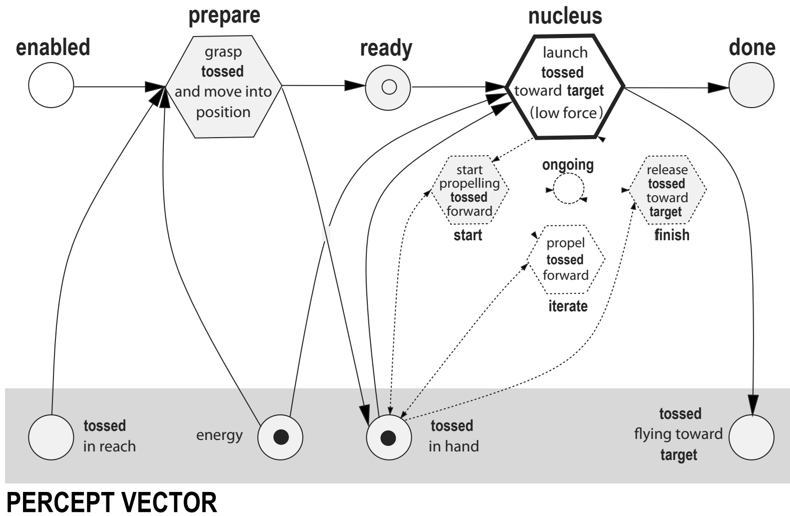

Figure 20: A simplified x-schema representing motor and perceptual knowledge of the tossing action, defined relative to the tosser. (Not all arcs are shown.)

Transitions typically represent an action or some other change in conditions or resources; the ones shown here each correspond to a complex action sequence with subordinate x-schemas whose details are suppressed, or **encapsulated**, at this level of granularity. The figure shows how the tossing x-schema's main launching action could be expanded at a lower level of granularity; the subordinate schemas are drawn with dotted lines to indicate that they are encapsulated. Note that these transitions also have labels relevant to the overall control of the action (***prepare***, ***start***, ***finish***, ***iterate***, ***nucleus***); again, these will be discussed in Section 3.2.2. Directed arcs (depicted in the figure as arrows) connect transitions to either **input places** (i.e., places from which it has an incoming arc) or **output** places (i.e., places to which it has an outgoing arc).

X-schemas model dynamic semantics by the flow of tokens. Tokens flow through the network along **excitatory** arcs (single-headed arrows), according to the following rules: When each of a transition's (excitatory) input places has a token, the transition is **enabled** and can **fire**, consuming one token from each input place and producing one token in each output place. An x-schema **execution** corresponds to the sequence of markings that evolve as tokens flow through the net, starting from an initial marking. Given the initial marking shown in the figure, the transition labeled ***nucleus*** can fire, consuming tokens from each input place. The firing of this transition causes the execution of the subordinate sequence of actions; once these have completed, the transition's firing is complete and tokens are placed in its output places, asserting that the tossed object is now on its trajectory. The overall token movement can be interpreted as the expenditure of energy in a movement that results in the tossed object leaving the tosser's hand and flying through the air.

Most of the arcs shown in the ***Toss-Execution*** schema are excitatory; places and transitions may also be connected by **inhibitory** and **enabling** arcs. Inhibitory arcs (not shown in the figure), when marked, prevent the firing of the transitions to which they have an outgoing connection. Enabling arcs (shown as double-headed arrows) indicate a static relationship in which a transition requires but does not consume tokens in enabling places. The figure shows two of the subschemas encapsulated within the ***nucleus*** transition as having enabling links from the place indicating that the object is in the tosser's hand; this makes sense since contact with the object is maintained throughout the action of propelling the tossed object. (Again, the arcs are drawn using dotted lines to indicate their encapsulated status.)

The x-schema formalism has just the properties needed to drive simulation in our framework. X-schemas can capture fine-grained features of complex events in dynamic environments, and they can be parameterized according to different event participants. Constructions can thus access the detailed dynamic knowledge that characterizes rich embodied structures merely by specifying a limited set of parameters. Moreover, the tight coupling between action and perception allows highly context-sensitive interactions, with the same x-schema producing strikingly different executions based on only slight changes in the percept vector or in the specified parameters. In the next section we show how x-schemas can be used for fine-grained inference on the basis of an analyzed utterance.

3.2.2 Simulation-based inferences

We complete the discussion of our example sentence by summarizing how the active representations just described are used during simulation. The semspec in Figure 19 contains all of the parameters necessary to run the simulation, including the ***Toss-Execution*** schema shown in Section 3.2.1, a ***Transfer*** schema for the overall event, and the relevant referents. We assume that the semspec referents are resolved by separate processes not described here; we simply use the terms *MARY*, *SPEAKER*, and *DRINK* to refer to these resolved referents. Our example semspec asserts that the specified tossing execution takes place (in its entirety) before speech time. In other words, the ***nucleus*** transition is asserted to have fired, placing a token in the ***done*** place, all before speech time.

The dynamic semantics described in the last section give x-schemas significant inferential power. The parameterization and marking state asserted by the semspec can be executed to determine subsequent or preceding markings. The asserted marking thus implies, for instance, that the ***object in hand*** place was marked at an earlier stage of execution (shown in the figure as part of ***Toss.ready***), and that the ***energy*** place has fewer tokens after execution than it did before (not shown in the figure). Part of the inferred trace of evolving markings is shown in Figure 21, organized roughly chronologically and grouped by the different stages associated with the event-level ***Transfer*** schema and the action-level ***Toss*** schema. We use the labels *TRANS* and *TOSS* to refer to the particular schema invocations associated with this semspec.

TRANS.ready		SPEAKER does not have DRINK
TRANS.nucleus		MARY exerts force via TOSS
	TOSS.enabled	DRINK in reach of MARY
	TOSS.ready	DRINK in hand of MARY
	TOSS.nucleus	MARY launches DRINK toward SPEAKER
		MARY expends energy (force-amount = low)
	TOSS.done	DRINK flying toward SPEAKER
		DRINK not in hand of MARY
TRANS.nucleus		MARY causes SPEAKER to receive DRINK
TRANS.done		SPEAKER has received DRINK

Figure 21: Some inferences resulting from simulating *Mary tossed me a drink*.

The stages singled out in the table are, not coincidentally, the same as in the bold labels in Figure 20. These labels play an important structuring role in the event: many actions can be viewed as having an underlying process semantics characterized by the identified stages. The common structure can be viewed as a generalized action controller that, for a particular action, is bound to specific percepts and (subordinate) x-schemas. This generalized action controller captures the semantics of event structure and thus provides a convenient locus for constructions to assert particular markings affecting the utterance's aspectual interpretation. The resulting inferences have been used to model a wide range of aspectual phenomena, including the interaction of inherent aspect with tense, temporal adverbials and nominal constructions (Narayanan 1997; Chang, Gildea, and Narayanan 1998). For current purposes, it is sufficient to note that certain constructions can effect specific markings of the tossing x-schema:

(6) a. Mary is about to toss me a drink. *(**ready** place marked)*
b. Mary is in the middle of tossing me a drink. *(**ongoing** place marked)*
c. Mary has tossed me a drink. *(**done** place marked)*

As previously mentioned, tense and aspect markers can also force an entire x-schema to be viewed as encapsulated within a single transition, much like the subordinate x-schemas in Figure 20. This operation has the effect of suppressing the details of execution as irrelevant for a particular level of simulation. In our example sentence, this encapsulated aspect is imposed by the Tossed construction described in Section 2. As a result, while the full range of x-schematic inferences are available at appropriate levels of simulation, the default simulation evoked by our example may eschew such complex details such as how far the tosser's arm has to be cocked and at what speed a particular object flies.

3.3 Scaling up

In this section we venture outside the safe haven of our example and show how the semantic expressiveness of the ECG formalism can be exploited to model some of the remarkable flexibility demonstrated by human language users. The key observation is that the inclusion of detailed semantic information adds considerable representational power, reducing ambiguities and allowing simple accounts for usage patterns that are problematic in syntactically oriented theories. Section 3.3.1 explores the use of semantic constraints from multiple constructions to cope with ambiguous word senses, while Section 3.3.2 addresses creative language use by extending the formalism to handle metaphorical versions of the constructions we have defined.

3.3.1 Sense disambiguation

Section 2 showed how verbal and clausal constructions interact to determine the overall interpretation of an event, as well as to license (or rule out) particular semantic combinations. As mentioned in Section 2.2.3, this account provides a straightforward explanation for the differing behavior of *tossed* and *slept* with respect to the ditransitive construction, as illustrated by (7a); a similar pattern is shown in (7b) (exemplifying Goldberg's (1995) construction, not shown here):

(7) a. Mary tossed/*slept me a drink. *(transfer)*
b. Mary tossed/*slept the drink into the garbage. *(caused motion)*

In both examples, the acceptability of the verb *toss* hinges directly on the fact that its associated semantic schema for tossing – unlike that for sleeping – explicitly encodes an appropriate force-dynamic interaction. The examples in (7) involving *tossed* also illustrate how the same underlying verb semantics can be bound into different argument structures. Thus, in (7a) the tossing action is the means by which a transfer of the drink is effected; in (7b) the tossing action is used as part of an event of caused motion.

The same mechanisms can help select among verb senses that highlight different event features:

(8) a. Mary rolled me the ball. *(caused motion)*
b. The ball rolled down the hill. *(directed motion)*

The verb *rolled* as used in (8a) is quite similar to the use of *tossed* in our example sentence, referring to the causal, force-dynamic action taken by Mary to cause the speaker to receive an object. But (8b) draws on a distinct but intimately related sense of the verb, one that refers to the revolving motion the trajector undergoes. A simple means of representing these two senses within the ECG framework is to hypothesize two schemas associated with rolling – one evoking the ***Caused-Motion*** schema shown in Figure 14 and the other evoking a ***Directed-Motion*** schema (not shown). Each of the two senses of the verb *rolled* could identify its meaning pole with the ***means*** of the appropriate schema. The requisite sense disambiguation would depend on the semantic requirements of the argument structure construction involved. Thus, the Active-Ditransitive construction's need for a sense involving force-dynamic interaction will select for the caused-motion sense. Although we have not shown the Directed-Motion construction that accounts for the use in (8b), it could be defined as requiring a verbal argument whose meaning pole binds with the ***means*** of a ***Directed-Motion*** schema. Note that the differences between the two verb senses are purely semantic: the particular schemas they evoke determine the clausal constructions in which they can participate.

We have focused so far on the interactions between verbal and clausal requirements, but in fact, semantic constraints imposed by features of entities also play a decisive role in constructional sense disambiguation:

(9) a. Mary poured me some coffee. *(pour = means of transfer)*
b. Mary poured me a drink *(pour = means of creation, with intent to transfer)*

The surface similarities between the sentences in (9) obscure their rather different interpretations. Sentence (9a) can be analyzed much as our example from Section 2, with pouring the means by which the transfer of coffee is effected. But in sentence (9b), pouring – which we assume requires a pourable liquid or mass – isn't a direct means of a transfer; in fact, no drink exists until the pouring action has happened. Rather, the pouring action is interpreted as an act of creation, and it is the resulting drink – and not its liquid contents – whose transfer is intended. In this creation variant of the ditransitive construction, the verb specifies not the means of transfer but the means of creation (a precondition for an intended transfer).

Although this situation is more complex than the other sense disambiguation cases, we can still address the inherent ambiguity of the combination of the verb *pour* with ditransitive expressions by examining the interacting constraints posed by its meaning pole and that of its accompanying nominal expressions. In particular, we can define the pouring schema definition as evoking a ***Creation*** schema relating the pouring action to a resulting bounded mass; the creation sense of *pour* would have this ***Creation*** schema as its meaning pole. The creation variant of the ditransitive construction would also involve a ***Creation*** schema, and require the potential nominal filler (*drink*) to be identified with the created object.

3.3.2 Metaphor: a case study in construal

The examples discussed in the last section demonstrate some relatively limited means of applying semantic constraints to problems that resist clean purely syntactic solutions. These mechanisms exploit static properties of the schema formalism, such as subcase relations, evokes relations, constituency and type constraints. By themselves, however, such static properties can encode only conventionalized patterns of meaning. They cannot capture unexpected or unusual patterns of usage; they cannot account for the ubiquity of creative language use, nor for the relative ease with which humans understand such usages. Lexical and phrasal constructions can occur in novel configurations that are nevertheless both meaningful and constrained. Ultimately, in a full-scale language understanding system intended to be robust to varying speakers and contexts, it would be neither possible nor desirable to pre-specify all potential uses of a semantic schema: under the right circumstances, constructs that do not explicitly satisfy a given semantic requirement may still be treated as if they do. Creative linguistic production must be mirrored by creative linguistic understanding. We use the general term **construal** to refer to a widespread set of flexible processing operations that license creative language use, including novel metaphorical and metonymic expressions (Lakoff and Johnson 1980), as well as implicit type-shifting processes that have been termed **coercion** (Michaelis, this volume). In this section we highlight metaphorical construal as a case study of how construal might be treated by a simple extension to the ECG formalism.

Metaphors are a pervasive source of creative language use, allowing speakers to structure a more abstract **target domain** in terms of a more concrete **source domain** (Lakoff and Johnson 1980). Metaphors can be characterized as conventionalized mappings spanning domains of knowledge, typically linking a perceptually and motorically embodied source domain (such as object manipulation, physical proximity, or physical force) onto a relatively more abstract target domain (such as reason, emotional connection, or social action). Some metaphorical uses might be treated simply as conventionalized linguistic units; the use of *delivered* in (10a) below exemplifies a conventionalized use of a metaphor in which the verbal communication of ideas is interpreted as the physical transfer of objects. But metaphors can also structure novel uses of constructions, as shown by the use of *tossed* in (10b). It is this second, creative use of metaphor that we consider an instance of construal and attempt to address in this section.

(10) a. Our president has just delivered the most important speech of his short career.
b. Mary tossed *The Enquirer* a juicy tidbit.

Sentence (10b) bears a surface resemblance to the example sentence analyzed in Section 2, employing several of the same constructions, including the Mary, Tossed, and A-CN-Expr. We assume that suitable constructions can be defined to license the remaining (sub)expressions: a *The Enquirer* referring expression whose meaning is a specific news agency; a common noun *tidbit* with two conventionalized senses referring to a small but high-quality unit of food or information, respectively; a similarly polysemous modifier *juicy* that can characterize the consistency of a unit of either information or sustenance; and a construction that licenses the combination of a modifier and a common noun. Given such constructions, could sentence (10b) be analyzed as instantiating the construction? This potential analysis yields some apparent type mismatches: the food sense of *juicy tidbit* fits the needs of the ***Transfer*** and ***Toss*** schemas better than the information sense, but the news institution *The Enquirer* cannot be a literal recipient (though not shown earlier, the ***Receive*** schema requires a physical entity as its ***Receiver***).

A potential solution to the analyzer's problems is to introduce metaphorical map capturing the intuitions described earlier. Figure 22 defines a ***Conduit*** metaphor that allows a target domain involving ***Communication*** to be structured in terms of a corresponding source domain of ***Object-Transfer***; the schemas are not defined here, but their relevant roles are shown in the figure, using notation similar to that used in the schema and construction formalisms. The mappings listed in the **pairs** block assert that a speaker communicating some information to a hearer can be construed as a physical agent sending a physical recipient some object.

```
map Conduit
 roles
   source : Object-Transfer
   target : Communication
 pairs
   source.sender ↦ target.speaker
   source.recipient ↦ target.hearer
   source.object ↦ target.information
```

Figure 22: Example map definition: the ***Conduit*** metaphor links a source domain of ***Object-Transfer*** to a target domain of ***Communication***.

We assume the analyzer has access to ontological information categorizing *The Enquirer* as an institution that can collect verbal information, making it a suitable ***hearer*** in the ***Communication*** schema. (We ignore for now the additional metonymy that could link *The Enquirer* to an associated reporter.) Access to the ***Conduit*** metaphor could help the analyzer deal with the sentence in (10b) by allowing *The Enquirer* to be construed as a suitable ***recipient*** in an ***Object-Transfer*** schema. Further analysis is affected by this mapping: If the recipient is metaphorical, then in the most likely analysis the object is metaphorical as well, leading to the selection of the information-related senses of *juicy* and *tidbit*. Similarly, both the overall event and the means by which it was asserted to have taken place must be interpreted as a verbal, rather than physical, acts of transfer.

A hallmark of metaphorical language use is that the mapping of inferences from source to target domain can involve relatively subtle simulative detail. For example, we know from Section 3.2 that *toss*, when used in a ditransitive context, implies that the launching action involves low force. Mapped to the target domain of communication, this inference becomes one of casualness on the part of the speaker. (For a technical description of how metaphorical inference can be performed and propagated to a target domain, the reader is directed to Narayanan (1997).) The inclusion of metaphor maps in the formalism, along with appropriate interfaces to the active simulation, opens the door to creative metaphorical inferences of this kind.

4 Concluding remarks

In this chapter, we have formalized and extended ideas from the construction grammar literature to accommodate the requirements of a larger simulation-based model of language understanding. Constructions in this model serve to evoke and bind embodied semantic structures, allowing language understanding to depend on both specifically linguistic knowledge and general conceptual structures. We have attempted to illustrate the representational properties of our formalism for a variety of linguistic phenomena, including straightforward issues that arise in our example analysis, as well as more complex issues surrounding sense disambiguation and metaphorical inference.

The ECG formalism diverges in several respects from other construction grammars in the literature, in large part due to its non-trivial interactions with both the analysis and simulation processes. It is also motivated and constrained by the need to develop a computational implementation of the overall model, which explains similarities it bears to object-oriented programming languages, as well as to some implementation-oriented versions of HPSG (Pollard and Sag 1994). As we have noted, the presentation in the current work has focused on the formalism itself, simplifying many details to highlight how particular analyses can be expressed within the overall framework. We thus conclude by briefly expanding on some of the issues that motivate ongoing and future research. Our example constructions use a somewhat restricted set of formal elements. But constructions can have formal realizations that span levels of description, including syntactic, lexical, morphological, phonological, and prosodic cues (for examples, see the discussion of *there*-constructions in Lakoff (1987)). In other work, we have shown how minor extensions allow the formalism to cover a broader range of phenomena in a common notation. For example, the same set of interval relations we use to express syntactic order can be applied to enforce word-internal order of morphemes and to align prosodic contours with lexical hosts.

Our discussion has also deliberately sidestepped complications related to situational and discourse context, but work in progress is exploring how the mechanisms we have introduced can be extended to address discourse-level phenomena in general and mental spaces phenomena (Fauconnier 1985) in particular. The notion of a **space** as a domain of reference and predication fits in especially well with semantic specifications, which are described here as likewise containing referents and predications. We can thus view semspecs as being situated in some space, and these spaces can be evoked, introduced, and constrained by constructions called **space builders**. Other constructions – and their corresponding semspecs – can then be defined relative to the currently active space. For example, a space-building construction X-SAID-Y might be defined to handle reported speech:

(11) Frank said, 'Mary tossed me a drink.'

Such a construction would presumably introduce an embedded space for the reported speech and require the corresponding constituent to associate its semspec with that embedded space. Given such a constraint, the Me construction – defined in Section 2.1 as identifying its referent with the speaker in the *current* space – would correctly designate the speaker in the embedded space (Frank), and not the global speaker. A more general treatment of mental spaces phenomena awaits further research, but Chang et al. (2002) offer a preliminary sketch of how the formal tools of ECG can be extended to capture interactions between constructions and multiple spaces.

Another dimension of ongoing research focuses on neural (or connectionist) modeling of our computational architectures. Previous models have explicitly related the conceptual structures and mechanisms mentioned here – including image schemas (Regier 1996), x-schemas (Bailey 1997), and metaphor maps (Narayanan 1997) – to neural structures. X-schemas, for example, are defined at the computational level as representing abstractions over neural motor control and perceptual systems (Bailey 1997). At a more detailed connectionist level of representation, Shastri et al. (1999) implement x-schemas as interconnected clusters of nodes. The binding of roles to other roles and to fillers has also been subject to extensive connectionist modeling, in particular as part of the SHRUTI model (Shastri and Ajjanagadde 1993). Although we have not emphasized this point here, the representational and inferential mechanisms used in the ECG formalism have been restricted to those that can be realized in a connectionist architecture.

As the strands of research mentioned here might suggest, the goals and methods driving both the formalism we have introduced and our broader approach to language understanding are inherently interdisciplinary. Our main goal has been to show how an embodied construction grammar formalism permits fine-grained interactions between linguistic knowledge and detailed world knowledge. The work presented here also, however, exemplifies the methodology of applying converging computational, cognitive and biological constraints to flesh out in formal detail insights from theoretical linguistics. Although many challenges remain, we are hopeful that the ideas we have explored will help to stimulate the continued integration of diverse perspectives on language understanding.

Notes

* This chapter in its various incarnations has benefited from a succession of collaborators and colleagues. The underlying formalism evolved from early collaboration with Mark Paskin and more recent work with Keith Sanders, Jerome Feldman, and Robert Porzel, Johno Bryant, and Srini Narayanan. We also gratefully acknowledge the input of George Lakoff, Charles Fillmore, Josef Ruppenhofer, and other associates of the Neural Theory of Language and FrameNet research groups at UC Berkeley/ICSI. We offer special thanks and our sympathy to two anonymous reviewers of a very early manuscript. All remaining errors are ours.

1 Although we focus here on processes involved in language comprehension, we assume that many of the mechanisms we discuss will also be necessary for meaningful language production.

2 Though we focus here on meaning, schematic representations in the form domain can also be viewed as schemas and represented using the same formalism, as we will show in the next section.

3 The **evokes** relation has some antecedents (though not previously formalized) in the literature: In combination with the **self** notation to be described, it can be used to raise some structure to prominence against a larger background set of structures, effectively formalizing the notion of *profiling* used in frame semantics (Fillmore 1982) and Cognitive Grammar (Langacker 1991).

4 Though no type constraints are shown in the other schemas, more complete definitions could require the relevant roles to be categorized as, for example, entities or locations.

5 Determining whether a given entity can satisfy a type constraint may require active *construal* that depends on world knowledge and the current situational context, discussed further in Section 3.3.2.

6 The subcase relation, for example, does not presume strict monotonic inheritance, and is thus more appropriate for capturing radial category structure (Lakoff 1987). Similarly, the **evokes** notation encompasses a more general semantic relation than either inheritance or containment; this underspecification allows needed flexibility for building semantic specifications.

7 This direct binding of the ***resolved-referent*** effectively captures the commonsense generalization that proper nouns (by default) pick out specific known entities. Other kinds of referring expressions typically require a dynamic *reference resolution* process, parameterized by the ***Referent*** schema, to determine the relevant entity; see Section 2.1.

8 Note that this view of constituency extends the traditional, purely syntactic notion to include form-meaning pairings.

9 Though not shown, the context model includes speaker and hearer roles, discourse context (referents and predications in previous utterances), situational context (entities and events in the actual or simulated environment), and shared conceptual context (schema instances known to both speaker and hearer). We use a simplified version of Lambrecht's (1994) terminology for referential identifiablity and accessibility, though other discourse frameworks could be substituted.

10 Other roles of this schema that may be relevant for particular languages include ***gender*** and ***animacy***; they are not relevant to the current example and thus are not discussed here.

11 Both constructions can be viewed as combining two other constructions: the finite verb *tossed* could result from a morphological construction combining the verbal stem *toss* with an -*ed* marker; and the information in the Active-Ditransitive construction could be separately specified in a Ditransitive argument structure construction and an Active clausal construction, which could also impose constraints on the predication's information structure (not included in the current analysis). These more compositional analyses are consistent with the approach adopted here and can be expressed in the ECG formalism.

12 Other possible relations mentioned by Goldberg (1995) include subtype, result, precondition, and manner.

13 See Goldberg (1995) for further motivation of details of the analysis, such as the choice of the action of receiving rather than a state of possession as the result of the transfer action.

14 This schema can be seen as one of many types of force-dynamic interaction described by Talmy (1988).

15 Our use of a formal case attribute does not preclude the possibility that case patterns may be motivated by semantic regularities (Janda 1991). The current analysis is intended to demonstrate how constraints on such a constructional feature could be imposed; a more detailed analysis would involve defining constructions that capture the form and meaning regularities related to case marking.

16 A fuller definition of the ***Receive*** schema would evoke an ***SPG*** as (part of) the ***effect*** of the ***Transfer*** schema's evoked ***Force-Application***. Since the forceful actions of the ***Toss*** and ***Transfer*** schemas are identified, their respective effects are as well, resulting in a binding between their ***tossed*** and ***theme*** roles.

17 Both probabilistic and connectionist models have some of the desired properties; either approach is theoretically compatible with the ECG formalism, where constructions and their constraints could be associated with probabilities or connection weights. See Narayanan and Jurafsky (1998) for a probabilistic model of human sentence processing that combines psycholinguistic data involving the frequencies of various kinds of lexical, syntactic and semantic information. The resulting model matches human data in the processing of garden path sentences and other locally ambiguous constructions.

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20 Logical and typological arguments for radical construction grammar*

William Croft

1 Introduction: vanilla construction grammar and Radical Construction Grammar

This paper gives a brief overview of some of the primary arguments for Radical Construction Grammar (Croft, 2001). Radical Construction Grammar is a theory of syntactic representation which is compatible with – in fact, I believe, is a consequence of – the facts of the grammars of human languages. In fact, Radical Construction Grammar proposes an extremely minimalist model of syntax from a universal perspective, as will be seen below.

Radical Construction Grammar, as its name indicates, is a variety of construction grammar. I take construction grammar to be a term that describes a family of theories of syntactic representation found in cognitive linguistics, and which has attracted considerable interest outside cognitive linguistics as well. In this section, I will describe what I believe all varieties of construction grammar to have in common, which I have christened in Silicon Valley style 'vanilla construction grammar' (see Croft & Cruse, to appear, ch. 9–11 for a fuller treatment and comparison of construction grammar theories). I will then present the three additional theses that define Radical Construction Grammar. The following three sections will outline the arguments for each of the theses of Radical Construction Grammar.

Vanilla construction grammar assumes that our grammatical knowledge is organized in constructions. The traditional definition of the term 'construction', as in the passive construction, is a holistic description of a complex syntactic unit. For example, the passive construction consists of a subject noun phrase, the auxiliary verb be, a verb in the past participle form, and (optionally) an oblique noun phrase governed by the preposition *by*.

The term 'construction' has been generalized in cognitive linguistics. The general definition of a construction in cognitive linguistics is as a *conventional symbolic unit*, using those terms in Langacker's meaning (Langacker, 1987, pp. 57–63). Roughly, a construction is an entrenched routine ('unit'), that is generally used in the speech community ('conventional'), and involves a pairing of form and meaning ('symbolic'; I will return to this aspect of the definition below).

The generalized definition means that there is a single way to describe any sort of symbolic grammatical unit in vanilla construction grammar. Fillmore, Kay & O'Connor (1988) distinguish syntactic constructions by degree of schematicity. A more schematic construction describes a complex structure with few (if any) component units specified as particular morphemes. For example, the Declarative Passive construction, which can be represented as something like [Sbj *be*-tns Verb-*en by* Obl], is largely schematic, except for the specification of the auxiliary verb *be* and the oblique preposition *by*.[1] In contemporary construction grammar, constructions such as the passive need not specify the linear order of their constituent elements; in many cases they do not, linear order being determined by other constructions with which they are combined.

Fillmore et al. were particularly interested in describing what are traditionally called idioms, which are constructions which are less schematic and more substantive than something like the passive construction.[2] An example of an idiom would be the verb phrase [*kick*-tns *the bucket*], in which only the verbal inflection is schematic (i.e. this idiom can be used in different tense-mood forms: *He kicked the bucket, He's gonna kick the bucket*, etc.).

One can also extend the notion of a construction to a maximally schematic syntactic unit, such as the transitive argument linking construction [Sbj Verb Obj] (see Goldberg, 1995, Kay & Fillmore, 1999; Langacker, 1999). In other words, syntactic phrase structure rules are reinterpreted as maximally schematic constructions in vanilla construction grammar.

Cognitive linguists have also extended the notion of construction to smaller units. Morphology represents word forms, including affixes and compounds. These are also complex symbolic units. Morphological structures can be described in varying degrees of schematicity, just as syntactic structures can. The pattern [Verb-tns] describes a fully schematic morphological structure, while the pattern [Noun-s] describes a partially substantive, partially schematic morphological structure.

Finally, cognitive linguists have extended the notion of construction to include atomic as well as complex symbolic units. An atomic schematic unit would be a syntactic category such as [Dem] or [Adj]. An atomic substantive unit would be a word or lexical item such as [*this*] or [*green*].

This fully generalized notion of construction allows for a uniform representation of grammatical knowledge, subsuming what in other syntactic theories is divided into syntactic rules, idioms, morphology, syntactic categories and the lexicon; see Table 1.

Table 1 The syntax-lexicon continuum

Construction type	*Traditional name*	*Examples*
Complex and (mostly) schematic	**syntax**	[SBJ *be*-TNS VERB-*en by* OBL]
Complex and (mostly) substantive	**idiom**	[*kick*-TNS *the bucket*]
Complex but bound	**morphology**	[NOUN-*s*], [VERB-TNS]
Atomic and schematic	**syntactic category**	[DEM], [ADJ]
Atomic and substantive	**word/lexicon**	[*this*], [*green*]

The uniform representation of grammatical knowledge as generalized constructions generally goes under the name *syntax-lexicon continuum* (cf. Langacker, 1987, pp. 25–27, 35–36; Langacker does not use this term in his book). The syntax-lexicon continuum is a salient distinguishing feature of vanilla construction grammar in contrast to syntactic theories in the generative tradition, which divide up different formal structures into separate grammatical components (Croft, 2001, pp. 14–15).

The second general characteristic of vanilla construction grammar is that the basic units of grammatical representation are symbolic. Grammatical units specify both the form – including morphology and even phonology and prosody as well as syntactic structure – and the function/meaning of that form – semantics and conventional discourse or information-structural properties. (To avoid confusion, I will use the term *element* to refer to parts of the formal or syntactic structure of a construction, and the term *component* to refer to parts of the semantic structure of a construction.) This is another salient distinguishing characteristic of construction grammar theories. Most contemporary syntactic theories in the generative tradition split symbolic units so that the form of symbolic units is represented in formal components of the grammar (syntax, morphology, lexicon) and the conventional function of symbolic units is represented in functional components (semantics and information structure). If one represents symbolic units with the classic Saussurean diagram of a sign with the signifier (form) on top and the signified (function) below, then one can describe construction grammar as offering a 'vertical' organization of grammatical knowledge into signs, in contrast to a generative theory's 'horizontal' organization of the formal structure and functional structure as separate components (as the components are normally displayed in diagrams).[3]

The third general characteristic of vanilla construction grammar is that the constructions of a language form what Langacker calls a structured inventory (Langacker, 1987, pp. 63–76) of a speaker's knowledge of the conventions of their language. This inventory is widely characterized as a network (Lakoff, 1987; Langacker, 1987; Goldberg, 1995). The network has (at least) taxonomic links – links of greater or lesser schematicity – among constructions. The exact nature and structure of this network is a matter of debate: some view it as a knowledge network of the sort pioneered in cognitive science research in the 1970s, while others view it as an activation network of the sort that became popular in cognitive science research from the mid 1980s onward; some advocate complete or at least default inheritance, while others advocate a usage-based model. The nature of the network organization of a speaker's grammatical knowledge in construction grammar will not be examined here. Again, the network structure distinguishes construction grammar theories from most generative theories. Construction grammar's network structure can be thought of as the alternative mode of grammatical organization to a generative theory's system of components and rules encapsulated within components.

Vanilla construction grammar as I have described it does not assume more specific universals of syntactic representation. In particular, vanilla construction grammar is neutral as to any hypotheses as to what types of constructions (if any) are universal, or at least found across languages, or what types of component grammatical categories are universal. Of course, specific theories of Construction Grammar such as Fillmore & Kay's Construction Grammar (Fillmore & Kay, 1993; Kay & Fillmore, 1999) do make specific claims. And all of the standard formal theories of grammar make specific claims about the inventory of syntactic primitives to be used in describing syntactic structure, and about what complex constructions are universal across languages. Vanilla construction grammar as I have described it also does not specify any more structure to complex constructions other than the part-whole relationship of complex constructions to the units that make them up. (These units may themselves be complex, of course.)

Radical Construction Grammar adds the following three theses to vanilla construction grammar as described above – perhaps they should be thought of as anti-theses. First, constructions, in particular complex syntactic units, are the primitive elements of syntactic representation; grammatical categories as such are derived from constructions. That is, there are no formal syntactic categories such as 'noun', 'verb', 'subject' or 'object' per se. (In the classification in Table 1, there are no atomic schematic units.) Second, the formal representation of constructions consists only of a (complex) construction and its component parts. That is, there are no syntactic relations at all. Third, there are no universal constructions (e.g. a universal passive). That is, all constructions are language-specific. In other words, virtually all formal grammatical structure is language-specific and construction-specific. This is to say: what I have described as vanilla construction grammar is all that is universal in formal syntactic representation. Vanilla construction grammar, with no toppings, is Radical Construction Grammar.

These anti-theses may appear radical, and in fact they are, in comparison to almost all theories of syntactic representation that I am aware of. The next three sections will defend each of these theses. For the first two theses, there are logical as well as typological arguments to support them. For the third thesis, the nonuniversality of constructions, there is chiefly typological evidence to support it. Of course, one must also specify what theoretical constructs do the work of the theoretical constructs whose existence is denied in Radical Construction Grammar. These will be described at the end of each section.

2 From syntactic categories to semantic maps

The argument for the nonexistence of syntactic categories as universal categories or as primitive elements of syntactic representation will be outlined briefly here (see Croft, 1999a,b; 2001, chapter 1).

The basic typological – indeed, empirical – problem is in the application of the distributional method to cross-linguistic data and language-internal data. The distributional method is used explicitly or implicitly in most syntactic research in a wide range of linguistic theories, from cognitive linguistics to various functionalist theories to various formal theories. The distributional method is used to identify a syntactic category such as 'noun' or 'subject' within a language or across languages. The distributional method itself is to examine the occurrence of members of the candidate category in certain constructions, in the general sense of a construction given above.[4] For example, one can distinguish transitive verbs from intransitive verbs in English by the distributional method. Transitive verbs occur in the transitive active construction, while intransitive verbs do not (see examples 1a-b); conversely, intransitive verbs occur in the intransitive construction, while transitive verbs do not (examples 2a-b):

(1) a. *Jack devoured the doughnut*
b. **Jack slept the doughnut*

(2) a. **Jack devoured*
b. *Jack slept*

The constructions that are used by the analyst are assumed to be *criteria* or *tests* for the syntatic category in question. In many cases, more than one construction is considered to be diagnostic of the syntactic category in question.

In §2.1, I present the typological problems with the applicability of the distributional method. In §2.2, I present a logical inconsistency with using the distributional method to establish syntactic categories, and argue that there is nothing wrong with the distributional method; instead, there is something wrong with the syntactic theory it is being used to justify.

2.1 The typological argument

The first typological problem with the application of the distributional method is that the construction used as a diagnostic for a syntactic category in one language may be absent in another language. For example, many theories of parts of speech use morphological inflections to divide words into the parts of speech: case marking for nouns, person indexation for verbs, etc. However, an analytic language such as Vietnamese lacks these inflections, and so inflections cannot be used to identify nouns, verbs etc. in that language. Likewise, a number of constructions are used to identify 'subject' and 'object' in a language such as English, for example, the occurrence and behavior of NPs in coordinate clause constructions and in nonfinite complement constructions. Wardaman, an Australian aboriginal language, lacks coordination and infinitival complements, so these tests for subjecthood in English cannot be applied in Wardaman.

In these situations, an analyst appears to have basically two options. The first is to look for other constructions in the language and use those constructions to identify the grammatical category in question. For example, one might look at other constructions in Vietnamese that yield the familiar noun-verb-adjective classes. However, this looks suspiciously like the analyst has already decided that Vietnamese has nouns, verbs and adjectives, and s/he is looking for any construction that will get the results that s/he wants to find. The reason that this illegitimate practice often is used is because there is no a priori means to decide which constructions should be used as the diagnostics for a given syntactic category.

The other option is to deny that the language in question has the category noun or subject, although English and languages similar to English do. For example, one might argue that Vietnamese has no word classes, or at least not the word classes noun, verb, etc. If so, one can ask, why are the English categories considered to be the syntactic primitives of a theory that is intended to describe properties of universal grammar applicable to all languages? Why not use the Vietnamese categories instead? A more legitimate approach, and the one advocated by American structuralists (and Dryer, 1997), is that English noun, verb etc. are just language-specific categories, no different in theoretical status than the categories of Vietnamese or of any other language.

A second problem is that when there is an equivalent diagnostic construction in the language in question, its distribution is dramatically different from that in English and similar languages. For example, Makah does have the morphological inflections equivalent to those in European languages to identify the category of verb (aspect and subject indexation), but the word class that allows these inflections includes not only European-type 'verbs', but also 'nouns', 'adjectives' and even 'adverbs' (examples from Jacobsen, 1979):

(3)	*k'upšil*	*baʔas*	*ʔu:yuq*
	point:**MOM:INDIC:3**	house	OBJ
	'He's pointing at the house.'		
(4)	*babałdis*		
	white.man:**INDIC:1SG**		
	'I'm a white man.'		
(5)	*ʔi:ʔi:x̣ʷʔi*		
	big:**INDIC:3**		
	'He's big.'		

As with the first problem, two options to deal with such cases are commonly chosen. One option is, again, to look for other constructions that would differentiate the parts of speech in Makah. (This is the option that Jacobsen takes.) This option suffers from the same problems referred to above: there is no a priori means to decide which construction can be used to define parts of speech in a language like Makah (or English, for that matter). In addition, choosing some other construction to differentiate parts of speech in Makah does not explain why verbal inflection does not differentiate parts of speech in that language, unlike European languages.

The other option is to say that Makah has only one part of speech, and it is 'verb', since it is defined by the same construction that defines verb in English and other languages. This option is fine as far as it goes, but it falls into the opposite trap from the first option: there are other constructions that differentiate word classes in Makah, and there is no a priori reason to ignore them either.

But the most direct manifestation of the basic problem is when two constructions that are commonly used to define a single syntactic category in a single language differ in the distributional patterns that they define. For example, some languages appear not to have subjects in the English sense, that is, a category including the one argument of intransitive verbs (labeled S by typologists) and the 'subject' argument of transitive verbs (labeled A). Instead, such languages have an *ergative* category consisting only of A, while S falls in the same category as the 'object' of transitive verbs (labeled P); this category is called *absolutive*.

In many languages, however, some constructions define an ergative (A) – absolutive (S+P) pair of categories while other constructions define a subject (A+S) – object (P) pair of categories. For example, Tongan case marking defines an ergative-absolutive pattern; it is S and P that have the absolutive preposition *'a*, while A is marked with the ergative preposition *'e* (Anderson, 1976, pp. 3–4):

(6) *na'e lea* ***'a*** *etalavou*
PST speak **ABS** young.man
'The young man spoke.'

(7) *na'e ma'u* ***'e*** *siale* ***'a*** *e me'a'ofa*
PST receive **ERG** Charlie **ABS** DEF gift
'Charlie received the gift.'

However, in infinitival complements, it is the S (example 8) and A (example 9) that are left unexpressed in the complement, not the P (example 10; all examples from Anderson, 1976, p. 13):

(8) *'oku lava* ***'a*** *mele 'o hū* ***Ø*** *ki hono fale*
PRS possible **ABS** Mary TNS enter to his house
'Mary can enter his house.'

(9) *'oku lava* ***'e*** *siale 'o taa'i* ***Ø*** *'a e fefine*
PRS possible **ERG** Charlie TNS hit ABS DEF woman
'Charlie can hit the woman.'

(10) **'oku lava* ***'a*** *e fefine 'o taa'i 'e siale* ***Ø***
PRS possible **ABS** DEF woman TNS hit ERG Charlie
*'The woman can Charlie hit'

Thus, there is a conflict between case marking and the infinitival construction as to whether Tongan has the categories subject-object or the categories ergative-accusative.

The option most commonly taken in this case is to choose one construction as diagnostic. For example, Anderson argues that the infinitival construction is diagnostic of grammatical relations in Tongan, and hence Tongan possesses the categories subject and object in the usual European sense. The same problem arises here as in the cross-linguistic examples, however: there is no a priori reason to choose one construction over another, and so choice of construction looks suspiciously like making the language fit the assumptions of the analyst. The same problem holds if one argues instead that case marking is diagnostic and therefore Tongan has ergative-absolutive categories. Whichever construction is chosen as diagnostic, there would remain the problem of explaining why the other construction has a different distribution pattern.

Having chosen one construction as diagnostic, one must then deal with the anomalous distribution pattern by marking it as exceptional in some way. Consider the different distribution of the 'object' and 'oblique' noun phrases in English:

(11) a. *Jack kissed Janet*.
b. *Janet was kissed by Jack*.

(12) a. *The old man walked with a cane*.
b. **A cane was walked with by the old man*.

(13) a. *Jack weighs 180 pounds.*
b. **180 pounds is weighed by Jack.*

The object NP Janet in 11 occurs postverbally without a preposition in 11a, and can be the subject of the counterpart passive construction in 11b. In contrast, an oblique requires a preposition as in 12a, and cannot be passivized; see 12b. However, the NP *180 pounds* occurs postverbally without a preposition in 13a, yet cannot be passivized; see 13b. The usual analysis here is to take passivizability as diagnostic of the direct object. Hence *180 pounds* in 13a is not a direct object. In this case, some exceptional feature has to be associated with *180 pounds* either to allow it to occur without a preposition, or to block it from passivizing even though it occurs in 13a without a preposition. Such an account is clearly ad hoc.

These are not the only problems with using the distributional method to identify categories. Analogous difficulties arise in trying to decide whether two distributionally defined classes are separate categories or are subcategories of a more general category; trying to decide whether a particular distributional pattern reflects multiple category membership of a distributional class or a separate category; and in dealing with variable class membership, both in nonce uses and conventional uses of a particular word (The first two problems are discussed in Croft, 1999b; all three problems are discussed in Croft, 2001, pp. 34–40).

2.2 The logical argument

All of the examples above illustrate one fundamental empirical fact: distributional tests/criteria do not match, both across languages and within languages. That is, different constructions define different distributional patterns, within and across languages. This is a very well known fact; I am not saying anything surprising here, and many interesting syntax articles discuss these conflicts. Nevertheless, the commonest analytical response to this fact is one of two strategies: to look around for distributional patterns that produce the results that the analyst is looking for; or not to look for distributional patterns that might produce results that the analyst is not looking for (i.e., ignore conflicting distributional patterns). But neither of these strategies can be justified without a priori principles for choosing which constructions are diagnostic of which syntactic categories. Yet the distributional method does not give one such principles, and no such principles are generally provided by the analyst.

There is a deeper problem here than has been recognized before. This is that there is a logical inconsistency between the distributional method and the theoretical assumption that the categories/relations defined by constructions are the syntactic primitives used to represent grammatical knowledge, given that distributional variation exists. Constructions are used to define categories – this is the distributional method. But then the categories are taken as primitives which define constructions – this is the syntactic model of representation. This approach is circular. Hence we must discard either the distributional method, or the assumption that syntactic categories are the primitive elements of syntactic representation.

Discarding the distributional method ignores the empirical facts of languages. Yet that is the most common strategy, in essence: ignoring distributional patterns that conflict with the categories that the analyst expects to find violates the distributional method. In other words, for these syntacticians the model of syntactic primitives is more important than the empirical facts of syntactic differences within and across languages.

Radical Construction Grammar takes the opposite position: it discards the assumption that syntactic categories are the primitive elements of syntactic representation. Instead, constructions are the primitive elements of syntactic representation. Constructions are not built up out of a small inventory of atomic categories. Categories are defined by constructions, that is, the elements that can fill the roles defined by the components of a construction. In other words, syntactic categories exist, but only derivatively, since they are defined by the construction(s) that they occur in.

This way of thinking about syntactic categories and constructions is difficult to comprehend at first. Although the purpose of this paper is simply to state the arguments as to why this way of representing grammatical knowledge is to be preferred over other ways, I will say a few words here about how constructions can be primitive elements of syntactic representation.

What occurs in natural discourse are constructions, that is, complex syntactic units: we do not hear individual words with category labels attached to them. Utterances are instances of constructions. In other words, from the point of view of the language learner (and the fieldworker), the larger units come first. Categorizing utterances as instances of constructions is one way of abstracting away from the input. But analyzing constructions into component parts is another way of abstracting from the input.

Constructions can be defined primitively. It is essentially a categorization problem, that is, categorizing the utterances one hears into discrete construction types. There are discontinuities in the input: constructions have distinctive structures and their elements define distinctive distribution classes. For example, there are significant discontinuities between the structure of an active transitive clause and a passive clause in English, so that the two can be reliably separated. There are also other important cues to categorization of constructions. First, many constructions involve some unique combination of substantive morphemes, such as the passive combination of *be*, past participle verb form, and *by*. Finally, and perhaps most important of all, constructions are symbolic units. The semantics of a construction plays a significant role in differentiating constructions for the purpose of categorization and identification. The different participant role of the subject of a passive is a major cue in identifying the passive construction in contrast to the active construction.

Radical Construction Grammar is a *nonreductionist* theory of syntactic representation. A *reductionist* theory begins with the smallest units and defines the larger or more complex units in terms of combinations of atomic primitive units. All contemporary theories of syntactic representation are reductionist; they differ chiefly in the inventory of syntactic primitives and the rules governing their combination. A nonreductionist theory begins with the largest units and defines the smaller ones in terms of their relation to the larger units. The Gestalt theory of perception is a nonreductionist theory. Radical Construction Grammar is another nonreductionist theory. The possibility of a nonreductionist theory demonstrates that the theoretical concepts 'atomic' and 'primitive' are logically independent notions and can be dissociated.

For example there is no construction-independent syntactic category Verb: there are Transitive Verbs in the Transitive Construction, Intransitive Verbs in the Intransitive construction, and so on. Reductionist theories overlook the differences in distribution between, say, the verb category in the intransitive and transitive constructions: some verbs can occur in both constructions, while others can occur in only one (and some ditransitive verbs occur in neither). In Radical Construction Grammar, the Intransitive Verb category is defined in terms of the Intransitive construction, not the other way around: it consists of all and only the words that can occur in the Intransitive Verb role. The same is true of the Transitive Verb category. In terms of Table 1, Radical Construction Grammar rejects the existence of atomic schematic units, because these would be defined independently of the constructions in which they occur.

This is not to say that generalizations over parts of different constructions – e.g. the identical inflections of verbs, no matter whether they are intransitive, transitive or ditransitive – are impossible in Radical Construction Grammar (see Croft, 2001, pp. 53–57; Croft & Cruse, to appear, ch. 10). But it is essential to recognize that the commonalities across all verbal subcategories must themselves be justified linguistically. In the case of 'verbs', the justification comes from the occurrence of the verb category in another construction, namely the morphological construction of tense-agreement (TA) inflection. I will label the category defined by TA inflection MVerb (mnemonic for 'morphological verb'), to remind the reader that this category is not an independent category, but itself defined by another construction (in the generalized concept of construction in construction grammar).

The (morphological) verb category is represented in Radical Construction Grammar as a taxonomically superordinate category to the Intransitive Verb category, the Transitive Verb category, and other verbal categories. The representation of the relationship between these constructions and the verbal categories in Radical Construction Grammar is given in Figure 1 (t = taxonomic link; argument phrase categories are left out of Figure 1 for clarity):

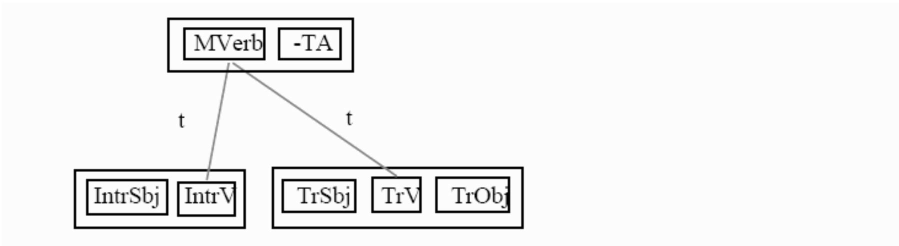

Figure 1 Radical Construction Grammar representation of verbal categories

The Radical Construction grammar analysis in Figure 1 is empirically adequate: it captures both the generalizations across verbal subclasses and the unique distribution defined by each verbal subclass in each construction. (Part/whole relations are represented in constructions by the nesting of the boxes describing conventional grammatical units of the language.)

In fact, the representation of similar parts between constructions by taxonomic relations in Radical Construction Grammar is similar to the representation in Construction Grammar, in which parts of constructions can inherit properties of other constructions (see e.g. Kay & Fillmore, 1999, p. 18).[5] That is, the treatment of meronomic relations is not a distinctive characteristic of nonreductionist models. The primary difference between a nonreductionist model such as Radical Construction Grammar and a reductionist model such as Construction Grammar is that the latter uses syntactic features and values for roles that are defined independently of the constructions in which the units occur.

The adoption of Radical Construction Grammar would mean the abandonment of the fruitless search for the ideal set of syntactic primitive elements and rules of combination in syntactic theory. Radical Construction Grammar recognizes that categories are construction- specific (and as we will see in §4, language-specific), and no more formal structure is needed than what was specified for vanilla construction grammar in §1.

Nevertheless, categories defined by constructional roles are similar across constructions, and one must represent the similarities as well as the differences. This is accomplished in Radical Construction Grammar by employing a model that has come into wide use in typology, the *semantic map* model (Croft, 2003, chapter 5; Haspelmath, 2003). A semantic map represents the functions of particular constructions and constructional roles in terms of their degree of similarity. In typology, the similarity of functions is defined inductively by comparing the range of functions of similar constructions across languages and constructing an underlying conceptual space of functions and their relations. The conceptual space is constructed in such a way that the semantic map of any construction in any language will bound a connected region in conceptual space (the Semantic Map Connectivity Hypothesis; Croft, 2001, p. 96; Croft, 2003:). But one can also construct a semantic map of different constructions in a single language. This is done for English parts of speech in Figure 2, using a typologically justified conceptual space defined in terms of lexical semantic class and the proposition act functions of the relevant constructions (adapted from Croft, 2001, p. 99, Figure 2.3):

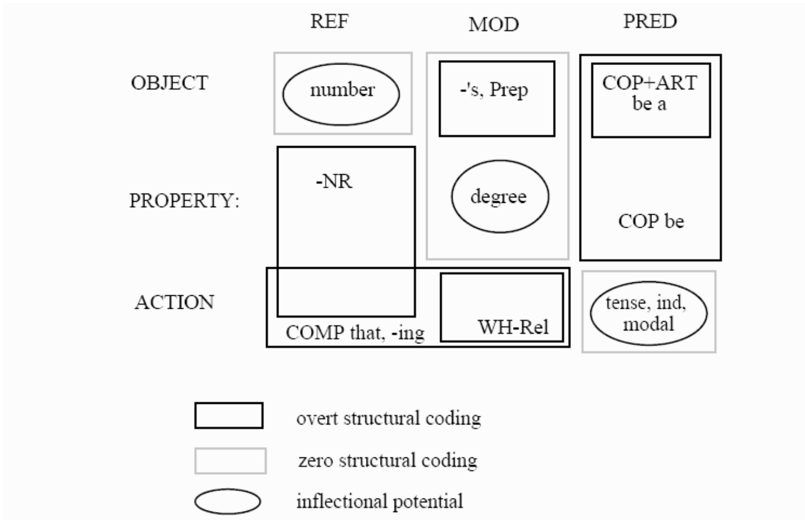

Figure 2 Semantic map of English parts of speech constructions

Figure 2 represents the semantic maps for English constructions for referring expressions (noun phrases), modifying expressions, and predications. English conforms to a number of typological universals for parts of speech constructions, represented by the different shape and shading of the maps in Figure 2. The typological universals of parts of speech include the prototypes for noun, adjective and verb, given in 14 (Croft, 2001, p. 89):

(14) noun = reference to an object
verb = predication of an action
adjective = modification by a property

Constructions with zero structural coding map onto a region that includes the prototypical 'point' (actually also a region) in conceptual space. For example, the Verbal predication construction of English uses no copula or auxiliary to encode the predication function. Constructions with overt structural coding map onto a region that includes a nonprototypical point in conceptual space: the copula constructions are found with predication of objects and properties (the Predicate Nominal and Predicate Adjectival constructions respectively). Finally constructions exhibiting behavioral potential, such as the ability to inflect for tense and subject indexation, map onto a region that includes the prototypical point in conceptual space (in this case, action predication). Moreover, in English there is a scale of overt coding of predication such that object predication requires two morphemes (copula *be* and article *a*), property predication only one (copula *be*), and action predication none. This hierarchy of predication is also found cross-linguistically (Croft, 1991, p. 130; Stassen, 1997, pp.

168–169). More generally, cross-constructional variation in single languages should reflect the same patterns as cross-linguistic variation in typology (Croft, 2001, p. 107). This observation allows us to integrate typological and language-specific generalizations into a single model of grammar.

It should be noted that the same arguments against reductionist theories of syntactic representation apply to reductionist theories of phonological and semantic representation. In phonology, there are problems in defining vowel vs consonant, in defining the set of primitive features for classifying natural classes of segments, and even in defining segment and syllable from a phonetic point of view. In a nonreductionist phonological theory, which we may call Radical Templatic Phonology, phonetically specified word forms and schematic phonotactic/prosodic templates generalized from them are the representational primitives, and syllable and segment categories would be derivative (Croft & Vihman, submitted).

In semantics, distributional analysis is used to identify semantic categories (see e.g. Cruse, 1986). Not surprisingly, problems arise in defining various sorts of semantic categories, and even such basic concepts as identity and distinctness of word senses (Croft & Cruse, to appear, chapter 5). In a nonreductionist semantic theory, complex semantic structures such as frames and the complex semantic structures found in constructions are the representational primitives, and the categories of components of semantic frames and other complex semantic structures are derivative. This, Radical Frame Semantics, is essentially Fillmorean frame semantics (Fillmore, 1982, 1985; Fillmore & Atkins, 1992).

3 From syntactic relations to symbolic relations

As the reader has no doubt recognized, the first anti-thesis of Radical Construction Grammar, the nonexistence of syntactic categories, was a bit of an overstatement. Radical Construction Grammar does not deny the existence of syntactic categories. It only argues that syntactic categories are derivable from constructions and hence are not the basic building blocks of syntactic representation. The second anti-thesis of Radical Construction Grammar, on the other hand, is not an overstatement. I am going to argue that there really aren't any syntactic relations. This is another respect in which Radical Construction Grammar is radically different from other syntactic theories.

In this section, I will present the logical argument before the typological argument. The logical argument in §3.1 demonstrates that if one accepts vanilla construction grammar (not even Radical Construction Grammar), one doesn't need syntactic relations (well, almost none; see §3.3). The typological arguments in §3.2 – just a selection of a larger range of arguments (see Croft, 2001, ch. 6) – give reasons why one would not want to have syntactic relations in one's theory of syntactic representation.

3.1 The logical argument

The argument against the necessity of syntactic relations in vanilla construction grammar follows from the model of a speaker's knowledge of a construction. Since syntactic relations hold between the elements of a complex construction, references to constructions in this section will pertain to complex constructions.

A construction is a pairing of a complex syntactic structure and a complex semantic structure. In vanilla construction grammar as described in §1, the complex syntactic structure consists of the formal elements of the construction but not any syntactic relations that might hold between the elements of the construction. The complex semantic structure consists of both the components of the semantic structure and the semantic relations that hold between the components of the semantic structure. The representation of a construction must also specify the correspondences between elements of the syntactic structure of a construction with the appropriate components of its semantic structure – *symbolic* relations (compare Langacker, 1987, pp. 76–86). These symbolic relations are necessary whether or not the syntactic structure also represents syntactic relations between elements: without correspondence relations, one would not be able to deduce the meaning of the utterance from its form.

The internal structure of a construction in ordinary construction grammar is illustrated in an exploded format in Figure 3 (Croft, 2001, p. 176, Fig. 5.1; compare Langacker, 1987, p. 84, Fig. 2.8b):

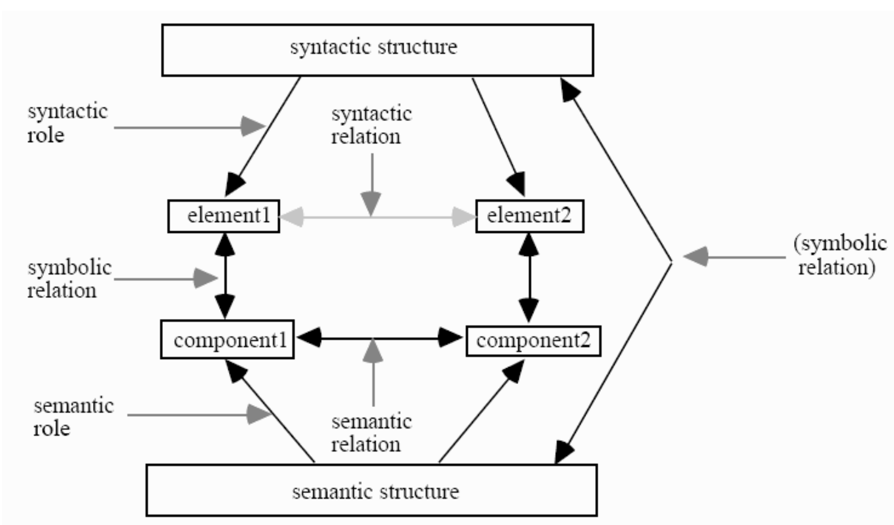

Figure 3 The internal structure of a construction (exploded diagram)

Given that description of a construction, it is straightforward to demonstrate that it is not necessary to assume the existence of syntactic relations for the purpose of communication. If a hearer hears an utterance and is able to identify (i) the construction's form, (ii) its meaning, and (iii) the correspondence between the syntactic elements of the construction and the components of its semantic structure, then he will be able to identify the semantic relations between the components denoted by the syntactic elements. That is, the hearer will have understood what the speaker meant. Understanding the meaning of an utterance is the goal of communication. Syntactic relations are not necessary to achieve this goal.

The argument in the preceding paragraph is an application of Ockham's razor to render an analysis simpler and more elegant: if a theoretical entity is not necessary in the analysis, eliminate it. In this case, the unnecessary theoretical entity is syntactic relations between elements in a construction. However, with constructions we are talking about a psychological entity, namely the speaker's knowledge of a construction. I do not believe that simplicity or elegance of an analysis is a sufficient argument for the nonexistence of some psychological entity. There is a considerable body of psychological research that strongly suggests that psychological representations possess redundant information (see Barsalou, 1992, for references). All that the preceding paragraph indicates is that if we have empirical linguistic reasons for abandoning syntactic relations, then doing so will not render our model of grammatical knowledge inadequate for the purposes to which language is put. The next section will offer some empirical reasons why syntactic relations are problematic.

3.2 The typological argument

The argument against syntactic relations is in two parts: first, that many allegedly syntactic relations are in fact semantic, and second, that it is in fact problematic to analyze what remains as syntactic relations.

Nunberg, Sag & Wasow (1994) argue that what I call *collocational dependencies* are essentially semantic. Collocational dependencies represent a continuum from what were called selectional restrictions in earlier versions of generative grammar (illustrated in examples 15–16), to collocations in the British tradition (examples 17–18; from Matthews, 1981, p. 5), to the majority of idiomatic expressions, those which Nunberg et al. call *idiomatically combining expressions* (examples 19–20):

(15) a. *Mud oozed onto the driveway.*
b. ?**The car oozed onto the driveway.*

(16) a. *The car started.*
b. ?**Mud started.*

(17) a. *roasted meat*
b. *toasted bread*

(18) a. ?**toasted meat*
b. ?**roasted bread*

(19) a. *Tom pulled strings to get the job.*
b. **Tom pulled ropes to get the job.*
c. **Tom grasped strings to get the job.*

(20) a. *She spilled the beans.*
b. **She spilled the succotash.*

Nunberg et al. argue that the phenomena in 15–20 represent a continuum which varies in the degree of conventionality of the forms encoding the semantic relation between the components of the semantic representation. Selectional restrictions are widely recognized to be semantic in nature. Nunberg et al. argue that idiomatically combining expressions also are fundamentally semantic in nature:

> When we hear *spill the beans* used to mean 'divulge the information', for example, we can assume that *spill* denotes the relation of divulging and *beans* the information that is divulged, even if we cannot say why *beans* should have been used in this expression rather than *succotash*. This is not to say, of course, that *spill* can have the meaning 'divulge' when it does not co-occur with the *beans*, or that *beans* can have the meaning 'information' without *spill*. The availability of these meanings for each constituent can be dependent on the presence of another item without requiring that the meaning 'divulge the information' attach directly to the entire VP. Rather it arises through a convention that assigns particular meaning to its parts when they occur together (Nunberg et al., 1994, p. 497)

In other words, *spill the beans* is compositional, because *spill* means 'divulge' when it is combined with *(the) beans* and *(the) beans* means 'information' when it is combined with *spill*. Nunberg et al. have demonstrated that the concepts 'conventional' and 'noncompositional' are logically independent, and they have dissociated them. Idiomatically combining expressions are conventional – their elements have conventional meanings specialized for just that idiomatically combining expression – yet compositional – those conventional meanings combine sensibly to produce the meaning of the whole expression.

Nunberg et al.'s analysis seems odd, but if it is rephrased in construction grammar terms, one can see that it is not really that odd. There is a construction [[*spill the beans*]/[DIVULGE THE INFORMATION]]; *spill* corresponds to DIVULGE, and *beans* corresponds to INFORMATION. The form of the construction is complex and its meaning is complex, and the elements of the syntactic structure correspond to the components of the semantic structure. This construction is illustrated in Figure 4 (dotted lines indicate form-meaning correspondences):

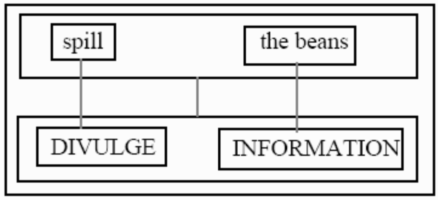

Figure 4 Construction Grammar representation of *spill the beans*

In Radical Construction Grammar, Nunberg et al.'s analysis is even more straightforward. The construction [*spill the beans*] is the primitive syntactic unit and the elements [*spill*] and [*the beans*], including their specialized meanings, are derived from the construction taken as a whole, namely [[*spill the beans*]/[DIVULGE THE INFORMATION]].

One of the consequences of Nunberg et al.'s analysis – one which they explicitly draw – is that many of the arguments for underlying syntactic structures in transformational generative theories are crucially dependent on collocational dependencies. If these dependencies are in fact semantic, then they should be represented in semantic structure and not in syntactic structure, and hence the arguments for underlying syntactic structures (and transformations) disappear. More generally, certain arguments for syntactic relations – the ones captured by underlying structures in transformational syntactic theories – disappear.

If this is the case, and I believe it is, then arguments for syntactic relations must be based on *coded dependencies*: overt morphology – case marking, agreement, classifiers, linkers, etc. – or constituency and word order patterns that are purported to express syntactic relations (Croft, 2001, ch. 5; 2003, ch. 2). In Croft (2001, ch. 6), I argue that coded dependencies in fact code symbolic relations, not syntactic relations, and so syntactic relations should be dispensed with. In order to make this case, I argue first that syntactic relations are not simply notational variants of symbolic relations, rendering the two interchangeable. Then I argue that syntactic relations are not simply notational variants of syntactic roles, the part-whole relations of constructions which are assumed in all syntactic theories, including Radical Construction Grammar. These arguments are typological, in that they depend on cross-linguistic empirical evidence.

If symbolic relations and syntactic relations are notational variants, then we could preserve syntactic relations and dispose of symbolic relations. This would lead us back to a componential model of syntax, i.e. not a construction grammar model. In a componential model of syntax, formal structure is represented in one module and semantic (or more broadly, functional) structure in a separate module. Of course, the two modules must be connected. These connections are performed by linking rules in componential models. Linking rules are the equivalent of the symbolic relations in a construction grammar. In fact, if linking rules are associated with specific syntactic structures, then they are indistinguishable from symbolic relations in a construction. Thus, to have any sort of substantive difference between a componential model with linking rules and a construction grammar model, one must have highly general linking rules.

In fact, most componential theories do have highly general linking rules. These rules generally exploit the widespread iconicity of syntactic structure: the linking rules provide one-to-one mappings between syntactic elements and relations on the one hand and semantic components and relations on the other. But many grammatical constructions are not iconic. More specifically, the putative syntactic relations in many grammatical constructions are not iconic. In this case, one must simply specify for the construction what the linking rule is. But this is essentially adopting the construction grammar model. The next few paragraphs offer a sampling of such constructions.

The first example is the phenomenon usually described as possessor ascension, but now also called external possession. In some languages, the semantic possessor of a referent appears to have a syntactic relation to the verb, not the noun phrase expressing the referent. One such language is Tzotzil (Aissen, 1980, p. 95):

(21)	*l-*	***i***-	*k'as*	*-b*	*-at*	*j-*	*k'ob*
	PF-	**1SG.ABS**-	break	-IND.OBJ	-PASS	1SG.POSS-	hand

'My hand was broken.'

In example 21, the first person semantic possessor is encoded as the (passive) subject of the verb, with the indexation prefix *i*-. It is also encoded as a morphosyntactic possessor of the NP denoting the possessum (*j*-).

Possessor ascension with verbs of this type is a common type of possessor ascension across languages. It can plausibly be argued that there really is a semantic relation between the 1st singular referent and the action in 21: the breaking of my hand affects me. Such an iconic analysis is plausible for many such examples in many languages. But in some languages, including Tzotzil, there is a semantic possessor argument of a verb for which a corresponding semantic relationship is much less plausible (ibid.):

(22)	*mi*	*muk'bu*	*x-*	*av-*	*il*	*-b*	***-on***	*j-*	*tzeb*
	INTERR	NEG	IMPF-	2SG.ERG-	see	-IND.OBJ	**-1SG.ABS**	1SG.POSS-	daughter

'Haven't you seen my daughter?'

It seems implausible that there might be a semantic relation between the seeing event and the referent first person verbal indexation suffix -on in example 22.

A similar observation can be made for the phenomenon usually described as quantifier float. In quantifier float, a quantifier is in a syntactic relation with a verb rather than the NP whose referent it quantifies. A language exhibiting quantifier float is Pima (Munro, 1984, p. 273); the quantifier immediately precedes the verb instead of being contiguous to the other elements of the noun phrase it is associated with semantically:

(23)	*hegai*	*'uuvi*	*'o*	***vees***	*ha-*	*ñeid*	*hegam*	*ceceoj*
	that	woman	3.AUX	**all**	them-	see	those	men

'The woman saw all the men.'

As with the possessor ascension example in 21, it is plausible to argue that there is a semantic relation between quantifier and event in example 23: the seeing event is either collective and so 'all' describes its collectiveness, or the verb+quantifier sums up all of the individual seeing events of the woman seeing a man.

Again, the iconic analysis applies to most cases of quantifier float in the literature. But some languages, including Pima, extend quantifier float to cases where it is implausible to assume a corresponding semantic relation (Munro, 1984, p. 275):

(24)	***vees***	*ñei*	*'ant*	*heg*	*heñ-*	*navpuj*	*ha-*	*maakaika*
	all	see	1SG.AUX	ART	my-	friends	their-	doctor

'I saw the doctor of all of my friends.'

It seems implausible that seeing a single doctor can be construed as a collective or summation event that could be described as 'all'.

In the above cases (and also in anomalous agreement relations and so-called Neg-raising, discussed in Croft, 2001, pp. 201–213), it would be difficult to identify a semantic relation corresponding to the putative syntactic relation. But if we abandon the assumption that there is a syntactic relation, the remaining syntactic structure – the part/whole relation – is iconic with the semantic structure. And there is no inherent difficulty in the hearer figuring out the semantic relations: the hearer can find the possessor or quantifier easily enough (verbal indexation affix in Tzotzil, preverbal position in Pima), and construction-specific symbolic relations license the NP argument to whose denotation the possessor referent or quantifier applies.

Finally, there is a plausible explanation as to how these 'noniconic' constructions arose. The constructions originated in the cases where there is a plausible semantic link between the possessor/quantifer and the event denoted by the verb; this is why these cases are widely found. Then in some languages, the construction was extended to other verb classes where the possessor/quantifier is not in a semantic relation with the situation denoted by the verb; these examples are found only in languages where the plausibly iconic cases are also found.

Another large class of problematic cases for iconicity if one assumes the existence of syntactic relations is found with 'moved' arguments. In all of these examples, a syntactic argument is not found in a putative syntactic relation with the verb describing the state of affairs that the argument's referent participates in. Instead, the syntactic argument is found in a putative syntactic relation with a verb in a different clause, usually the main clause.

The first example given here is an instance of what has been called *Tough*-movement. In English examples of *Tough*-movement such as *Bill is easy to fool*, the referent of the subject *Bill* can be plausibly construed as having a semantic relation to the predicate (*be*) *easy to fool*; this is a way of characterizing some property of the person (see for example Langacker, 1990, pp. 199–201). It is less plausible to posit a semantic analysis for the relationship between 'Mary' and 'be hard' in the following example from Moose Cree (James, 1984, p. 210):

(25) *ālimēliht* *-ākosi* *-w* ***mēri*** *kihči-* *tot* *-aw* *-iyan* *kihči-* *tāpwē* *-ht* *-amān*
hard -AI -3 **Mary** SUB- make -TA -2→1 SUB- believe -TI -1

ē- *āhkosi* *-t*
SUB- sick:AI -3

'It is hard for you to make me believe that Mary is sick.'
[lit. 'Mary is hard for you to make me believe is sick.']

On the other hand, a description of the construction indicating just the correspondence relation between the subject of 'be hard' and the undergoer of the sickness, as in Radical Construction Grammar, would enable the hearer to comprehend the sentence.

Another example is the phenomenon called clitic climbing. Napoli gives an attested example 26 to illustrate clitic climbing from Italian (Napoli, 1981, p. 861):

(26) *me* ***lo*** *sa* ***dire****?*
to.me it you.can tell:INF
'Can you tell it to me?'

In 26, the object clitic pronoun *lo* is apparently in a syntactic relation with the verb sa '[you] can'. It is implausible to posit a semantic relation holding directly between the thing said and the ability auxiliary; but it is easy for the hearer to identify the semantic relation between *lo* and *dire*, given knowledge of the construction and the correspondence relations between the syntactic elements and the syntactic components.

Similar arguments can be applied to examples of what has been called raising. In all of the following examples, an argument that semantically 'belongs' to the lower clause is found in a putative syntactic relation to a verb in the higher clause, but there is no plausible semantic relationship between the argument's referent and the event denoted by the verb in the higher clause:

Ancash Quechua: argument-raising (Cole 1984:111)

(27) *noqa* ***Huaraz*** ***-chaw*** *muna* *-a* *wayi* *-ta* *rura* *-y* *-ta*
I **Huaraz** **-in** want -1 house -ACC make -INF -ACC
'I want to make a house in Huaraz.' [lit. 'I want in Huaraz to make a house']

Moose Cree: raising across two clauses (James 1984:210)

(28) *itēliht* *-ākosi* *-w* ***mēri*** *ē-* *kī-* *alamotam* *-ātan* *ē-* *ākhkosi* *-t*
seem -AI -3 **Mary** SUB- PST- tell -TA:1→2 SUB- sick:AI -3
'It seems that I told you that Mary is sick.'
[lit. 'Mary seems that I told you that (she) is sick.']

Japanese: passive of evidential complement subject (Tsukiashi 1997:49; attested example)

(29) ***watasi*** ***wa*** *[haitte* *-iru* *-koto]* *o* *satorarenu* *-yoni*
I **TOP** be.in -PROG -COMP OBJ notice:PASS:NEG so.that
'so that it will not be noticed that I am in'
[lit. 'so that I will not be noticed to be in']

In 27, *Huaraz-chaw* 'in Huaraz' appears to be in a syntactic relation with *muna* 'want'; but I can want to make a house in Huaraz without the wanting event taking place in Huaraz. In 28, it seems implausible to construct an analysis in which my telling you that Mary is sick is an apparent property of Mary. Example 29 seems more plausible, in part because the English construction seems plausible (as a passive of ?*They noticed me not to be in*). Nevertheless, I am somewhat reluctant to posit a semantic relationship between the 1st person referent and 'be noticed', since what is being noticed is a state of affairs, not a person (in fact, the person is absent).

In all of these examples, it is pushing commonsense plausibility, to a greater or lesser degree, to posit a semantic relation corresponding to the putative syntactic relation. But in all of these examples, if we assume knowledge of a construction that specifies only symbolic relations between syntactic elements and semantic components, it is not at all difficult for the hearer to identify who did what to whom where, in the commonsense intuition of the meaning of these sentences. And if we dispense with syntactic relations, the elements of the construction map iconically onto the components of the semantic structure.

And again, there is a plausible historical scenario for the occurrence of these noniconic constructions. They are all examples of the early stages of the process of two clauses being reanalyzed as a single clause, with the former matrix verb becoming an auxiliary indicating tense, aspect or modality (possibility, evidentiality, etc.) of the state of affairs denoted by the former subordinate clause. This diachronic change is a gradual process, and the examples in 25–29 show that for some languages, one of the first steps in this process is the reassignment of syntactic arguments to the higher clause.

Finally, one should not underestimate the role of discourse/information structure in motivating the constructions in 25–29. The assignment of the syntactic argument to the main clause is almost certainly an indicator of the topicality of the argument's referent, regardless of whether or not there is a semantic relationship between the topical referent and the event denoted by the main verb.

The examples of noniconic constructions given in this section can be multiplied (see Croft, 2001, chapter 6). Although a plausible iconic analysis can sometimes be provided for particular cases, and in some cases motivates the creation of the construction, I believe that one cannot always provide a plausible iconic motivation. If on the other hand, we abandon syntactic relations, the remaining syntactic structure – the syntactic elements and the semantic components – is iconic. Most important of all, hearers can still succeed in understanding what the speaker said, with the knowledge of construction structure that remains in Radical Construction Grammar.

The second argument against syntactic relations addresses their relationship to syntactic roles, the part-whole relations that hold between elements of a construction and the construction as a whole. If semantic roles and syntactic relations are notational variants, then again one could use syntactic relations and possibly dispense with syntactic roles. But in fact, syntatic relations are notational variants with semantic roles only when there are two elements in a construction. If there are three or more elements, there are four or more logically possible sets of syntactic relations that hold between the elements. But there is only one semantic role representation, the one that indicates that each element is a part of the construction as a whole. Even worse, a syntactic relation representation assumes the existence of the two elements that are syntactically related, and of the relation itself. Neither of these is commonly the case.

A syntactic relation is a formal relation that holds between two formal elements in a construction. But in many cases, one of the elements in the syntactic relation is absent. A very common case is the absence of the element 'agreed with' in a putative syntactic relation encoded by agreement (indexation as I have called it so far). For example, in Warlpiri, the NP 'agreed with' does not always appear in the sentence: it is absent from 30 (Jelinek, 1984, p. 43, from Hale, 1983, p. 6), but present in 31 (ibid., 49, corrected by Ken Hale, pers. comm.):

(30)

wawirri	*-Ø*	*kapi*	***-rna***	*-Ø*	*panti*	*-rni*	*yalumpu*	*-Ø*
kangaroo	-ABS	FUT	**-1SG.SBJ**	-3SG.OBJ	spear	-NPST	that	-ABS

'I will spear that kangaroo.'

(31)

ngajulu	*-rlu*	*kapi*	***-rna***	*-Ø*	*wawirri*	*-Ø*	*panti*	*-rni*	*yalumpu*	*-Ø*
I	-ERG	FUT	**-1SG.SBJ**	-3SG.OBJ	kangaroo	-ABS	spear	-NPST	that	-ABS

'I myself will spear that kangaroo.'

A number of proposals have been made to deal with this problem. One is to say that in 30, the 'agreement' marker is actually a bound pronominal. If so, then there is a problem in analyzing 31: either one says that it is not a bound pronominal in this sentence, or that it is, and the NP *ngajulu* is then an 'adjunct' or 'appositive' NP. Another proposal for 30 is to posit a null NP which the verb 'agrees' with; the methodological dangers of positing null NPs are fairly obvious. Both of these analyses make a hidden assumption, that there can be only one syntactic argument per clause (or one syntactic argument per phrase, in phrases containing 'agreement'). If we abandon this assumption, then the problem disappears; but so does the syntactic relation of 'agreement' – we have simply two argument expressions that index the same referent (hence the choice of the term indexation here). And indexation is a symbolic relation.

A further problem is that 'agreement' is not actually agreement in the sense of matching features of the agreement marker with features of the 'controller' NP; there is a complex interplay of factors between the agreement marker and the 'controller' NP (Barlow, 1988). Barlow surveys a wide range of complex interactions between 'agreement markers' and the NPs to which they are alleged to be syntactically related, and compares them to the relationship between an anaphoric expression and the NP that the anaphorical expression is coreferential with – a relation which is generally not syntactic (especially across clauses). Barlow concludes, 'there are many similarities and no major distinction between local and anaphoric agreement' (Barlow, 1988, p. 154). In other words, there is no strong motivation to analyze local agreement any differently than anaphoric agreement. That is, there is no strong motivation to analyze local agreement as a syntactic relation, rather than as two coreferential expressions.

If one assumes there is no syntactic relation between the verbal inflection in examples such as 30–31 and an NP as in 31, then comprehension by the hearer in processing is not affected. The construction specifies that the verbal inflection and the NP (if present) in the syntactic structure indexes the relevant participant referent in the semantic structure, and that information is sufficient for the hearer to identify the participant role of the referent in question. In other words, a symbolic relation – indexation – is a superior analysis to 'agreement' – a syntactic relation – because of the frequent absence of the 'controller' of agreement.

The second common and serious problem for syntactic relations is the optionality or absence of the element alleged to encode the syntactic relation. For example, in Rumanian the preposition *pe* codes the direct object of a verb, but is only obligatory for human and definite referents, or for definite referents in certain constructions; it is optional if the referent is human and specific or nonhuman and pronominal; and it is prohibited if the referent is a nonspecific indefinite, generic or partitive (Nandris, 1945, pp. 183–185). Likewise, in Kanuri the 'agreement' (indexation) affix is optional for objects (Hutchison, 1981, p. 139):

(32) ***nyí*** *-à* *rú* *-kɔ́* *-nà*
2SG -ASSOC see -1SG -PF
'I saw/have seen you.'

(33) ***nyí*** *-à* ***nzú-*** *rú* *-kɔ́* *-nà*
2SG -ASSOC 2SG- see -1SG -PF
'I saw/have seen you.'

Another example is that numeral classifiers, which could be argued to encode the syntactic relation between a numeral and a noun, are often found only on lower numerals, and is often absent from base numerals ('10', '20', etc.; Aikhenvald, 2000, p. 117).

In these cases, one would be forced to say that the syntactic relation appears when the morpheme encoding it appears, and it disappears when the morpheme encoding it disappears. One might object that if the morpheme is absent, there would be other criteria to determine the existence of the syntactic relation. But what other criteria? Most of the other criteria offered for syntactic relations are in fact indicators of collocational dependencies, which I have argued are semantic, not syntactic. There may be some other morphosyntactic coding of the putative syntactic relation, but they do not always match the optional coding in question (Croft, 2001, pp. 199–201). Hence we cannot make inferences for the existence of a syntactic relation beyond the type of coding in question.

It is far more natural to conclude that the syntactic relation does not appear and disappear with its encoding, but that there is no syntactic relation and the morphosyntactic means of encoding the 'syntactic' relation is encoding something else, namely the symbolic relation between the syntactic element and the semantic component that it denotes or symbolizes (see §3.3).

There are other problematic aspects of analyzing morphosyntactic coding as encoding syntactic relations, such as using word order for syntactic relations among three or more units, second position elements 'breaking up' constituents, and some difficulties analyzing coded dependencies between clauses (see Croft, 2001, pp. 221–226). All of these examples indicate that syntactic relations are highly problematic; yet all of these phenomena can easily be represented in a model with syntactic roles and no syntactic relations, such as Radical Construction Grammar.

3.3 Comprehending constructions without relations

The reader who may be willing to accept the arguments in §3.2 on why positing syntactic relations is empirically problematic may still be wondering if a hearer really has enough information to recognize the construction and the correspondence relations that are necessary to understand the speaker's utterance. In this section, I will briefly discuss how the hearer can successfully understand the speaker, given no more structure than is postulated in Radical Construction Grammar.

First, it should be noted that syntactic structure in Radical Construction Grammar is not completely flat, as the absence of syntactic relations may imply. Constructions can be nested inside other constructions. The universal example of this is phrasal constructions nested in clausal constructions. Hence there is some hierarchical structure to constructions in Radical Construction Grammar (though one must not underestimate the extent to which the hierarchical structure can be blurred; see e.g. the phenomena discussed in Sadock 1991). Also, I am specifically arguing against syntactic relations between elements in a construction.

A syntactic element still has a formal relation to the construction as a whole, namely the part/whole relation. After all, a hearer must be able to identify which part of the construction is which.

Second, the logical argument against syntactic relations given in §3.1 goes through only if a hearer hears an utterance and is able to identify (i) the construction's form, (ii) its meaning, and (iii) the correspondence between the syntactic elements of the construction and the components of its semantic structure. In the rest of this section, I argue (again) that the formal properties of constructions that are interpreted as evidence for syntactic relations in standard syntactic theories can be analyzed, and are better analyzed, as aiding the hearer in identifying (i) and (iii), thereby accessing (ii) and hence understanding the speaker.

What I called coding morphosyntax – morphemes such as case marking, adpositions, agreement markers, classifiers, linkers etc., and groupings based on contiguity, prosody, etc. – is of course present in the world's languages. I argued in §3.2 that coding morphosyntax does not code relations between syntactic elements. However, coding morphosyntax does perform other important functions. First, it helps to identify which part of the construction is which – the first part of (iii). But equally important, coding morphosyntax codes the correspondence relation between a syntactic element and its counterpart semantic component in the construction – the rest of (iii). that is, coding morphosyntax codes symbolic relations, not syntactic relations.

And cross-linguistically, coding morphosyntax tends to be around when you need it, and absent when you don't. For example, overt case marking in clauses is typically found when the referent is unexpected for the participant role it is playing in the event (Croft, 1988). The Rumanian 'object preposition' *pe* is present when the object referent is most likely to be mistaken for the subject referent, i.e. when it is human and/or definite. In other words, overt case marking is there when the hearer might mistake the referent's role. Indexation markers index highly salient referents (Givón, 1976; Croft, 1988), i.e. those referents which are most likely to be left unexpressed as NPs (and thus unavailable to the hearer) because they are highly accessible (Ariel, 1990). Referents of objects and especially obliques are less likely to be highly accessible, and so will be typically overtly expressed as NPs; and indexation is much rarer cross-linguistically (or in the case of obliques, virtually absent).

Similar arguments apply for so-called constituency relations. In standard syntactic theories, constituency, like categories, is argued for by using syntactic tests or criteria. These have the same problems as we found for syntactic categories: certain tests don't exist in many (let alone all) languages, two different tests yield different results, etc. (Croft, 2001, pp. 185–197). As in §2, we infer from this that there is no unique constituent structure valid across all constructions in a language. But there are many different kinds of clues for identifying syntactic elements in a construction and linking them to the right semantic components. There is physical contiguity of elements, which occurs in greater and lesser degrees of tightness; there are grammatical units defined by their occurrence in intonation units (Chafe, 1980; 1994; Croft, 1995) and other prosodic properties; there are grammatical units defined by the point where speakers initiate self-repair (Fox & Jasperson, 1995); and these are probably not the only clues present. These are all properties of the utterance's actual physical (phonetic) form, and as such are available to the hearer without positing any abstract constituent structure.

Also, despite the fact that I showed in §3.2 that there are many cases of noniconic syntactic structures, I would stress that the great majority of constructions in the world's languages do have a substantially iconic relationship between syntactic structure and semantic structure, even for physical relations between elements (linear order, contiguity, prosodic unity, etc.). Why is syntactic structure mostly iconic? Because that's one of the easiest ways to allow a hearer to identify the semantic components corresponding to the syntactic elements of a construction – item (iii). But as the examples in §3.2 show, it's not the only way. Any reasonable way for the hearer to get the symbolic relations of the speaker's utterance will do.

So far I have discussed how a hearer can identify the elements of the syntactic structure of a construction, and the correspondence relations between syntactic elements of a construction and the semantic components of that construction, thereby identifying the relevant semantic relations without having to have recourse to syntactic relations. This task presupposes that the hearer can identify the construction in the first place – item (i). But there are clues in the structure of constructions that aid the hearer in this task as well.

For example, the English passive construction has rigid word order of its essential elements, and it has two unique parts – the auxiliary verb *be* and the past participle verb form – which jointly specify that this construction is a passive (and not a progressive or a perfect); the agent phrase provides a third unique part, the preposition *by*. These cues taken as a whole provide a structural Gestalt which aids the hearer in identifying the construction, and hence its elements and the correspondence relations to its semantic structure.

Functionalist analyses of grammatical structure have been criticized because language possesses substantial redundancy, and this redundancy is assumed to be dysfunctional. For instance, Durie describes redundancy as a case of functional overkill:

> …with respect to *The farmer killed a duckling* it is clear that ducklings don't kill farmers, and if English did have 'free' word order, there would be no need for a speaker to further disambiguate the sentence. Such further disambiguation would be redundant. As a disambiguating device, English SVO word order displays functional over-generalization, or overkill: it is there even when you don't need it (Durie, 1995, p. 278, emphasis original)

But word order and other role-identifying devices have another function besides identifying roles: they identify constructions (in Durie's example, the English [Nontopicalized] Declarative Transitive Active construction). Without being able to identify constructions, semantic roles would be much harder to identify. Much 'functional overkill' in language is not really dysfunctional because it (also) serves the function of identifying constructions; it is there because the hearer still needs it.

Finally, the discourse context and the shared knowledge between speaker and hearer, including knowledge of their immediate surroundings, offers clues as to what the semantic structure of the speaker's utterance is. In other words, even item (ii), in some schematic form, may be identifiable to the hearer in context. What a speaker will say at a certain point in the conversation is not entirely unpredictable. In fact, many aspects of what a speaker will say are probably quite predictable in many cases, to a hearer that has been paying attention to the conversation. To the extent that what a speaker will say is predictable, certain constructions will be primed in the hearer's mind, and that will facilitate recognizing the syntax of the speaker's utterance when it does come.

The abandonment of syntactic relations allows us to escape a number of serious empirical problems in syntactic analysis, some of which were illustrated in §3.2. It also dramatically simplifies the syntactic structure of our grammatical knowledge. Instead, analysis is focused on the correspondence relations of a construction: the relation between the construction as a whole and the complex semantic structure it symbolizes, and the relation between the elements of the syntactic structure and the corresponding components of the semantic structure. This is in fact where the real work by speaker's grammars is done in actual language use, and where the real work should be done in syntactic theory.

4 From universal constructions to syntactic space

The last anti-thesis of Radical Construction Grammar is rather anticlimactic. This is the hypothesis that the formal structures of constructions themselves are not universal. There is no logical argument for this position, of course, only the typological argument. The typological argument is that one cannot find a fixed set of formal syntactic properties that can unambiguously define the 'same' construction across languages. Clearly, formulating a set of formal syntactic properties would be quite difficult, given the radically language-particular character of syntactic categories argued for in §2. But even if we leave aside those objections, one still finds a remarkable diversity of syntactic structures employed by languages for similar functions.

Obviously, the only fully convincing argument for the last thesis of Radical Construction Grammar would be to demonstrate that every construction proposed as a universal construction does not hold up under empirical scrutiny. From a typologist's point of view, I must admit that I feel that the burden of proof is on the linguist who wants to argue in favor of a universal construction. My experience suggests that in fact this would be very difficult, and probably impossible, for the reasons to be given at the end of this section. Hence the final anti-thesis. In this section, I will illustrate with just a few examples of the diversity of a subset of voice constructions in the world's languages, focusing on the passive and inverse constructions.[6]

The English passive, illustrated in 34, can be described structurally as in 35, using A as the abbreviation for 'transitive subject participant roles' and P for 'transitive object participant roles':

(34) *The boy was taken to school (by his parents).*

(35) a. A encoded as oblique (if it can be expressed at all)
b. P encoded as subject
c. Morphology distinguishes passive verb form from active (usually, an overt morpheme for passive contrasting with zero marking of active)

The description in 35 reflects proposals for a universal passive construction that is said to be found across languages. Of course, identifying categories such as 'subject', 'oblique', 'verb' and 'active', both within a language and across languages, is highly problematic (see §2); but we will ignore those problems here for the sake of argument (see Croft, 2001, pp. 284–288 for further discussion; there will turn out to be problems enough with the definition in 35).

Some languages have voice constructions which, while similar to the passive, most contemporary linguists would not describe as passive. Instead, a different voice category has been defined, the inverse construction. The inverse construction contrasts with the direct construction just as the passive contrasts with the active. The standard type of an inverse voice construction is taken to be that found in Algonquian languages. Examples of Cree direct and inverse constructions are given in 36–37 (Wolfart & Carroll, 1981, p. 69, analysis as in Wolfart & Carroll, ibid.), and the structural description of the inverse in 38:

(36) *ni- wāpam* ***-ā*** *-wak*
1- see -DIR -3PL
'I see them'

(37) *ni- wāpam* ***-ikw*** *-ak*
1- see -INV -3PL
'They see me.'

(38) a. A encoded as a direct argument (not unlike P in direct construction)
b. P encoded as a direct argument (not unlike A in direct construction)
c. Morphology distinguishes inverse from from direct (sometimes, overt morpheme for inverse contrasting with zero marking of direct)

Unlike the passive, in the inverse the A argument remains a direct argument of the verb. An additional feature of inverse constructions is that the inverse is typically used when the P argument is higher than the A argument on the person hierarchy 1, 2 < 3.[7] It should be pointed out, however, that there is sometimes a similar constraint on the use of passive constructions, as defined by the structural description in 34; this will become important later.

Field work and typological research on the properties of passives and inverses across languages has yielded a wide range of problematic cases which clearly belong in the same general syntactic domain, but are missing key structural features of the standard type of passive or inverse. Space prevents me from presenting all of the examples found in the literature. I will restrict myself to just two examples.

The first example is the Arizona Tewa construction illustrated in 39–40. This construction has been called a passive (Kroskrity, 1985; examples from pp. 311, 313) and an inverse (Klaiman, 1991, citing the same examples). The structural description of the Arizona Tewa construction is given in 41, following the format of the descriptions of the passive and inverse in 35 and 38 above.

(39)	*hę'i*	*sen*	***-di***	*nɛ́'i*	*kʷiyó*	***'ó:-***	*tų́*	*-'án*	*-'i*	*dó-*	*tay*
	that	man	**-OBL**	this	woman	3SG/**3.PASS-**	say	-COMP	-REL	1SG/3.ACT-	know

'I know the woman who was spoken to by the man.'

(40)	*ų*	*kʰóto*	*hę'i*	*sen*	***-di***	***wó:-***	*mɛ́gi*
	you	bracelet	that	man	**-OBL**	**2/3.PASS-**	give

'You were given a bracelet by that man.'

(41) a. A is encoded as oblique (case marking; Kroskrity, 1985, p. 314), and with special indexation forms
b. P is encoded as subject (case marking, and also relativization and reference tracking; Kroskrity, 1985, pp. 313–314), and with special indexation forms
c. No overt morphology distinguishes Passive verb form from Active

The oblique case marking of A and subject case marking of P invites analysis as a passive. However, the verb is transitive, and it indexes both A and P (albeit with special indexation forms). Also, there are restrictions on the occurrence of the Arizona Tewa construction that are reminiscent of inverse systems:

(42) a. 1,2→3: always Active
b. all→1,2: always Passive
c. 3→3: either Active or Passive

These latter facts invite analysis of the Arizona Tewa construction as an inverse. In fact, of course, the Arizona Tewa construction is somewhere between the two: it has some structural properties of the standard passive, and some of the standard inverse.

In my survey of voice constructions, a third type that is significantly different from the 'passive' and 'inverse' types cropped up in various parts of the world. This is a voice system which looks like an inverse system, but has a special set of agreement affixes for P, instead of agreement affixes looking like the A affixes of the direct forms. An example of this system is the Inverse system of Guaraní (data from Gregores & Suárez, 1968, pp. 131–132, analysis mine):

Table 2 Distribution of Guarani agreement forms

SBJ	OBJ 1SG	1PE	1PI	2SG	2PL	3SG	3PL
1SG	–	–	–	ro-	po-	**a-**	**a-**
1PE	–	–	–	ro-	po-	**ro-**	**ro-**
1PI	–	–	–	–	–	**ya-**	**ya-**
2SG	*še-*	*ore-*	–	–	–	**re-**	**re-**
2PL	*še-*	*ore-*	–	–	–	**pe-**	**pe-**
3SG	*še-*	*ore-*	*yane-*	*ne-*	*pene-*	**o-**	**o-**
3PL	*še-*	*ore-*	*yane-*	*ne-*	*pene-*	**o-**	**o-**

Table 3 Analysis of Guarani agreement forms

Direct	*Inverse*	*Unique*
a-: 1SG	še-: 1SG	po-: 1→2PL
ro-: 1PE	ore-: 1PE	ro-: 1→2SG
ya-: 1PI	yane-: 1PI	
re-: 2SG	ne-: 2SG	
pe-: 2PL	pene-: 2PL	
o-: 3		

The special P 'subject' indexation prefixes are those listed under Inverse in Table 3; the forms in the third column are unique (see footnote 5). Examples of direct and inverse prefixes are given in 43–44 (Gregores & Suárez, 1968, pp. 156, 131), and the structural description of the construction is given in 45:

(43) *ho-* *ʔú* *soʔó*
3.DIR- eat meat
'He eats meat.'

(44) ***ne-*** *peté*
2.INV- hit
'He/she/it/they hit thee.'

(45) a. A encoded like P (i.e., no indexation)
b. P encoded like A (indexation), but with special forms
c. No morphology distinguishes Inverse verb form from Direct

Anomalous voice constructions are relatively easy to find in the syntactic literature because so much attention has been paid to hypotheses of a universal passive construction and a universal inverse construction that many linguists have published analyses of the anomalous constructions in their native language or field research language. Also, typological surveys of both passive and inverse have been made. In both cases, the typologists who conducted the surveys concluded that there were no identifying structural properties of passives and inverses across languages: 'The analysis of the various constructions referred to in the literature as *passive* leads to the conclusion that there is not even one single property which all these constructions have in common' (Siewierska, 1984, p. 1); 'I know of no structural features which can define inverse constructions and distinguish them from passives' (Thompson, 1994, p. 61). Hence I believe that it is safe to conclude that there is no universal passive or inverse construction.

This is not to say that there is no pattern in the distribution of structural features of this subdomain of voice constructions. One can construct a *syntactic space* of voice constructions using the structural descriptions given above. The dimensions of this syntactic space include how P is coded (in a 'subject-like' fashion, i.e. like A in the active/direct construction, to an 'object-like' fashion), and how A is coded (from 'subject-like' to 'oblique-like' to 'prohibited'); case marking and indexation sometimes do not match. What results is a continuum of voice constructions from the active/direct through inverse-like constructions to passive-like constructions. The syntactic space then maps onto a conceptual space representing the salience or topicality of A and P, which often manifests itself as an animacy or person hierarchy constraint. Figure 5 (adapted from Croft, 2001, p. 317, Fig. 8.16) superimposes the syntactic space of the coding of A and P onto the conceptual space of the relative salience of A and P (and extends it to antipassives, not discussed here).

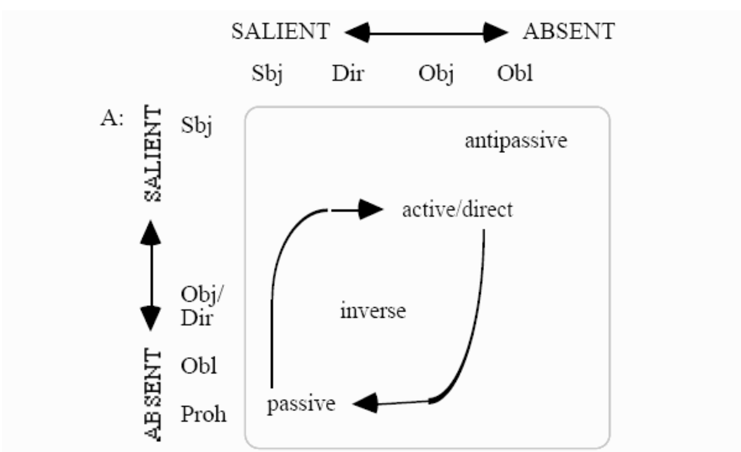

Figure 5 The syntactic and conceptual spaces for voice and transitivity

Moreover, there is a clear relationship between the relative topicality of A and P and the typological markedness of the voice construction (see Croft, 2003, chapter 4).[8] The typologically less marked voice constructions are used when A is more topical than P, and the typologically more marked voice constructions are used when P is more topical that A. In other words, although there are no simple (unrestricted) structural universals for particular types of voice constructions, there are structural universals of how the relative topicality of A and P are encoded in the variety of voice constructions found across the world's languages.

In this section, I have presented a few examples to argue that there is no universal structural description of passive or inverse voice constructions that will hold empirically. As mentioned at the beginning of this section, a demonstration of the final thesis of Radical Construction Grammar, that there are no universal constructions in structural terms, would require examining all proposed construction types across languages. While this is an impossible task from a practical point of view, I would like to close this section with two reasons why I believe that the last thesis of Radical Construction Grammar probably holds.

First, language change is gradual; there is overwhelming evidence in support of this view (see e.g. Croft, 2000, §3.2 and references therein). The consequence of this for construction grammar is that syntactic change in constructions will also be gradual. Each intermediate step in the process represents an intermediate construction type in structural terms. Hence a cross- linguistic survey that uncovers the intermediate construction types will yield a synchronic continuum of construction types in structural terms. Figure 5 indicates the broad paths of syntactic change of active to passive and back again.

Second, there are usually multiple paths of grammatical change. For example, it is known that there are different paths by which passives arise: from a resultative predicate, from a third person plural construction, from a reflexive construction, etc. (see for example Haspelmath 1990). All of these processes are gradual (see Croft, 2001, p. 314, for a more detailed description of paths of change in voice constructions). The uncovering of the multiple paths of grammatical change and their intermediate stages further fills out the syntactic space of structural possibilities for a given construction type.

5 Conclusion

In this paper, I have briefly outlined the logical and typological arguments in favor of Radical Construction Grammar. Radical Construction Grammar recognizes that virtually all formal grammatical structure is language-specific and construction-specific. This confirms what some field linguists and typologists have long suspected, having faced the diversity of grammatical structures in the world's languages.

This is not to say that syntactic categories and constructions are random. There are universals underlying the grammatical diversity of the world's languages. But the universals are functional, that is, semantic/pragmatic/discourse-functional. As a number of typologists have now proposed, the distributional patterns of categories defined by constructions can be mapped onto a conceptual space that is hypothesized to hold for all languages (see Croft, 2001, pp. 92–102; 2003, ch. 5–6; Haspelmath, 2003, and references therein). Also, structural variation across languages fall into broad patterns of form-function mapping described by such generalizations as typological markedness and typological prototypes.

Radical Construction Grammar also shows how formal syntactic structure is much simpler than is widely believed. One does not need syntactic relations, and therefore one may dispense with both syntactic relations and the various add-ons that are required where the empirical data is problematic for the establishment of syntactic relations. There still exist, of course, the morphological elements and syntactic groupings that are generally taken to indicate syntactic relations. I have argued that these supposed indicators of syntactic relations are really indicators of the correspondence relations between syntactic elements and semantic components in a construction, and (taken as a whole) are indicators of the construction's identity, facilitating understanding by the hearer.

Radical Construction Grammar is in one sense the 'syntactic theory to end all syntactic theories'. Radical Construction Grammar does not set up yet another representation language to describe syntactic structure, applicable to all languages. There is no such representation language, because syntactic structure is construction-specific and language-specific. On the other hand, there are many important issues in Radical Construction Grammar, and in other construction grammar theories, that remain unresolved.

Of these unresolved issues, one in particular stands out. This is the nature of the network organization of constructions. As mentioned in §1, this is a matter of debate among construction grammarians of all flavors. I know of no large-scale attempt to model the construction network of English or any other language. I am sure that important and interesting problems will arise when this task is finally taken on. For those construction grammarians who support the usage-based model, and I count myself as one, fundamental issues about the establishment of schemas and the interaction between frequency and similarity of utterances in constructing the network need to be addressed both theoretically and empirically.

Thus, the arguments presented here, and in fuller detail in Croft (2001), are only a first step. Nevertheless, I hope that they are a step in the right direction.

Notes

* Versions of this paper were presented to the First Chester Child Language Development Group Workshop at Gregynog, Wales, and the Theme Session on Construction Grammar, 7th International Cognitive Linguistics Conference, Stockholm, Sweden. I would like to thank the audiences at those presentations, the Linguistics- Psychology reading group at the Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany, Chuck Fillmore and Paul Kay for their comments and input. All responsibility for product quality control remains with the author.

The following abbreviations are used in this paper: 1 first person; 2 second person; 3 third person; A transitive subject; ABS absolutive; ACC accusative; ACT active; ActObj active object phrase; ActSbj active subject phrase; ActTrV active transitive verb; ADJ adjective; AI animate intransitive; ART article; ASSOC associative; AUX auxiliary; COMP complement; DEF definite marker; DEM demonstrative; DIR direct; ERG ergative case; FUT future; IMPF imperfective; IND indicative; IND.OBJ indirect object; INF infinitive; INTERR interrogative; INV inverse; MOM momentaneous aspect; NEG negative; NP noun phrase; NPST nonpast; OBJ object; OBL oblique; P transitive object; PASS passive; PassAg passive agent phrase; PassSbj passive subject phrase; PassV passive verb; PE plural exclusive; PF perfective; PI plural inclusive; POSS possessive; PP past participle; PRS present; PST past; REL relative clause marker; S intransitive subject; SBJ subject; SG singular; SUB subordinate verb form; TNS tense; TA transitive animate; TI transitive inanimate; TOP topic; V verb. Examples are glossed in accordance with the system developed in the Framework for Descriptive Grammars and the EUROTYP projects. In order to make the typological examples easier to follow, the morphemes being discussed and their interlinear gloss is emphasized with boldface.

1 I have chosen the relatively specific example of the Declarative Passive construction for illustrative purposes. The Declarative Passive could be further abstracted into a Passive argument linking construction, independent of sentence mood and without a specified word order, and a (Nonverbal) Declarative construction, specifying the copula and the order of elements. The circumstances under which such abstractions are made depend on one's model of the organization of construction (e.g. complete inheritance vs. the usage-based model; see below).

2 Fillmore et al. use the term *formal* instead of *schematic*. Since substantive constructions are also formal in the sense of specifying linguistic form, I use Langacker's term *schematic* here.

3 Construction Grammar allows for constructions which have formal values but no semantic value (Fillmore, 1999, p. 121, fn 11). However, this is a limiting case in a model that is organized in terms of symbolic units like other construction grammar theories.

4 In transformational syntactic theories, occurrence in a construction such as the passive which is the output of a transformational rule is described as *undergoing* the rule, e.g. undergoing passivization. Hence, distributional analysis in generative grammar is described as testing whether or not the putative category member undergoes the rule.

5 More precisely, Radical Construction Grammar allows parts of constructions to be instances of a part of another construction (as in Figure 2), as well as allowing them to be instances of another whole construction. It does not appear that Construction Grammar allows the former possibility.

6 Croft (2001, ch. 8) gives fuller details of voice constructions, and also discusses complex sentence constructions (ibid., ch. 9). Croft 1997 presents the continuum of constructions in the domain of external possession and ditransitive constructions.

7 In Algonquian, the person hierarchy is 2 < 1 < 3; in other languages it is 1 < 2 < 3. In many languages, there are also special unique forms for 1st person acting on 2nd person or vice versa.

8 Ranking on the person hierarchy is a common conventionalized manifestation of argument topicality. The fact that similar restrictions on person ranking exist for 'inverse' and 'passive' constructions is further evidence of the two voice constructions and their intermediate types as having a single general explanation of grammatical change and their intermediate stages further fills out the syntactic space of structural possibilities for a given construction type.

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Section VI
Introduction

Conceptual structure in language

Vyvyan Evans

One of the primary concerns of cognitive semantics has been to employ language in order to investigate conceptual organisation and structure. The purpose of the three papers collected in this section is to give something of the flavour of this research. Moreover, the papers, two by Talmy – which investigate the conceptual domains of FORCE and SPACE) – and one by Evans – which investigates the domain of TIME – represent two distinct ways in which cognitive semanticists have sought to employ language in order to investigate conceptual structure. We begin, therefore, by considering two of the fundamental guiding principles of cognitive semantics which are in evidence in these papers.

The two relevant principles concern the thesis of 'embodied cognition', and the thesis that semantic structure reflects conceptual structure. The first of these holds that the concepts we have access to and the nature of the 'reality' we think and talk about is a function of our embodiment. In other words, the human mind bears the imprint of embodied experience: conceptual structure (the nature of human concepts) is a consequence of the nature of our embodiment.

The second guiding principle holds that language refers to concepts in the mind of the speaker rather than, directly, to entities which inhere in a putatively objectively real, external world. In other words, semantic structure (the meanings conventionally associated with words and other linguistic units) can be equated with conceptual structure (i.e., concepts) – see Evans, Bergen and Zinken (this volume) for discussion of these two points.

These two principles manifest themselves as follows in the ensuing articles. Beginning with the second of the two principles introduced, both Evans and Talmy assume, along with other scholars working in cognitive semantics, that language can be employed as a means of directly investigating the human conceptual system. In other words, conceptual structure is encoded and externalised via language. Language can accordingly be employed in order to directly investigate the nature of the concepts and thoughts we have. Thus, both Evans and Talmy assume that the range of concepts encoded in language reflect, in non-trivial ways, the nature and organisation of conceptual structure.

In terms of the first guiding principle, the thesis of embodied cognition, Talmy and Evans are focusing on slightly different ways in which conceptual structure is embodied (as reflected by language). In the article by Evans, focused as it is on the human conceptual system for TIME, it is argued that distinct temporal concepts are structured in terms of motion events of various kinds. This follows due to co-occurrences in experience between phenomenologically real, but distinct, temporal experiences and motion events of varying kinds. Thus, the co-occurrences establish conventional associations between concepts that show up in language. Hence, the human mind reflects correlations in experience, and in this way the mind is embodied.

Talmy, in contrast, is concerned more with the intricacies of structural or grammatical aspects of language. Accordingly, he addresses the fundamental sorts of physical experiences which serve to structure the experiences we conceptualise and encode in grammar. He identifies a number of structuring systems, known as 'schematic systems' (discussed in greater detail below), which reflect fundamental aspects of humanly relevant, and thus embodied, experience. Moreover, the grammatical 'fine-structure' or closed-class elements of language appear to be comprised of these 'embodied' schematic systems. The two papers in this section by Talmy reflect two of these sorts of experiences: FORCE(-DYNAMICS) and SPACE, both of which are central to human interaction and experience with the physical world about us.

We now consider in slightly more detail the nature of the proposals made by the three articles which follow. The first and third of the papers are by Talmy. According to Talmy, the way language conveys entities and scenes is by reflecting or encoding the language user's cognitive representation (CR), or conceptual structure. In other words, although conceptual structure is not open to direct investigation, the properties of language allow us to reconstruct its properties, and to build a model of that system that, among other things, accounts for the observable properties of language. Talmy suggests that the CR, as manifested in language, is made up of two systems, each of which brings equally important but very different dimensions to the scene that they co-construct. These systems are the conceptual structuring system and the conceptual content system (Talmy 2000: Chapter 1/this volume). While the conceptual structuring system, as its name suggests, provides the structure or 'scaffolding' for a given scene, the content system provides the majority of rich substantive detail. It follows from this that the meaning associated with the conceptual structuring system is highly schematic in nature, while the meaning associated with the conceptual content system is rich and highly detailed.

Given the thesis that semantic structure reflects conceptual structure, assumed by Talmy, it follows that the system of semantic structure is also divided into two subsystems, reflecting the bifurcation in the CR. These two systems are the open-class semantic system and the closed-class semantic system. These semantic subsystems correspond to the formal distinction between open-class elements (for example, nouns like *man*, and *cat* and adjectives like *happy*, and *sad*), and closed-class elements (idioms like *kick the bucket;* grammatical patterns like declarative or interrogative constructions; grammatical relations like subject or object; word classes like the category verb; grammatical words like *in* or *the*; and so on).

Talmy's research has examined the way in which both the open-class and closed-class semantic systems encode the CR. However, he has been primarily concerned with elaborating the semantics of the closed class subsystem, the part of semantic structure that is at the grammar 'end' of the lexicon-grammar continuum (see Evans and Green 2006: Chapter 15, for a review). Thus, Talmy's work is important for cognitive semantics, for at least two reasons: i) Talmy's theory illustrates that the closed-class or grammatical subsystem is meaningful (albeit that the meaning is schematic); ii) Talmy's findings suggest that the grammatical subsystem encodes meaning that relates to key aspects of embodied experience. For these reasons, Talmy's research both illustrates and supports the position adopted in cognitive semantics that semantic structure reflects conceptual structure, which in turn reflects embodied experience.

According to Talmy, the conceptual structuring system is based upon a limited number of large-scale 'schematic systems'. These provide the basic organisation of the CR, upon which the rich, contentful meaning encoded by open-class elements can be organised and supported. Nevertheless, the closed-class grammatical subsystem is specialised for the encoding of these schematic systems.

The first of Talmy's papers relates to the schematic system of FORCE-DYNAMICS. Talmy argues that this system, as it is manifested in semantic structure, relates to the way in which objects are conceived relative to the exertion of force, which derives, in embodied terms, from the haptic system; this encompasses proprioception (our bodily experience of muscular effort or motion), and somesthesia (our bodily experience of sensations such as pressure and pain). To illustrate this system, and the linguistic devices that give rise to force-dynamic distinctions, consider the following examples drawn from Talmy (2000: 412).

(1) Physical force
   a. The ball <u>was rolling</u> along the beach
   b. The ball <u>kept rolling</u> along the beach

The examples in (1) highlight a contrast in physical force. The expression in (1a) depicts a scene that is neutral with respect to force, in the sense that, while encyclopaedic knowledge tells us that something or someone must have caused the motion of the ball, the sentence does not refer to this knowledge. In contrast, the use of the *keep* V-*ing* construction in (1b) conveys a scene in which we understand that the ball's natural tendency towards rest is overcome by some external force, perhaps the wind, which ensures that the ball remains in a state of motion. The only difference between these two examples is in the grammatical constructions: specifically, the auxiliary verb *be* versus the quasi-auxiliary *keep*, together with the progressive participle V-*ing*. According to

Talmy, FORCE forms part of the conceptual structure associated with our CR, and can be encoded via closed-class elements like grammatical constructions.

The second of Talmy's papers, and the third in this section, relates to the schematic system for the encoding of SPACE in language. Space is one of the fundamental domains of human experience. Moreover, many of the perceptual mechanisms for constructing spatial experience are innate, including top-down perceptual processes such as 'figure-ground segregation' and our cognitive mapping ability (O'Keefe and Nadel 1978; Bloom *et al*. 1996). Talmy argues that spatial representation in language encodes spatial scenes, which reflects our conceptualisation of space. Spatial scenes are configured according to three parameters: i) figure-ground segregation; ii) the relative proximity of the figure with respect to the ground; and iii) the location of the figure with respect to the ground. This is achieved by the employment of a particular reference frame, which involves the use of co-ordinate systems, centred on the ground, or a secondary reference object in order to locate the figure.

For instance, Talmy shows that linguistic representations of spatial scenes reflect a figure-ground asymmetry. It is a striking fact that language reflects perceptual organisation in the way that spatial scenes are segregated. In English, this is mirrored by the syntax. For instance, in simple sentences like those in (2), the figure (underlined) normally precedes the preposition (*near*), while the ground (bracketed) follows the preposition. Sentences in which the ground precedes the preposition, although grammatically well-formed, are semantically odd:

(2) a. <u>The bike</u> is near [the house]
b. ?[The house] is near <u>the bike</u>

The semantic 'oddness' of this example can be explained by the fact that the ground is typically the immovable entity that only serves to locate the figure.

The second approach to conceptual structure evident in this section relates to the work on the conceptualisation of time by Evans (e.g., 2004a, 2004b/this volume, 2005). In contrast to Talmy, Evans is primarily concerned with the way in which the open-class semantic system encodes conceptual structure, here relating to the domain of TIME. In particular, Evans employs novel lexical semantic analysis of the lexeme *time* in order to uncover the range and complexity of concepts for time.

Evans argues that temporal experience, as it is represented and encoded in language, exhibits two levels of organisation. The first level relates to the notion of the 'lexical concept'. A lexical concept is the meaning that is represented by a lexical form, or word. Examples of temporal expressions from English include the words *time*, *past*, *present*, and *future*, among others. The lexical concepts that underlie words of this kind can be organised in a number of ways at the conceptual level. For instance, the languages of the world appear to structure TIME in terms of MOTION. The second level of organisation relates to 'cognitive models' for time. This is a level of organisation in which various lexical concepts are integrated, together with their patterns of conventional imagery. Evans calls this process 'concept elaboration'. For example, in the expression *a long time*, the lexical concept expressed by the word *time* relates to DURATION, while the imagery that elaborates the lexical concept relates to LENGTH, lexicalised by *long*.

In sum, cognitive semantics assumes that conceptual structure reflects the imprint of embodied experience, and that semantic structure reflects conceptual structure. The second of these assumptions allows cognitive semanticists to employ language in order to directly investigate conceptual structure. As illustrated by the papers in this part of the Reader, cognitive semantics provides a methodological 'toolkit', for employing language as a window on the nature and structure of conceptual representation.

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21 Force dynamics in language and cognition

Leonard Talmy

1 Introduction

A semantic category that has previously been neglected in linguistic study is that of **force dynamics** – how entities interact with respect to force. Included here is the exertion of force, resistance to such a force, the overcoming of such a resistance, blockage of the expression of force, removal of such blockage, and the like.[1]

Though scarcely recognized before, force dynamics figures significantly in language structure. It is, first of all, a generalization over the traditional linguistic notion of 'causative': it analyzes 'causing' into finer primitives and sets it naturally within a framework that also includes 'letting', 'hindering', 'helping', and still further notions not normally considered in the same context.

Force dynamics, furthermore, plays a structuring role across a range of language levels. First, it has direct grammatical representation. In English, our main language of demonstration, such representation appears not only in subsets of conjunctions, prepositions, and other closed-class elements but, most significantly, also as the semantic category that most uniquely characterizes the grammatical category of modals as a whole, both in their basic and in their epistemic usages. Force-dynamic patterns are also incorporated in open-class lexical items and can be seen to bring many of these together into systematic relationships. Lexical items involved in this way refer not only to physical force interactions but, by metaphoric extension, also to psychological and social interactions, conceived in terms of psychosocial 'pressures.' In addition, force-dynamic principles can be seen to operate in discourse, preeminently in directing patterns of argumentation, but also in guiding discourse expectations and their reversal.

Finally, the conceptual system for force interaction that appears to be built into language structure can be related to other cognitive domains. The linguistic system, in fact, shows close parallels with the conceptual systems for force interaction both in naive physics and psychology, and in early science, as well as in casual treatments of modern science – though it is often at variance with rigorous modern science. Overall, force dynamics thus emerges as a fundamental notional system that structures conceptual material pertaining to force interaction in a common way across a linguistic range: the physical, psychological, social, inferential, discourse, and mental-model domains of reference and conception.

In historical perspective, developed concepts of force interactions are of course not novel, in particular, for physical phenomena, long the study of disciplines like physics. Outside the physical, perhaps the most familiar application is that of Freud to the psyche, with such psychodynamic concepts as libido and drives, repression and resistance, id-superego conflict, and a tension-reduction model for restoring equilibrium. To my knowledge, however, systematic application of force concepts to the organization of meaning in language remained neglected until an initial endeavor in Talmy (1976a) and, as an initial presentation as a basic linguistic system, in Talmy (1981). Earlier reference to force, of course, is to be found. Whorf (1941) cited and diagrammed force opposition as the referent of a particular Shawnee root, and the psychologist Fritz Heider (1958), whose work has recently come to my attention, discussed force concepts in modality. But these treatments were neither systematic nor explanatory. More recently, Gee and Kegl (1982, pp. 348 – 350) have developed a system involving forces to account for certain motion concepts in American Sign Language. Sweetser (1982; 1984), adopting the present force-dynamic framework, has carried it into an account of the epistemic senses of modals. Aspects of the present system have also been incorporated into the theoretical frameworks of Pinker (1989; 1997), Jackendoff (1990), and Brandt (1992).

The method I adopt here in investigating the category of force dynamics is based within the broader approach of cognitive semantics. This approach includes the idea that language uses certain fundamental notional categories to structure and organize meaning, but that it excludes other notional categories from this role. The included categories are most directly evident across languages as the categories of concepts that are expressed by closed-class forms – or, broadly speaking, by *grammar* – such as inflections and particles, as well as grammatical categories, relations, and constructions (see Talmy, 2000, chapter II-1). Many of these same notional categories play a prominent role as well in structuring lexicalization patterns for open-class lexical items. To illustrate, many languages have noun inflections that indicate the *number* of the noun's referent, but they never have inflections that indicate this referent's *color*. From similar observations, we can construct two sets, one consisting of notional categories like 'color' that never appear in languages' closed-class forms, and the other of those that regularly do so and thus play a basic conceptual structuring role. In addition to number, this set will contain such generally recognized categories as aspect, mood, and evidentiality. One purpose of this study is to establish force dynamics as a further member of this privileged set of fundamental semantic categories. Beyond this, as cognitive scientist as well as linguist, I address the issue of how the semantic structuring evident within language relates to conceptual organization in other cognitive systems, such as the perceptual modalities and reasoning. In other work (Talmy, 1983; 1987), I have compared the system that language uses to schematize and structure space and time, with properties of visual perception. Here, I will compare the way that linguistic force dynamics organizes conceptions of physics and psychology with the naive as well as the scientific mental models that we use to reason about these same areas.

The earlier outline of force-dynamic properties largely matches this chapter's sequencing, which steadily proceeds from more basic to more complex forms. First shown are the fundamental force-dynamic distinctions together with a system for diagramming them (sections 1 and 2). This leads to a demonstration of force dynamics as a generalization over the traditional causative (section 3). Next is shown how language extends physical force concepts to the expression of internal psychological interactions (section 4). This expansion allows us to bring together in a systematic pattern a number of lexical items that involve such psychodynamics (section 5). Language is then shown to further extend force-dynamic concepts to social interactions, and to organize lexical items with social reference in the same way as the psychological ones (section 6). The progression of parameters to that point permits an examination of the modal system in force-dynamic terms (section 7). Then a look at discourse shows how force-dynamic concepts extend, without augmentation, to the discourse factors that direct argumentation and to a familiar phenomenon here called vector reversal (section 8). The final text section (section 9) compares the conceptual models of physics and psychology that are built into language in its force-dynamic system with comparable models in other cognitive domains. In the conclusion (section 10), further lines of research on force dynamics are sketched out, and the system is set within larger contexts, both that of other conceptual systems in language and that of human conceptual structure as a whole.

1.1 Illustrating the category

Since force dynamics is a novel category in linguistics, it would be best to give it immediate illustration. The minimal pairs in (1) mostly contrast force-dynamically neutral expressions with ones that do exhibit force-dynamic patterns, showing these in a succession of semantic domains.

(1) (a) be VPing/ keep VPing [*physical*]
i. The ball was rolling along the green.
ii. The ball kept (on) rolling along the green
(b) not VP/can not VP [*physical/psychological*]
i. John doesn't go out of the house.
ii. John can't go out of the house.
(c) not VP/refrain from VPing [*intrapsychological*]
i. He didn't close the door.
ii. He refrained from closing the door.
(d) polite/civil [*intrapsychological*: *lexicalized*]
i. She's polite to him.
ii. She's civil to him.
(e) have (got) to VP/get to VP [*sociopsychological*]
i. She's got to go to the park.
ii. She gets to go to the park.

Illustrating the purely physical realm, (1ai) depicts a force-dynamically neutral event. The use of the word *keep* in (1aii), however, brings in either of two force-dynamic patterns: either the ball has a tendency toward rest that is being overcome by some external force acting on it, say, the wind, or the ball presently has a tendency toward motion that is in fact overcoming external opposition to it, say, from stiff grass.

In (1b) a psychological force factor joins the physical one. The force-dynamically neutral expression in (1bi) merely reports an objective observation, John's not going out. But (1bii), in addition to the same observation, also sets forth a full force-dynamic complex: that John *wants* to go out (conceivable as a forcelike tendency toward that act), that there is some kind of force or barrier opposing that tendency, and that the latter is stronger than the former, yielding a net resultant of no overt action.

Example (c) illustrates that language can depict a force opposition as wholly psychological, and in fact as occurring within a single psyche. Again, both (ci) and (cii) refer to the same overtly observable situation, an agent's nonaction. But (cii) in addition represents this situation as the resultant of an intrapsychological conflict, one between the agent's urge to act and the same agent's stronger inhibition against acting.

Example (d) exhibits the same type of force-dynamic contrast as (c) but demonstrates that this can be lexicalized. While the *polite* of (di) is neutral, (dii)'s *civil* indicates that the subject's basic tendency here is to be impolite but that she is successfully suppressing this tendency.

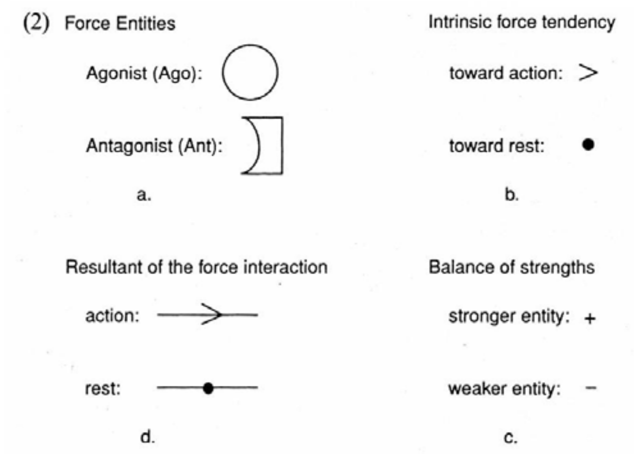
Example (e) demonstrates that language extends force-dynamic concepts as well to interpsychological – that is, social – interactions. Here, both of the expressions exhibit force-dynamic patterns, but of different types, ones that yield the same overt resultant for different reasons. In (ei), the subject's desire (= force tendency) is not to go to the playground, but this is opposed by an external authority who does want her to do so, and prevails. In (eii), the subject's desire *is* to go to the playground, and stronger external circumstances that would be able to block her from doing so are reported as either disappearing or not materializing, thus permitting realization of the subject's desire.

2 Basic force-dynamic distinctions

We begin the progression of force-dynamic parameters with the most fundamental – the ones that are operative throughout the system. In the present section, these are considered only for their application to the realm of physical force.

2.1 Steady-state force-dynamic patterns

Underlying all more complex force-dynamic patterns is the steady-state opposition of two forces, and we now examine the factors that comprise it. The primary distinction that language marks here is a role difference between the two entities exerting the forces. One force-exerting entity is singled out for focal attention – the salient issue in the interaction is whether this entity is able to manifest its force tendency or, on the contrary, is overcome. The second force entity, correlatively, is considered for the effect that it has on the first, effectively overcoming it or not. Borrowing the terms from physiology where they refer to the opposing members of certain muscle pairs, I call the focal force entity the Agonist and the force element that opposes it the Antagonist.[2] In the system of diagramming used throughout this chapter to represent force-dynamic patterns, the Agonist (Ago) will be indicated by a circle and the Antagonist (Ant) by a concave figure, as shown in (2a).

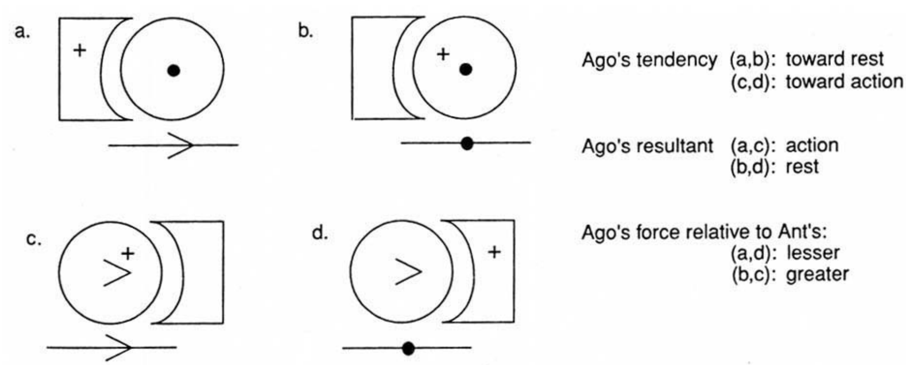


As language treats the concept, an entity is taken to exert a force by virtue of having an intrinsic tendency toward manifesting it – the force may be constant or temporary, but it is in any case not extrinsic. In an entity's force tendency, language again marks a two-way distinction: the tendency is either toward motion or toward rest – or, more generally, toward action or toward inaction. Diagrammatically, an Agonist's tendency toward action will be represented by an arrowhead and a tendency toward rest by a large dot, as seen in (2b), placed within the Agonist's circle. Unless needed for labeling purposes, no tendency marker is shown within the Antagonist symbol, since it is here understood to be opposite that of the Agonist.

A further concept in association with opposed forces is their relative strengths. As language treats this, the entity that is able to manifest its tendency at the expense of its opposer is the stronger. In the diagrams, a plus is placed in the stronger entity (and a minus, when necessary, can indicate the weaker entity), as in (2c). Finally, according to their relative strengths, the opposing force entities yield a resultant, an overt occurrence. As language schematizes it, this resultant is one either of action or of inaction, and it is assessed solely for the Agonist, the entity whose circumstance is at issue. The resultant will be represented as a line beneath the Agonist, one bearing either an arrowhead for action or a large dot for inaction, as in (2d).

With these distinctions in hand, we are able to characterize the four most basic force-dynamic patterns, those involving steady-state opposition, as diagrammed and exemplified in (3). To describe these in turn, (3a) involves an Agonist with an intrinsic tendency toward rest that is being opposed from outside by a stronger Antagonist, which thus overcomes its resistance and forces it to move. This pattern is one of those to be classed as "causative," in particular involving the extended causation of motion. The sentence in (3a) illustrates this pattern with a ball that tends toward rest but that is kept in motion by the wind's greater power. In (3b), the Agonist still tends toward rest, but now it is stronger than the force opposing it, so it is able to manifest its tendency and remain in place. This pattern belongs to the 'despite' category, in this case where the Agonist's stability prevails despite the Antagonist's force against it. In (3c), the Agonist's intrinsic tendency is now toward motion, and although there is an external force opposing it, the Agonist is stronger, so that its tendency becomes realized in resultant motion. This pattern, too, is of the 'despite' type, here with the Antagonist as a *hindrance* to the Agonist's motion. Finally, in (3d), while the Agonist again has a tendency toward motion, the Antagonist is this time stronger and so effectively *blocks* it, rather than merely hindering it: the Agonist is kept in place. This pattern again represents a causative type, the extended causation of rest.[3]

(3) *The basic steady-state force-dynamic patterns*



a. The ball kept rolling because of the wind blowing on it.
b. The shed kept standing despite the gale wind blowing against it.
c. The ball kept rolling despite the stiff grass.
d. The log kept lying on the incline because of the ridge there.

Of these four basic force-dynamic patterns, each pair has a factor in common. As the diagrams are arranged in the matrix in (3), each line captures a commonality. In the top row, (a,b), the Agonist's intrinsic tendency is toward rest, while in the bottom row (c,d), it is toward action. In the left column, (a,c), the resultant of the force opposition for the Agonist is action, while in the right column, (b,d), it is rest. More significantly, the diagonal starting at top left, (a,d), which represents the cases where the Antagonist is stronger, captures the factor of extended causation. These are the cases in which the resultant state is *contrary* to the Agonist's intrinsic tendency, results *because of* the presence of the Antagonist, and would otherwise *not occur*. And the diagonal starting at top right, (b,c), which gives the cases where the Agonist is stronger, captures the 'despite' factor. In fact the very concept of 'despite/although' can be characterized in terms of the common factor in this subset of force-dynamic patterns. Here, the resultant state is *the same* as that toward which the Agonist tends, results *despite* the presence of the Antagonist, and would otherwise *also occur*. Thus, the force-dynamic analysis so far captures certain basic general concepts – for example, 'despite' as counterposed to 'because of', as well as certain particular concepts, such as 'hindering' and 'blocking'. In doing so, an advantage of the present analysis becomes evident: it provides a framework in which a set of basic notions not usually considered related are brought together in a natural way that reveals their underlying character and actual affinity.

As the examples in (3) demonstrate, certain force-dynamic concepts have grammatical – that is, closed-class – representation. With the Agonist appearing as subject, the role of a stronger Antagonist can be expressed by the conjunction *because* or the prepositional expression *because of* (which in other languages often appears as a simple adposition), while the role of a weaker Antagonist can be expressed by the conjunction *although* or the preposition *despite*. Force-dynamic opposition in general can be expressed by the preposition *against*, as seen in (3b) or in such sentences as *She braced herself against the wind/They drove the ram against the barricade*. Perhaps the single form most indicative of the presence of force dynamics here is *keep -ing*. Technically, of course, this expression is not a closed-class form, since it is syntactically indistinguishable from any regular verb taking an *-ing* complement, such as *hate*. Nevertheless, its very frequency and basicness suggest for it a status as an 'honorary' auxiliary, in the same way that *have to* can be taken as an honorary modal akin to the authentic *must*. Moreover, in the course of language change, *keep* is likelier than, say, *hate* to become grammaticalized, as its equivalents have done in other languages and much as *use to*, which stems from a syntactically regular verb, is now partially grammaticalized in its limitation to a single form. Whether *keep* is taken as closed-class or not, its force-dynamic role can be seen as well in other forms that are unimpeachably closed-class, such as the adverbial particle *still* and the verb satellite *on*, as illustrated in (4).

(4) a. The ball kept rolling
b. The ball was still rolling despite the stiff grass.
c. The ball rolled on

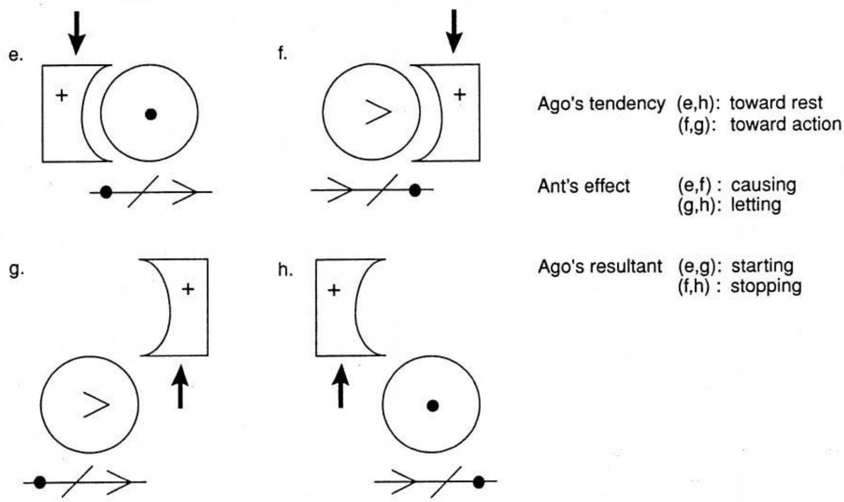
2.2 Shifting force-dynamic patterns

At this point, another factor can be added – change through time – and with it, the steady-state force-dynamic patterns give rise to a set of change-of-state patterns.

2.2.1 Shift in state of impingement

In one type of changing pattern, the Antagonist, rather than impinging steadily on the Agonist, instead enters or leaves this state of impingement. The cases with a stronger Antagonist (based on (3a,d)) are the most recognizable and are considered first. As they are diagrammed in (5), these shifting patterns are not indicated with a sequence of static snapshots, but with the shorthand conventions of an arrow for the Antagonist's motion into or out of impingement, and a slash on the resultant line separating the before and after states of activity. These patterns are exemplified in (5) with sentences now taking the Antagonist as subject.

(5)



e. The ball's hitting it made the lamp topple from the table.
f. The water's dripping on it made the fire die down.
g. The plug's coming loose let the water flow from the tank.
h. The stirring rod's breaking let the particles settle.

To consider each in turn, the pattern in (5e) involves a stronger Antagonist that comes into position against an Agonist with an intrinsic tendency toward rest, and thus causes it to change from a state of rest to one of action. Thus, this is another pattern to be classed as causative, but this time it is the prototypical form, the type most often associated with the category of causation. If the two steady-state causative types, (3a,d), may be termed cases of **extended causation**, the present type can be called a case of **onset causation**, in particular, onset causation of motion. The pattern in (5f), correlatively, is that of onset causation of rest. In it, the stronger Antagonist comes into impingement against an Agonist that tends toward motion and has been moving, and thus stops it.

The four patterns that thus constitute the general causative category, (3a,d; 5e,f), have in common one property, absent from all other force-dynamic patterns, that emerges from force-dynamic analysis as definitional for the concept of causation. This property is that the Agonist's resultant state of activity is the opposite of its intrinsic actional tendency.

In the remaining patterns, these two activity values are the same. The force-dynamic interpretation is that an object has a natural force tendency and will manifest it unless overcome by either steady or onset impingement with a more forceful object from outside. This is a family of circumstances that language classes together under a single conceptual aegis, one that can appropriately be termed the 'causative.'

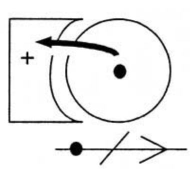
In the next pattern, (5g), the concept of 'letting' enters, and with it, further demonstration of the force-dynamic framework's power to bring together, in a systematic account, notions whose relatedness may not have previously been stressed. In (5g), a stronger Antagonist that has been blocking an Agonist with a tendency toward motion now disengages and releases the Agonist to manifest its tendency. This is the prototypical type of letting, onset letting of motion. In (5h), accordingly, is a nonprototypical type of letting, onset letting of rest, where an Antagonist that has forcibly kept in motion an Agonist tending toward rest now ceases impinging on this Agonist and allows it to come to rest. Where the category of causing was seen to depend on a notion of either the start or the continuation of impingement, the present 'letting' patterns involve the *cessation* of impingement.

As the shifting force-dynamic patterns are arrayed in (5), each line of the matrix again isolates a systematic factor. The diagonal starting at the top left, (e,h), holds as constant the Agonist's tendency toward rest, while the opposite diagonal, (f,g), does this for the tendency toward action. The top row, (e,f), indicates onset causation, while the bottom row, (g,h), indicates onset letting. And the left column, (e,g), represents the Agonist's starting into action, while the right column, (f,h), represents its stopping. The patterns as they are arrayed in columns thus serve to represent the category of force-related starting and stopping.[4]

2.2.2 Shift in balance of strength

It was said at the beginning of this section that an Antagonist's entering or leaving impingement with the Agonist was only one type of shifting force-dynamic pattern. We can now outline another form. The Antagonist and Agonist can continue in mutual impingement, but the *balance* of forces can shift through the weakening or strengthening of one of the entities. For each impingement-shift pattern in (5), there is a corresponding balance-shift pattern. The correspondence can be understood this way: instead of a stronger Antagonist's arriving or leaving, to thus begin or end its overpowering effect, an Antagonist already in place can become stronger or weaker with the same results. One of these patterns is selected for illustration in (6), with the arrow here indicating the shift in relatively greater strength (of course with no implication of any actual transfer of force from one entity to the other). In one of its usages, the word *overcome* represents this pattern and is shown exemplifying it.

(6)

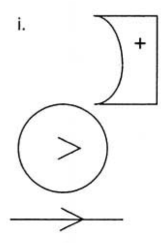


The enemy overcame us as we stood defending the border.
[enemy = Ant, us = Ago]

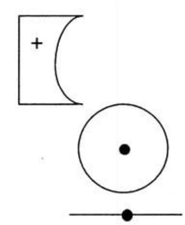
2.3 Secondary steady-state force-dynamic patterns

The cases in (5) where the Antagonist moves away from the Agonist suggest further cases in which the Antagonist *remains* away. In fact, corresponding to each of the steady-state patterns in (3), with an Antagonist opposing an Agonist, is a secondary steady-state pattern with the Antagonist steadily disengaged. Where this Antagonist is stronger, we have the two patterns for 'extended letting'. Illustrated in (7i) is extended letting of motion and, in (7j), extended letting of rest. These together with the patterns for 'onset letting' seen in (5g,h) comprise the general category of 'letting'. It can now be seen that the major delineations within the overall causing/letting complex can be characterized in terms of types of impingement by a stronger Antagonist. Causing involves positive impingement: onset causing correlates with the start of impingement and extended causing with its continuation. Letting involves nonimpingement: onset letting correlates with the cessation of impingement and extended letting with its nonoccurrence.

(7) i.



j.



i. The plug's staying loose let the water drain from the tank.
j. The fan's being broken let the smoke hang still in the chamber.

I have called the present group of steady-state patterns 'secondary' because, it seems, they must be considered conceptually derivative, founded on a negation of the basic steady-state forms. The notions of Agonist and Antagonist, it can be argued, intrinsically involve the engagement of two bodies in an opposition of force, and reference to an Agonist and Antagonist not so engaged necessarily depends on their potential for such engagement. In Fillmore's (1982) terms, the disengaged cases presuppose the same semantic frame as the engaged cases.

2.4 The relation of agency to the force-dynamic patterns

I should make clear why I have used for illustration, as in (5) and (7), sentences based on two clauses and without an agent, when linguists familiar with the causative literature are used to sentences like *I broke the vase*. The reason is that I regard such nonagentive forms as more basic than forms containing an agent. As argued in Talmy (2000, chapter I-8), the inclusion of an agent in a sentence, though often yielding a syntactically simpler construction, actually involves an additional semantic complex. An agent that intends the occurrence of a particular physical event, say, a vase's breaking, is necessarily involved in initiating a causal sequence leading to that event. This sequence must begin with a volitional act by the agent to move certain parts or all of his body. This in turn either leads directly to the intended event or sets off a further event chain, of whatever length, that leads to the intended event.

To represent a whole sequence of this sort, many languages permit expression merely of the agent and of the final event, like English in *I broke the vase*. Here, the sequence's remaining elements are left implicit with their most generic values (see Talmy, 200, chapter I-4). The next element that can be added by itself to the overt expression is the one leading directly to the final event – that is, the penultimate event, or else just its (so-called) instrument, as in *I broke the vase (by hitting it) with a ball*. This privileged pair of events, the penultimate and the final, forms the identifying core of the whole agentive sequence. It can in fact be excerpted from there for expression as a basic precursor-result sequence, as in *The ball's hitting it broke the vase*.

This is the basic sequence type of our illustrative sentences. In it, all the causal and other force-dynamic factors can be worked out in isolation and yet be known to hold as well when occurring within a larger sequence containing an agent. In this way, the sentences of (5) can be immediately associated with corresponding agentive sentences, as exemplified in (8), and there maintain all the same force-dynamic properties.

(8)	*Autonomous*	*Agentive*
	The ball's hitting it made the lamp topple	I made the lamp topple by hitting it with the ball.
	The plug's coming loose let the water flow out.	I let the water flow out by pulling the plug loose.

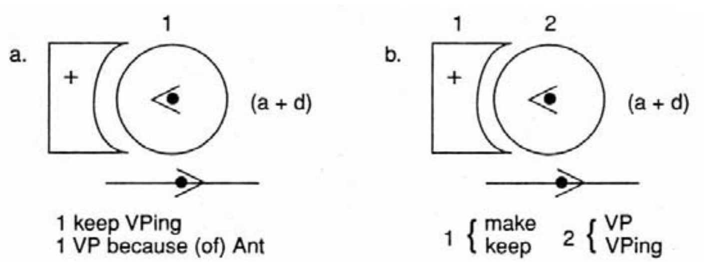
2.5 Alternatives of foregrounding in force-dynamic patterns

All of the interrelated factors in any force-dynamic pattern are necessarily co-present wherever that pattern is involved. But a sentence expressing that pattern can pick out different subsets of the factors for explicit reference – leaving the remainder unmentioned – and to these factors it can assign different syntactic roles within alternative constructions. Generally, the factors that are explicitly referred to, and those expressed earlier in the sentence or higher in a case hierarchy, are more foregrounded – that is, have more attention directed to them. As with the agentive situation, those factors not explicitly mentioned are still implicitly present, but backgrounded.

With respect to representation, we can identify the explicit factors and their syntactic roles with a system of labeling on the force-dynamic diagrams. For this system, I borrow from Relational Grammar the use of 1 to indicate the element appearing as subject, and 2 for direct object. The label VP is placed beside the element that will be expressed as a verbal constituent. The particular syntactic character of this constituent can range widely, as we will see, so that the VP must be construed actually to designate a form of abstracted verb-phrasal base. An element not labeled is generally not represented explicitly in the construction. When labeled, a complete diagram thus represents a specific construction, usually one of sentential scope and with particular lexical inclusions. In addition, I use the following convention for capturing a commonality: where two patterns differ in only one factor – such as a tendency toward action versus a tendency toward rest – and also underlie the same construction, they can be represented in a single diagram with both values marked, for example, with both arrowhead and dot.[6]

Turning now to actual cases, a difference in foregrounding due to syntactic role can be shown for the steady-state force-dynamic patterns of (3a,d), diagrammatically combined in (9). Familiar already from (3), the Agonist can be foregrounded by subject status, while the Antagonist is backgrounded either by omission or as an oblique constituent, as shown in (9a) with constructions involving intransitive *keep* or prepositional/conjunctional *because (of)*. Alternatively, the same force-dynamic patterns can be viewed with the reverse assignment of salience, where the Antagonist is foregrounded as subject and the Agonist backgrounded as the direct object, as shown in (9b) with constructions involving transitive *keep* or *make*.

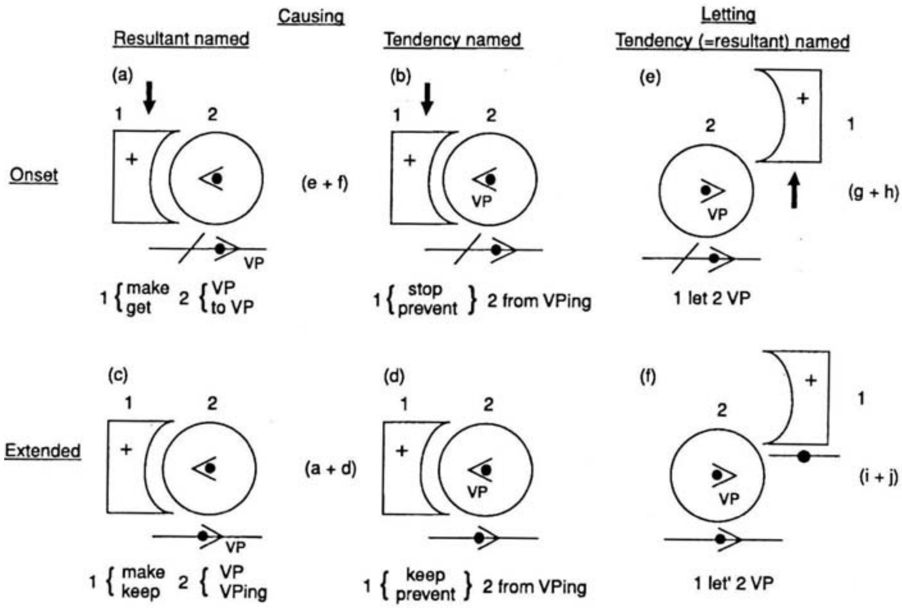
(9)



a. The ball kept rolling. / The ball is rolling because of the wind.
b. The wind kept the ball rolling. / The wind is making the ball roll.

The other main alternation in foregrounding pertains to the actional properties of a force-dynamic pattern. Either the Agonist's actional *resultant* can receive the main explicit representation in a construction, as in the cases seen so far, or its actional *tendency* can. Of course, this distinction in emphasis can apply only to causative patterns, since in these alone do the two actional values differ. The diagram in (10) brings together all the causing and letting patterns we have seen, here only with the Antagonist foregrounded, and the constructions that represent them. The new constructions are those in (b) and (d), which refer to the Agonist's tendency in causative patterns. Note that here the key force-dynamic word *keep* occurs again, but now in conjunction with *from* in a construction indicating 'prevention'. With these additions, the force-dynamic analysis relates still further linguistic phenomena within a single framework. (Note that examples for the (e) and (f) patterns appear in (7).)

(10)



The added soap (a) got the crust to come off. (b) stopped the crust from sticking.
The shutting valve (a) made the gas stay inside. (b) stopped the gas from flowing out.
The fan (c) kept the air moving. (d) kept the air from standing still.
The brace (c) kept the logs lying there. (d) kept the logs from rolling down.

2.5.1 *Asymmetry in the expression of 'make' versus 'let'*

English offers more syntactic options for the expression of 'making' than it does for 'letting'. For 'making', the Antagonist can be mentioned either by itself or along with the event in which it is involved, while 'letting' has only the latter option, as illustrated in (11a,b). This asymmetry continues when the 'making' and 'letting' patterns are embedded within an agentive matrix (as also noted by Jackendoff, 1976), as seen in (11c,d). It is for this reason that in the 'letting' diagrams of (10e,f), the 1 indicating subjecthood was shown marking the Antagonist together with the Antagonist's activity.

(11) a. i. The piston's pressing against it made the oil flow from the tank.
ii. The piston made the oil flow from the tank.
b. i. The plug's coming loose let the oil flow from the tank.
ii. *The plug let the oil flow from the tank
c. i. I made the oil flow from the tank by pressing the piston against it.
ii. I made the oil flow from the tank with the piston.
d. i. I let the oil flow from the tank by loosening the plug.
ii. *I let the oil flow from the tank with (*of/*from) the plug.

The explanation for this asymmetry may lie in a language-universal treatment of 'instrument' as involving only positive impingement. For supporting evidence, note that in talking about causing a stacked display of cans to topple, an instrumental with-phrase as in (12) can refer either to the beginning of impingement (12a) or to its continuation (12b), but not to its cessation (12c). And there is no other phrasal indication for such a reverse instrument, as seen in (13).

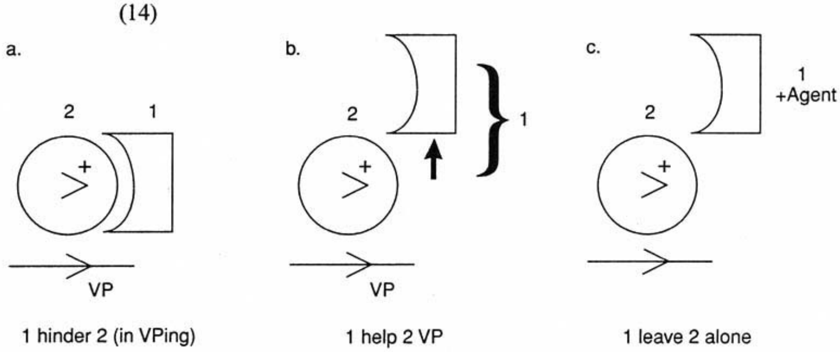
(12) I toppled the display *with a can* – covers:
  a ….by throwing a can at it.
  b ….by pressing against it with a can.
  c. *...by pulling a can out from the bottom tier.

(13) *I toppled the display *from/of/... a can*.

2.6 Force-dynamic patterns with a weaker antagonist

Since our initial look at the basic steady-state patterns, all the force-dynamic patterns dealt with have had a stronger Antagonist. But the present framework allows for a set of eight patterns with weaker Antagonist. These are the two steady-state patterns in (3b,c) with the Antagonist impinging against the Agonist, and correspondingly: two with this Antagonist coming into impingement, another two with the Antagonist leaving impingement, and a final two with the Antagonist remaining out of impingement. As a set, these patterns seem to play a lesser role than the set with stronger Antagonist, but certain patterns among them are nevertheless well represented in English. This is certainly the case for the earlier-discussed 'despite/although' formulations, where the Agonist appears as subject. In addition, for cases with the Antagonist as subject, (14) shows patterns with the Antagonist (a) engaged (the same as the steady-state (3c) pattern, now labeled), (b) disengaging, and (c) steadily disengaged, where these underlie constructions with *hinder*, *help*, and *leave alone*, respectively.

(14)



  a. Mounds of earth hindered the logs in rolling down the slopes. /
     The benches hindered the marchers in crossing the plaza.
  b. Smoothing the slopes helped the logs roll down the slope. /

Removing the benches helped the marchers cross the plaza.

c. I left the rolling logs alone. / The police left the marchers alone in their exit from the plaza.

It is significant that the lexical verb *help* should be found in a force-dynamic context. As illustrated in (15), there are four transitive verbs in English that take an infinitive complement without *to*, namely, *make*, *let*, *have*, and *help* (i.e., outside of perception verbs, which form a separate class in also taking an *-ing* complement). We have already seen *make* and *let* figure deeply in the expression of basic force-dynamic patterns. *Have* is also force dynamic, expressing indirect causation either without an intermediate volitional entity, as in *I had the logs roll down the south slope*, or, as is usual, with such an entity: *I had the boy roll the log along*. And now we find *help* also with force-dynamic usage. The significance of this is that a syntactically definable category can be associated with a semantically characterizable category, thus lending relevance to both and support to the idea of structural integration in language. More will be made of this cross-level association of categories in the discussion of modals.

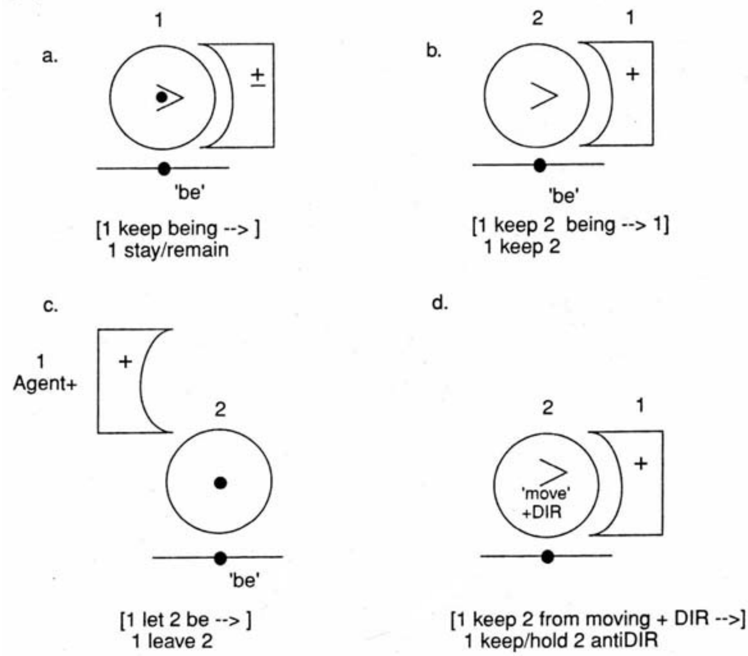
(15) I made/let/had/helped the logs roll along the ground.

2.7 Particularized factors in force-dynamic patterns

In every force-dynamic pattern treated so far, the component factors have been at their most generic. Any element or event with the minimal requisite property called for by a factor can instantiate that factor and, accordingly, be expressed in the construction that represents the pattern. But this system has an extension. Constructions exist that correspond to a force-dynamic pattern in which a particular factor has a specific identity. Where this identity involves a basic notion, say, where a pattern's VP factor is particularized as 'be' or 'move', the corresponding construction generally also includes some basic lexical item. In this way, we find more of the core lexicon and syntax brought under the force-dynamic aegis.

Thus, we find such prominent English lexical verbs as *stay/remain*, *leave*, *hold*, and, once again, *keep*, arising from the particularized patterns shown in (16). The depicted correspondences preserve certain syntactic properties as well. Thus, *be*, which particularizes the VP in the (16a,b,c) patterns, can normally occur with a nominal, an adjective, or a locative, as in *He was a doctor/rich/in Miami*. The same is true of the verbs in the corresponding constructions, as in *He remained a doctor/rich/in Miami.*, *Events kept/left him a doctor/rich/in Miami*. In (16d), the *DIR* (Directional) element accompanying '*move*' has been left generic. But if it, too, is particularized, say, as '*down*' or '*out*', then the pattern yields still further constructions. Thus, beside *1 keep 2 from moving down/out* is not only *1 hold 2 up/in*, but further *1 support 2* and *1 confine 2*.

(16)



a. [the log kept being on the incline (because of the ridge there).→]
The log stayed on the incline (because of the ridge there).
(tendency: >; Ant: +)
[The shed kept being on its foundation (despite the gale wind). →]
The shed remained on its foundation (despite the gale wind).
(tendency: •; Ant: -)

b. [The ridge kept the log being on the incline. →]
The ridge kept the log on the incline.

c. [Let the cake be (keep being) in the box! →]
Leave the cake in the box!

d. [The ridge kept the log from moving ahead. →]
The ridge held the log back.

3 Force dynamics as a generalization over 'causative'

Given this survey of the basic force-dynamic patterns and their linguistic expression, we are now in a position to view the whole system for its properties as an integrated framework. One main understanding that emerges is that force dynamics is a generalization over the traditional notion of 'causative' in the linguistic literature. That tradition itself has a progression of treatments. The earlier ones, such as in McCawley (1968), abstracted an atomic and uniform notion of causation, often represented as 'CAUSE,' that countenanced no variants. Later treatments, such as those of Shibatani (1973) and Jackendoff (1976), perceived a finer complex of factors. Talmy (1976b, 1985b) has distinguished at least the following: resulting-event causation, causing-event causation, instrument causation, author causation, agent causation, self-agency, and inducive causation (caused agency). But even these treatments did not analyze far enough. While they revealed the factors that go into more complex forms of causativity, these were all still founded upon the same, unanalyzed notion of primitive causation. With the force-dynamic framework, now this too gives way. What had been viewed as an irreducible concept is now seen as a complex built up of novel primitive concepts. And because these finer primitives recombine in a system of different patterns, the idea of causation is now seen as just one notion within a related set.

I can now detail the generalization. First, the force-dynamic analysis provides a framework that accommodates, among the patterns with a stronger Antagonist, not only 'causing', but also 'letting'. Further, it accommodates not only the prototypical forms of these, but also the nonprototypical, in the sense in which Lakoff (1987) characterizes prototypicality for a conceptual category. Thus, it accommodates not only the prototypical type of causing, 'onset causing of action', which all accounts treat, but also 'onset causing of rest'. The previous neglect of this latter pattern is evident in the very terminology that had been selected. Thus, Shibatani's (1973) term most closely corresponding to the present 'onset' is 'ballistic causation,' a term that could never have been meant also to include causing to come to rest (see Talmy, 2000, chapter I-8); 'beginning-point causation' fares a bit better in this regard. The nonprototypical pattern 'extended causing of action' has had some prior recognition – for example, with Shibatani's 'controlled causation' or my earlier 'extent causation.' But neither of these authors had envisioned the correlative pattern, 'extended causing of rest'. As for 'letting', this notion has in most treatments gone unmentioned beside discussion of causing. If mentioned, it is generally the prototypical type, 'onset letting of action', that is treated. Though Talmy (1976b) and Jackendoff (1976) did include analysis of several further types, it has remained for the present force-dynamic analysis to provide an adequate matrix for the inclusion of 'onset letting of rest' and 'extended letting of action/rest'.

The next major generalization in the force-dynamic framework is that it classes both causing and letting together as cases involving a stronger Antagonist and then counterposes to these the cases with a weaker Antagonist. This larger picture now contains a set of notions not normally considered in the same context with causation. Included among them are the general notions of 'despite' and 'although', and such particular notions as 'hindering', 'helping', 'leaving alone', and, as we will see below, 'trying'.

Finally, with the idea of alternative foregrounding, the force-dynamic framework is able to capture the concept not only of the causing of a result, but also of the *prevention* of a *tendency* (a factor also noted below for modals, in alternations of the type *He must go*. / *He may not stay*.). The provision for alternatives of foregrounding, furthermore, permits treating not only constructions with the affecting entity (the Antagonist) as subject. It also brings in on a par constructions with the affected entity (the Agonist) as subject and even as the only-mentioned participant, as with intransitive *keep* (and all modals, as seen below).[6]

The set of the force-dynamic framework's generalizations can be summed up as in (17). The important point to make here is that force dynamics does not simply *add* cases; rather, it *replaces* an earlier limited conception, then taken as a primitive, with a more general and systematic matrix of concepts.

(17) Force dynamics provides a framework in which can be placed:
not only 'causing', but also 'letting'
not only the prototypical cases of 'causing/letting', but also nonprototypical:
prototypical causing: 'onset causing of action' (5e)
seldom considered: 'onset causing of rest' (5f)
sometimes considered: 'extended causing of action' (3a)
seldom considered: 'extended causing of rest' (3d)
prototypical letting, sometimes considered: 'onset letting of action' (5g)
seldom considered: other three 'letting' types (5h) (7i) (7j)
not only the stronger-Antagonist types ('causing/letting'), but also the weaker-Antagonist types ('despite/although', 'hindering/helping/leaving alone', 'trying'…)
not only cases with the result named, but also cases with the tendency named ('causing' vs. 'preventing')
not only the affecting entity (Antagonist) as subject, but also the affected entity (Agonist) as subject (e.g., with intransitive *keep* and modals)

4 Extension of force-dynamics to psychological reference

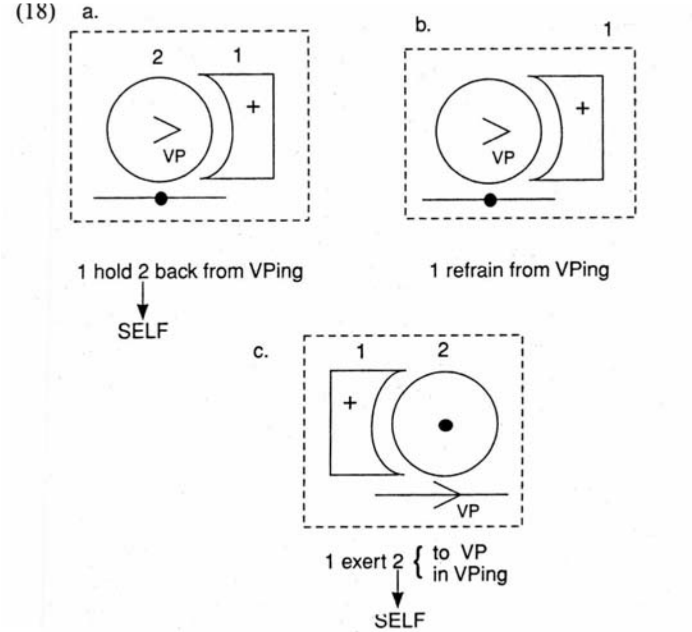
The point of the preceding outline was to demonstrate the generality of the force-dynamic framework as compared with previous conceptions. But in the terms in which it was developed, that framework does have a particular limitation: its founding concepts are of the domain of *physical* force interactions. However, it becomes apparent that force dynamics has a yet more general role in language. Its concepts and distinctions are extended by languages to their semantic treatment of *psychological* elements and interactions. This linguistic *psychodynamics* thus generalizes notions of physical pushing, blocking, and the like to the framing of such concepts as wanting and refraining.

To take a particular example, 'wanting', as in *He wants to open the window*, seems to be conceived in terms of a kind of psychological 'pressure,' 'pushing' toward the realization of some act or state. As a metaphoric extension, it can be well represented by the arrowhead within the Agonist in a force-dynamic diagram, symbolizing 'tendency toward action'.

4.1 The self divided

For the force-dynamic concept of two forces opposing, if we do not yet consider the social interrelation between two individuals but remain with a single psyche, we are led to a basic semantic configuration in language, the divided self. This notion is seen in such formulations as *I held myself back from responding* or, as conflated in a single lexical form, in *I refrained from responding*. The sense of these expressions is that there is one part of the self that wants to perform a certain act and another part that wants that not to happen, where that second part is stronger and so prevents the act's performance. This arrangement is by now, of course, immediately recognizable as a basic force-dynamic pattern applied in this case to intrapsychological forcelike urges. It can be diagrammed as in (18a,b), with the new feature of a dotted box around the elements to indicate that they are parts of a single psyche.

(18)



a. He held himself back from responding.
b. He refrained from responding.
c. He exerted himself in pressing against the jammed door.

The construction diagrammed in (18a), *1 hold oneself back from VPing*, is an idiomatic extension of the construction in (16d), now without particularization of the force tendency. The force components of the diagram are individually labeled: the subject of the construction can be identified with the blocking part of the psyche, acting as Antagonist, and the reflexive direct object with the desiring part, acting as Agonist. In (18b) is diagrammed the corresponding *refrain* construction. All the elements are the same; the only difference is that they are not individually identified. Rather, the whole configuration is lexicalized in a single word with the subject identified as the psyche as a whole. This pattern can support still further lexicalization. If the VP in this diagram were particularized as 'be impolite', the pattern would underlie the expression *1 refrain from being impolite* or, alternatively, the conflated form *1 be civil*. This latter is the force-dynamic expression that was used in the introduction to show a contrast with the neutral '1 be polite'. That is, while both *civil* and *polite* indicate the same overt condition of nonrudeness, *civil* adds to this a whole intrapsychological force-dynamic complex involving blocked desire.

There is another intrapsychological pattern of force opposition that is the opposite of 'refraining': that for 'exertion', diagrammed in (18c). Here, one part of the psyche, taken as the Agonist, is characterized as wanting to be inactive (tending toward rest), while another part acting as Antagonist overcomes this resistance so as to bring about an overall generation of activity. As in (18a), the *exert oneself* construction is based on the individual labeling of the separate components of the psyche, so that the expression contains a reflexive direct object.

4.2 Central versus peripheral within the self

In all the patterns of (18), the self is not simply divided into equivalent parts, but rather into parts playing different roles within a structured whole. The Agonist is identified with the self's desires, reflecting an inner psychological state. It is being overcome by an Antagonist acting either as blockage – in this psychological context, one might say 'suppression' – or as a spur. This Antagonist represents a sense of responsibility or propriety and appears as an internalization of external social values. In effect, perhaps, a force-dynamic opposition originating between the self and the surroundings seems here to be introjected into an opposition between parts of the self. Correspondingly, the desiring part is understood as more *central* and the blocking or spurring part as more *peripheral*. This semantic arrangement is reflected syntactically in the transitive constructions of (18a,c): the peripheral part of the self is expressed as the subject Agent, which acts on the central part of the self appearing as the direct object Patient (the reflexive).

4.3 Psychological origin of force properties in sentient entities

We have seen that language can ascribe intrinsic force properties to physical entities without sentience such as wind, a dam, or a rolling log. The overt force manifestations of sentient entities, however, are generally treated not as native to the physical body per se but, rather, as arising from underlying psychological force dynamics – in particular, from the psychological configuration of 'exertion'. Consider, for example, the semantics of the two sentences in (19).

(19) a. The new dam resisted the pressure of the water against it.
b. The man resisted the pressure of the crowd against him.

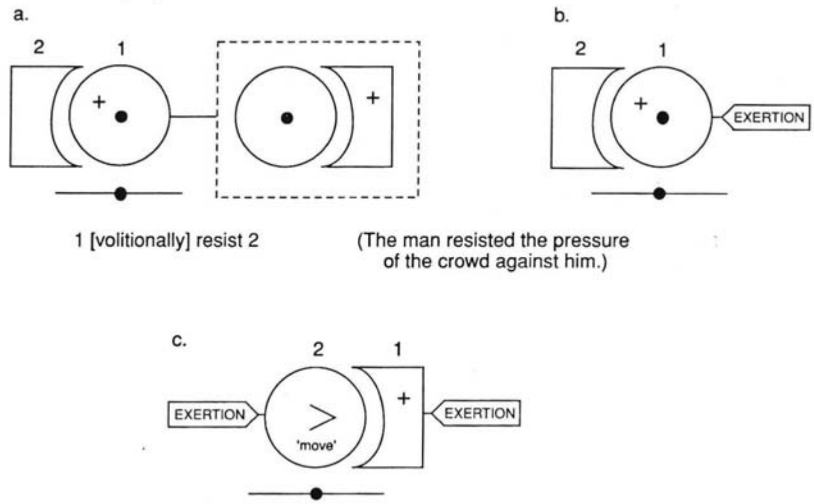
The nonsentient dam in (19a) is understood to continue in its tendency to stand in place due to its intrinsic properties of physical solidity and rootedness. This is not the case with the sentient man in (19b). If that entity were considered only for his physical body, without the psychological component, he would be viewed as a force-dynamically weaker Agonist that would be swept along by the crowd. But the psychological component is normally included and understood as the factor that renders the man a stronger Agonist able to withstand the crowd. It accomplishes this by *maintaining the expenditure of effort*, that is, by a continuously renewed *exertion*, in which a goal-oriented part of the psyche overcomes a repose-oriented part so as to generate the output of energy.

The psychological component not only can cause greater strength in the physical Agonist, but can set its force tendency. Thus, while the 'man' in (19b) set his body for a tendency toward rest, the 'patient' in (20) has set his body for a tendency toward motion, and is understood as *straining* against what holds him. (This example's verb, *restrain*, corresponds to the (3d) pattern with its force tendency particularized as 'move'.) If this patient were only a physical body, he would just lie there inert, uninvolved in any force interactions. But he also has a psyche that here generates his possession of an active force tendency, determining that he *tries* to get free. This example also demonstrates further applicability of the psychological 'exertion' pattern. This pattern can attach not only to an Agonist, like the 'man' or the 'patient,' but also to an Antagonist. Thus, the strap in (20a) manifests its Antagonistic force by virtue of its physical characteristics alone, whereas the attendant in (20b) does so only by the psychogenic expenditure of effort.

(20) a. A strap restrained the patient.
b. An attendant restrained the patient.

In diagramming these more complex force-dynamic relationships, I place a connecting line between the physical entity acting as Agonist or Antagonist and the psychological 'exertion' complex. An example of the resulting full pattern is shown in (21 a), and examples with a symbolic shorthand that I will use are diagrammed in (21b,c)

(21)



a. 1 [volitionally] resist 2

b. (The man resisted the pressure of the crowd against him.)

c. 1 [volitionally] restrain 2
(The attendant restrained the patient.)

4.4 The force-dynamic properties of repose, animation, and generativity

Implicit in this analysis of the psyche's force-dynamic character are three further factors that bear on conceptual organization in language and perhaps also more generally. The first is that one basic state of the central part of the psyche, perhaps its most basic (or 'unmarked') state, is that of *repose*. In this state, the central force element of the psyche has an intrinsic tendency toward rest that must be overcome by a more peripheral part of the psyche for energy to be expended. Without such spurring, no effort would be exerted.

Second, the semantic component of language is so organized as to treat the physical aspect of a sentient entity as essentially inert, requiring *animation* by the psychological aspect. By itself, the body lacks an intrinsic force tendency and if placed in a force-dynamic situation would generally be a weaker Agonist. It is the psyche that imbues the body with force properties – that is, that animates it. In the diagrams, the line linking the psychological and the physical aspects can be treated as representing this semantic component of 'animation'.

Third, this very linking of a psychological with a physical force-dynamic pattern is an example of the more general capacity of force-dynamic patterns to concatenate or to embed. That is, there is the capacity for the Agonist or Antagonist of one pattern to serve in turn as a force entity in a further pattern. Complex combinations of this sort can be formed, as in a sentence like *Fear kept preventing the acrobat from letting the elephant hold up his tightrope*. The important point in this is that the force-dynamic system in language is not limited to a small inventory of simplex patterns but has the property of open-ended *generativity*.

From the preceding analysis, thus, it appears that language ascribes to the psychophysical nature of sentient entities the following particular force-dynamic concatenation: A more peripheral part of the psyche overcomes a more central part's intrinsic repose to animate the otherwise inert physical component into overt force manifestation against a further external force entity.

5 Force dynamics with more complex aspectual patterns

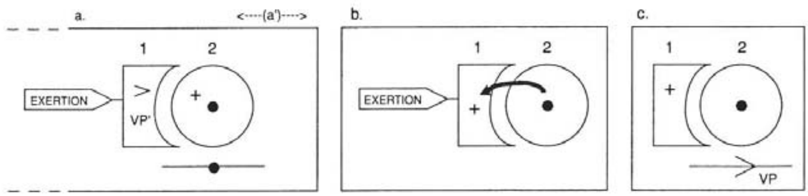
The shifting type of force-dynamic patterns discussed in section 1.1 involved simple changes through time, of an aspectual type basic enough to be represented on a single diagram with an arrow. But more complex patterns of force-dynamic change through time are also countenanced by language and underlie specific constructions and lexicalizations. To depict them, I resort to a strip of diagrams to represent the sequence of patterning.

I can point to a particular set of lexical items, within their respective constructions, that are all based on a single complex force-dynamic sequence. There are essentially two factors that distinguish the expressions within this set. The first is what I will call phase: the location along the temporal sequence at which focal attention is placed. The second is factivity: the occurrence or nonoccurrence of portions of the sequence and the speaker's knowledge about this.

The relevant diagram strip is shown in (22-diagram) with the 'phase/factivity' patterns in (22-formulas). Here, the first phase, (a), is a stretch of time during which a sentient Antagonist, foregrounded as subject, impinges extendedly on a stronger Agonist, intending that this will make it act as shown in the subsequent phases. The Antagonist's force tendency is indicated here because it can be referred to explicitly in some of the constructions. The (a) phase may include a latter portion, (a'), during which the Agonist weakens or the Antagonist strengthens. In the punctual (b) phase, a criterial shift in relative strength takes place. Phase (c) is the aftermath of this shift, with the Agonist now forced to manifest the intended action.

We see in (22-formulas) that a range of constructions and construction types all refer to this same force-dynamic 'script.' The lexical verb *try* involves focus at the initial phase without knowledge of its outcome, while *succeed* and *fail* focus on a known occurrent or nonoccurrent outcome. And constructions with adverbial forms like *finally* and *in vain* take their place beside those with verbs. (Note that the subscript c on a VP indicates a causative lexicalization.)

(22)



(22-formulas) With (22-diagram)'s 1 and 2 as depicted; condition: the Antagonist intends that (a) cause (b–c)

Phase/factivity patterns	*Constructions*
i. focus at (a) (b–c)'s occurrence unknown	1 try to $\left\{\begin{matrix}\text{make 2 VP}\\ {}_{c}\text{VP 2}\end{matrix}\right\}$ by VP′ing
ii. focus at (c) (b–c) has occurred	1 $\left\{\begin{matrix}\text{succeed in }{}_{c}\text{VPing}\\ \text{manage to }{}_{c}\text{VP}\end{matrix}\right\}$ 2
	1 finally ${}_{c}$VP 2
iii. focus at (c) (b–c) has not occurred	1 fail to ${}_{c}$VP 2
	1 VP′ in vain/futilely/to no avail

i. He tried to open the window by pressing up on it.
ii. He succeeded in opening/managed to open the window.
He finally opened the window.
iii. He failed to open the window.
He pressed up on the window to no avail.

All the preceding constructions were based on the Antagonist's foregrounding as subject. But this same force-dynamic sequence underlies further expressions with the Agonist as subject. The force-dynamic analysis is here bringing together expressions with previously unanticipated relationships. For this new set, the same strip as in (22-diagram) holds, except that the 1 and 2 are reversed, and the 'exertion' box is now optional and could be shown within parentheses. The corresponding constructions and examples are given in (23).

(23) With (22-diagram)'s 1 and 2 reversed, and its "exertion" box optional

i. focus at (a) (b–c)'s occurrence unknown	1 resist 2('s VP′ing)
ii. focus at (c) (b–c) has occurred	1 $\left\{\begin{matrix}\text{give way}\\ \text{yield}\end{matrix}\right\}$ (to 2)
	1 finally VP
iii. focus at (c) (b–c) has not occurred	1 withstand 2('s VP′ing)
	1 will not VP

i. The window resisted my pressing on it.
ii. The window gave way (to my pressing on it).
The window finally opened.
iii. The window withstood my pressing on it.
The window wouldn't open.

The reason that the 'exertion' box is optional for (23) is that there all the constructions, which give nonsubject status to the Antagonist, do not require that this Antagonist be sentient, as did the subject-Antagonist constructions of (22). Involved here, in fact, is a systematic gap in English expression. There are no simple locutions with a nonsentient Antagonist as subject for the (3b)-type pattern of a weaker Antagonist impinging on a stronger Agonist that is stably at rest.[7] What would be needed here is a locution that would function as *try* does for a sentient Antagonist subject but that could be predicated, say, of wind, as in some sentence like **The wind tried to overturn the hut*. The closest serviceable expressions here would seem to be *The wind blew on the hut with little/no effect/ineffectively*. It is not obvious why such a gap should exist. There is clearly no semantic barrier to it, since the same conception *is* expressed with nonsubject Antagonist forms, as shown by (23)-type expressions like *The hut resisted the wind*.

6 Extension of force-dynamics to social reference

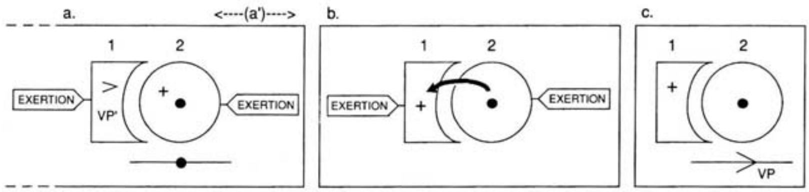
We have seen how our framework extends from physical force interactions to psychological ones, in particular to intrapsychological force interactions within sentient entities. Here we see that the framework extends still further to *inter*psychological force interactions *between* sentient entities. That is, it extends to *social* force interactions, or to *sociodynamics*. A basic metaphoric analogy is at work here that is seemingly built into semantic organization. The base of the metaphor is one object's direct imposition of physical force on another object toward the latter's manifesting a particular action. Conceptualized as analogous to this is one sentient entity's production of stimuli, including communication, that is perceived by another sentient entity and interpreted as reason for volitionally performing a particular action. This linguistic analogical extension from the physical to the interpreted is seen, for example, in the English use of words like *push* and *pressure* pertaining to sociodynamics, as in (24).[8]

(24) a. peer pressure/social pressure
b. He's under a lot of pressure to keep silent.
c. Our government exerted pressure on that country to toe our line.
d. Getting job security relieved the pressure on her to perform.
e. The gang pushed him to do things he didn't want to.

As testimony to the integration provided by the present framework, we now find that the same force-dynamic sequence treated in the last section – though now with the addition of 'exertion' to the Agonist as well as the Antagonist – underlies a new set of lexical items and constructions with interpersonal reference. Among these, for example, is *1 urge 2 to VP*. Here, strictly, an Antagonist through communication aims to affect an Agonist's intention as to the performance of some action. But the semantic effect of the locution is to cast this social interaction as a form of force dynamism, with the Antagonist exerting pressure on the Agonist toward the particular action. The relevant diagram strip, with the additional 'exertion' box, is shown in (25-diagram). As before, there are constructions corresponding to alternative foregroundings, with either the

Antagonist or the Agonist as subject. These are indicated in (25-formulas), with (i)-(iii) representing the same phase/factivity patterns as earlier.

(25)



(25-formulas)

With 1 and 2 as depicted	*With 1 and 2 reversed*
i. 1 urge 2 to VP	1 be reluctant to VP
ii. 1 persuade/get 2 to VP	1 {relent / give in to 2} (on VPing)
iii. ?[1 strike out with 2 (on VPing)]	1 {refuse to / will not} VP

i. She urged him to leave.
He was reluctant to leave.
ii. She persuaded him to leave.
He relented. / He gave in to her on leaving.
iii. (She struck out with him on his leaving.)
He refused to leave. / He wouldn't leave.

The parallelism of our particular force-dynamic sequence's application both to psycho-physical interactions and to interpersonal interactions allows us to place all the relevant constructions in a single table, as shown in (26). The table demonstrates graphically the way that force-dynamic concepts extend across semantic domains to reveal common patterns, some perhaps not noticed earlier for want of an adequate explanatory system.

Table of Constructions for the Complex FD Sequence of (22) and (25)

Effect on Ago: *Physical*	Focus at (a): (b–c)'s occurrence unknown	Focus at (c): (b–c) has occurred	Focus at (c): (b–c) has not occurred
Ant = 1	1 try to $_c$VP 2	1 {manage to $_c$VP / succeed in $_c$VPing} 2 1 finally $_c$VP 2	1 fail to $_c$VP 2 1 VP′ in vain/futilely/ to no avail
Ago = 1	1 resist 2	1 {give way / yield} (to 2) 1 finally VP	1 withstand 2 1 will not VP
Communicative Ant = 1	1 urge 2 to VP	1 persuade 2 to VP	[1 strike out (with 2)]
Ago = 1	1 be reluctant to VP 1 resist VPing	1 relent 1 give in to 2 1 finally VP	1 {refuse to / will not} VP

7 Modals as a syntactic category for the expression of force dynamics

The progression of properties and their extensions adduced for the force-dynamic system to this point now permits treatment of modals in this light. Though modals have been investigated from many perspectives, there has been general inattention to what appears to lie at the core of their meanings, namely, force opposition. This force-dynamic perspective is presented here.

The English modals form a graduated grammatical category, with more core and more peripheral members, as characterized by the degree to which they show certain syntactic and morphological properties. Among these properties are lack of *to* for the infinitive form of the following verb, lack of *-s* for the third-person singular, postposed *not*, and inversion with the subject as in questions. Modals characterized by more or fewer of these properties are shown in (27a) in their historically corresponding present and past tense forms. The forms in (27b) are syntactically and morphologically regular, but their meanings and usage are so close to those of real modals that they are often considered in the same terms and may be accorded 'honorary' modal status. In the discussion that follows, the more colloquial *have to* will usually be used over *must*, being equivalent to it in the relevant factors. Also, the usages of *will*, *would*, and *shall* that express pure tense or mood will be disregarded.

(27) a.	can	may	must	_	shall	will	need	dare	had better
	could	might	_	ought	should	would		(durst)	
b.	have to		be supposed to be to				get to		

Before some deeper analyses, an immediate inspection reveals core force-dynamic reference by the modals in their basic ('deontic') usage, as exemplified in (28). Thus, *can* in the context of *not*, as originally described in the introduction, indicates that the subject has a tendency toward the action expressed by the following verb, that some factor opposes that tendency, and that the latter is stronger, blocking the event. *May* in the context of *not* expresses this same force-dynamic configuration, but as limited to an interpersonal context, one where the main force factor is an individual's desire to perform the indicated action and the opposing factor is an authority's denied permission. While *may not* indicates an authority's *blockage* to the expression of the subject's tendency, *must* and *had better* in the context of *not* suggest an active social *pressure* acting against the subject to maintain him in place. *Should* and *ought*, similar in their effect, pit the speaker's values as to what is good and his beliefs as to what is beneficial against the contrary behavior of the subject. *Will/would not* indicate refusal by the subject to yield to external pressure to perform the expressed action. *Need* in the context of *not* indicates the release from the subject of a socially based obligation, imposed from outside against the subject's desires, to perform the indicated action. And *dare* opposes the subject's courage or nerve against external threat. In all of these indications of force opposition, the subject of the modal represents the Agonist, while the Antagonist is usually only implicit in the referent situation, without explicit mention.

(28) John can/may/must/should/ought/would/need/dare/had better not leave the house.

A notable semantic characteristic of the modals in their basic usage is that they mostly refer to an Agonist that is sentient and to an interaction that is psychosocial, rather than physical, as a quick review can show. Only *can (not)* and *will not* appear to have regular physical reference, as exemplified in (29a,b). *Must/have to* have limited physical usage as in (29d), primarily, I suspect, where the subject referent is confined to a minimal space.

(29) a. The knob wouldn't come off, no matter how hard I pulled.
b. The ball can't sail out of the ballpark with the new dome in place.
c. *The ball has to stay in the ballpark with the new dome in place.
d. An electron has to stay in a particular orbit around the nucleus.

Modals are involved in two further usages that do allow nonsentient subjects and so seem to contravene the idea of psychosocial reference. But these can be shown not to fault the main observation. The first of these usages is illustrated in (30).

(30) The cake can/may/must/should/need not/had better stay in the box.

The subject here is not really the Agonist of the situation. There is a real Agonist in the situation, and a sentient one, but it is not expressed. This Agonist acts as an Agent controlling as a Patient the item named by the subject. Thus, (30) can be identified as a distinct construction incorporating modals that allows the foregrounding of a Patient and the backgrounding of the sentient Agonist. An apt term for the process yielding this construction is **Agonist demotion**, and for the force element itself, the **demoted Agonist**. In particular, sentences with Agonist demotion, as in (30), are of the construction type represented in (3lb), but refer to a situation more accurately represented by the corresponding construction in (31a).

(31) *Agonist demotion*
a. Agonist (= Agent) MODAL make/let/have Patient VP ⌧
b. Patient MODAL VP

Thus, *The cake must stay in the box* can be more accurately paraphrased as *People/You must make/let/have the cake stay in the box*. The only modal not allowing this additional usage is *dare*: **The cake dare not stay in the box*, a fact that demonstrates that here a genuinely distinct and distinguishable construction is involved, one that each modal individually either does or does not participate in.

The second modal usage allowing nonsentient subjects is the epistemic, illustrated in (32).

(32) The pear could/may/must/should/needn't be ripe by now.

Involved here is the application of modality to the domain of our *reasoning* processes about various propositions, not to the semantic contents of those propositions themselves. It is true that the modals in their epistemic usage do not in fact apply to sentient entities in social interaction, but to beliefs within an inferential matrix. But this is a specialized usage referring to the same domain in every case, not an open-ended application to any nonsentient element.

It is especially significant for the present analysis that epistemic senses are associated with modals at all. Historically, the English modals acquired epistemic usage *after* their root (deontic) usage. Sweetser (1984) has adopted the present force-dynamic framework for root modal usage; she has argued that the original reference to psychosocial interaction extended diachronically to the semantic domain of inference and is represented there synchronically as a metaphoric extension. That is, she sees force-dynamic concepts as extending from interpersonal impingements to the impingements of arguments on each other or on the reasoner, constraining him toward certain conclusions. Thus, she has argued that the present force-dynamic analysis has still further explanatory power, able to account for the semantics of epistemics as well as that of modality.

7.1 The 'greater modal system'

In section 2.6, we noted that the verbs *make/let/have/help* form a syntactically definable category, on the basis of their taking a *to*-less infinitive complement, and that as a group they all have force-dynamic reference. In these respects, this group resembles that of the modals, which also take no *to* and have force-dynamic reference. Accordingly, these two categories together can be considered to form a single larger category, characterizable as the 'greater modal system,' with these same syntactic and semantic properties. The regular-verb members of this larger category all take the Antagonist as subject, while the modals all take the Agonist as subject, so that the two subcategories in this respect complement each other. Further evidence of analogizing between the two subcategories is that *help*, as in *I helped push the car*, may well be the only regular verb in English that can be directly followed by the bare form of another verb (without an intervening direct object NP), rendering it still closer to the syntactic properties of the modals. With the greater modal system, English appears to have established a syntactic category to correspond, in part, to the semantic category of force dynamics. Note the parallelism in (33).

(33) He can/may/must/should/would not/need not/dare not/had better
I made him/let him/had him/helped (him)
– push the car to the garage.

An analysis gains validation if it can link phenomena not previously connected. Such is the case with the present combining of two syntactic categories and their joint association with a semantic category. Such syntactic-semantic linkage is especially significant since it attests to linguistic integration. Previously treated cases of such integration are the association of adpositions with geometric schematization, as described in Herskovits (1986) and Talmy (2000, chapter I-3), and the association of conjunctions with relations between events, as discussed in Talmy (2000, chapters I-5 and I-6). And the present example of the greater modal system's correlation with force dynamics is a substantive addition.

7.2 Force-dynamic matrix combining modals and open-class lexical forms

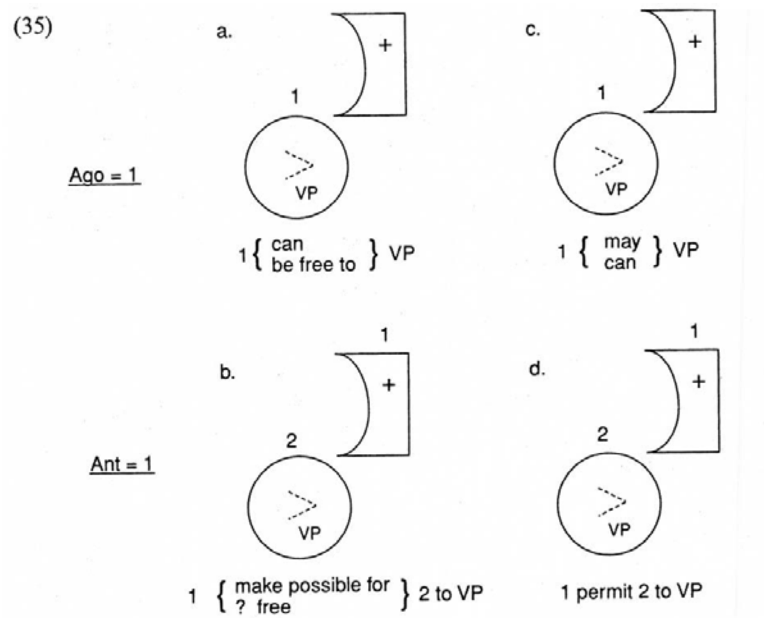
While modals are largely dedicated to the expression of force-dynamic concepts, especially of psychosocial character, they of course are not alone in this. Many of the notions they encode are expressed as well by open-class lexical forms, some of which have already been presented in this chapter. These two types of forms can complement each other in certain ways. The modals must take the Agonist as subject and offer no ready syntactic slot for the expression of the Antagonist, though this element is no less present in the total referent situation. A number of open-class verbs, on the other hand, do involve expression of the Antagonist, generally as subject, while expressing the Agonist as well, usually as direct object.

In characterizing the meanings of modals and their lexical compeers, one further factor needs to be added to the force-dynamic system. We have so far dealt with the Agonist's force tendency as an *abiding* property of that element. But this type of force tendency needs to be distinguished from one that is *contingent*. The latter type might be needed for physical force-dynamic reference to account for adventitious events, as suggested in (34a), although this is not clear. However, it is definitely needed for psychological force-dynamic reference to account for a sentient entity's *decisional* behavior, as indicated in (34b). Such contingent force tendency will be assumed to apply to much modal and related lexical reference, and will be indicated in the diagrams with a *dotted* marking of the force tendency.

(34) a. The ball can roll off the table (if it gets jostled).
b. Dad says that she may go to the playground (if she wants).

With this emendation, we can now apply the earlier diagramming conventions to represent the force-dynamic content of certain modals and related lexical forms. Shown first in (35) are secondary steady-state cases, where the Antagonist is out of the way of the Agonist. For simplicity, only the patterns with force tendency toward action are shown, though those with tendency toward rest are also possible. A parallelism is set up between forms with physical reference and ones with psychosocial reference, but the relative inadequacy of the physical in English, noted earlier for modals in general, appears here as well for open-class lexical forms, as seen in (35b).

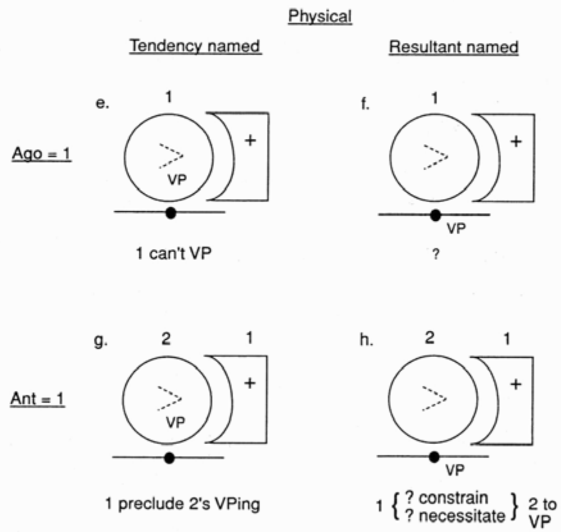
(35)

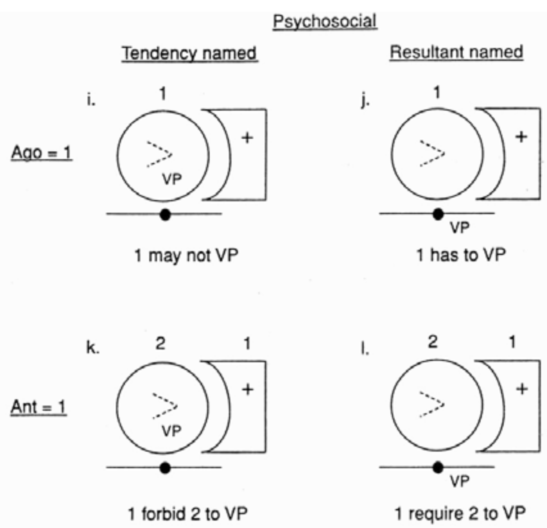


a. A flyball can sail out of this stadium.
b. The lack of a dome makes it possible for a flyball to sail out of this stadium.
c. You may go to the playground.
d. I permit you to go to the playground.

We can represent as in (36-diagram) the counterpart matrix, where the Antagonist now impinges on the Agonist. Since these patterns all have a stronger Antagonist, the Agonist's force tendency is now the opposite of the resultant. Accordingly, either the tendency or the resultant could be mentioned explicitly in alternative locutions, and the chart become doubled in size. Again, the patterns for the physical domain are poorly represented in English. The difficulty with the (36f) pattern was already discussed in connection with (29). The issue for the (36g,h) patterns is that any locution representing them must preserve the notion of the force tendency's 'contingency.' *Preclude* does this for (36g) but is not a common vocabulary item, whereas even that much is not available for (36h), since *constrain/necessitate* do not fully provide the needed meaning. It won't do to use *prevent* for (36g) and *make* for (36h) – as in *The dome prevented flyballs from sailing out of the stadium* or *The dome made flyballs stay in the stadium* – because, especially in past tense usage, these forms presuppose that the Agonist has in fact exerted force against the Antagonist which is not the idea of contingency present in the other forms. By contrast, the patterns with psychosocial reference, both in (36) and in (35) are fully captured by modals and common lexical forms, the latter including such verbs as *permit*, *forbid*, and *require*.

(36)





(36-examples)

e. A flyball can't sail out of this stadium.
f. [*A flyball has to stay in this stadium.]
g. The dome precludes a flyball from sailing out of the stadium.
h. The dome ?constrains/?necessitates a flyball to stay in the stadium.
i. You may not leave the house.
j. You have to stay in the house.
k. I forbid you to leave the house.
l. I require you to stay in the house.

(36-examples)

e. A flyball can't sail out of this stadium.
f. [*A flyball has to stay in this stadium.]
g. The dome precludes a flyball from sailing out of the stadium.
h. The dome ?constrains/?necessitates a flyball to stay in the stadium.
i. You may not leave the house.
j. You have to stay in the house.
k. I forbid you to leave the house.
l. I require you to stay in the house.

7.3 The force dynamics of 'should'

Given the analysis to this point, we are in a position to inspect some particular modals in greater depth for what their semantic organization reveals about force dynamics. *Should* is a good form to treat in this way because a strong sense of force opposition is part of its immediate semantic impact. Sample sentences to consider while examining its semantics are, say, those in (37). I analyze the general form of the *should* construction as shown in (38), and its semantic components as shown in (39). Here, E and E' stand for sentient entities, and VP for an action the E can perform volitionally.[9]

(37) a. She should lock her doors when she goes out.
b. He should spend more time with his children.

(38) E' holds that E should VP.

(39) a. E does not VP or has not VPed.
b. In E's belief system, E's VPing would benefit E or others.
c. In E''s value system, E would be a better person if she or he VPed.
d. Because of (b – c), E' wants E to VP.

Explanation is needed for the presence of (38)'s first three word: Whether expressed or not, there is always some entity within *should*'s total reference that holds the implied beliefs and values noted. Usually, this entity is 'I,' the speaker, or alternatively perhaps, some conception of generalized societal authority. When this is the case, (38)'s initial phrase can be omitted from explicit expression, yielding the commonest overt form, bare *should* clauses of the kind seen in (37). But the evaluating entity must be named if it is not 'I/society', and it *can* be named even if it is, as in sentences like those of (40).

(40) a. (I think) she should lock her doors when she goes out.
b. Do you think he should spend more time with his children?
c. He feels I should return the lost money.

Note that of the semantic components in (39), (a) to (c) by themselves do not capture the force-dynamic import of *should*. Their contribution can be captured by a sentence like (41), corresponding to (37a).

(41) I think that she would be benefited and would be a better person if she locked her doors when she goes out.

But such a formulation lacks the force impact of the original *should* sentence. It is the component in (39d) that adds the crucial factor, rendering E' into an Antagonist that in effect exerts pressure on E as an Agonist.

The *should* construction has several further noteworthy semantic properties, pertaining to the relationship between its two sentient entities. In one type of relationship, E"s opinion is known to E. This must be the case where the subject of *should* is I or you – for example, in such Antagonist-Agonist pairings as I-you/he-you/you-I/he-I, as in *(I think) you should leave*. Here, in addition to the four factors in (39), a *should* sentence further implies that (e) E (the Agonist) wishes not to VP, and that (f) E experiences direct social pressure from E' (the Antagonist) counter to this wish. That is, the psyche of the Agonist is the experiential arena for force-dynamic opposition, the Antagonist's wishes against his own.

Where the E' and the E are the same person, as in sentences like *(I think) I should leave* and *He thinks he should leave*, the force opposition is introjected into the self. As earlier, the self is then conceived as divided, with a central part representing the inner desires and a peripheral part representing the self's sense of responsibility.

There remains the peculiar circumstance in which E does not know of E"s opinion, as in (37a,b). There is here *still* a sense of force impingement, and its character wants specifying. Clearly E cannot be an arena of opposing forces since he is aware only of his own wishes and behavior. Only E' can be experiencing FD opposition, and its character is novel here. It pits E"s desires against an actuality that does not accord with those desires. Until now, we have seen oppositions only between forces of the same kind within the same conceptual domain, whether the physical, the psychological, or the interpersonal. Here, however, forces of two different domains are nevertheless conceived as clashing. Given that the *should* construction has a single syntactic form, language here is clearly not distinguishing between these rather different semantic situations, the same-domain and the cross-domain cases.

Consider a different example of the same phenomenon. A sentence like (42a) is fully interpretable as a same-domain interpersonal Antagonist-Agonist interaction, as described in section 6: John relents under socio-psychological pressure. But the lizard in sentence (42b) knows nothing of outside social expectation and certainly has done no relenting. It has simply moved at its own wish. The *finally* pertains, instead, to a cross-domain clash between actuality and the speaker's desires. Specifically, the speaker had wanted the lizard to move; this wish was frustrated and built up in tension until finally relieved by the occurrence of the lizard's motion.

(42) a. John finally agreed.
b. The lizard finally moved.

7.4 The force dynamics of 'have to'

Offering further insights into force-dynamic properties is another modal, *must*, or its regular surrogate *have to*, as exemplified in (43). The sentences here are on a semantic continuum. In (43a), there is an implicit sentient external authority that wants the boy to act in the way stated and that threatens to produce consequences unpleasant for him if he does not. In (43b), there is an implicit external authority that threatens consequences, but it is unaware of the fugitive's stated actions and would not want them if it were so aware. In (43c), there is no external authority at all, merely worldly exigencies.

(43) a. The boy had to stay in and do his homework (or else get punished).
b. The fugitive had to stay in hiding (or risk capture).
c. I had to get to the bank before 3:00 (or have no cash for the evening).

To capture the basic complex of meaning components present in such uses of *have to*, one might initially come up with the analysis presented in (44).

(44) a. E wants not to VP
b. Not VPing has consequences that E wants even less (the 'or else' constituent)
c. E opts to VP as the lesser displeasure
d. Some E' wants E to VP, and would initiate the unpleasant consequences of E's not VPing

The analysis in (44) is formulated largely in terms of an intrapsychological decision process, involving the weighing of two displeasures within the single psyche of the entity named in the subject. Some process of this sort, however conscious or unconscious, may in psychological actuality be what underlies a conceptualization of such a situation. If (44) sufficed, we would be able to paraphrase, say, (43b) as in (45).

(45) The fugitive chose the lesser displeasure of hiding over the greater displeasure of getting caught.

But this is clearly inadequate to the *have to* sentence in (43b), which suggests little deciding and a sense of externally imposed pressure. How must (44) be altered to render the right semantic result? A specific series of factors is involved in the reconceptualization.

The first thing to notice about the semantics of the sentences in (43) is that there is little sense of *internal* psychological disparity. Rather, there is a sense of opposition between the self and the outside. In particular, that component of the self that sought to avoid the greater displeasure of a threatening consequence here recedes into the background. Its capacity to bring about an undesired action that is nevertheless the lesser of two displeasures is ascribed instead to an outside entity, to which is thereby attributed the power to coerce. This outside entity is the actual entity where one is present; otherwise, it is an abstract fictive one that is imputed to the situation.

There thus emerges in the *have to* situation an *authority*, whether manifest or virtual. Further, in the place of a psychological process that is force neutral, there is now an authority that acts as an Antagonist exerting pressure on the self as an Agonist.

In this reconceptualization, the fact that the effect of one component in the psyche is attributed to an outside entity can be regarded as a form of psychological *projection*. In this respect, *have to* involves a conception opposite to that in, for example, *refrain* as treated in section 4.1. There, an originally external social pressure is *introjected* to form an additional component within the psyche. Accordingly, where the conceptual organization of language was previously seen to include a concept of the divided self, in which the psyche has componential structure, here we see as well the concept of a psychological *black box*, in which the self is without internal differentiation. That is, linguistic structure can also frame the concept of the psyche as a black box, one whose inner structure and processes are unknown and that is considered only as to its interactions as a unit with outside units.

In sum, the reconceptualization in the semantically corrected description of *have to* involves a shift from an internal division to a self-other distinction, from an autonomous decision process to a concept of an external authority, even if fictive, and from a force-neutral selection process to a force-dynamic coercive pressure. Further, it demonstrates that linguistic structure encompasses the concept not only of introjection resulting in a divided self, but also of projection resulting in a psychological black box.

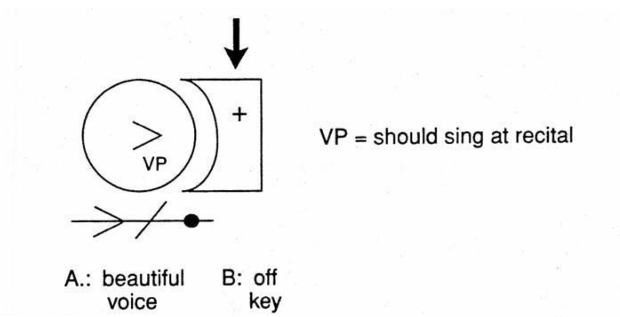
To characterize the findings of the present section, we have seen that there is a syntactically definable category – conservatively, the modals proper, liberally, the 'greater modal system' – that as a whole is dedicated to the expression of force-dynamic concepts. Some of the modals pattern together with each other and with open-class lexical items in semantically structured matrices. And some of the modals exhibit quite complex force-dynamic configurations that bring to light a number of additional semantic factors, ones that in turn shed light on how certain conceptual models of the psyche and of the world are embedded in semantic organization.

8 Force dynamics in discourse: argumentation and expectation

Force dynamics functions extensively in the domain of discourse, and preeminently so in the process of *argumentation*. This is the rhetoric of persuasion and includes efforts to exhort, to convince, and to logically demonstrate. The process involves the deployment of points to argue for and against conflicting positions. In a force-dynamic understanding of 'argument space,' each such point can in turn oppose or reinforce another point and overcome or be overcome by it; each successive resultant of these encounters can move the current argument state closer to or further from one of the opposing conclusions.

Crucial to this process, and specialized for it, is a particular class of closed-class expressions and constructions, present in some number in every language. As a class, these forms can be designated as force-dynamic **logic gaters**. Taken together through a portion of discourse, such forms can be seen to perform these functions: to limn out the rhetorical framework, to direct the illocutionary flow, and to specify the logical tissue. Included in the set of logic gaters for English are such forms as *yes but*, *besides*, *nevertheless*, *moreover*, *granted*, *instead*, *all the more so*, *whereas*, *on the contrary*, *after all*, *even so*, *okay*, and *well* (intoned as well with the meaning 'I grudgingly concede your point, though with a proviso'). To illustrate, the argumentational meaning of *yes but* can be characterized as: 'Your last point, arguing toward a particular conclusion, is true as far as it goes, but there is a more important issue at stake, one leading toward the opposite conclusion, and so the point I now make with this issue supersedes yours'. In the constructed example in (46), B's *yes but* thus acknowledges the truth of vocal beauty and of the force-dynamic push of that toward public performance, but then blocks that push with the point about tunefulness, presented as more important.

(46) a. You know, I think Eric should sing at a recital – he has a beautiful voice.
b. Yes, but he can't stay on key

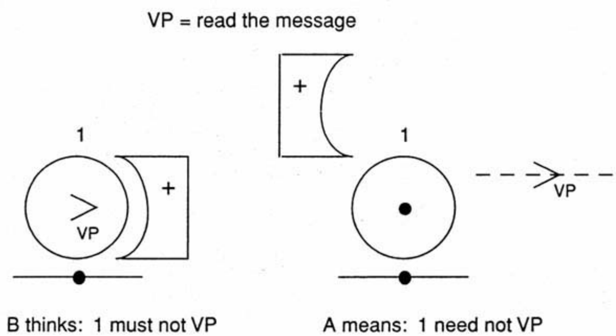


Other instances of argumentational meaning are *moreover* 'The point I am now making reinforces the preceding one in arguing toward the same overall conclusion', and *granted* 'Despite my prior objection, I concede that your last point refutes part of my total argument, but the remainder of my argument still holds and still prevails over your total argument'. In the meaning of *granted*, note the cluster of force-dynamic operations involved: 'despite', 'concede', 'refute', 'prevail'. The force-dynamic argumentation system is more extensive and important than can be described here, but future expositions are planned.

In addition to argumentation, force dynamics operates in other discourse functions, for example that of *discourse expectation*. This includes the moment-to-moment expectations of participants in a discourse as to the direction and content of succeeding turns. One type of discourse expectation – immediately recognizable to all but apparently without prior linguistic treatment – I will call **vector reversal**. It is the discourse situation in which the overtly observable resultant is agreed on, but one participant discovers that he has had one set of assumptions about the underlying direction of implication, while his interlocutor has had a converse set. Such an arrangement of semantic factors is immediately amenable to a force-dynamic analysis, and two examples are represented diagrammatically here.

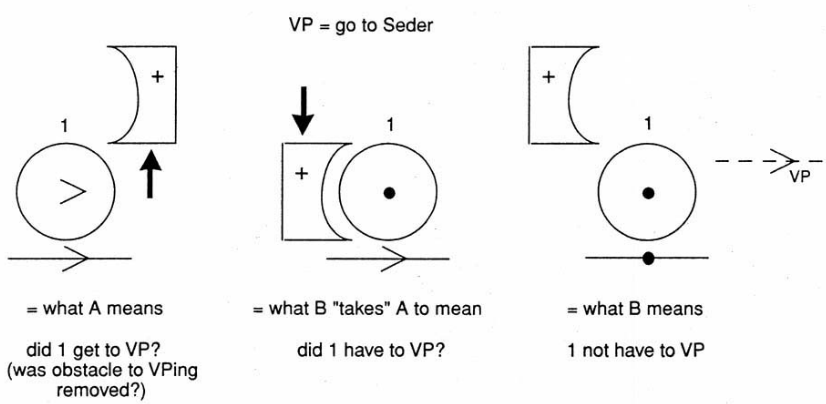
The first example, in (47), is an interchange taken from our campus e-mail system. Here, person B has interpreted a message in terms of a blockage, intended to prevent outsiders from performing an action they would want to (namely, read the message). Person A corrects this misimpression by noting that his assumption was that others would not want to perform that action and that he was sparing them the trouble. In the diagram, the dashed resultant line is a shorthand to indicate the action not undertaken, used here to avoid a diagram strip

(47) A titles message: "For Chinese students only."
B protests that it is exclusionary.
A responds that the intent was: "Others need not bother to look."



Example (48), an overheard interchange, is more complex. It includes one interlocutor's use of disingenuousness for the purpose of humor. Note again that for the two examples, the resultant of action is the same under both interlocutors' interpretations; all that differs is their understanding of the underlying force vectors operative in the social situations. (A 'Seder': a sometimes-trying family Passover ceremony.)

(48) A: Did you get invited to a Seder this year?
B: No. I was spared.



9 Conceptual models of physics and psychology implicit in linguistic force dynamics

As our analysis of the linguistic force-dynamic system has revealed, conceptual models of certain physical and psychological phenomena are built into the semantic structure of language. These conceptual models can be compared with ones found in a cognitive system that I posit as existing apart from language, the **understanding system**. This putative understanding system generates mental models that one experiences as accounting for or explaining the structure and function of some domain of phenomena – at any level of consistency, elaboration, or sophistication, from idiosyncratic personal accounts, to folk cultural accounts, to scientific theories. The understanding system, thus, would underlie both our untutored 'commonsense' conceptions, and the sophisticated reasoning providing the basis for the scientific and mathematical tradition. Now, it appears on the whole that the conceptual models within linguistic organization have a striking similarity to those evident in our naive world conceptions, as well as to historically earlier scientific models. These same basic conceptual structures are even much in evidence within contemporary science when it engages in casual thinking or expression. As to where a greater disparity can be found, however, these basic conceptual structures often diverge substantially from the fully rigorous conceptions of contemporary science.

Research to ascertain conceptual structure has a long tradition and has recently become an active agenda. Within linguistics, Whorf's (1956) work was among the earlier contributions, while more recent work has included that of Talmy (1978b, 1987), Jackendoff (1983), Langacker (1987), and Lakoff (1987), the last particularly with his idea of linguistic 'ICM's': integrated cognitive models. Within other disciplines of cognitive science, recent work includes that of Gentner and Stevens (1982), who work within the framework of 'mental models' using protocols from subjects asked about their conceptions of everyday phenomena, Hayes (1985), with a formal approach to 'naive physics,' and Hobbs and Moore (1985), working toward a theory of common sense within an artificial intelligence approach. The work of diSessa (1986, 1993, 1996) on 'intuitive physics,' also using protocols and abstracting the 'phenomenological primitives' that individuals use in understanding physical situations, has shown striking parallels with the analyses of the present chapter.

The present findings in linguistic force dynamics can make a substantial contribution to this line of research. The concepts uncovered here offer insight into naive thought and provide a ready contrast with rigorous scientific thought. I now treat certain force-dynamic concepts in this respect, considering first ones with physical reference, and then ones with psychological reference.

9.1 Force dynamics and physics

Consider the following force-dynamic concepts with physical reference.

9.1.1 *Conception of privilege, tendency, stationariness, and strength*

In force dynamics, the 'Agonist' concept confers on one object in an interaction a privileged status and special characteristics not shared by its opposite, the 'Antagonist,' even where these two are otherwise equivalent. While this imparity is so natural in language-based conceptualizing, it has no counterpart in physical theory. There, equivalent objects have the same properties: there is no physical principle for differentiating equivalent objects according to 'privilege.'

Further, in terms of the cognitive structure of language, an object in a given situation is conceptualized as having an intrinsic force tendency, either toward action or toward rest. This concept appears to correlate with historically earlier scientific theories involving an object's impetus in motion or a tendency to come to rest. The concept, however, is at considerable variance with modem physics. Objects have no internal impulsion toward some state of activity but, rather, continue at their current velocity unless externally affected. Moreover, stationariness is not a distinct state set apart from motion, but is simply zero velocity.

Next consider the linguistic force-dynamic concept of greater relative strength, represented in our diagrams with a plus sign. In one application of this conception, a stronger Antagonist is required so as to be able to block an Agonist with tendency toward motion and to hold it stationary in place. So natural is this linguistic, and perhaps also commonsense, conception that it may have escaped special attention during our exposition. Yet, it is at variance with one of the more familiar principles of physics, that two interacting objects – including two objects in contact at zero velocity – must be exerting *equal* force against each other. If one of the objects exerted a stronger force while in contact with the other object, the pair of objects would accelerate in the direction of the force.

9.1.2 *Conception of causality*

Another property of force-dynamic and related semantic patterns is that they comprise a severely limited selection from the causal actualities of referent situations. Two forms of this schematic reduction can be cited. First, the grammatical, constructional, and to some extent lexical structure of language presents an extremely simple representation of causality, one that marks few distinctions and lumps together ranges of diversity. This representation abstracts away, for example, from particularities of rate, scope of involvement, manner of spread, and the like. The disregard of such particularities is illustrated by the sentences in (49). The manner of breaking caused by heat, in (49a), would involve slow and gradual warping, spread of a tracework of cracks, and the like. On the other hand, that caused by a falling heavy object, in (49b), would involve sudden localized disruption. Though these situations involve very different causal particulars, they are treated together by a common grammatical structure and lexical item. Here, and generally, the kind of simplified schema in which linguistic constructions represent causation is a tripartite structure: a static prior state, a discrete state transition, and a static subsequent state. Linguistic structures, in effect, 'chunk' the complexities and continuities of occurrence into this simplified schema and, in this, may well parallel conceptual patterns of naive physics. In scientific physics, by contrast, causation involves a continuum of interactions occurring at the finest scale of magnitude: there is no operative physical principle of 'chunking.'

(49) a. The heat broke the guitar.
b. A falling radio broke the guitar.

In a second form of schematic reduction to which language subjects causality, an 'event' – that is, a portion conceptually partitioned out of the continuum of occurrence – can be represented as existing outside of causality altogether. Regular linguistic constructions, like those in (50a), can thus present an event as autonomous, without causal precursor or consequence, and without causal process during its occurrence. In such formulations, causality may be inferred, but it falls outside the represented scope or depth of attention. The length to which language can carry this perspective is evident in (50b). The sentence here can have no other interpretation than one in which an agent has physically searched through objects and then espied a missing item, yet that item is depicted as emerging into visibility on its own.

(50) a. The book toppled off the shelf. / The ball sailed through the window.
b. My cufflink finally turned up at the bottom of the clotheshamper.

With respect to the linguistic representation of causality seen in this section, the extrinsic partitioning (chunking), isolating, and decausativizing that language can conceptually impose on the stream of occurrence is in direct contrast with the perspective of physics, in which everything is an unbroken causal continuum.

9.1.3 Conception of blocking, letting, resistance, and overcoming

Significantly, some of the most basic force-dynamic concepts – blocking and letting, resistance and overcoming – have no principled counterpart in physics. For their viability, these concepts depend on the ascription of entityhood to a conceptually delimited portion of the spatiotemporal continuum, and on the notion of an entity's having an intrinsic tendency toward motion or rest. For example, the plug in a tank of water can be seen as 'blocking' flow, and its removal as 'permitting' flow, only if one conceptualizes the water as a unified entity with tendency toward motion, the space below the plug as an entity that the water has the potential to occupy, and the plug as a unitary entity in between. These concepts of blocking and letting vanish, however, under physics' fine-structural perspective of individual particles and forces in local interaction.

The same can be demonstrated for the concepts of resistance and overcoming. Consider the following examples. The quotation in (51a) is taken from a *Scientific American* article on primitive evolutionary processes at the molecular level, and that in (51b) was noted down from a chemist speaking.

(51) a. 'The variant [molecule] that is resistant to this degradation folds in a way that protects the site at which the cleavage would take place.'
b. 'To get the molecule to react, you have to add energy to overcome its resistance.'

Both are examples of scientific discourse that frames its concepts in the very same force-dynamic terms that we have found built into language. But these terms can here be only a convenience for conceptualization: they have no operation in physical systems. Thus, for (5la), it is we as thinkers that select a set of atoms with certain linkages between them (notions that can in turn be seen as constructs) for consideration together as a unitized concept, a molecule. There is no actual physical property of 'entityhood' inhering in this set of atoms such that – as (51 a) describes it – the set marshals itself as a unit to 'resist' another such unit, or such that a particular spatial configuration constitutes 'protection,' or such that a separation between the atoms would constitute 'degradation.' All that can actually happen is the occurrence or nonoccurrence of a shift of linkages following on a juxtaposition of certain atoms with certain other atoms.[10]

9.2 Force dynamics and psychology

Consider the following force-dynamic concepts with psychological reference.

9.2.1 Physicalizing the psyche and animating the body

Turning now to how language structures conceptions about the mind as a form of 'naive psychology,' the main factor to note is that language largely extends its concepts of physical force interaction to behavior within the psyche and between psyches. That is, it largely *physicalizes* the psychosocial domain of reference. This phenomenon was treated at length in sections 4 and 6, which described conceptualizations like psychological desire as a force tendency, components of the psyche in force-dynamic opposition, and the social pressure of one psyche on another. To that discussion, we can here add the evidence seen in (52).

(52)	*Intransitive*	*Transitive*
Physical	a. The drunk sailed out of the bar.	b. They threw the drunk out of the bar.
Volitional	c. The drunk went out of the bar.	d. They sent the drunk out of the bar.

The forms in (52a) and (52b), where the Patient is involved in purely physical interaction, are intransitive for the autonomous motion event and transitive for the direct causative motion event, respectively. But syntactically parallel to these are the forms in (52c) and (52d) with volitional Patient. Now, there is no a priori reason why a self-agentive event, like that in (52c), should be expressed in the same syntactic form as an autonomous event. Yet, this is regularly the case in English and most other languages. Other constructions for the self-agentive do exist, ones that more closely reflect the underlying semantics – for example, the two-argument reflexive form *She dragged herself to work*. But the preponderant type of construction is the single-argument one, as in *She trudged to work*. Comparably, the complex psychosocial semantic situation of (52d), where one agent communicatively directs another to undertake volitional action, is framed syntactically like an event of direct physical causation, such as that in (52b). These syntactic parallelisms that language imposes reflect a conceptual analogy. The component of sentient volition can be treated as if it had no characteristics beyond physical ones. Thus, the contribution of volition in (52d) as an intermediary force-dynamic factor can be conceptually backgrounded, so that the Patient is regarded as propelled forth much as if physically moved.

A complementary conceptualization was also seen to be represented in language structure. Under this conceptualization, the physical body of a sentient entity, unlike other physical objects, is typically treated as a weaker Agonist or as force-dynamically neutral. It is the entity's psyche that must animate this body for it to exhibit stronger, or any, force-dynamic properties. Thus, while the preceding conceptualization physicalized the mind, the present one psychologizes the body.

9.2.2 Introjection and a divided self; projection and a unitary self as black box

Another feature of the linguistic model of psychology is that the self can be divided into separate components. This conceptualization was earlier treated at length for the situation in which the two components exert a force opposition against each other. One case of this was where the component with desires is treated as more central and the component opposing those desires is treated as more peripheral, and presumably as introjected from external social precepts. The former is syntactically realized as the reflexive direct object representing Patient status, while the latter is the Agent subject. That is, there is grammaticalization of the conception as to which psychological component does the affecting and which is affected. Consider the parallel between these concepts and Freud's notions of id and superego. The id is a deep component of the self that includes basic desires, the superego arises as an internalization of socially derived values, and the two are in conflict. Thus, there is an analogy between the Freudian id-superego conflict and the divided-self grammatical pattern. These Freudian concepts may in part have arisen as a theoretization of concepts already built into the semantic and syntactic organization of language (as well as perhaps into everyday mental models). In effect, thus, the Freudian model of an id-superego conflict can be virtually read off from the semantic and syntactic pattern of a sentence like *I held myself back from responding*.

Linguistic representations of the divided-self conception also occur that do not involve force opposition. Thus, as contrasted with (53a), which represents the self as a unitary entity, in (53b) the self is conceptualized as encompassing two parts, one acting as if in the role of host and the other as if in the role of guest. These internal roles are introjected from the two distinct social roles of the dyadic situation normally referred to by *serve*, which is illustrated in (53c). (See the discussion of dyadic and monadic 'personation' types in Talmy, 2000, chapter II-1.)

(53) a. I went and got some dessert from the kitchen.
b. I served myself some dessert from the kitchen.
c. I served her/She served me some dessert from the kitchen.

Language structure also includes a conceptualization complementary to that of an external notion becoming introjected as a new component of the self in conflict with an original component of the self. In this complement, which is exhibited by modals like have to, an already-present component of the self that is in conflict with another self component is projected onto an external entity. This process removes the conflict from inside the psyche, which is then treated as a unitary black box, while the entity that receives the projection takes on the conflicting role with the psyche as a whole.[11]

10 Further research

In a way, it is remarkable that the semantic category of force dynamics had escaped notice until the present line of work, given the attention to concepts of force outside linguistics as well as their pervasiveness within language. Once recognized, however, it is widely evident, and in fact must be acknowledged as one of the preeminent conceptual organizing categories in language. Thus, we have here seen that the linguistic force-dynamic system operates in a common way over the physical, psychological, social, inferential, discourse, and mental-model domains of reference and conception. As a system, force dynamics warrants much additional investigation, and I now suggest several lines of further research.

10.1 Parameters of the force-dynamic system

While a number of parameters of the force-dynamic system have been presented during the exposition, still further distinctions appear to play a role. In (54) many of the distinctions we noted are summarized, and the final five name additional possibilities (discussed below).

(54) A force (or force-bearing object) is –

a.	present	absent	i.e., a force-dynamic vs. a neutral situation
b.	focal	peripheral	i.e., Agonist vs. Antagonist
c.	stronger	weaker	i.e., realized or overcome
d.	toward action	toward rest	in its tendency
e.	action-yielding	rest-yielding	in the resultant

f.	steady-state	shifting	in pattern of impingement
g.	balance-maintaining	balance-switching	in the Agonist's and Antagonist's relative strengths
h.	impinging	nonimpinging	
i.	foregrounded	backgrounded	-as expressed by alternative constructions
j.	generic	particularized	-as expressed by specific constructions
k.	abiding	contingent	
l.	physical	psychological	
m.	in a different object from its opposite	in the same object with its opposite	-as for the divided self
n.	same-domain	cross-domain	in relation to its opposition
o.	simplex	concatenated	
p.	localized	distributed	
q.	pushing	pulling	
r.	contact-effective	distance-effective	
s.	compressing	stretching	
t.	uniform	changing (gradient/discrete)	

Of the new parameters in this list, the first, (54p), pertains to whether a force-exerting entity is localized or distributed with respect to space and force. The examples in the exposition mostly featured entities conceptualized as spatially localized and as manifesting their force at a single locus – for example, the log as Agonist and the ridge as Antagonist in (3d). But some of the examples had a spatially distributed Antagonist with a distributed delivery of its force. Thus, the 'stiff grass' of (3c) that the ball as Agonist encounters as it rolls along is an Antagonist that manifests the effect of its oppositional force distributively. Likewise in (3b), it is distributively successive portions of the 'wind' as Antagonist that impinge on the immovable shed as Agonist.

Next, parameter (54q) distinguishes the predominant pushing form of force exertion, the only type considered in this chapter, from the pulling form, which is evident in locutions like *pull (on)*, *draw*, *attract*. The basis for the distinction between pushing and pulling can be characterized fairly straightforwardly. It depends on whether the main portion of the Antagonist exerts its force toward (pushing) or away from (pulling) the main portion of the Agonist. In this formulation and in the one below, the notion 'main portion' can generally be replaced by an appropriate notion of 'geometric center.' For example, with my hand taken as the Antagonist and a mug as the Agonist, if my open hand presses against the back of the mug causing it to slide forward, I am 'pushing' the mug (*I pushed the mug along*) because the main portion of my hand exerts its force toward the main portion of the mug. But if I cause the mug to slide forward by hooking one finger through its handle and retracting my hand, I am 'pulling' the mug (*I pulled the mug along*) because the main portion of my hand is now exerting its force away from the main portion of the mug. True, a lesser portion of my hand, a finger, exerts force *toward* a lesser portion of the mug, its handle, but the 'main portion' stipulation within the above formulation correctly ensures the 'pulling' interpretation. The formulation holds as well for a static situation as for a dynamic one. Thus, if the mug were stuck fast to the surface underneath, the basis for distinguishing between 'pushing' and 'pulling' remains the same, though English now requires the insertion of an *on*, as in *I pushed/pulled on the mug*. In an alternative formulation that is based on spatial relations rather than on force vectors, the distinction depends on whether the main portion of the Antagonist is behind (pushing) or ahead of (pulling) the main portion of the Agonist along the line of motion. But this formulation only applies to dynamic situations and, to extend to static situations, would need to add the following phrase: 'that would occur if the Antagonist caused the Agonist to move.'

Now, in some situations, what constitutes the Antagonist or the Agonist, and hence what its main portion is – or, where its geometric center is located – is open to alternatives of construal. Accordingly, such situations permit alternatives of conceptualization as to whether the Agonist is being pushed or pulled. For example, say that I am seated with forearm resting on a table and extended away from my body, but with my hand bent back and, by pivoting at the wrist, sliding a paperweight toward my body. If the Antagonist here is treated as consisting of just my hand, whose center is behind the paperweight in its path of motion, then the concept of 'pushing' applies, and I can say *I pushed the paperweight toward myself*. But if the Antagonist is construed as consisting of my whole arm, whose center is now ahead of the paperweight in its path of motion, then the concept of 'pulling' applies, and I can now say *I pulled the paperweight toward myself*.

Note that, although often thought so at first, any direction of motion that an Antagonist and Agonist manifest away from or toward an Agent's body is not a principal determinant of the 'push/pull' distinction. This fact is demonstrated by the paperweight example, as well as by examples like *I pushed the two paperweights together* / *I pulled the two paperweights apart*, in referring to a situation in which I move both hands along a left-right line in front of me.

The next parameter, (54r), concerns whether the force of a force-bearing object can manifest its effect only through direct impingement of that object with its opposite, or can also do so at a distance. In the physical realm, only the type requiring direct contact has been considered so far. This includes the actions of pushing and pulling just discussed for parameter (54q). But as represented by the present parameter, we can also have concepts of actions analogous to pushing and pulling, except for working at a distance, without immediate contact. These are the concepts of repulsion and attraction (as with magnets). It is not clear whether social, or interpsychological, force dynamics is construed as involving direct impingement or action at a distance. Perhaps under one conceptualization the sphere of one psyche can be conceived as abutting on the sphere of another's psyche in 'psychological space.' But surely the conceptualization in terms of psychological action at a distance – as with affective repulsion and attraction – is also available.

Parameter (54s) concerns whether the force exerted by an Antagonist on an Agonist results in the compression or the stretching of either object. Note that although compression of the Agonist is commonly associated with pushing and stretching with pulling, the present parameter is fully independent of parameter (54q). For example, one can compress a spring by either pushing or pulling on its free end, depending on where one stands in relation to it – say, behind its free end pushing it away from oneself, or in front of its anchored end, pulling the free end toward oneself. The same is true for stretching the spring.

The present parameter, however, does interact with parameter (54p). In the earlier discussion of that parameter, the quality of being distributed, as against localized, was seen able to apply to an Antagonist. Now, we can see that this quality can also apply to an Agonist. For an Agonist that undergoes compression or stretching, as in the referents of *I squeezed the rubber ball* or *I stretched the spring*, is not conceptualized as a simplex locus of resistance to the force of the Antagonist, but rather as a region over which the resistive force is cumulatively distributed.

Finally, parameter (54t) distinguishes the strength of the force exerted by an Agonist or by an Antagonist when it is uniform from when it is changing, where this change can be either gradient or discrete. Most of the examples in the text – for both the steady-state and the shifting force-dynamic patterns – assumed that the force exerted by an Agonist or an Antagonist when the two entities are in impingement is of a particular and constant strength. But we can cite here a form of force change of the gradient kind, the 'rubber band' type, in which the further an Agonist or Antagonist is removed from its home position, the greater its resistance or force toward return. Thus, both the Agonist spring and my Antagonist hand in the sentence *The further I stretched the spring, the harder I had to pull* increase the strength of their force exertion along a gradient.

One type of force-dynamic pattern already presented – the one involving a shift in the balance of strength between an Agonist and an Antagonist, exemplified for *overcome* in section 2.2.2 – does involve a change in an entity's degree of force. And, in fact, this change could be either gradual or a discrete jump. But, as the preceding 'spring' example shows, a change of strength can occur without tipping the balance as to which entity prevails. Hence, parameter (g), which pertains solely to such a tipping of the balance, must be listed separately from the present parameter pertaining to strength shift alone.

It is clear that additional work on linguistic force dynamics will yield still further parameters, as well as an amplified system within which the new parameters interrelate.

10.2 The prototype of force dynamics

Another line of research concerns the constraints that limit the linguistic force-dynamic system. The preceding parameters outline the system's degrees of freedom, but we can identify a number of options that the system does not exhibit, or exhibits only minimally, as indicated in (55).

(55) As encoded in language, force interactions preponderantly or exclusively involve

a. two forces
– not one, and not three or more

b. two forces opposing each other 180° head on
– not coming at each other at some other angle so as to yield a resultant off in a new direction

c. two forces opposing each other
– not acting in concert in the same direction (In-concert forms like *buttress*/*urge on*/*moreover* are few.)

d. a stronger force overcoming a weaker one
– not two equal forces in balance against each other

e. a force acting along a straight line
– not along a curved line

f. a force acting straightforwardly along a line
– not concentrically outward or inward
(Closed-class forms able to refer to concentric force do exist, like the Latin verb prefix *con-* as in the precursors of English *confine*/*contain*, but they are rare.)

g. a constant force tendency in the Agonist
– not one that varies

h. a two-valued force tendency in the Agonist, toward either action or rest
– not one of multiple or continuous value

i. a two-valued resultant state in the Agonist, either action or rest
– not one of multiple or continuous value

An explanatory account can be provided for this pattern of what is included and what is excluded in the linguistic force-dynamic system. The included factors are basically the ones consistent with a particular conceptual prototype of force interaction, that characterized in (56). It is deviations from this prototype that have minimal linguistic representation. The prototype itself, moreover, may turn out to be a significant conceptual template, playing a role both in cognitive development and in general conceptual organization.

(56) A stronger force opposing a weaker force head on, with all-or-none conditions

10.3 Force dynamics among other schematic systems

An additional line of research involves further explication of how the force-dynamic system relates to other semantic categories in language. Some progress has already been made here. I have so far identified in language at least four 'schematic systems' for organizing a referent scene or the speech-event scene, each to some extent independent of the others (see Talmy, 2000, chapter I-1). The first schematic system is that of 'configurational structure,' by which certain sentence elements specify for a scene a particular spatial and temporal structure. The second schematic system is 'location of perspective point': given the specification of a structural framework for a scene, linguistic elements can direct that one imagistically view this framework from a particular perspective point, one that is fixed at a certain location or moving in a particular way over time. The third schematic system is 'distribution of attention': given a structured schema viewed from a particular vantage point, linguistic expression can specify that one direct greatest attention to a particular selection of elements within the configuration. And, finally, force dynamics is a fourth schematic system: to the preceding basically pictorial complex, one now adds the forces that the elements of the structural framework exert on each other. While the first three schematic systems relate most directly to our system of visual perception, force dynamics relates most to the kinesthetic system. For this reason, in fact, the addition of force-dynamic considerations to many research agendas can serve to counterbalance a general bias toward the use of vision-based models in theoretical formulations. The linguistic task that remains here is to integrate these four and still further schematic systems into a unified account of conceptual structure in language.

10.4 Language among other cognitive systems

Finally, we will need to explore further the relationships between the conceptual structuring in language and that in other cognitive domains. We have here seen how force dynamics pertains to this issue. The conceptualizations in language of physical and mental force interaction can correspond closely to the commonsense concepts of physical and psychological properties in our mental-model domain. Further structural parallels between language and other cognitive domains can be cited. Both Jackendoff (1987a) and Talmy (1988b) describe correspondences, as well as differences, between the structuring in linguistic schematic systems and that in visual perception. Language, further, incorporates a system that pertains to reasoning, not only in epistemic forms, but also in evidential forms, which grammatically mark such distinctions as 'known as fact', 'inferred', 'deduced', and 'considered probable', a system that appears to parallel much in our general cognitive domain of reasoning. And the linguistic system of discourse functions for marking such distinctions as 'given', 'new', and 'in focus' seem to parallel much in the system of 'orienting responses' described in psychology, which includes such comparable factors as 'familiar,' 'surprising,' and 'at the focus of attention.' On the basis of observations like these, it appears that there may be a fundamental core of conceptual structure that is common across cognitive domains, though each domain will have features of structure not shared by others. The long-range goal, therefore, toward which the present study is intended to contribute, is the determination of the overall character of conceptual structure in human cognition – a goal requiring a cooperative venture among the cognitive disciplines.

Notes

1 This chapter is a modestly revised and expanded version of Talmy (1988a), which was itself a moderately revised version of Talmy (1985a). My great thanks to Eric Pederson for assistance with the content, organization, editing, and diagramming in the original papers, as well as to Per Aage Brandt and Ray Jackendoff for our subsequent discussions on force dynamics.

2 As they function within language, I regard Agonist and Antagonist as semantic roles, on a par with, say, Agent. The roles that they represent for force interactions, moreover, are wholly parallel to those within spatial and temporal relations that I have designated 'Figure' and 'Ground' (Talmy 1975, 1978a).

3 For clarity, most illustrative sentences in this chapter contain explicit mention of both force elements. But more colloquial sentences mentioning only one element can equally represent the same force-dynamic patterns. Thus, *The shed kept standing* can, in context, represent the same (3b) pattern that the fuller sentence given in illustration represents unambiguously.

4 Language is also able to represent starting and stopping as autonomous events, independent of force interactions, as in sentences like *The wind started to blow / It stopped raining*, and such cases join with the force-involved case of (5) to form the general 'start/stop' category.

5 A developing practice is the systematic use of schematic labeled diagrams to represent the meanings of linguistic forms. Perhaps with an origin in Whorf (1956), this practice is seen, among other contemporary writers, in Talmy (1972, pp. 413 – 420) (Talmy, 1976b, contains the first force-dynamic diagrams), Fillmore (1977), showing alternative labelings for the same diagram, and Langacker (1986; 1987), with the most elaborated system. Where I use different labelings for alternatives of foregrounding, Langacker draws with bold lines different 'profiles' within a single 'base.'

6 Particularization is, of course, also a feature of the force-dynamic framework, but this, at least, has had ample parallel in traditional causative studies, with their discussions of the lexicalization of 'cause' together with other particular semantic material.

7 Other weaker-Antagonist patterns do underlie constructions with a nonsentient Antagonist as subject – for example, ones containing *hinder*, *help*, *leave alone*, as in *The grass hindered the rolling ball*.

8 The analogy extends to the sociodynamic domain from generally the whole complement of basic force-dynamic patterns. For example, a 'letting' pattern is seen in *He (finally) let her present her opinion*, in which blockage and release of blockage exist in a communicative and interpretive realm of convention-guided and volitionally initiated actions, not as physical impingements.

9 Talmy (2000, chapter I-4) demonstrates that counterfactual propositions are interconvertible with factual causative propositions. For example, the sentence *I would have caught the ball if the car hadn't been in the way* is basically equivalent to *I didn't catch the ball because the car was in the way*. Accordingly, the (39) semantic analysis of *should* can be equally well rendered with its (b,c) counterfactual propositions replaced by causal forms as in:

b'. In E''s belief system, E's not VPing is detrimental to E or others.

c'. In E's value system, E is a worse person because she or he does not VP.

(The counterfactual character of (39b) can be made explicit as in *...there would be benefit to E or others if E VPed*, and the causal character of (b') can be made explicit as in *...there is detriment to E or others because E does not VP*.)

Force dynamics captures this kind of equivalence with its causative patterns, (3a,d; 5e,f). Here a stronger Antagonist, which can be represented by a *because*-clause, blocks an Agonist's force tendency, which can be represented as the unrealized factor in a counterfactual *would*-clause.

10 An issue that arises here, of course, is how one can use the conceptual models that language provides in thinking about domains with quite different properties. One answer is that we are able to maintain more than one distinct conceptual system side by side and switch as necessary. Thus, an astronomer in an everyday context may well think of the sun as moving across the sky but can switch to thinking of the earth's rotation when the first model will lead to inconsistency (example from Edwin Hutchins).

11 Besides physics and psychology, other areas exhibit correspondences between naive and sophisticated conceptualization. Thus, built into language is a theory of topology, one in many respects parallel to that in mathematics (see Talmy, 2000, chapter I-1). For example, most closed-class elements are *shape neutral*, as shown by *through* in (i), and most are *magnitude neutral*, as to both size and distance, as evidenced by *this/that* in (ii).

(i) I zigzagged/circled *through* the woods.

(ii) *This* speck/planet is smaller than *that* one.

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22 How we conceptualise time: language, meaning and temporal cognition

Vyvyan Evans

1 Introduction

This paper represents a linguistic investigation into the nature of time, and is based on proposals developed at greater length in Evans (2004). Given that linguistic organisation and structure reflects, at least partially, the nature and structure of thought, as it must if we are to be able to employ language in order to facilitate the expression of our thoughts, then language constitutes a key tool in investigating the nature of conceptual organisation. My focus here is on what language can reveal about CONCEPTUAL STRUCTURE – the nature and structure of thought. I will be focusing on TEMPORAL COGNITION– that aspect of conceptual structure which relates to our conceptualisation of time. The crux of my argument is that time, as realised at the conceptual level (and as revealed by linguistic organisation), is not a unitary phenomenon, but rather, constitutes a complex set of temporal concepts, which combine to form a number of distinct larger-scale cognitive representations for time.

While I will be focusing, in this paper, on the 'structure' of time at the conceptual level, that is, how we represent time as revealed by the way temporal concepts are encoded in language, this level of temporal representation derives from our experience of time. Accordingly, we must first, briefly, get a sense of what temporal experience is, as revealed by research in cognitive science. First, we turn to evidence from neuroscience, which points to the view that temporal experience is grounded in mechanisms necessary for regulating and facilitating perception.

Findings from neuroscience, the interdisciplinary study of the brain and nervous system, suggest that temporal experience is ultimately related to the perceptual mechanisms that process sensory experience (e.g., Turner & Pöppel 1983; Pöppel 1994; Michon 2004). That is, perceptual processing is underpinned by temporal intervals, termed PERCEPTUAL MOMENTS, which facilitate the integration of sensory experience into perceptual 'time-slots'. In other words, perception is a kind of 'windowing' operation, which presents and updates our representation of the external environment. The updating occurs by virtue of timing mechanisms: perceptual moments, which hold at all levels of neurological processing, and which range from thousandths of a second in duration to an outer limit of around three seconds. It is these timing mechanisms which form the basis of our experience of time.

Evidence for timing mechanisms comes from a number of sources, which are associated with a range of different brain structures including the cerebellum, and the cortex (see Mauk & Buonomano, 2004, for an excellent review). One source of evidence comes from electrophysiological experiments. For instance, brain activity can be measured by techniques such as the electroencephalogram (EEG). The brain produces electrical signals, which are measured by attaching electrodes to the scalp. These read signals and send them to a galvanometer, an instrument which measures small electrical currents. An EEG allows researchers to observe changes in brain activity over split seconds of time. The brain rhythm revealed by an EEG is measured by the frequency of electrical pulses per second, and is produced on a galvanometer as a series of 'waves' with peaks and troughs (see Figure 1).

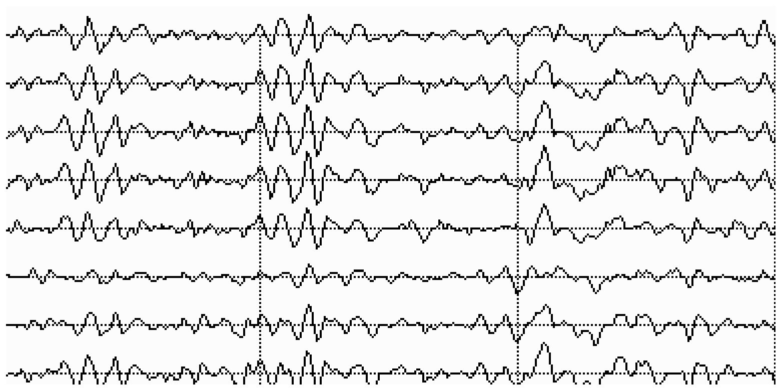

Figure 1: Approximately 3 seconds of data from 8 EEG electrodes

A second way of assessing timing mechanisms comes from exposing subjects to stimuli of certain kinds, at particular points of brain activity. A well-known experiment of this kind involves exposing subjects to two flashing lights, and relies on the phenomena known as APPARENT SIMULTANEITY and APPARENT MOTION. If the lights are set to flash with less than a period of between 0.1 and 0.2 seconds between their respective flashes, the lights will be perceived as flashing at the same time. This is the phenomenon of apparent simultaneity. If the interval between the two flashing lights is increased slightly, the flashing appears to be in rapid motion, the phenomenon of apparent motion. If the interval between flashes is increased again slightly, the flashing appears to be distinctly sequential. However, when lights are set to flash at an interval close to the transition between apparent simultaneity and apparent motion, experimenters have found that when the flashing is correlated with the brain's own activity, what is perceived depends on when in the subject's own brain rhythm the subject is exposed to the flashing lights.

In the visual cortex, the dominant rhythm, the alpha rhythm, has a frequency of around 10 pulses per second. If the lights are set flashing when the alpha rhythm is at a peak, then what the subject sees is apparent motion. If the flashing lights are started when the alpha rhythm is in a trough, it results in apparent simultaneity being perceived. Findings such as this provide compelling evidence that it is neurological activity in the brain, innate 'timing mechanisms', which give rise to perceptual moments, and thus are in large part responsible for what we perceive.

A second source of evidence for perceptual moments comes from symbolic systems such as language. Language, like other human symbolic behaviours, notably music, appears to manifest rhythmic organisation. For instance, Turner and Pöppel (1983) have shown that the fundamental unit of metered poetry, what they term the LINE, can contain between four and twenty syllables, depending on the language. This is based on a wide survey of languages from a range of different language families and geographical areas, and even from different periods in history. Languages surveyed included Latin, Greek, English, Chinese, Japanese, French, German, Ndembu (Zambia), Eipo (New Guinea), Spanish, Italian, and Hungarian. Remarkably, however, despite the number of syllables involved, Turner and Pöppel found that the time taken for recitation of the Line among these languages typically ranges from between 2.5–3.5 seconds. The striking similarity in duration in units of metre across such a diverse set of languages is strongly suggestive that there is a common timing mechanism, or set of mechanisms, which is coordinating such rhythmic behaviour.

The upshot of all this is that, as Michon (2004) has strikingly put it, the basis of temporal experience is 'between the ears' rather than 'between the stars'; the provenance of time is internal rather than external. While time is not a physical thing, something that is objectively 'out there' which can be perceived in the same way that objects in space can be, it is nevertheless a real experience. Our awareness of time emerges from the process of perceiving, and from the properties of our perceptual apparatus. That is, it is a consequence, ultimately, of the various 'timing mechanisms' in the brain which give rise to a range of perceptual moments, or different intervals, which are necessary for and underpin perceptual processing. As such, time necessarily enters into our experience of everything as it is fundamental to the way in which perceptual processes operate.

Having considered some findings from neuroscience, we now briefly examine the results of research from psychology. Unlike space, time is not a concrete or physical sensory experience. Moreover, unlike the sensory-perceptual apparatus humans have that are specialised for assessing spatial experience (e.g., the visual system), we have no analogous apparatus specifically dedicated to the processing of temporal experience. Nevertheless, we are aware of the 'passing' of time. This awareness of time appears to be wholly introspective or subjective in nature, consonant with the findings from neuroscience. Research from psychology suggests that (i) temporal experience is both phenomenologically real, that is, we actually perceive temporal experience, albeit as an introspective experience; and (ii) our subjective experience of time is not a single unitary phenomenon. Rather, it is comprised of a number of distinct, although related, experiences such as our ability to assess duration, our ability to assess simultaneity, our ability to assess 'points' in time, our awareness that sometimes duration appears to proceed more 'slowly' or more 'quickly' than usual, our experience of 'now', and so on. For instance, one striking finding to emerge from both the pioneering work of cognitive psychologist Robert Ornstein (1997[1969]), and the more recent work of social psychologist Michael Flaherty (1999) is that there are different kinds of experiences of duration. Moreover, and startlingly, rather than being dependent upon the nature of external events, our experience of duration depends on how we attend to the stimulus array associated with a particular event. That is, it is how we interact with and attend to a particular event, rather than any 'objective' temporal properties associated with such an event, which gives rise to our experience of duration. Flaherty (1999, p. 96) argues in detail that humans experience what he terms PROTRACTED DURATION. This constitutes the experience that temporality is proceeding more 'slowly' than usual. Flaherty suggests that

> protracted duration emerges within the context of so-called empty intervals (e.g., solitary confinement) as well as intervals which are full of significant events (e.g., interpersonal violence) [...this is because these] intervals are in fact filled with cognitive and emotional responses to one's predicament. A sharp transition from normal interaction to 'empty' [...or 'full'] time ignites a preoccupation with aspects of self and situation that would have been overlooked in ordinary encounters. In particular, we often find that the person becomes more caught up in the rhythms of his or her own physiological existence.

In addition to protracted duration Flaherty discusses the experience of TEMPORAL COMPRESSION. As he puts it, while '[p]rotracted duration is experienced when the density of conscious information processing is high [...] temporal compression is experienced when the density of conscious information processing is low' (1999, pp. 112–113). The density of conscious information can be said to be high when the subject is attending to more of the stimulus array. The density of conscious information can be said to be low when the subject is attending to less of the stimulus array. Flaherty provides a taxonomy of the various kinds of experiences which give rise to high and low densities of conscious information processing. For instance, experiences which give rise to a higher density of information processing and hence in which time appears to pass more slowly (protracted duration) include suffering and intense emotions, violence and danger, waiting and boredom, concentration and meditation, and shock and novelty. As the subject is consciously attending to the stimulus array, a greater density of information processing occurs. Given that our experience of duration appears to correlate with the amount of memory taken up (Ornstein 1997[1969]), then if more of the stimulus array is attended to, more memory is required to store and process what is being attended to, and consequently it is to be expected that we should actually experience the duration as being more protracted, which is what we find.[1]

Flaherty suggests that experiences which produce a lower density of information processing, and hence in which time appears to 'pass more quickly' (temporal compression) include those which involve ROUTINE COMPLEXITY. This relates to the idea that activities, which while potentially complex, through routine practice give rise to 'an abnormally low level of stimulus complexity brought on by the near absence of attention to self and situation' (1999, p. 108). Habitual conduct results in little of the stimulus array being attended to, resulting in low density of information processing. Accordingly, time seems to have passed 'quickly'.

In sum, the view that there are qualitatively distinct kinds of durational experiences which are associated with patterns of attending to particular stimulus arrays, and our level of familiarity with particular sorts of events, provides compelling evidence for the two claims which prefaced this discussion of Flaherty's work. First, temporal experience is phenomenologically real. We've all experienced events such as the first day drive to work which appears to take an extended period of time (protracted duration) as we carefully pay attention to the details of the route, etc. However, once mastered, after a few weeks or months, the same drive appears to go by 'in a flash' (temporal compression, due to the phenomenon of routine complexity). Second, temporal experience is not a unitary phenomenon. In just focusing on duration we have seen that there are two 'abnormal' kinds of durational experience, protracted duration and temporal compression.

Temporal experience, as it is represented at the conceptual level and encoded in language, which is the subject of the remainder of this paper, exhibits two levels of organisation. The first concerns LEXICAL CONCEPTS, which is to say, a concept which is conventionally represented by a single word, or by a fixed expression. Examples from English include the words *time*, *past*, *present*, *future*, etc. Lexical concepts of this kind can be structured in a range of ways at the conceptual level. For instance, the languages of the world appear to structure time in terms of motion, as we will see below. The second level of organisation concerns COGNITIVE MODELS for time. This is a level of organisation in which various lexical concepts are integrated together in order to provide complex, yet coherent, representations for time. It is this level of organisation that, for the most part, we employ in our everyday lives when we think and reason about time, and which we employ when we co-ordinate cultural and interpersonal activities such as scheduling meetings, moving meetings 'forwards' or 'backwards', when we prepare for 'approaching' events, and so forth. Thus, the main purpose of this paper is to provide an overview of the nature of our representation of these two levels of organisation which give rise to our conceptualisation of time, as evidenced by language.

2 Concepts for time

In order to provide an initial focus for the present investigation, I will examine the English lexical item *time*.[2] This presumably relates to our experience of time and so provides a good departure point. An important assumption that I am making is that lexical items constitute FORM-MEANING PAIRINGS. That is, the sound segments or PHONES which make up the lexical item *time*, consisting of a consonant, a diphthong and another consonant: [taɪm], are conventionally associated with a meaning element, i.e., a lexical concept. In this section I will show that *time* is conventionally paired with (at least) eight distinct, albeit related, lexical concepts.[3] The range of distinct temporal lexical concepts uncovered will begin to indicate both the complexity and the diversity of the way in which we conceptualise time.

2.1 Methodological issues

In order to be able to judge whether a particular linguistic usage of *time* relates to a distinct lexical concept or not, we require 'decision principles'. I propose three such principles or criteria. These relate to meaning, to concept elaboration and to grammar. In other words, when a particular usage of *time* is distinct in terms of meaning, or the way the concept is elaborated (which is to say structured), or if it exhibits a distinct grammatical pattern, then this is suggestive that we are dealing with a distinct lexical concept for *time*.

Let's consider each of the three criteria in turn. The first, the MEANING CRITERION, concerns whether a particular usage of *time*, in context, gives rise to a significant difference in meaning. To illustrate, consider the examples in (1) and (2):

(1) The relationship lasted some time

(2) The time for a decision is approaching

In the sentence in (1), *time* relates to the notion of duration, that is, an extended temporal elapse. This is in contrast with the sentence in (2) where *time* relates to a discrete temporal point or moment. Clearly, these two usages of time relate to significant differences in meaning.

The CONCEPT ELABORATION CRITERION relates to the way in which a particular lexical concept is structured at the conceptual level. This is reflected in the nature of the semantic content which collocates, i.e., co-occurs, with a particular meaning. One common way for the 'duration' meaning in (1) to be elaborated is in terms of length, as illustrated in (3):

(3) The relationship lasted a long/short time

As we saw in (2), the conventional way in which the 'moment' reading is elaborated is in terms of motion, as lexicalised by *is approaching*. A motion event of this kind is EGO CENTRED, as it relates to a contextually understood ego or 'perspective point' with respect to which the motion is directed. In other words, in (2) it is with respect to the speaker, or some other person, that the time for a decision 'is approaching'.

The final criterion, the GRAMMATICAL CRITERION, relates to the way the lexical form *time* is encoded. In grammatical terms the 'duration' reading associated with *time* is encoded as a mass noun, while the 'moment' reading is encoded as a count noun. The terms 'mass' and 'count' relate to a functional distinction in noun-types in which count nouns relate to entities conceptualised as being enumerable and thus can be counted, while mass nouns relate to entities which are not and thus cannot be counted. That is, while we can 'count' moments of time, as when we count seconds or minutes, precisely because entities of this kind constitute discrete moments, duration cannot be enumerated in this way, and constitutes an internally un-analysable mass. This distinction is reflected grammatically. Mass nouns can be encoded employing the quantifier *some*, as in (1). *Some* serves the conceptual function of excerpting a portion of a mass entity thereby providing a discrete, and thus countable, unit (Talmy 2000). This quantifier cannot be applied to count nouns as these entities are already discrete, as illustrated by the ungrammaticality of the sentence in (4):

(4) *Some time for a decision is approaching

Following the convention in linguistics, the sentence in (4) is preceded by an asterisk indicating that when the 'moment' reading of *time* is encoded as a mass noun (i.e., employing *some*) the sentence is ungrammatical.

While we have just seen the 'moment' reading of time is not a mass noun, there is evidence that it is encoded as a count noun. This comes from the grammatically acceptable use of the indefinite article in conjunction with this reading, as in (5):

(5) A time for a decision will come one day

Only count nouns can appear with the indefinite article. This follows as the indefinite article indicates one instance of a particular entity, and thus an entity which can, in principle, be counted. As in the sentence in (1), the use of *time* in (5) relates to a temporal moment, and is elaborated in terms of ego-centred motion.

The three criteria discussed, with differential patterning in terms of meaning, conceptual elaboration and grammatical encoding suggest that the two distinct readings identified in the sentences in (1) and (2) constitute two distinct lexical concepts, despite both being encoded by the lexical form *time*. In the remainder of this section I will briefly examine the range of distinct lexical concepts or SENSES associated with the lexical form *time*.[4]

2.2 The duration sense

We met the Duration Sense in the previous section, an example of which was given in the example in (1). We observed that the meaning associated with this lexical concept related to the notion of duration, that it was elaborated in terms of length and was encoded grammatically as a mass noun.

Interestingly, the Duration Sense has two variants, the 'temporal compression' and 'protracted duration' variants illustrated in (6) and (7) respectively:

(6) Time flies when you're having fun ['temporal compression']

(7) Time drags when you're bored ['protracted duration']

These two variants relate to the phenomenologically real experiences in which time 'feels' as if it is 'passing' either abnormally 'quickly' or 'slowly', as discussed in Section 1.[5] What is common to the readings in (1), (3), (6) and (7) is that they all relate to the experience of duration, albeit of slightly different kinds. However, while the Duration Sense can be elaborated in terms of length, as attested by the use of adjectives *long* or *short* as in (3), the two variants in sentences (6) and (7) are systematically elaborated in terms of distinct kinds of motion events. The 'temporal compression' variant is invariably elaborated in terms of motion events involving rapid motion, as in (8):

(8) Time whizzes/speeds/zooms/rushes (by) when you're having fun

or imperceptible motion as in (9):

(9) (a) The time has sneaked/tiptoed by/past
(b) Where has all the time gone?
(c) The time's vanished

This contrasts with the nature of motion events which elaborate the 'protracted duration' variant. These invariably relate to stationariness:

(10) Time seemed to stand still

or else extremely slow motion as we saw in (7).

Accordingly, what is common to the Duration Sense illustrated in (1) and (3) and the two variants illustrated in (6) and (7) respectively is that they are all related to the notion of 'duration', and hence all represent assessments of temporal magnitude. However, the two variants illustrated in (6) and (7) are distinct from the examples in (1) in that they are elaborated in terms of distinct kinds of motion events rather than in terms of length.

Hence, while partially distinct, these variants do share certain similarities with the Duration Sense: notably, they relate to different aspects of the notion of duration. Put another way, they do not concern wholly distinct meanings, despite their differential patterns of concept elaboration. Accordingly, I classify the 'temporal compression' and 'protracted duration' variants as SUB-SENSES[6] of the Duration Sense rather than as distinct senses (Evans 2005).

2.3 The moment sense

The next lexical concept we turn to is the Moment Sense. As with the Duration Sense, we met this lexical concept above in the examples in sentences (2) and (5). The key characteristics of this lexical concept are that it encodes a discrete temporal 'point', is elaborated in terms of ego-centred motion events, as lexicalised by verbs such as *come*, *approach*, *arrive*, etc., and is encoded grammatically as a count noun.

2.4 The instance sense

The third lexical concept conventionally encoded by *time* is termed the Instance Sense. In this lexical concept *time* prompts for an instance of a particular event, activity, process or state, rather than an interval as in the Duration Sense, or a discrete temporal point as in the Moment Sense. Consider some examples of this lexical concept:

(11) (a) O'Neil improved for the fourth time this winter when he reached 64.40 metres at a meeting in Melbourne
(b) The horse managed to clear the jump 5 times in a row

In each of the sentences in (11), *time* references a particular instance (i.e., occurrence) of an event or activity, rather than an interval or a moment. For example, in (11a) if we attempt to construct a 'moment' reading for *time*, we find that *time* does not mean, for instance, that O'Neil improved for a fourth consecutive moment, or that he improved on the fourth moment of trying. In terms of a possible 'duration' reading, time does not mean that the improvement lasted for a period of four moments. Rather, it means that there were four distinct instances of improvement, each instance representing an improvement on a previous instance (of improvement). Clearly, this usage of *time* constitutes a new and distinct meaning, suggesting that we are in fact dealing with a distinct lexical concept.

In terms of concept elaboration, the semantics associated with this lexical concept, the Instance Sense – it relates to an entity which constitutes an instance of something else – has little in the way of distinctive content ascribed to it. Hence, there are no salient or striking patterns of concept elaboration specifically associated with this lexical concept. In fact, this is the only lexical concept conventionally associated with the English lexical item *time* which lacks a striking pattern of concept elaboration.

Finally, in terms of grammatical encoding, one of the notable features of the Instance Sense is that it can occur with both ordinal numbers (11a) and cardinal numbers (11b). This follows as the Instance Sense relates to distinct occurrences of the same or similar kind of event or activity, and hence can be iterated. This pattern of grammatical encoding appears to be unique to this temporal lexical concept.

2.5 The event sense

The Event Sense relates to a lexical concept in which *time* references specific BOUNDARY EVENTS. A boundary event constitutes a particular event which signals the beginning or ending of some more complex event sequence. To illustrate this, consider some examples:

(12) (a) The young woman's time [=labour] approached
(b) Arsenal saved face with a Thierry Henry leveller five minutes from time after having a jaded, end-of-season look

In (12a) *time* prompts for a particular boundary event, namely the beginning of childbirth. In (12b) *time* prompts for the end of a game of soccer in which the London team Arsenal equalised five minutes from the close of play. In other words, in these examples the lexical item *time* does not relate to a temporal interval, moment or instance, but rather to a specific boundary event, such as the beginning of childbirth, or the end of a football match.

In terms of concept elaboration, the Event Sense is similar to the Moment Sense, and is elaborated in terms of ego-centred motion events. The following examples are indicative:

(13) (a) His time [=death] has come/arrived
(b) Her time [=labour] is approaching/getting closer

In terms of grammatical encoding, the Event Sense, unlike the other lexical concepts so far considered, cannot co-occur with the definite or indefinite articles, 'the' or 'a'. This is evidenced in (12) in which no articles are present. In subject position, the Event Sense is unable to constitute a 'bare' noun, but is preceded by a possessive noun phrase, signalled by the apostrophe 's' ['s] marker, as in: *the young woman's* in (12a), or by a pronoun, such as *his* or *her*, as in (13). When not in subject position the Event Sense appears as a 'bare' noun, which is to say without a modifier, such as a preceding noun phrase as in (12b).

2.6 The matrix sense

In the Matrix Sense, *time* prompts for an entity which is unbounded, in the sense that it has an infinite elapse, and is conceptualised as subsuming all other events. It is for this reason that I employ the label 'matrix'. Accordingly, the Matrix Sense prompts for an entity, which, rather than being an attribute of other events and entities, is conceived as itself an independent entity, a reality apart from the events it subsumes. This lexical concept is evidenced in the following examples:

(14) (a) [T]ime, of itself, and from its own nature, flows equably without relation to anything external [Newton][7]
(b) Time flows/runs/goes on forever

In the examples in (14) *time* relates to a 'temporal matrix', which serves as the backdrop for the occurrence of other events. This is particularly clear with the example in (14a). This example is drawn from Newton's *Principia Mathematica*[8] in which the notion of ABSOLUTE TIME was famously propounded. According to Newton, 'absolute time' constitutes an entity unrelated to external events, and against which the rate of change of events can be measured. Hence, on this view, *time* is a manifold which 'contains' events, and is independent of events. As this manifold is conceived as being in the world 'out there', the 'passage' of time represents an infinite entity which subsumes all other events.

One extremely common way for the Matrix Sense to be elaborated is in terms of motion.[9] In particular, the Matrix Sense is commonly elaborated in terms of the motion event described by the lexical item *flow*, as evidenced by the ubiquity with which it is likened to bodies of water such as streams or rivers which prototypically 'flow'. Consider the following examples, which evidence this elaboration, the sentence due to Marcus Aurelius, in (15c), revealing the antiquity of this imagery:

(15) (a) Time like an ever-rolling stream
Bears all its sons away [Isaac Watts][10]
(b) A wanderer is man from his birth,
He was born in a ship
On the breast of the river of Time [Matthew Arnold][11]
(c) Time is like a river made up of the events which happen [Marcus Aurelius][12]
(d) Time is but the stream I go fishing in [H.D. Thoreau][13]

While other temporal lexical concepts are elaborated in terms of motion events, it should by now be clear that a distinct pattern in terms of concept elaboration is emerging. The two sub-senses of the Duration Sense (the 'protracted duration' and 'temporal compression' variants) are elaborated in terms of motion which involve very slow or very fast motion respectively. The Moment and Event Senses are elaborated in terms of ego-directed motion, while the Matrix Sense is elaborated in terms of steady-state motion (unlike the Duration Sense) which is non-terminal (unlike the Moment and Event Senses). It is for this reason that the motion described by the verb *flow* is ideally suited to elaborating this particular lexical concept.

In terms of grammatical encoding, the Matrix Sense is a mass noun. The reason for thinking this is that it cannot be preceded by the indefinite article. In this it follows the Duration Sense. In addition, and unlike the Duration Sense, the Matrix Sense cannot be preceded by the definite article. This is likely to be because as one function of the definite article is to signal unique reference, and as the Matrix Sense already has unique reference (it refers to the single unbounded entity subsuming all other events), the use of the definite article becomes redundant. Thus, in addition to a distinct meaning, and a distinct pattern of concept elaboration, the Matrix Sense also has a distinct pattern of grammatical encoding.

2.7 The agentive sense

This lexical concept conventionally associated with *time* prompts for an entity which has the ability to affect us and our environment. For this reason it is termed the Agentive Sense. Consider some illustrative examples:

(16) (a) Time is the great physician [Benjamin Disraeli][14]

(b) Time is the greatest innovator [Francis Bacon][15]
(c) Time, the avenger! [Lord Byron][16]
(d) Time has aged me

In the sentences in (16), *time* relates to an entity which can variously heal, as in (16a), innovate (16b), steal our youth (16c), and age us (16d). In so far as this lexical concept relates to some change or effect that can be wrought, this lexical concept is clearly distinct, in terms of its meaning, from the other senses conventionally associated with time.

As is already clear, the Agentive Sense is elaborated in terms of acts or agents which bring about a change of state. To make this explicit, consider the following examples:

(17) (a) Time devours all
(b) Time reveals all
(c) Time heals all wounds
(d) Time had transformed him into an old man

The result of being devoured is that the entity being acted upon is no longer a discrete entity and hence no longer exists; the result of being revealed is to be exposed or rendered visible; being healed results in becoming better or well; and being transformed results in a markedly different form and state. Each of the examples above is unlikely to occur unless there is an agent who performs the devouring, revealing, healing and transforming. Thus, such acts correlate with agents. Moreover, these kinds of acts typically require agents with a particular skill or facility. That is, the acts are not accidental or random, but are contingent in some way. For instance, *devour* conjures up images of a ferocious beast, *reveal* and *transform* evoke the image of a magician or sorcerer, while *heal* connotes some kind of healer such as a medic. In short, each of the agents evoked by these terms possesses special features or abilities which enable them to bring about a relatively rapid and marked change in state. This is a pattern of concept elaboration which is not evident in the other senses associated with *time*.

Finally, the Agentive Sense is unique in that it appears to behave akin to a proper as opposed to a common noun (although see the discussion of the Measurement-system Sense below). That is, the Agentive Sense is encoded grammatically in similar fashion to names, which lack either a definite or indefinite article, as in (18), and cannot be preceded by quantifiers, as in (19):

(18) Time is a great healer

cf. Max is a great healer

(19) *Some time reveals all [Agentive Sense]

cf. Some time has passed/flowed (by) [Matrix Sense]

2.8 The measurement-system sense

In this sense, time prompts for a lexical concept which represents a measurement-system. Temporal measurement arises due to the correlation between periodic behaviour in the external world and our subjective experience of duration. As periodic behaviour correlates with internal temporal experience, it can be employed to represent temporality. Bergson (1999 [1922]:34) makes this point with the following example:

> If I draw my finger across a sheet of paper without looking at it, the motion I perform is, perceived from within, a continuity of consciousness… [which is to say]… duration. If I now open my eyes, I see that my finger is tracing on a sheet of paper a line that is preserved… Now, this line is divisible, measurable. In dividing and measuring it, I can then say, if is suits me, that I am dividing and measuring the duration of the motion that is tracing it out.

That is, physical (i.e., visual and aural) symbols can be employed to represent (i.e., measure) the duration with which they are correlated. An example of this is PERIODICITY. As some physical entities and events exhibit periodicity – a predictable cycle or rhythm of behaviour – such entities and events are highly useful for 'measuring' the duration with which they are correlated. It is this principle which underpins the concept of a clock, for instance. Clocks serve to divide the day into equal parts, originally into hours and later into minutes and seconds with the advent of accurate pendulum clocks from 1656, and accurate spring-powered clocks from 1700 onwards (Whitrow 1988; Barnett 1998).

In the Measurement-system Sense, *time* prompts for an entity which constitutes a system for measuring duration. A temporal measurement-system is defined primarily in terms of its rate of periodicity and for time-reckoning (as measured by clocks), by its place of occurrence. In what follows I will restrict my discussion to time-reckoning. For other examples of measurement-systems lexicalised by *time* see Evans (2004, chapter 13). To illustrate this lexical concept consider the following examples:

(20) (a) In the 1850s Railway Time was introduced as standard
(b) Don't forget to move the clocks forward with the start of Summer Time
(c) Eastern Standard Time is five hours behind Greenwich Mean Time

In each of the examples above, *time* prompts for a system of measurement which serves to regulate and co-ordinate.

A common way in which the Measurement-system Sense is elaborated is in terms of motion events of the kind illustrated in the following example:

(21) The time is approaching noon

There is a long tradition of time-reckoning in which clocks have manifested motion. One of the most salient forms of motion manifested is due to the motion of the clock 'hands' across a circular analogue clock or watch 'face'. As the literal motion of the hour hand towards the numeral 12, symbolising noon, correlates with the on-going function of the measurement process, this may have motivated the elaboration of the Measurement-system Sense in terms of motion. Accordingly, the Measurement-system Sense is typically elaborated in terms of motion events as exemplified by lexical items such as *approach*, *moving towards*, etc., and as implied by the prepositions which identify the location of clock hands against a conceptual frame of 'clockwise' (as opposed to 'anticlockwise') motion:

(22) The time is approaching 11pm

(23) (a) The time is (a) quarter to eight
(b) The time is (a) quarter past eight

Other kinds of motion concepts cannot productively be employed as they do not match-up with the behaviour associated with the motion of hands around a clock-face. Thus, the nature of the motion content which serves to elaborate the Measurement-system Sense, while oriented with respect to a reference point, is distinct from the motion which elaborates the Moment and Event Senses considered earlier. In those earlier lexical concepts, the motion which serves to elaborate is oriented, at least implicitly, with respect to an animate reference point or ego, e.g., *The time for a decision is moving closer (to us)*; *His time [=death] is approaching (him)*. In the Measurement-system Sense, the reference point with respect to which motion is oriented constitutes an inanimate landmark, typically a particular calibration on the clock 'face', as in (22), or a particular temporal moment which represents a particular calibration with which it correlates, as in the use of *noon* in (21) which stands for the numeral 12.

Finally, the Measurement-system Sense is distinct grammatically in that it can take the form of a mass noun or a proper noun. No other sense associated with *time* appears to have such flexibility. For instance, while the examples in (21) and (22) are mass nouns the examples in (20) are akin to proper nouns (i.e., names). In other words, time can refer either to a specific kind of measurement-system, e.g., *Eastern Standard Time* versus *Greenwich Mean Time*, or refer to a particular value within a measurement-system, e.g., *What time is it?* The former variant is encoded as a proper noun and the latter as a mass noun.

2.9 The commodity sense

We now turn to the final lexical concept to be considered. *Time*, in the Commodity Sense, refers to an entity which is valuable, and hence can be exchanged, traded, acquired, etc., as attested by the following examples:

(24) (a) Remember that time is money [Benjamin Franklin][17]
(b) Time has become a scarce commodity. Everyone wants more of it. [The Observer][18]
(c) Self-assessment tax and finding a stakeholder pension are both examples of the state taxing our time [The Observer][19]
(d) They sold/bought more advertising time

In the Commodity Sense, *time* prompts for an entity which is inherently valuable. As such, *time* constitutes a commodity which can be bought and sold. In this sense *time* prompts for a conceptualisation of an investment which yields returns, and which can be taxed. As the central characteristic of this lexical concept is of an entity which is valuable, content pertaining to entities conceived as valuable, such as commodities, can serve to elaborate the Commodity Sense. In this it is distinct from any other lexical concept lexicalised by time. A salient example of a valuable commodity is money, and just as we can *spend*, *invest*, *borrow*, and *budget* money, so too we can *spend*, *invest*, *borrow*, and *budget* time. Other entities which are valuable, including resources, can also serve to elaborate the Commodity Sense. For instance, content relating to valuable resources such as personnel, natural resources such as forests, water, minerals, etc., and manufactured products, can all serve to elaborate the Commodity Sense. For instance, we *manage* people, and other resources and commodities, and so too can *manage* time. Prospectors *find* oil, gold, silver, etc., and so too we can *find* the time to do something. Manufactured products are *made*, and so too we can *make* time for tasks, others and ourselves.

In terms of grammatical encoding, the Commodity Sense like the Matrix and Duration Senses is a mass noun. Evidence for this comes from the fact that the Commodity Sense undergoes the operation of portion-excerpting, in which a mass noun can be bounded using a quantifier such as *some*. For instance, in sentences such as: *Can you spare me some time?* the Commodity Sense is preceded by the quantifier *some*. It will be recalled from the discussion in Section 2.2 that this kind of quantification is one of the formal indices of a mass noun.

2.10 Summary

We have seen in this section of the paper that there are eight distinct lexical concepts conventionally associated with the lexical item *time*. The basis for claiming that these lexical concepts are indeed distinct mental representations derived from examining evidence relating to distinctiveness in terms of meaning, concept elaboration and grammatical encoding. For convenience, the major findings presented in this section are summarised in Table 1.

Table 1: Summary of lexical concepts for *time*

Name	Meaning	How elaborated	Grammatical encoding
Duration Sense Sub-sense 1: protracted duration Sub-sense 2: temporal compression	Assessment of magnitude of duration Duration 'slower' than usual Duration 'faster' than usual	Length, e.g., *a long time* Slow motion, e.g., *time drags* Fast motion, e.g., *time flies*	Mass noun; can appear with definite article and some quantifiers
Moment Sense	A discrete temporal 'point'	Ego-centred motion, e.g., *the time is approaching…*	Count noun; can appear with definite and indefinite articles
Instance Sense	An occurrence of some kind	N/A	Count noun; can appear with ordinal and cardinal numbers
Event Sense	A boundary-event of some kind	Ego-centred motion, e.g., *Her time is approaching…*	Count noun; cannot take articles, but can be preceded by pronouns and possessive noun phrases
Matrix Sense	An unbounded elapse conceived as the event subsuming all others	Non-terminal motion, e.g., *Time flows on forever*	Mass noun; cannot be preceded by definite or indefinite articles
Agentive Sense	A causal force responsible for change	Agent-centred action, e.g., *Time devours*	Proper noun; cannot be preceded by definite or indefinite articles
Measurement-system Sense	A means of measuring change and other behaviours, events, etc.	Motion events oriented with respect to an inanimate centre, e.g., *The time is moving towards 10*	Proper noun or mass noun
Commodity Sense	A resource	The manipulation of resources, e.g., *We're spending time together*	Mass noun

The general finding to emerge from this is that how we conceptualise time is relatively complex. Moreover, the complexity we have uncovered so far relates only to a single lexical item, *time*, and to a single level of conceptual structure, namely the lexical concept. It ignores other lexical items which relate to temporality such as *present*, *past*, *future*, *era*, *epoch*, *yesterday*, *tomorrow*, and so on, and to more complex temporal structures such as large-scale cognitive models for time, to be explored later. Although I have reviewed eight distinct lexical concepts for time in the foregoing, these concepts can broadly be divided into two kinds, what I term PRIMARY LEXICAL CONCEPTS for time, and SECONDARY LEXICAL CONCEPTS. Primary lexical concepts are those that relate to common aspects of human cognitive processing. That is, they relate to experiences such as duration, simultaneity, assessment of a temporal 'point', the experience of now, etc. Experiences of this kind can be traced to underlying perceptual mechanisms and processes. Accordingly, concepts of this kind are likely to be more common in the languages of the world, and when they occur, to be more similar across languages. Primary lexical concepts include the Duration, Moment, Event and Instance Senses. That is, the ability to experience duration and a temporal moment, the ability to perceive and apprehend events, and the ability to categorise particular temporal moments and events as constituting instances of event-types, would seem to constitute basic cognitive abilities which enter into almost every aspect of perceptual processing and cognitive evaluation. In short, the processes and mechanisms that such lexical concepts relate to suggest themselves, with good reason, as being among the foundational mechanisms of our cognitive architecture. Primary lexical concepts can be contrasted with secondary lexical concepts, which, rather than relating to fundamental aspects of cognitive function, are cultural constructs, and thus may often be culture specific. A good example of this is the concept of time as a commodity, in which time is conceptualised as being a valuable resource which can be bought and sold, just like physical merchandise. This lexical concept while present in the languages of the industrialised world which pay for labour in terms of 'units' of time, is entirely absent in many non-industrialised cultures. Other secondary lexical concepts for time include the Matrix Sense, the Agentive Sense and the Measurement-system sense.

3 Cognitive models for time

We now turn to a consideration of more complex conceptualisations for time. I noted at the outset of this paper that there is linguistic evidence for (at least) two levels of conceptual structure for time. In Section 2 we considered the first level, that of lexical concepts. There is an additional and more complex level which is the subject of the present section. This relates to cognitive models for time.

Cognitive models are large-scale, relatively stable knowledge structures relating to our understanding of time. They consist of lexical concepts (both primary and secondary) and their patterns of concept elaboration, which are integrated in ways which are consistent and coherent. A crucial aspect of cognitive models for time is that they serve to structure our conceptualisation of time in terms of space and motion through space. In this way they facilitate TEMPORAL REFERENCE, which is to say the 'location' in time of particular entities and events. An important function associated with cognitive models for time is to provide a REFERENCE FRAME for assessing temporal experience, and the occurrence of events. Temporal reference is achieved by virtue of establishing a temporal reference point which provides an 'anchor' with respect to which reference is established.

There are two main ways in which temporal reference is achieved. The first relates to EGO-BASED REFERENCE, giving rise to ego-based cognitive models for time. Cognitive models of this kind take as their reference point the experiencer, or ego. The ego correlates with the experience of 'now'. Hence, in models of this kind location of the ego metaphorically represents the experience of 'now'. In addition, the lexical concepts relating to the forms *present*, *future* and *past* are conventionally elaborated in terms of locational structure, such that the future is in front of the ego, the present is co-locational with the ego, and the past is located behind the ego.[20] That is, we normally think and talk about temporal concepts such as *present*, *future* and *past* in terms of physical locations relative to us.[21] This is illustrated below:

Present

(25) From our perspective **here** in the present, the Victoria era was a bleak **place**

Future

(26) She has a bright future **ahead** of her

Past

(27) His troubled past lies **behind** him

Accordingly, the lexical concepts associated with the forms *present*, *future* and *past* are integrated into ego-based cognitive models for time, providing a reference frame which serves to 'locate' the ego and events in time. There are two specific ego-based models in English. In the first, the MOVING TIME MODEL, the ego is stationary and time is conceptualised as undergoing motion. In the second, the MOVING EGO MODEL, time constitutes a stationary landscape across which the ego moves, as we will see below.

Now let's turn to the second way in which temporal reference is achieved. This relates to TIME-BASED REFERENCE, giving rise to time-based cognitive models for time. Cognitive models of this kind take as their reference point a particular temporal event which serves to 'anchor' the temporal reference frame. Rather than identifying 'location' in time, a time-based cognitive model serves to establish whether a particular temporal event is earlier or later, with respect to the anchoring temporal event. Hence, this kind of cognitive model is, in principle at least, independent of the egocentric experience of 'now', and the concepts of present, past and future (although see Evans 2004, chapter 18). There is just one kind of time-based cognitive model in English: the TEMPORAL-SEQUENCE MODEL, in which assessments as to whether a particular temporal event is earlier or later with respect to another temporal event is provided by virtue of this cognitive model being elaborated in terms of spatial content relating to the horizontal spatial axis.[22]

The three cognitive models discussed in this section are diagrammed in Figure 2.

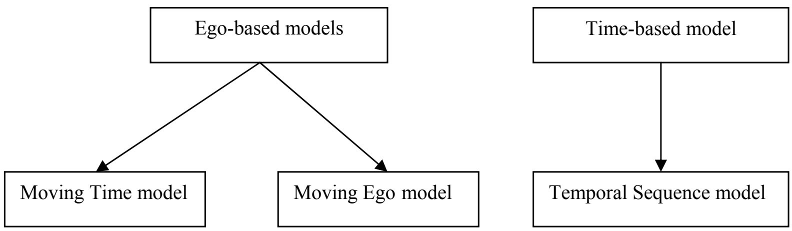

Figure 2: Taxonomy of cognitive models for time

3.1 The Moving Time model

The Moving Time model involves the integration of at least the following lexical concepts: Present, Future, Past, the Duration Sense (subsuming its two variants: 'temporal compression' and 'protracted duration'), the Matrix Sense, the Moment Sense, and the Event Sense. What is integrated constitutes the patterns of elaboration associated with these concepts in a way which is coherent and consistent with the other lexical concepts and their elaborations integrated in the model.

The model is diagrammed in Figure 3. As this model is ego-based, this means that the ego's location, which correlates with the experience of the 'present', serves as the reference point for establishing temporal 'location' of other temporal concepts. Moreover, as the patterns of elaboration concerning motion events associated with the Event, Moment and Matrix senses are integrated, it is this which gives rise to the notion of 'moving time'. As the future is 'located' in front of the ego, temporal motion is directed towards the ego, such that time moves towards the ego before passing behind.

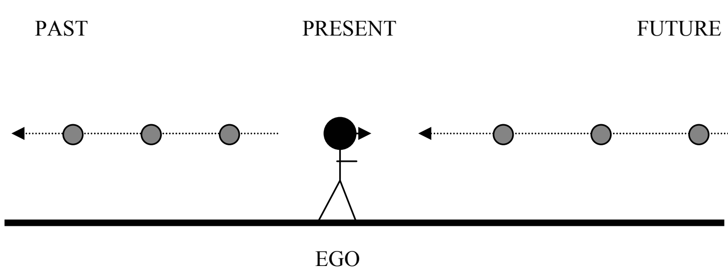

Figure 3: The Moving Time model for English

In Figure 3, the orientation of the ego, represented by the human figure, is indicated by the small arrow attached to the figure's head. The direction of temporal motion is indicated by the arrows associated with the dashed line. The dashed line indicates the motion associated with the temporal matrix. Temporal moments and events are indicated by small grey circles, 'embedded' in the temporal matrix. Hence, temporal moments and events ('times') are also in motion.

In addition, the 'temporal compression' and 'protracted duration' sub-senses are integrated into this model. Accordingly, rapid motion of the temporal matrix (or of temporal events or moments) past the ego results in the conceptualisation of 'temporal compression' – time passing abnormally quickly. Conversely, slow motion of the temporal matrix (or of temporal events or moments) past the ego results in time being conceived as passing abnormally slowly. This conception results in the inference that the normal state associated with the 'passage' of time is steady-state motion. In other words, this inference is not due to a particular lexical concept, but emerges as a consequence of the way the various lexical concepts and their patterns of elaboration are integrated into the Moving Time model.

Indeed, it is common to forget that this is in fact a way of conceptualising a fundamentally subjective experience. That is, whatever it is that time is and does, it presumably does not literally undergo locomotion. Yet, both philosophers and scientists appear to have often taken the cognitive models we employ to understand time, such as the Moving Time model, as physical fact. For instance, Newton took the inference regarding steady-state motion associated with Moving Time, what he termed 'absolute time', as a central axiom in his theory of mechanics (see Evans, 2004).

In sum, I present below in (28) the conventional patterns of inference that emerge from this model. For instance, motion of the temporal matrix past the ego 'gives rise to' an awareness of the 'passage' of time.

(28)
a. motion of the temporal matrix (and hence embedded times and events) past the ego → awareness of 'passage' of time
b. rapid motion of events past the ego → temporal compression
c. slow motion of events past the ego → protracted duration
d. steady-state motion of events past the ego → experience of normal duration
e. events in front of the ego → future
f. events co-located with the ego → present
g. events behind the ego → past
h. an event approaching the ego → imminent occurrence of the event
i. arrival of an event at the ego → occurrence of the event

Further, the Moving Time model also accounts for a range of other secondary temporal concepts, as lexicalised by *Christmas*, *graduation*, *the deadline*, etc., which can all be integrated with this model. Lexical items and expressions of this kind relate to secondary lexical concepts as they concern culturally-relative notions, rather than directly relating to more cognitively basic temporal experiences. Hence, these expressions can be conceptualised in terms of the Moving Time model, as evidenced by the following examples:

(29) (a) Christmas is getting closer (to us)
(b) Graduation is coming up
(c) The deadline has passed

For instance, the example in (29a) can be accounted for based on (28h). By virtue of 'getting closer', the occurrence of Christmas is imminent. After all, being an abstract temporal concept *Christmas* cannot literally get closer. Yet, by virtue of understanding Christmas in terms of this model, we understand its motion in terms of imminence. That is, all secondary temporal lexical concepts can be integrated into the model such that the inferences deriving from the Moving Time model can be applied to them.

3.2 The Moving Ego model

The Moving Ego model is presented in Figure 4. In Figure 4 the location of the ego at any particular time constitutes the present. The past is located behind the ego and the future in front. This model is distinct from the Moving Time model in that here it is the ego, rather than time, which moves. The ego moves over or across the temporal 'landscape'. The motion of the ego is signalled by the arrows in Figure 4, while the temporal landscape is captured by the bold line upon which the ego is standing. Temporal events (the grey circles) are located on the temporal landscape and constitute 'locations'. The ego moves towards and then past these temporal events.

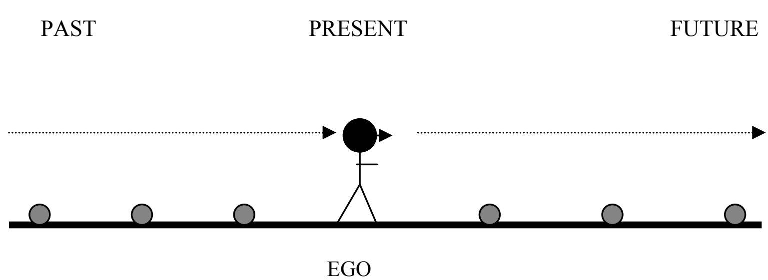

Figure 4: The Moving Ego model

The lexical concepts which are integrated into this model are similar to those integrated in the Moving Time model. The fundamental difference is that whereas in the Moving Time model the elaborations relating to the motion of temporal concepts were integrated, it is rather patterns of elaboration relating to non-motion content (i.e., spatial relations) which are integrated in the Moving Ego model.

One conventional means of elaborating the Matrix Sense is in terms of a straight linear path 'across' which events pass. This elaboration provides the temporal 'landscape' elaboration, which is integrated into this model. A consequence of integrating the Event and Moment Senses with the temporal landscape conception is that these senses, both of which are discrete with respect to the on-going temporal Matrix, are conceptualised as discrete locations embedded within the temporal 'landscape'. Integration of the Duration Sense, in which duration can be elaborated in terms of length (as discussed earlier), results in the distance between events being conceptualised as 'lengths' of duration. Hence, an important consequence of this model is that the temporal landscape can be quantified, and that this quantification results from temporal events being embedded as 'locations' within a temporal Matrix conceptualised as 'landscape'. This is illustrated in the following example:

(30) Manchester United FC is approaching three matches in the space of 5 days.

In (30), soccer matches are conceptualised as locations contained 'in' a physical container of 5 days which the English team, Manchester United, approach.

Accordingly, the nature of the elaborations integrated, and the way in which they are integrated provides a number of inferences deriving directly from the Moving Ego model itself. These are detailed in (31):

(31)	(a)	motion of the ego across the temporal landscape	→	awareness of the 'passage' of time
	(b)	locations	→	events (and moments of time which correlate with events)
	(c)	distance between events	→	magnitude of duration
	(d)	the landscape in front of the ego	→	future
	(e)	the landscape behind the ego	→	past
	(f)	the landscape in the proximal	→	present vicinity of the ego
	(g)	ego approaching a location	→	imminent occurrence of an event
	(h)	arrival of ego at location	→	occurrence of an event
	(i)	motion of ego past a location	→	an event's occurrence being past

As with the Moving Time model there are a large number of secondary temporal concepts which can be conceptualised in terms of the Moving Ego model, as we began to see with the example in (30). For instance, our ability to conceptualise our own motion with respect to abstract concepts such as Christmas, etc., serves as a means of 'locating' the occurrence of Christmas relative to our experience of now. This accordingly serves to provide temporal reference. Some everyday examples which are motivated by the Moving Ego model are given below:

(32) (a) We're moving up on Christmas
(b) We're approaching my favourite part of the piece
(c) She's passed the deadline
(d) We'll have an answer within two weeks
(e) The meetings were spread out over a month

3.3 The temporal sequence model

This model integrates those temporal lexical concepts which can be conceptualised as being discrete. That is, this model relates to specific temporal events, moments etc. and does not involve integration of the Matrix Sense. Moreover, as this model does not involve the integration of the concepts Present, Past and Future, the reference frame which organises this model as a whole is not anchored with respect to an ego, but rather another temporal event in a sequence of temporal events.

The distinguishing feature of this model is that the various temporal events which are integrated into this model, and which are conceptualised as undergoing motion, form a sequence, hence the term Temporal Sequence. The motion sequence involving the temporal events and moments is unidirectional, exhibiting what I will refer to as IN TANDEM ALIGNMENT (Evans 2004; see also Tyler and Evans 2003). A motion event of this kind is one in which the entities involved in the motion event are travelling in the same direction such that they are sequenced with respect to one another. This is diagrammed in Figure 5.

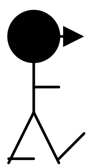

Figure 5: In tandem alignment

Thus, in this model, as there is no ego, the important configuration is not a spatial one involving the location of the ego relative to time. Rather, the key aspect of the model is the relative position of a particular temporal moment or event with respect to another temporal moment or event. Moreover, in the Temporal Sequence model, the in-tandem alignment is a consequence of the model itself, rather than being associated with any of the individual lexical concepts which give rise to the model. The Temporal Sequence model is illustrated in Figure 6.

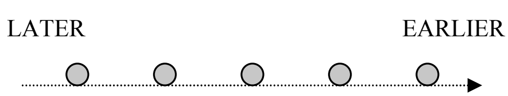

Figure 6: The temporal sequence model

In Figure 6 the shaded circles represent temporal events of various kinds. These include, but are not limited to, the Event Sense, the Moment Sense, and temporally framed events such as days of the week, months of the year, seasonal holidays such as Christmas, sub-events of particular events, e.g., half-time and full-time in a soccer match, etc. While each of these events can be elaborated in terms of ego-centred motion events, a consequence of their integration in the Temporal Sequence model is that an in-tandem alignment is imposed on the various temporal events, as signified by the arrow which designates orientation. Accordingly, these events are conceptualised in terms of their sequence with respect to each other, resulting in an assessment of an earlier/later relationship.

That is, an assessment of an earlier/later relationship is a consequence of this complex cognitive model.

Evidence for this comes from the fact that the verbs *follow* and *precede* and the prepositions *before* and *after* are compatible with this model, while these lexical items are not otherwise employed with the individual lexical concepts which are integrated in this model. For instance, while verbs of motion such as *come*, *draw near*, *arrive*, *approach*, etc., are conventional ways of elaborating, for instance, the Event Sense, as in the following:

(33) (a) The young woman's time [=labour] is approaching/coming/drawing near
(b) The young woman's time has arrived

However, the lexical items *precede/follow* or *before/after* are not conventional ways of elaborating this lexical concept, as evidenced in (34), where a question mark preceding a sentence indicates its semantic oddness:

(34) (a) ?The young woman's time is following
(b) ?The young woman's time is preceding
(c) ?The young woman's time is/comes before/after

In none of the sentences in (34) do we derive a reading in which it is understood that childbirth is imminent. This follows as the verbs *precede/follow* and the prepositions *before/after* are only compatible with the Event Sense when it is integrated in the Temporal Sequence model. This model serves to relate one event to another by virtue of imposing an in-tandem schema which relates all the events integrated in the model.

Interestingly, other prepositions which are related to *before* and *after*, namely *in front of* and *behind* (and *in back of* in American English) are not compatible with the Temporal Sequence model[23]:

(35) (a) ?February is behind January (cf. February is after January)
(b) ?January is in front of February (cf. January is before February)

This follows as prepositions such as *in front of* and *behind* relate elements in static spatial scenes. Hence, they are incompatible with spatial configurations which also involve motion. As the temporal lexical concepts which are integrated in the Temporal Sequence Model are already elaborated in terms of motion, then we would expect that prepositions of this kind would be incompatible with this model, which is what we find. By way of summary, the inferences resulting from integration of temporal lexical concepts in the Temporal Sequence model are as follows:

(36) (a) sequence of temporal events → chronology of events
(b) temporal events located before → earlier events or preceding other events
(c) temporal events located after → later events or following other events
(d) motion of temporal events with respect to other temporal events → awareness of the 'passage' of time

3.4 Evidence for cognitive models of time

There are potentially a large number of lines of evidence in support of positing a level of conceptual organisation at the level of cognitive model, in addition to the 'simpler' level of lexical concept. These relate to (i) unpredictable inferences associated with individual lexical concepts, (ii) entailments, and (iii) distinct patterns of temporal reference. I briefly describe each of these below.

3.4.1 Unpredictable inferences

The first line of evidence relates to linguistic examples such as the following:

(37) Time flows by

I argued earlier that linguistic examples involving the ascription of motion which is continuous and ongoing as lexicalised by the verb *flow* relate to the Matrix Sense. Moreover, this lexical concept is not normally elaborated in terms of ego-centred motion as the Matrix Sense is conceptualised in terms of an unbounded and eternal elapse. However, in (37) the use of the spatial particle *by* presupposes an ego-like reference point. That is, time 'flows **by**' something or someone. An informal survey suggests that for native speakers of English, in a sentence such as this, the reference point is assumed to be facing the moving temporal matrix, such that as a portion of the temporal matrix 'passes', it comes to be 'located behind' the ego. That is, the ego and time are aligned in something akin to a 'face-to-face' configuration. Yet, there is nothing in the sentence which might provide such a reading, as the landmark past which the 'flow' of time proceeds is not encoded linguistically, and as such its orientation with respect to the temporal matrix cannot be established based on linguistic evidence. The fact that native speakers of English appear to consistently derive a reading in which the ego is facing the approaching temporal matrix in examples such as this is highly suggestive that they are applying a conventional schema or cognitive model in order to interpret this sentence. In other words, there is a cognitive model beyond the Matrix Sense – the Matrix Sense encodes nothing regarding reference points or ego, with respect to which temporal motion is experienced, or past which time moves – that facilitates our understanding of examples such as (37). In the case of this example, the cognitive model in question is that of Moving Time, which integrates an ego corresponding to the experience of 'now' with that of the Matrix Sense.

3.4.2 Entailments

The second line of evidence relates to the notion of entailments. I define an entailment as an obligatory inference. Crucially, certain entailments cannot be traced to individual lexical concepts. For instance, steady-state motion is associated with the normal experience of duration. Yet, all things being equal, the Duration Sense is not conventionally elaborated in terms of steady-state motion. The Duration Sense is normally elaborated in terms of length, e.g., *a long time*, and its two sub-senses in terms of slow or rapid motion. However, due to integration of these sub-senses in the Moving Time model, there is an entailment that our 'normal' experience of duration can be elaborated in terms of steady-state, or 'equable' motion. Indeed, it is this entailment, which emerges from the Moving Time model which Newton ascribes to his notion of 'absolute time'. Entailments of this kind provide evidence that there is a distinct level of mental representation above the level of lexical concepts. In other words, entailments emerge from the integration of lexical concepts which make up the model. However, a particular cognitive model may include inferences which involve more than the 'sum of the parts' which make up the model. In the case of the inference relating to equable motion, as we've seen this is not a pattern of conceptual elaboration associated with any of the lexical concepts which make up the model. Rather it is EMERGENT, arising from the cognitive model itself.

3.4.3 Distinct patterns of temporal reference

The third line of evidence relates to the temporal reference frames imposed by the three cognitive models we have examined in this section. That is, the cognitive models provide a frame of temporal reference which is distinct, and emerges from integration of a number of distinct temporal lexical concepts rather than the individual lexical concepts themselves. Moreover, there are three kinds of reference frame in English and many languages, suggesting there are (at least) three kinds of cognitive model. As the Moving Time and Moving Ego models are ego-based, they serve to locate a particular temporal experience or event with respect to the ego's experience of now. Yet they do this in different ways. In Moving Time, temporal experience is in motion and constitutes the FIGURE understood with respect to a stationary ego which serves as the GROUND, in order to identify the 'location' of a particular temporal event. In the Moving Ego model it is temporal experience which is the ground, serving to 'locate' the ego, the figure which moves 'in' and 'across' time.

The Temporal Sequence model is not concerned with 'locating' temporal events or moments with respect to an ego. Rather, this model serves to provide assessments of earlier or later relationships, by relating events to each other. It does this by imposing an in-tandem sequence of temporal motion. These three distinct patterns of temporal reference suggest that there are three distinct types of cognitive model at work.

4 The spatial basis of concepts for time

It has frequently been observed that time at the conceptual level is structured in terms of spatial experience such as motion through space (e.g., Smart 1949; Clark 1973; Lakoff and Johnson 1980, 1999; Evans 2004). Indeed, the research presented here supports this view. In particular, I have shown that at all levels of conceptual organisation (i.e., lexical concepts and cognitive models), time is conceptualised in terms of spatial relations and motion through space. In this section I briefly consider why.

Some scholars have suggested that we structure time in terms of motion though space because time is a mental achievement, grounded in more directly perceivable and more concrete experiences such as that of space, and motion events. In other words, we cannot actually experience time itself, if time is even a thing unto itself, but always do so by constructing it from more basic experiences. This is the view advocated by scholars as diverse as the ecological psychologist James Gibson (e.g., 1975) and cognitive linguists George Lakoff and Mark Johnson (e.g., 1999: Chapter 10), and constitutes a view which can be traced back to the philosophy of Leibniz (1646–1716), who argues that time is an ideal, rather than a real experience (Turetzky 1998). One reason for this view is that unlike our experience of space, time is not a concrete sensory experience. Moreover, unlike our perceptual apparatus specialised for assessing spatial experience (e.g., the vestibular, haptic and visual systems, which contribute to the detection of motion in space), there is no analogous sensory apparatus specifically dedicated to the processing of temporal experience.

However, this view assumes that 1) time cannot be related to cognitive mechanisms or processes and 2) is not directly perceived. As we saw at the outset of this paper, evidence from neuroscience and from psychology offers compelling evidence both that temporal experience can be traced to neurological mechanisms, such as the notion of the perceptual moment, and that time is a phenomenologically real, albeit complex set of related experiences. These two lines of evidence undermine the claim that time, at base, is merely a construct of the intellect.

Yet, if time is a real and directly perceived experience, why at the conceptual level is it systematically elaborated in terms of patterns of imagery which relate to space and motion through space? Grady (1997) argues that the reason that temporal concepts are structured in terms of spatial elaboration is due to a distinction between what he terms RESPONSE CONCEPTS versus IMAGE CONCEPTS. Response concepts arise from evaluations and assessments, i.e., responses to sensory experience, which enter into the sensory experiences they are responses to. Image concepts derive from sensory experiences which they are 'redescriptions' of. Hence, subjective responses receive a lower level of attention in conscious experience than sensory experience. For instance, when judging the similarity of two dogs, it is the dogs in question that constitute the focus of our experience. The experience of similarity relates to a subjective response deriving from comparing the two dogs. Hence, it is the dogs themselves rather than the experience of similarity which is foregrounded. Analogously, evaluations of temporal magnitude, i.e., assessments of duration, constitute responses to events and/or states of particular kinds. Thus, the evaluation of duration enters into the event or state being perceived, rather than being focused on in its own right. Put another way, duration is a response to something rather than an experience which emerges in its own right. On this account, the reason response concepts such as the primary lexical concepts for time are elaborated in terms of structure relating to space and motion through space, is that they are structured in terms of the kinds of image concepts they are responses to, and thus correlate with. This serves to facilitate the foregrounding of otherwise backgrounded subjective experiences.

However, this account does not directly address temporal lexical concepts which I termed secondary lexical concepts. The reason for this is that such concepts, which include the Matrix Sense, the Agentive Sense, the Measurement-system Sense and the Commodity Sense are cultural constructs which do not so directly relate to phenomenologically basic and real evaluations and responses. Rather, such lexical concepts relate to and are grounded in more complex culturally-situated relationships and connections. The patterns of elaboration which serve to structure temporal concepts of this kind appear to be motivated by the need to provide more abstract concepts, in the sense of concepts which are not directly grounded in subjective experience, and thus really are cultural and mental constructs, with concrete models which serve to add (relational) structure to the concepts in question. Accordingly, the Matrix Sense is elaborated in terms of entities such as rivers, which provide a concrete analogue of the matrix conception of time; the Agentive Sense is elaborated in terms of entities which are agents of change, such as physicians; the Measurement-system Sense is elaborated in terms of the motion associated with canonical time-reckoning artefacts, such as the motion of hands on a clock-face; and the Commodity Sense is elaborated in terms of other kinds of commodities, particularly money, which is the example of a valuable commodity *par excellence*.

5 Conceptual metaphor theory and time

I conclude this paper with a discussion of CONCEPTUAL METAPHOR THEORY (CMT), and implications of the present analysis for this theory and its approach to time. CMT, advanced, in particular, in the work of Lakoff and Johnson (e.g., 1980, 1999; Lakoff 1993), represents a relatively well developed theory within cognitive linguistics, and constitutes an approach to conceptual organisation and structure which has been influential in cognitive science more generally. The central idea associated with CMT is that the kinds of patterns I have been referring to as concept elaboration are motivated by CONCEPTUAL METAPHORS. A conceptual metaphor consists of a mapping or a set of mappings holding between concepts in two distinct conceptual domains, e.g., the domains of time and space, for instance. The idea is that these sets of mappings, which constitute relatively stable knowledge structures, serve to conventionally structure one kind of more abstract domain, such as time, in terms of a more concrete kind of domain such as space. This relationship can be expressed by the mnemonic TIME IS SPACE, with two distinct variants TIME IS THE MOTION OF OBJECTS, and TIME IS (MOTION ALONG) A PATH. In other words, these two variants of time constitute conventional knowledge structures which license many of the patterns of elaboration of temporal concepts in terms of motion outlined in this paper.

Accordingly, it might appear, on first blush, that the main (or only) distinction between the CMT account of time and the lexical concepts and cognitive models (LCCM) approach presented here is one of detail. While CMT views things from the perspective of relatively schematic mappings, the present approach is more concerned with the detailed patterning in terms of distinct kinds of lexical concepts, and the differential patterns of concept elaboration associated with each distinct lexical concept for time. However, the present account, I argue, actually gives rise to a much more fundamental critique of CMT, which calls into question the way it models the phenomenon of CONCEPTUAL PROJECTION – the projection of imagery in order to provide conceptual representations with additional structure. The critique that the present approach gives rise to be can be subsumed under two headings, the problem of abstractness, and the problem of psychological plausibility. I address each of these below.

5.1 The problem of abstractness

In recent years CMT has increasingly moved towards much more abstract representations for metaphoric patterns. The current position advanced in Lakoff and Johnson (1999) and based on work by Grady (1997) is that there is a distinction to be made between what are known as PRIMARY METAPHORS and COMPOUND METAPHORS. Primary metaphors relate to mappings holding between concepts which derive from basic and directly perceived aspects of subjective and sensory experience. Moreover, metaphors of this kind are foundational. Compound metaphors, on the other hand, result from integration of the more foundational primary metaphors. On this view, primary metaphors constitute conceptual primitives, from which more complex kinds of conceptual representations can be constructed. However, primary metaphors are stated at a very high level of abstraction. For instance, TIME IS THE MOTION OF OBJECTS, and TIME IS (MOTION ALONG) A PATH have been proposed as possible primary metaphors for time (Grady 1997).

The difficulty here, as we have seen, is that there are a range of temporal lexical concepts that have distinct patterning in terms of motion events. For instance, the two primary metaphors TIME IS THE MOTION OF OBJECTS and TIME IS (MOTION ALONG) A PATH would account for the range of motion events which serve to structure both the variants of the Duration Sense, as well as the Moment Sense, the Event Sense, the Matrix Sense and the Measurement-system Sense. However, they do this by being stated at a very high level of abstractness. In other words, the conceptual metaphor account has no way of predicting (or accounting for) the differential patterning in terms of the nature and range of motion events which can (and cannot) structure the individual lexical concepts uncovered in this paper. This suggests that the foundational conceptual metaphors, primary metaphors, may be stated at too high a level of abstraction, and in fact, conceptual representations, based on the linguistic evidence, are more correctly captured at a more specific and detailed level, the level of the lexical concept, as defined in this paper. Indeed, primary metaphors such as TIME IS THE MOTION OF OBJECTS and TIME IS (MOTION ALONG) A PATH might better be thought of as relating to the level of the cognitive model (Evans 2004).

5.2 The problem of psychological reality

The second major problem that the present study poses for CMT is that the psychological reality of conceptual metaphors, particularly primary metaphors, as the foundational level of conceptual structure, is called into question. This follows for the following reason. A primary metaphor constitutes a conventional association holding between response and image concepts in distinct conceptual domains. Yet the response and image concepts associated in a primary metaphor are supposed to relate to phenomenologically 'simple' and unitary kinds of experiences. Moreover, the association between the response and image concepts is meant to be psychologically real. Yet, the kind of linguistic evidence that metaphor scholars employ relate to very different aspects of temporal experience and motion events. In other words, neither the kind of temporal experience nor the motion events invoked relates to a single kind of 'simple' temporal experience or motion experience.

For instance, consider just two of the examples Lakoff and Johnson (1999) present to support what they term the 'Moving Time' Metaphor (=TIME IS THE MOTION OF OBJECTS):

(38) (a) The time for action has arrived
(b) The summer just zoomed by

While in the first example the temporal experience being described relates to the occurrence of a particular temporal moment or point (what I have identified as the Moment Sense for time), the second relates to the experience of temporal compression, i.e., the summer 'feels' as if it's gone by abnormally quickly. Moreover, in terms of the kinds of motion event involved, the first sentence employs terminal ego-centred motion, while the second employs a motion event which is extremely rapid. Put another way, neither of these examples relate to time in general or motion in general, but rather, to specific and distinct kinds of temporal and motion experiences in service of particular and distinct kinds of conceptualisation. In particular, it makes little sense to claim that there can be a unified concept of time, which relates to a correspondingly 'simple' phenomenological experience of time, precisely because the linguistic evidence suggests that there is no such unified concept of time – the English word *time* relates to a set of distinct, albeit related, lexical concepts. Moreover, research from neuroscience and psychology, reviewed briefly at the outset of this paper, supports this conclusion. Thus, as primary metaphors represent levels of abstraction not supported either by the linguistic data employed to make the case for the conceptual metaphors posited, nor are such abstract representations supported by evidence from neurological or phenomenological levels of function and experience, we must conclude that in terms of psychological plausibility, primary conceptual metaphors are on shaky ground (Evans 2004).

However, in making this claim, I want to re-iterate that what is at stake is not the principle of conceptual projection implicit in the conceptual metaphor framework. I am not suggesting that conceptual projection itself is psychologically implausible. Indeed, in my discussion of concept elaboration I have argued for just that, which is to say, for conventional patterns of imagery being associated with distinct lexical concepts for time. Rather, my claim is that the primary metaphors for time considered don't constitute a psychologically plausible foundational level of conceptual representation. Based on the evidence presented here, this level is better modelled in terms of lexical concepts. If (primary) metaphors are psychologically real, then they are better thought of in terms of cognitive models, of the kind discussed in this paper.

Notes

1 Pöppel (1994, p. 194) has suggested that as perceptual processing appears to only be able to unify experiences within a temporal window with an outer limit of between 2–3 seconds, temporal compression may be the result of 'temporal leakage', in which 'successive information disintegrates into parts, if longer lasting stimulus sequences have to be processed.'

2 I will use the term 'lexical item' in a technical way to refer to discrete units of language such as words.

3 This phenomenon, in which a single form has a range of distinct but related meanings associated with it is termed POLYSEMY, and is an extremely common and widespread phenomenon in English and indeed, in other languages (see Tyler & Evans, 2001, 2003; Evans & Tyler, 2004; Evans, 2004, 2005; Evans & Green, 2006). Polysemy represents an innovative solution to the problem of conventionally encoding a relatively large set of concepts in language with a smaller set of lexical forms, thereby reducing mental storage pressures.

4 I will use the term 'sense' inter-changeably with the term 'lexical concept'.

5 For discussion of these phenomena see Evans (2004) and Flaherty (1999).

6 The term 'sub-sense' is borrowed from the work of Cruse (e.g., 2000; Croft & Cruse, 2004).

7 Newton's view of 'absolute time', cited in Turetzky (1998, p. 73). See also Griffiths and Sinha (2004).

8 Newton (1642–1727) enshrined his view of mechanics in his great work *Principia Mathematica*. Classical mechanics stood firm until the advent of Einstein's work on special and general relativity at the beginning of the twentieth century.

9 For a discussion of other ways in which this sense is elaborated see Evans (2004).

10 Psalms xc.

11 The Future.

12 Meditations, IV. 43. Marcus Aurelius was Roman Emperor from 161–180 AD, and was also an influential Stoic philosopher.

13 Walden, 'Where I lived and what I lived for'.

14 Endymion, book. I, chapter 81.

15 Essays: 24, Of Innovations.

16 Childe Harold IV, cxxx.

17 Advice to Young Tradesmen.

18 The Observer on-line: 'The Mad Rush to Save Time' 3rd October 1999 [www.newsun-limited.co.uk/observer/ focus/story/].

19 The Observer on-line: 'The Mad Rush to Save Time' 3rd October 1999.

20 While English and many languages elaborate lexical concepts associated with the forms *past* and *future* in terms of locations which are behind and in front of the ego respectively, this is not the way all languages elaborate these concepts. For instance, there is now evidence that the South American language Aymara elaborates future-based concepts in terms of locations behind the ego and past-based concepts in terms of locations in front of the ego. See Núñez and Sweetser (in press).

21 Indeed, in general it is extremely difficult to think and talk about our temporal experience without making using of the spatial reference frames to be discussed below.

22 There is good evidence that some languages, such as Mandarin, additionally make use of the vertical spatial axis in order to elaborate the time-based cognitive model for time. See Evans (2004) for a review.

23 See Tyler and Evans (2003, chapter six) for a discussion of the complexity, and distinct semantic character associated with prepositions of this kind.

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23 How language structures space

Leonard Talmy

1 Introduction

This chapter is concerned with the structure ascribed to space and the objects within it by linguistic 'fine structure,' the subdivision of language that provides a fundamental conceptual framework.[1] The primary aim of the chapter is to characterize the general properties of this structuring and the linguistic-cognitive system in which it participates.

Previous linguistic space studies, by authors like Gruber (1965), Fillmore (1968), Leech (1969), Clark (1973), Bennett (1975), Herskovits (1982), Jackendoff (1983), and indeed, myself (Talmy, 1972, 1975a, 1975b), have laid a groundwork by isolating many of the basic geometric and dimensional distinctions that languages mark, and by recognizing the patterns that these form.[2] The present study, however, aims beyond pure description of spatial categories to an account of their common fundamental character and place within larger linguistic-cognitive systems.

This aim is addressed in several ways. First, the chapter considers the foundational role played in linguistic space descriptions by **schematization** – a process that involves the systematic selection of certain aspects of a referent scene to represent the whole, while disregarding the remaining aspects. A range of schematization types is documented in section 2, including some by which a scene receives its primary division into subparts and some that attribute to these parts certain structural conformations. Section 3 then provides an overview of the little-recognized generic properties of schematization; these properties include idealization, abstraction, and a topological type of plasticity, as well as a disjunct character, which permits alternative schematizations of a single scene.

Second, the study addresses the cognitive processes attending schematization in communication, treating both the speaker's decision-making process concerning the alternative of schematization and degree of specificity she wishes to convey for a scene and also the listener's image-constructing process as it interacts with this selection (section 3.2).

Finally, the findings on how languages represent space are taken as a particular case of the system by which language represents meaning in general, with the conclusion that this system is not so much 'classificatory' in a strict sense as it is *representative,* supplying the requisite schemas for a sufficiently dense and distributed 'dotting' of semantic space (section 4.1.1).

A few comments may be in order on the manner of presentation. I have concentrated on English as my primary source of examples. But the general applicability of the examples – and such generality is the aim since this study's concern is with universal properties of languages – is underwritten by my work with a range of languages. Finally, since first-order observations must precede higher-level generalizations, section 2 is primarily devoted to cataloging certain major types of scene and object schematizations, while section 3 abstracts their common properties and determines the larger system in which these take part. Thus, the reader more concerned with theoretical demonstration and systematic principles can skip directly to section 3 and infer many of the particulars described earlier.

1.1 The fine-structural level of language

The fact that this analysis will focus on only one subdivision of language, its 'fine-structural level,' calls for some justification. In a study of how conceptual material is represented in language, one must distinguish two main levels, each with possibly distinct properties and organization. One of these is the macroscopic expository level. Here, within the scope of a sentence, a paragraph, or a whole discourse if need be, one can convey conceptual content of any sort, including feelings, local gossip, and practical medicine – or indeed, the organization of space, time, and causality. The main resource for this level is a language's stock of open-class lexical elements – that is, commonly, the stems of nouns, verbs, and adjectives.

The second level, which can be characterized as the fine structural, is that of closed-class 'grammatical' (as distinguished from 'lexical') forms – including grammatical elements and categories, closed-class particles and words, and the syntactic structures of phrases and clauses, as detailed in Talmy (2000, chapter I-1).[3] These forms also represent conceptual material, but from a much more limited array. They do not refer to items of gossip or medicine. They represent only certain categories, such as space, time (hence, also form, location, and motion), perspective point, distribution of attention, force, causation, knowledge state, reality status, and the current speech event, to name some main ones. And, importantly, they are not free to express just anything within these conceptual domains but are limited to quite particular aspects and combinations of aspects, ones that can be thought to constitute the 'structure' of those domains. Thus, the closed-class forms of a language taken together represent a skeletal conceptual microcosm. Moreover, this microcosm may have the fundamental role of acting as an organizing structure for further conceptual material (including that expressed by the open-class elements) – as if it were a framework that the further material is shaped around or draped over. More speculatively, this language-based microcosmic selection and organization of notions may further interrelate with – and even to some degree constitute – the structure of thought and conception in general. Hence, the importance of determining the fine-structural level's representation of various conceptual domains – and in particular that of space, under study here, which itself may play a central role by functioning as a (metaphoric) model for the structuring of other domains.

An illustration can be given of the exclusive nature of the fine-structural system – the fact that only certain notions and not others are permitted representation – with this example of spatial descriptions that one person might give to another while standing at the edge of a field.

(1) a. This field is plowed in concentric circles. Look at the middlemost furrow. There is a pit dug at one point of it. The plow you are looking for is in that pit.

Here, a complex set of spatial configurations and relationships are conveyed in an expository paragraph. That may well be the only way to do so. But now consider another expository description, one that seems comparable to (la) except that it is still more complex.

(1) b. This field has two borders that are relevant to us. These two borders are roughly parallel and don't coincide. Any perpendicular line between them would run crosswise to the pull of gravity – in other words, would be horizontal. We're standing at one point on one border. There's a point on the other border that's roughly on a perpendicular line drawn from our point. The plow you're looking for is at that point.

What is special in this case is that all the spatial information can be equivalently conveyed in English by a single closed-class word, the preposition *across,* as in

(1) b′. The plow is across the field.

By contrast, there is no simplex word that represents the spatial information in (1a), a word that would function like the hypothetical preposition *apit* in

(1) a′. *The plow is apit the field.

Moreover, a search through the world's languages would probably turn up no cases of a closed-class element representing the (la) configuration, whereas the (1b) configuration is clearly well represented. What is it about some spatial configurations, but not others, that makes them crosslinguistically suitable for fine-structural representation, and hence foundational status? This study will research the properties common to such special forms.

The fact that this study, for the sake of accessibility, draws mainly on English to demonstrate points about spatial fine structure will necessarily involve us in a treatment predominantly of prepositions. However, the points made apply generally to the comparable closed-class elements of other languages as well – hence, also to space-indicating noun affixes, postpositions, adpositional phrases based on a noun, affixes on the verb, and so on.

2 Basic spatial distinctions made by language

Our conceptualization of spatial structure can be understood to exhibit two main subsystems. One subsystem consists of all the schematic delineations that can be conceptualized as existing in any volume of space. This subsystem can be thought of as a matrix or framework that contains and localizes. Static concepts relevant to it include **region** and **location**, and dynamic concepts include **path** and **placement**.

The second subsystem consists of the configurations and interrelationships of material occupying a volume of the first subsystem. The second subsystem is thought of more as the contents of space. Such contents can constitute an **object** – a portion of material conceptualized as having a boundary around it as an intrinsic aspect of its identity and makeup – or a **mass**, conceptualized as having no boundaries intrinsic to its identity and makeup.

The material subsystem of space can bear certain static relations to the matrix subsystem of space. With respect to relations that it can exhibit directly, material can, for example, **occupy** a region and be **situated** at a location.

Spatial properties that material entities exhibit in themselves or with respect to each other can also be related to schematic delineations of the containing framework. We can see three forms of this. First are the spatial properties that a single object or mass of material exhibits in itself. Examples are the contour of the entity's external boundary that determines its shape – for instance, the shape of a doughnut or a skyline – and its internal structure, such as the interior disposition of a solid or a latticework. Second are the spatial properties that one material entity can have with respect to another. These include geometric relations, like those specified by such English prepositions as the ones in X *is near/in/on Y,* as well as ones specified more elaborately. Third are the spatial properties that a set of material entities can exhibit as an ensemble. These include their 'arrangement,' potentially to be conceptualized as a Gestalt of geometric patterning, as in a cluster or a sheaf. (An ensemble whose multiplex composition has been backgrounded can be conceptualized spatially in the same way as a single object or mass.)

The material subsystem of space can also bear certain dynamic relations to the matrix subsystem of space. With respect to relations that it can exhibit directly, material can, for example, move through a region or along a path, or exhibit a transposition from one location to another. Spatial properties that material entities exhibit in themselves or with respect to each other can also be related to schematic delineations of the containing framework in the same three ways as before. Thus, first, a single material entity can exhibit dynamic spatial properties in itself. Examples include change of shape – for example, twisting or swelling. Second, one entity can execute various paths relative to another entity. Examples are the paths represented by the English prepositions in X *moved toward/past/through* Y. Third, a set or ensemble of entities can alter their arrangement. Examples of this are scattering and converging.

2.1 The primary breakup of a spatial scene

One main characteristic of language's spatial system is that it imposes a fixed form of structure on virtually every spatial scene. A scene cannot be represented directly at the fine-structural level in just any way one might wish – say, as a complex of many components bearing a particular network of relations to each other. Rather, with its closed-class elements and the very structure of sentences, the system of language is to mark out one portion within a scene for primary focus and to characterize its spatial disposition in terms of a second portion (as treated in this section), and sometimes also a third portion (treated in section 2.7), selected from the remainder of the scene. The primary object's spatial disposition here refers to its site when stationary, its path when moving, and often also its orientation during either state.

2.1.1 Characterizing one object's spatial disposition in terms of another's

The spatial disposition of a focal object in a scene is largely characterized in terms of a single further object, also selected within the scene, whose location and sometimes also 'geometric' properties are already known (or assumed known to an addressee) and so can function as a reference object (see the more detailed discussion in Talmy, 2000, chapter I-5). The first object's site, path, or orientation is thus indicated in terms of distance from or relation to the geometry of the second object. For example, in the sentences

(2) a. The bike stood near the house.
b. The bike stood in the house.
c. The bike stood across the driveway.
d. The bike rolled along the walkway.

the bike's site is characterized in (2a) by *near,* in terms of distance from the house's location ('proximal'). The bike's site is characterized in (2b) by *in,* in terms of the house's location *and* geometry ('colocational' + 'part of interior'). The bike's site *and* orientation are characterized in (2c) by *across* in terms of the driveway's location and geometry ('colocational' + 'the former's axis perpendicular to the latter's long axis'). And the *bike's path* is expressed in (2d) by *along* in terms of the walkway's location and geometry ('colocational' + 'colinear with the long axis'). Throughout characterizations of this sort, it remains implicit that the second object can be used as a reference only by virtue, in a recursive manner, of its own known spatial disposition with respect to the remainder of the scene. That is, spatial characterizations expressed overtly (as with prepositions) ultimately rest on certain unexpressed spatial understandings.

The distinct referencing functions that have here been isolated for a scene's two main objects are seen generally, though not absolutely, to correlate with other property differences between the two objects. The alignment is as follows:

(3)	*Primary object*	*Secondary object*
	• Has unknown spatial (or temporal) properties to be determined	• Acts as a reference entity, having known properties that can characterize the primary object's unknowns
	• More movable	• More permanently located
	• Smaller	• Larger
	• Geometrically simpler (often pointlike) in its treatment	• Geometrically more complex in its treatment
	• More recently on the scene/in awareness	• Earlier on the scene/in memory
	• Of greater concern/relevance	• Of lesser concern/relevance
	• Less immediately perceivable	• More immediately perceivable
	• More salient, once perceived	• More backgrounded, once primary object is perceived
	• More dependent	• More independent

It might be argued for cases like (2) that language simply relates two objects in space without any inequality of status – in other words, without one serving as reference for the other. But the semantic reality of their functional difference can be demonstrated simply by interchanging their nouns in a sentence pair like that in (4).

(4) a. The bike is near the house.
b. The house is near the bike.

One could have expected these sentences to be synonymous on the grounds that they simply represent the two inverse forms of a symmetric spatial relation. But the obvious fact is that they do not have the same meaning. They *would* be synonymous if they specified *only* this symmetric relation – that is, here, the quantity of distance between two objects. But in addition to this, (4a) makes the nonsymmetric specification that the house is to be used as a fixed reference point by which to characterize the bike's location, itself to be treated as a variable. These nonsymmetric role assignments conform to the exigencies of the familiar world, where in fact houses have locations more permanent than bikes and are larger landmarks, so that (4a) reads like a fully acceptable sentence. The sentence in (4b), on the other hand, sounds quite odd, and is thereby well flagged as semantically distinct from (4a). Since the assertion of nearness is unchanged, the reason for the difference can only be that (4b) makes all the reverse reference assignments, ones that in this case do not happen to match the familiar world.

It might at first be thought that certain grammatical constructions, like the reciprocal, are means available in a language specifically to avoid assigning different referencing roles, which otherwise are inescapably imposed upon a basic proposition in formulations like (4). But in fact, the reciprocal does not abstract the symmetric relation common to the inverse asymmetric forms, but rather *adds* the two together. This is shown by the fact that the reciprocal for the preceding example

(5) The bike and the house are near each other.

sounds odd in just the same way as (4b) itself – that is, because of the implication that the house is somehow a floating entity to be fixed with respect to a stable bike.

2.1.2 Figure and Ground

The distinct roles played by the 'primary' and 'secondary' objects just described for linguistic schematization appear to be closely related to the notions of 'Figure' and 'Ground' described in Gestalt psychology, and the same terms can be applied to them. Thus, in examples (2a) and (2b), *bike* functioned as the Figure and *house* as the Ground. But for their specifically linguistic application, the Figure and Ground concepts must be given the following particular characterization.

(6) *The general conceptualization of Figure and Ground in language*
The Figure is a moving or conceptually movable entity whose site, path, or orientation is conceived as a variable the particular value of which is the relevant issue.
The Ground is a reference entity, one that has a stationary setting relative to a reference frame, with respect to which the Figure's site, path, or orientation is characterized.

In a linguistic context, the term **Reference Object** may at times be more suggestive than Ground and will be used interchangeably with it from now on.[4]

In a linguistic context, the Figure and Ground notions amount to semantic roles or 'cases,' in the sense of Fillmore's (1968) 'Case Grammar.' The present notions, in fact, compete with those of Fillmore, and certain advantages can be claimed for them. Full comparison aside (see Talmy, 2000, chapter I-5), one main difference is that four Fillmorian cases – 'Locative,' 'Source,' 'Path,' and 'Goal' – because they incorporate particulars of direction, fail to capture the crucial spatial factor they have in common, their function as reference object for a figural element, a function specifically delegated to our Ground notion. Further, because it names separate cases for several different incorporated directionals, Fillmore's system is open to question over how it can handle novel directional distinctions that some languages might mark or directions that do not clearly fit any established case. For example, should the directionals represented by the prepositions in *The ball rolled across the crack. /past the TV./around the lamp.* all be classed as 'Path'? By identifying a core Ground notion, our system can set up a separate Directional component for the various attendant path types – one that can, within universal constraints, expand or contract and exhibit somewhat different structurings as appropriate for each particular language. This separation, moreover, corresponds to the usually encountered division of morpheme classes, where the Ground notion is expressed by a noun root (plus any modifiers) and the Directional notions by closed-class elements such as noun affixes or adpositions.

2.2 Figure and Ground geometries and their relations

The particular spatial schemas ascribed to Figure and Ground objects by closed-class elements of languages can be specifically termed geometries, and their basic types and distinguishing features can be regarded as a map of the kinds of spatial discriminations language is concerned with.

One major feature of this 'map' is that closed-class spatial elements generally characterize the Figure's geometry much more simply than the Ground's geometry. The explanation for this can perhaps be found in our very mode – in large part presumably innate – of conceiving, perceiving, and interacting with the contents of space. In this mode, our predominant concern is with a smaller portion of focal interest within a broader field and, often also, with a determination of that portion's spatial relation to the field, so that we can achieve direct sensory (or imaginal) contact with it. The very concept of the 'location' of an object within space – with its implication of an immediate containing region, itself cross-indexed within the space – owes its existence and character to this cognitive mode. And 'localizing' an object (determining its location), in turn, involves processes of dividing a space into subregions or segmenting it along its contours, so as to 'narrow in' on an object's immediate environment. Accordingly, elements like prepositions largely delineate a field and the reference objects in it with some particularity, while typically treating the focal object as reducible simply to a geometric point. Nevertheless, some spatial elements do indicate greater Figural complexity, and their types are analyzed in sections 2.2.1 and 2.2.2.

As just noted, closed-class specifications for Figure geometries more complex than a point do exist and are addressed at length in this chapter. But Levinson (1992) cites the Mayan language Tzeltal as a challenge to the idea that point geometries always predominate. He notes that in referring to a locative situation (though not to a motion event), Tzeltal typically uses a verb that refers to the Figure's shape and orientation, doing so, in fact, more specifically than the abstractions of our usual geometric schemas. Further, the Ground nominal is often accompanied solely by a generic locative preposition that can cover the range of English *at, in, on,* and *near.* His point is that Tzeltal uses a strategy for the listener to locate a Figure object in a surrounding scene that depends on scanning for and spotting the object from linguistically specified shape characteristics, rather than on partitioning the scene with elaborate Ground geometries and finding the Figure with respect to that.

While it may be true that Tzeltal locative sentences are often constructed as just described, several points in Levinson's argument about them can be faulted. Most important, the Tzeltal verbs that refer to the Figure's shape and orientation – the 'position' verbs – are not a small closed class, but rather number in the hundreds, and thus either are or come near to being an open class. The claim in this chapter for a preponderance of Figural point geometry pertains only to closed-class forms, and so this claim remains unchallenged by the Tzeltal data. If open-class forms were to be included in consideration, then we would need to note that English also has no small number of verbs that refer to the Figure's shape and orientation. Examples include *lie, sit, stand, lean, dangle, squat, kneel, crouch, sprawl, bow, bend, curve, arch, sag, droop, cluster.* Further, position verbs are not obligatory in Tzeltal locative sentences. The language also has a generic 'be located' verb comparable to English *be.* And the language can in addition use verbs with no reference to the Figure's shape or orientation – for example, ones with meanings like 'roast' or 'dry', as in *The beetle is roasting/drying at the fire.* Finally, with its closed-class set of prepositional complexes, Tzeltal can as readily refer to elaborate Ground geometries as English. (Levinson makes a point of the fact that much of this set derives by analogic processes from body-part terms, but whatever its diachronic origins, this set is today a schematically abstract closed-class system.)

A further general feature of the 'map' of geometric distinctions that languages typically mark is that objects are not characterized as to just any properties of physical configuration or makeup. Missing from the catalog of geometric types that follows, for example, are virtually all properties specific to metric spaces (including the Euclidean) such as particular size, length, distance, angle, or contour, as well as more substantive properties like texture, material, or identity. Instead, the objects are characterized almost solely by more qualitative or 'topological' properties such as their type of structural conformation, degree of subdivision ('partiteness'), number of relevant dimensions, boundary conditions, and symmetry versus distinguishability of parts.

2.2.1 Geometric relations of a nonpoint Figure to a Ground

Though the seeming majority of spatial elements schematize the Figure solely as a point or related simple form, in contrast with the treatment given the Ground, one type accords the Figure a full geometry and relates it to that of the Ground. Elements of this type can in fact represent a quite elaborate spatial complex, simultaneously indicating a particular geometry for the Figure, another one for the Ground, the Figure's position or path with respect to the Ground, and the concurrent relation of the Figure's geometry to that of the Ground – that is, its orientation thereto. An example of this type is the English preposition *across,* as in

(7) The board lay across the railway bed.

The preposition here indicates that the Figure (the board) is linear, that the Ground (the railway bed) is 'ribbonal' – in other words, a plane bounded along two parallel edges (what Herskovits (1986) terms a 'strip') – and that these two forms bear certain positional and orientational relations to each other, summarized as follows.

(8) (F = the Figure object; G = the Ground object)
  a. F is linear (and generally bounded at both ends).
  b. G is ribbonal: a plane with two roughly parallel edges as long as or longer than the distance between them.
  c. The axis of F is horizontal.
     (The plane of G is typically, but not necessarily, horizontal.)
  d. The axes of F and G are roughly perpendicular.
  e. F is parallel to the plane of G.

f. F is adjacent to – not in – the plane of G.
g. F's length is at least as great as G's width.
h. F touches both of G's edges.
i Any extension of F beyond G's edges is not enormously greater on one side than on the other, nor than the width of G itself.

If one or the other of these factors fails to hold in a referent situation, then some expression other than *across* must be used. For example, the plane of the Ground may be vertical, but if the axis of the Figure is still horizontal, as in the parenthesized sentence of (9c'), then *across* can still be used. But if the Figure is not horizontal (factor c), then instead of *across* one must use some expression like *up and down on/against,* as in the unparenthesized sentence of (9c'). If the Figure's axis is not perpendicular to that of the Ground (factor d) but rather parallel to it, then *along* is more suitable, as in (9d'). If the Figure is not parallel to the plane of the Ground (factor e) but is rotated away from it, then a locution like *stick into/out of* may apply, as in (9e'). If the Figure is not adjacent to the plane of the Ground (factor f) but is part of it, then the preposition *in* is more appropriate, as in (9f'). If the Figure's length is not great enough to span the Ground's width (factor g), then the preposition *on* is more fitting, as in (9g'). Next consider the case where the Figure is long enough to be able to span the Ground's width and indeed is perpendicular to the Ground's length, but, say, is so positioned as to lie half on and half off the ribbon of the Ground. Here, the Figure does not touch both edges of the Ground (factor h), but it does satisfy all the factors (a) through (g). But then the form *across* would again no longer apply, and some locution like *half on* or *extend halfway onto* would be needed, as in (9h'). Finally, if the Figure satisfies all of the earlier factors but extends beyond both edges of the Ground by an amount disproportionately large relative to the width of the Ground (factor i), then one might use the preposition *over* instead of *across,* as in (9i' (i)). And if the Figure extends disproportionately beyond just one edge of the Ground, then a locution referring to one end of the Figure might be used, as in (9i' (ii)).

(9) c'. (The spear hung across the wall.) The spear hung up and down on the wall.
d'. The board lay along the railway bed.
e'. The board stuck (obliquely) into the railway bed. **/** The (horizontally level) spear stuck (obliquely) into the wall.
f'. The board lay (buried) in the railway bed.
g'. The board lay on the railway bed.
h'. The board lay half across the railway bed/extended halfway across the railway bed/extended onto the railway bed.
i'. (i) The 50-foot board lay over the railway bed.
(ii) The end of the 50-foot-long board lay across the railway bed.

2.2.2 The orientation of the figure relative to the ground

Prepositions of the *across* or *along* type can generally be used even in situations where a Figure's site relative to a Ground is already known. In this case, they shed their localizing function and serve solely to indicate the Figure's orientation with respect to the Ground. They are then equivalent to expressions like *crosswise to* and *parallel to,* which always indicate orientation alone:

(10) a. The gate was set across/crosswise to the pier.
b. The gate was set along/parallel to the pier.

2.3 The range of geometries of the Figure

Looking over those linguistic elements that relate a full Figure geometry to one for a Ground, we find represented a certain array of Figural geometries more complex than just a point. One type here seems universal. Languages allow a term referring to a point Figure that is in motion, and therefore describing a linear path, to apply as well to a linear Figure moving coaxially along the same path, and sometimes also to a stationary linear Figure positioned in coincidence with such a path, as in the following English examples.

(11) (i) *Motion of a point Figure*
(ii) *Coaxial motion of a linear Figure*
(iii) *Coaxial location of a linear Figure*
a. (i) The ball rolled ... (ii) The trickle flowed (iii) The snake lay ...
across the railway bed.
b. (i) The ball rolled ... (ii) The trickle flowed (iii) The snake lay ...
along the ledge
c. (i) The ball rolled ... (ii) The trickle flowed (iii) The snake lay
around the tree trunk.
d. (i) The ball rolled ... (ii) The trickle flowed (iii) *The snake lay
past the rock.
e. (i) The ball rolled ... (ii) The trickle flowed (iii) *The snake lay ...
through the tube.
f. (i) The car drove ... (ii) The stream flowed (iii) *The road lay...
from Burney *to* Redding.

While a stationary linear Figure as such is excluded from the reference of some spatial terms, as in (11d) to (11f), it can be rendered suitable there if it is conceptualized as having a leading edge in virtual motion, or as being scanned along its length by one's focus of attention – as is generally indicated by verbs that unlike *lie,* suggest movement, as in (12).[5]

(12) This road runs past the factory/extends through the tunnel/goes from Burney to Redding.

Reference to a moving point (and, hence, also to a moving coaxial line) may be considered more basic than reference to a stationary line. As one form of evidence for this proposition, those forms in (11) that refer to only one of these two types, rather than covering both types – namely, (11d) to (11f) – all apply to the motion type, not to the locative type. Accordingly, we can reinterpret the linear-locative *across* case in (8), even with its elaborate features, as derived in some way from the moving case, as suggested in (13).

(13) A point moved across a bounded plane.
→ A line was located across a bounded plane.

Thus, although the example of locative linear *across* was introduced as representing an instance of Figural geometry more complex than a point, even it may reduce to a form of Figural point geometry.

Although there is thus some question here whether linear Figure geometry has any original (nonderivative) reference, at least by English prepositions, we can look further to observe that at least some such prepositions do genuinely indicate other nonpoint Figural geometries. One preposition, *over,* in one usage represents the Figure as planar, further specifying that it is largely coextensive with and everywhere touching a planar Ground (or a salient planar part of a Ground), as in (14).

(14) The tablecloth lay over the table. / The tapestry hung over the east wall of the living room.

An additional group of prepositional expressions characterizes the Figure as a distributed quantity – indifferently, either as a continuous mass or a composite aggregate. These expressions further distinguish the Figure as having a one-, two-, or three-dimensional distribution in agreement with the dimensionality of the Ground object, as shown in (15).

(15)

		The Ground is:
{ There was oil / There were droplets of oil }	*all along* the ledge.	linear
	all over the table.	planar
	throughout the aquarium.	volumar

(Note that *over* and *all over* behave in the distinct ways outlined here and are not interchangeable.)

2.4 The range of geometries of the Ground

In accordance with our mode of cognizing space, linguistic closed-class elements – while they usually treat the Figure as a point or simple extension thereof – mark an elaborate range of geometric distinctions for the Ground. Certain main types in this range are surveyed here and in the next section.

2.4.1 Degree of partiteness

In one such type, the Ground's 'partiteness' is marked in degrees increasing from unity to comminution. One such series of English prepositions is presented in (16).

(16) *Prepositions indicating progressively greater partiteness for the Ground*
The Ground is treated schematically
as a single point by *near:*
a. The bike stood *near* the boulder.
a point pair by *between:*
b. The bike stood *between* the boulders (i.e., two of them).
a set of points – more than two, but typically not very many – by *among:*
c. The bike stood *among* the boulders.
as an aggregate mass – that is, a set of points that are numerous enough, and closely enough spaced relative to their size, to approximate or be conceptualized as a continuous mass – by *amidst:*
d. The bike stood *amidst* the cornstalks.

As a kind of limiting case for this series, *through* in one of its motion usages characterizes the Ground as anything from an aggregate on up to a continuous mass, a range that can be generalized as forms of a *medium:*
e. The tuna swam *through* the minnows/the seaweed/the polluted water.

2.4.2 Qualitative geometric configuration

Another group of prepositions – usually referring basically to motion – represents the Ground as of one or another qualitative kind of integrated geometric configuration, as shown in (17).

(17) *Prepositions indicating different geometric configurations for the Ground*
The Ground is treated schematically
as a bounded plane by *across:*
a. The bike sped *across* the field.
as a linear enclosure – that is, as a kind of cylindrical form – by *through* (in another of its usages):
b. The bike sped *through* the tunnel.
as a surface so curved as to define a single volume by *into:*
c. The bike sped *into* the sports hall.

Languages other than English often mark different, sometimes additional, geometric distinctions for the Ground, ones that can seem quite exotic from our perspective. The class of space-characterizing elements in these languages is not always one of prepositions, or even postpositions, adjacent to the noun that indicates the Ground. Thus, Atsugewi, a California Indian language that I have worked on, has a set of suffixes appearing on the verb that mark some 50 distinctions of Ground geometries and the paths that relate to them. Some dozen of these suffixes mark distinctions covered by the English preposition *into,* which does not itself reflect such finer subdivisions.[6] (The '+' below indicates that the form must be further followed by a suffix indicating 'hither' or 'hence'; the superscript vowel represents a special phonological element of this language.)

(18)	-iċt	'into a liquid'
	-cis	'into a fire'
	-isp -u· +	'into an aggregate' (e.g., bushes, a crowd, a ribcage)
	-wam	'down into a gravitic container' (e.g., a basket, a cupped hand, a pocket, a lake basin)
	-wamm	'into an areal enclosure' (e.g., a corral, a field, the area occupied by a pool of water)
	-ipsn^{u} +	'(horizontally) into a volume enclosure' (e.g., a house, an oven, a crevice, a deer's stomach)
	-tip -u· +	'down into a (large) volume enclosure in the ground' (e.g., a cellar, a deer-trapping pit)
	-ikn +	'over-the-rim into a volume enclosure' (e.g., a gopher hole, a mouth)
	-ik̓s^{u} +	'into a corner' (e.g., a room corner, the wall-floor edge)
	-mik·	'into the face/eye (or onto the head) of someone'
	-miċ	'down into (or onto) the ground'
	-cis^{u} +	'down into (or onto) an object above the ground' (e.g., the top of a tree stump)
	-ik̓s	'horizontally into (or onto) an object above the ground' (e.g., the side of a tree trunk)

Although the Atsugewi forms subdivide the semantic domain of in beyond what english speakers might have thought that 'in-ness' merited, these forms still by no means get down to any level of semantic primitives. On the contrary, it can be observed that the references of the Atsugewi forms in turn represent easily discernible complexes of still finer components. Thus, the form -warn referring to a container and the form -ipsnu + referring to an enclosure (specifically, a volumetric type of enclosure) each comprise a constellation of factors and differ from each other with respect to all these factors. The container form indicates that the figure moves prototypically downward to enter the ground object, fills much of the empty volume defined by the ground, is pressed against the sides of the ground by gravity (hence involving force dynamics in addition to spatial configuration), and would spill radially outward if those sides were not in place. Examples of its usage include the motion of acorns into a basket, articles into a pocket, and water into a lake basin. By contrast, the enclosure form indicates that the figure prototypically moves horizontally to enter the ground, sits alone on the ground's bottom otherwise surrounded by the empty volume that the ground defines, does not press against the sides of the ground, and would remain in place if those sides were not present. Examples of its usage include the motion of a dog into a room, a cake into an oven, a broom into the space between a refrigerator and a wall, and a rock into a deer's stomach. For cases with properties between those of the two constellations, it is probable that Atsugewi speakers would choose one of the two full schematic complexes and impose it on the intermediary spatial referent.

While perhaps reeling from the semantic pyrotechnics of a language like Atsugewi, we should not overlook the additional distinctions that English does mark, not with distinct forms, but with distinct combinations of and constraints on its forms. For example, in referring to entry of an enclosure, either *in* or *into* will serve, as seen in (19a). (In the definitions here and below, braces enclose the type of entity that the prepositional object must refer to.)

(19) a. *in(to):* 'into {an enclosure}'
I ran in the house/into the house.

But there is a separate usage, referring to passage through an opening in the wall of an enclosure, that can be expressed only by *in* and not also by *into,* as seen in (19b). (This same pattern holds for *out* as against *out of: I ran out the back door.* / *out of the back door.)

b. *in.* 'through {an opening} into an enclosure'
I crawled in the window/*into the window.

And there is a third usage, for which only *into* will serve, indicating impact with a solid object:

c. *into:* 'into collision with {an object}'
I ran into the wall/*in the wall.

Moreover, while English has such geometrically encompassive forms as *in/into* – spanning geometric situations as different as immersion amidst liquid and encirclement by a curved plane – it does also possess forms with finer specifications, ones that thus more closely approximate the Atsugewi-type forms. For example, *inside,* unlike *in/into,* can refer to enclosures, but not also to liquids, as seen in (20). Thus, in effect, the closed-class system of English, like that of Atsugewi, does recognize 'liquid immersion' as a distinct concept, but only, as it were, by semantic subtraction, since this concept is merely implicit in the difference between the smaller semantic range of *inside* and the larger one of *in/into.*

(20) a. The ball $\left\{\begin{array}{l}\text{is in}\\\text{fell into}\end{array}\right\}$ the water.

*The ball $\left\{\begin{array}{l}\text{is inside}\\\text{fell inside}\end{array}\right\}$ the water.

b. The ball $\left\{\begin{array}{l}\text{is in}\\\text{fell into}\end{array}\right\}$ the box.

The ball $\left\{\begin{array}{l}\text{is inside}\\\text{fell inside}\end{array}\right\}$ the box.

Finally, English extends its familiar prepositions in their standard constructions to include further reference to various complex geometries. One particular pattern of such extension was already seen in (19b). This pattern accounts for a small set of complex geometric references. In this pattern, a preposition relevant to a certain object A within the geometric complex in reference is used instead with an object B that bears a particular relation to object A.

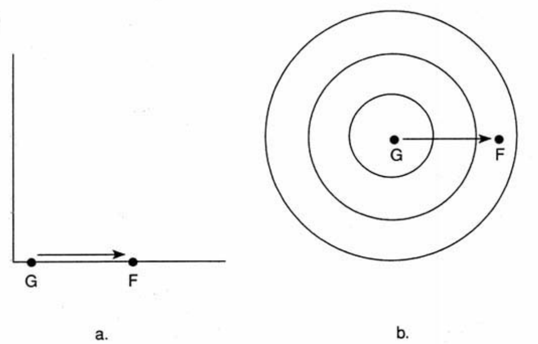
(21) a. *in/out:* 'through {an opening} into/out of an enclosure' I crawled in/out the window.
[as if, e.g., from: I crawled through the window into/out of the house]
b. *across:* 'along/over {a bounded linear extent} across a bounded plane/space' I walked across the bridge.
[as if, e.g., from: I walked along/over the bridge across the canyon]
c. *around:* 'along {a linear extent} around a bounded plane' I ran around the track.
[as if, e.g., from: I ran along the track around the field][7]

2.4.3 Association with a framework

A spatial form such as a preposition can appeal not only to geometric characteristics actually present in a Ground object – as just seen for the partiteness or configuration of a Ground object – but also to the geometric characteristics of a virtual framework that is only fictively associated with the Ground. In particular, a Ground object that is geometrically idealized as a point can be conceptualized as being situated within a rectilinear framework – in effect, at the intersection of the x-axis and y-axis of a Cartesian coordinate system. Alternatively, it can be conceptualized as situated at the center of a radial or concentric framework – in effect, at the origin of a polar coordinate system. Thus, in English, both *away from* and *out from,* as in (22), refer to the motion of a schematically pointlike Figure along a path that progressively increases its distance from a schematically pointlike Ground. But *away from* suggests the conceptualization that the Ground is, in effect, on a line and that the Figure's path begins at the Ground point and extends perpendicularly to that line, as represented in diagram (23a). On the other hand, *out from* suggests the conceptualization that the Ground is, in effect, at the center of a set of concentric circles and that the Figure's path begins at the Ground point and extends radially through those circles, as represented in diagram (23b).

(22) The boat drifted further and further away/out from the island.
The sloth crawled 10 feet away/out from the tree trunk along a branch.

(23)



2.5 Asymmetric Ground geometries

While the preceding Ground geometries have all been in a certain sense 'regular,' with homologous parts or aspects not distinguished from each other, a major group of space-characterizing linguistic forms makes appeal to a Ground object's having some form of asymmetry, or biasing, in its structure. Either it has structurally distinct parts – parts that in themselves are distinguishable from one another and can form a basis for spatial discriminations – or it has some kind of unidirectionality. This unidirectionality can consist either of a static one-way directedness or, dynamically, of an actual path of motion. Here, 'asymmetry' is used as a technical term intended to refer not to all, but only to certain, forms of nonsymmetry, as these are characterized below.

2.5.1 Asymmetry of parts

The prepositions in section 2.4 did not appeal to a Ground object's having any parts with distinguishable identities. In the use of *across* with reference to a field, for example, there is no a priori singling out of one edge of the field as the starting point over the other edge as terminus, and in the use of *through* with a tunnel, one end of the tunnel is as good as the other. But in other cases, the important factor is distinguishable parts. This can be termed asymmetry of parts. Typically, objects have such parts in opposed pairs. Objects with only one such pair are a headlight with a front and a back or a tree with a top and a bottom. Objects with two pairs of distinguishable parts and a third derivative pair are a TV or a person or a building – all having a front and a back, and a top and a bottom, and, derived from these, a right and a left, where the parts of this last pair are generally not different from each other in shape or features. A partially different three-way pattern is usually ascribed to an object like a lizard, with a head (front) end and a tail (rear) end, an upper (dorsal) side and an under (ventral) side, and again a derivative right and left. The objects that exhibit such differentiation of parts cover a distribution of types. They range from the integral forms just mentioned, to composite objects like a line of people, to objects of geographic extent like a fairground or the plane of the earth.

A general way to characterize the present asymmetric kind of geometry is that here (at least) one part of an object is uniquely identifiable without any external indicators – either because that part has its own distinguishing characteristics or because it has a distinct relation to the structure of the whole object.

2.5.1.1 Contact with an asymmetric part

Expressions that refer to a Reference Object's parts in order to localize a Figure divide into three kinds according to the amount of separational distance that they indicate. In one kind the Figure is in contact with – either within the substance of or simply touching – the physical part singled out from the Reference Object. In English, the part thus named is treated as a regular noun and, because of its function within the noun phrase, therefore usually occurs after *the.*

(24) a. The mosaic is $\left\{\begin{array}{l}\text{on the front of}\\ \text{on the back of}\\ \text{on the (right/left) side of}\end{array}\right\}$ the church.

b. The boy is in the front of the line.

c. The carousel is in the front of the fairground.

2.5.1.2 Adjacency to an asymmetric part

The second type of expression uses a Reference Object's part to indicate the volume of space, or portion of terrain, *immediately adjacent* to it, and localizes the Figure within that region. In such expressions in English, the words *front* and *back* have no *the* before them.

(25) The bike is $\left\{\begin{array}{l}\text{in front of}\\ \text{in back of/behind}\\ \text{on one side of/beside}\\ \text{on the right/left of}\end{array}\right\}$ the church.

The police officer is in front of the line.

The parking lot is in front of the fairground.[8]

The fact that these expressions cannot be used to localize figures at a greater distance shows that they indicate relative adjacency to the reference object. For example, a bike directly lined up with the front of a church but three blocks away cannot be said to be 'in front of' the church.

Notice that the human body, although presumably the prototype for the ascription of asymmetric geometries to many other objects, is not structurally treated as any kind of special case in many languages, including English. Thus, in the examples above, the word *church* can be replaced by *me* without any disturbance to the spatial indications or grammaticality of the expressions (except that perhaps a preferable alternative to *on the right/left of me* is *on my right/left).*

2.5.1.3 At some distance from an asymmetric part

The third type of expression is like the second except that the adjacency condition is removed. The Figure is localized in a particular quadrant by reference to some Reference Object part, but it is at any remove. However, this type is poorly represented in English. Perhaps only *to the right/left of* really serve in this sense. Note that the English construction with this property is the one that contains *to* (not, say, the one containing *on),* as in *The bike is to the right of the church* (anywhere from three feet to three blocks). *Rearward of* might work for the back direction, as in *The bike is rearward of the church,* but *forward of* will certainly not do for the front direction. In general, conveying these concepts requires lengthy expressions, and then ones that are not neutral to distance but in fact indicate nonadjacency, as in *The bike is a way off from the front of the church.*

2.5.2 Asymmetry in directedness

A sense of unidirectionality, itself a form of asymmetry, can attach to some axis in an object or other spatial array that functions as a Ground. This can be termed asymmetry in directedness. In the type we first consider here, this unidirectionality can be static, consisting of a sense of one-way directedness implicit within the object or array. With this static directedness, it is thereby possible, within the object or array alone, to characterize a Figure's path of motion along the contained axis as occurring in one direction or its opposite. In some cases, such a directed axis can be conceptualized as having an end point that is associated with a particular asymmetric part of the object or array. Or it can be conceptualized as having two end points associated with two different asymmetric parts and as extending from one of those parts to the other. In such cases, the direction of a Figure's path can be characterized by either of the two asymmetric systems, the one based on parts or the one based on directionality. Several types of configurations exhibit these properties.

One type is a queue – for example, a line of people all facing in the same direction. Such a queue has an asymmetric directedness, one that points in the direction the people are facing in. A Figure can be characterized as moving in this direction by such English forms as *ahead* or *forward,* and as moving in the opposite direction by forms like *backward* or *back down,* as shown in (26a). Alternatively, expressions like *toward the front* and *toward the rear* appeal to a queue's asymmetry of parts, as seen in (26b).

(26) (The people who were queued up at the box office assisted the man in the wheelchair.)
  a. They passed his \$20 bill ahead in the line, and passed his ticket back down the line.
  b. They passed his \$20 bill to the front of the line, and passed his ticket back to the rear of the line.

Another venue for asymmetric directedness is the interior anatomy of an organism's body. Here, English terms like *ventrally* appeal to a concept of a directed axis from the back toward the stomach side of a body, and refer to the motion of a Figure in that direction, as seen in (27a). This type, again, also permits a construal in terms of asymmetry of parts with such expressions as *toward the ventral side,* as seen in (27b).

(27) In an affected fish, the parasites hatch along the spine
  a. and move ventrally/dorsally through the tissue.
  b. and move through the tissue toward the ventral/dorsal edge of the fish.

A further type of asymmetric directedness is present in a gradient. In a gradient, the quantity of some factor differs progressively in some direction. A Figure can then be characterized as moving in the direction of increasing or decreasing quantity. An expression like English *along* can indicate such motion with respect to a gradient. It does not intrinsically indicate increase or decrease, but once this feature is established in a given context, a term like *against* can refer to motion in the opposite direction, as seen in (28). The gradient form of directedness does not readily allow a counterpart construal in terms of asymmetry of parts.

(28) The growing axon moves along/against the interstitial chemical gradient to encounter its target.

A number of languages, such as Samoan, express a fourth type of asymmetric directedness with a pair of forms that can be roughly glossed as 'seaward' and 'inland'. The 'seaward' term can refer to motion from the center of an island toward the sea, or from the island into the sea, or from one sea location to another that is further from the island. Complementarily, the 'inland' term refers to motion from one sea location to another that is closer to the island, or from the sea onto the island, or on the island toward its center. These referents of the terms could in principle be characterized very simply as 'away from/toward the center of the island'. Here, the direction is based on a form of asymmetry of parts, since it is determined with respect to a particular part of the spatial array. But apparently the usual construal evoked by these terms is of an asymmetric directedness that permeates the array, and any notion of the island's center is greatly backgrounded. In a parallel way, the center of the earth could in principle be used to characterize the meanings of English *up* and *down,* but here, too, the 'upward' and 'downward' senses seem to suffuse the vertical axis, and any concept of an end point at earth's center lies outside of main attention. Apropos of this observation, the earth is in fact a fifth venue of asymmetrically directed axes, and it will be treated as such separately in section 2.6.

2.5.3 Asymmetry in motion

In the preceding section, the unidirectionality associated with a Ground object or array was of the static type, termed 'directedness.' But such unidirectionality can also be dynamic, consisting of an actual path of motion, whether of the whole Ground object or of some part of it. Such Ground motion constitutes a form of asymmetry – one that can be termed asymmetry of motion – and the path of a Figure object can be characterized with respect to it. For the case in which the moving Ground is an extended linear entity and the Figure is situated within it, the English term *with* generally represents the Figure's path as parallel to and heading in the same direction as the motion of the Ground object, while the form *against* represents the Figure's path as heading in the opposite direction, as seen in (29). The situations that these terms refer to probably also include a sense of force dynamics in the interaction of the Figure with the Ground.[9]

(29) a. Jane swam with/against the current.
b. Jane sailed with/against the wind.
c. Jane biked with/against the (flow of) traffic.

In addition, English has some special forms for particular moving Grounds, as seen in (30). Note here that *upstream/downstream* permit the Figure to move alongside the moving Ground, not just within it. Note also that any construal in terms of asymmetry of parts – say, of the Figure's motion with respect to a stream's end points, its source or mouth – seems semantically unrealistic.

(30) a. Jane swam/drove her car upstream/downstream.
b. Jane ran upwind/downwind.

2.6 The earth as a Ground with asymmetric geometry

The earth is regularly used as a Ground object in languages' systems for structuring space, and as such is – along with the human body – the most important case of an asymmetric geometry. It generally encompasses a three-way opposition like that of English up and down, north and south, east and west.

In principle, one could consider the asymmetry in these oppositions to be based either on distinguishable parts or on instances of directedness. Under the former interpretation, one would single out such reference portions of the earth as the north and south poles or an 'east' and a 'west' – that is, an eastern/western horizon, coast, land mass, and so on. Then, in saying, for example, *The balloon floated north(ward)/east(ward),* one would be referring to motion toward the north pole or toward the east. Similarly, indication of an object's vertical motion might appeal to a concept of movement toward or away from a singled-out reference portion of the earth. Thus, indication of an object's motion up or down in the air, as in *The balloon floated up/down,* might appeal to a concept of movement toward or away from the surface of the earth, while indication of an object that moves within the ground, as in *The oil drill tip moved up/down,* might evoke the earth's center as a reference point.

However, our everyday usage of earth-based geometry generally seems more to appeal to a sense of certain forms of directedness implicit throughout earth-associated space, or to a use of the familiar visual backdrop as a reference for such forms of directedness. Some evidence can be adduced for the primacy of this asymmetry-in-directedness interpretation. If asked, an average English speaker would probably answer that there is no qualitative difference between the two sentences *The plane flew north* and *The plane flew east,* only a difference in the heading. One might then need to point out that the plane could continue flying north only until it reached the North Pole, and then it would be flying south, whereas the plane could continue flying east indefinitely. That is, the fact that there is an end point to northern directedness is greatly backgrounded in attention. A northerly heading is thus generally experienced as consisting of a pervasive directedness, rather than as a Goal-targeted course. The same finding might result on asking for a qualitative difference between *The balloon floated up* and *The balloon floated down.* The fact that the upward path would be unlimited, whereas the opposite path would by definition cease to be downward either at the surface or at the center of the earth, would seem to be backgrounded in the average speaker's attention.

Possibly even when the form of a spatial expression suggests singled-out reference points, a predilection for directionality could prevail, so that both *Sue drove north* and *Sue drove toward the north* would be felt equally as involving pure directedness.

The earth can also be used as a Ground object to characterize not location or path, but the orientation of a Figure with a more complex (especially linear) geometry. Section 2.2.2 considered such orientations generally with respect to any Ground object, with English here using expressions like *along/parallel to* or *across/crosswise to,* which require indication of the particular Ground object involved. When the earth provides the reference geometry, however, a language usually furnishes special locutions to indicate orientation, ones that do not call for explicit mention of the earth or its geometric delineations. Thus, instead of locutions like those in (3la), we find the special forms in (31b).

(31) The beam is
 a. ?parallel to/crosswise to the earth's up-down direction.
 b. vertical/horizontal.

2.7 Characterizing location by more than one reference object

The spatial expressions treated so far have involved the partitioning of a referent scene at only a first order of complexity. They have characterized a Figure's spatial disposition on the basis of just a single Ground object, whose internal structural characteristics alone – whether asymmetric or irrelevant to symmetry – sufficed for the task, as in (32).

(32) The bike is near/in/behind the church.

But language also permits easy reference to a more complex partitioning of a spatial scene. Most frequently, this involves the distinction between a **primary Reference**

Object, one that has the same syntactic position and largely the same semantic role as the single Ground objects studied up until now, and a **secondary Reference Object**, which in many cases is not explicitly named but merely implied by a particular spatial term.[10] Such further Reference Objects are considered here under two categories: those that 'encompass' the primary Reference Object and those wholly outside it. We treat such further Reference Objects here only for their capacity to characterize the location of a Figure; their capacity to characterize the path or orientation of a Figure arises by extension from their locative capacity.

2.7.1 Encompassive secondary Reference Object

One type of secondary Reference Object, generally with an asymmetric geometry based on directedness, encompasses the primary Reference Object. That is, its forms of directionality permeate – can be referred to throughout – the environment of the primary Reference Object. It can be termed an **encompassive secondary Reference Object**. In section 2.5.2, it was seen that different types of Ground objects and arrays that contained some asymmetric directedness could, in their own right, serve to characterize the path of a Figure. Here, we see how such types can also serve as secondary Reference Objects, working in conjunction with an enclosed primary Reference Object, to characterize the location of a Figure.

Thus, the queue discussed earlier simply as a Ground array directed from back to front can also function as a secondary Reference Object that encloses a primary Reference Object within it, as seen in (33).

(33) John is ahead of Mary (in the line).

To localize the Figure, John, we need to know not only the location of a primary Reference Object, Mary, but also the directionality of a second object that is distinct from it and, in the present case, encompassive of it, a queue. The Prepositional phrase *ahead of* implies just such an exterior lineup. Moreover, it is appropriate regardless of the direction in which 'Mary' is facing. By contrast, if there were no queue and Mary were the sole Reference Object, a more suitable spatial expression would be *in front of,* though now Mary must actually face John.

Similarly, the directed interior of an organism's body, discussed earlier simply as a Ground, can also function as a secondary Reference Object, as seen in the following example.

(34) In this fish species, the swim bladder is ventral to the spine.

Here, *swim bladder* refers to the Figure, *spine* refers to the primary Reference Object, and *ventral to* includes reference to the secondary Reference Object.

The commonest secondary Reference Object of the encompassive type is the directed space set up by the earth. This can be used to localize a Figure object at any of the three removes from the Reference Object discussed earlier, as in (35).

(35)	a.	The mosaic is on the east wall of the church.	*[physical contact with a part of the primary Reference Object]*
	b.	The bike is on the east side of the church.	*[location in a region adjacent to the primary Reference Object]*
	c.	The bike is east(ward) of the church.	*[location at an unspecified remove from the primary Reference Object]*

As with the contrast between *ahead of* and *in front of,* an expression like *on the east side of* implies the presence, relevance, and identity of a secondary Reference Object, whereas an expression like *on the left side of* – despite the identity of syntactic form between the two – has no such implication in its relevant reading. In this reading, the 'left' expression (as in *The bike is on the left side of the church)* makes appeal to nothing outside the primary Reference Object itself, referring only to one of its distinct parts in order to narrow down the locale of the Figure. However, the 'east' expression (as in *The bike is on the east side of the church)* requires looking outside the main Reference Object, to the arrangement of the earth's orientations, in order to effect a comparable narrowing down of locale. In this process, it still, however, does not name the earth overtly, as *ahead of* mentioned no queue, and the earth's axes are indicated much less saliently than the primary Reference Object, without their own independent noun phrase.

The earth-based vertical axis plays a comparable backgrounded role as a secondary Reference Object in a whole paradigm of English expressions, those in (36). Together, these constitute another series, like those in section 2.4, where the primary Reference Object varies along some parameter. As arrayed from left to right here, these expressions imply a decreasing relevance of the primary Reference Object's other – non-verticality-related – characteristics to the localization of the Figure.

(36)		(a)	(b)	(c)	(d)	(e)
	Upward-directed	on the top of	on top of	over	above	higher than
	Downward-directed	on the bottom of	underneath	under	below	lower than

The columns of forms in (36) contrast semantically with each other in the following ways. First, the forms in (36a) do not strictly belong to the present paradigm because they make no direct appeal to earth-based verticality as a secondary reference. They refer to intrinsic parts of the primary Reference Object regardless of the object's current orientation (though these parts *are* named for their *canonic* orientation with respect to the earth). Thus, a fly that is 'on the top of' a TV that happens to be lying on its side now flanks the TV rather than being uppermost on it. A fly that js 'on top of' this TV – using (36b's) *the*-less expression – *would* be uppermost on it, resting on its side panel.

The forms in (36b) indicate a Figure's physical contact with the primary Reference Object, in particular with that portion of it that is most extreme, in either direction, with respect to the earth-based vertical dimension – for example, *The seagull is on top of the round boulder,* which indicates that the bird is touching the uppermost part of the rock. The forms in (36b) share with those in (36c) and (36d) the indication that the Figure and the Reference Object are vertically aligned – that is, that a single up-down line could be drawn through the two objects – but it differs from them in indicating physical contact, which they both deny.

The (36c) forms differ from those of (36d) in seeming to suggest a location closer to the Reference Object, a location somehow more related to or 'in the sphere of' the Reference Object, and one in a direct line of sight with the Reference Object without other objects in the way. Thus, *The seagull is over the boulder* seems to suggest that the bird is about to relate to the boulder in some way (e.g., alight on it or pick off some food from it) or is closer to the boulder than the same sentence with *above* would do. Thus, the use of *above* in *The seagull is above the fog bank* would be preferable to the use of *over* when the idea to be conveyed is that the bird is *clear of* the fog and thereby out of relation to it. The use of *above* is mandatory in *The sixth floor is above the first floor,* because there is intervening matter.

The (36e) forms differ from the preceding three groups in that they do not necessarily indicate vertical alignment. Thus, *The seagull is higher than the top of the tree* does not require that the bird be directly over the tree. All these four groups of forms tend to exhibit 'slippage' toward the right. For example, while *underneath* predominantly suggests physical contact, it can also be found functioning like *under.* And *above* is often found used like *higher than* with the indication of vertical alignment relaxed.

Here, as in all semantic analysis, care must be taken not to confuse separate senses of a word. Thus, the 'surface-covering' meaning that *over* has in *Hang the calendar over the hole in the wall*, which would be lacking if *above* were the preposition used, is a distinct sense described for *over* in section 2.3 and should not be confounded with its verticality sense. This latter reappears when the context is changed to render the surface-covering meaning impossible, as in *Hang the microphone over* (= *above) the large hole in the wall.*

Again, spatial expressions that at the surface appear entirely similar – like the English single-word prepositions *in* and *over* – can be of quite different semantic types. One type characterizes location in terms of the geometry of a single object. Thus, for example, *in the box* appeals only to the box's establishment of an interior space. The other type uses two objects. For instance, *over the box* appeals not only to our knowledge about the box – in this case, only its location rather than its geometry – but also, though less saliently, to our knowledge about earth-based upward directedness.

A number of spatial terms are extremely covert in their incorporation of a secondary Reference Object role for earth-based orientations, in particular for the vertical dimension or its complement, the horizontal plane, as seen in (37). For some terms, such as (37d). the implication of a secondary reference is so subliminal that one is surprised to learn of its having any role at all. Because of these additional covert references, terms like *in* and *across* that were earlier treated, in a simplified way, as not looking outside the primary Reference Object must now be seen as actually somewhat more complex.

(37) a. *across:* The plane of the primary Ground can have any orientation, but the Figure's path must be horizontal:
The fly walked across the tabletop./across the blackboard from right to left. /*across the blackboard from bottom to top.

b. *past:* The Figure's path must be horizontally to one side of, not over, the primary Ground (contrast Italian *passare,* which is indifferent to this horizontal/vertical distinction):
The bullet flew past my head, grazing my temple. /*grazing my pate.

c. *around:* The Figure's path involves a horizontal deviation from straightforward horizontal motion – complementing *over/under*'s indication of a vertical deviation from such a motion:
I went around the fence. vs. I went over/under the fence.

d. *in:* The primary Ground object cannot merely surround the Figure, but must also be in its canonical vertical orientation so as to contain or enclose the Figure in its customary way.
with the opening of the bowl up/of the tent down:
The pear is in the bowl. **/** He's standing in the tent.
with the bowl/the tent inverted
The pear is under/*in the bowl. **/** He's standing on/*in the tent.
(tent example is from Shingo Imai)

2.7.2 External secondary Reference Object

The other type of secondary Reference Object is one that is wholly outside the primary object, that exhibits a range of often nonasymmetric geometries, and that is generally expressed by an independent nominal, thereby exhibiting a degree of salience comparable to that of the primary object. One type of such an **external secondary Reference Object** functions like a geometric point that singles out the particular portion of the primary Reference Object nearest to it – or, alternatively, furthest from it. This portion in turn serves to characterize the location of an adjacent Figure, as seen in (38). This strategy for localizing a Figure thus works through an 'externally characterized Ground part.'

(38) a. The bike is on the side of the church toward the cemetery.
= The bike is on the cemetery side of the church.

b. The bike is on the side of the church away from the cemetery.

The speaker's own body in its current location is also able to serve as this kind of external secondary Reference Object. This is a situation for which English (among many languages) provides specialized locutions.

(39) a. The bike is on this side of the church.
(i.e., on the side of the church toward me)

b. The bike is on the other side of the church.
(i.e., on the side of the church away from me)

The speaker – or some comparable entity, such as the last perspective point adopted in a discourse – also serves as an external secondary Reference Object when incorporated as a component in the meaning of certain prepositions. An example is *beyond,* as in (40).

(40) The travelers are now beyond the continental divide.

Here, the location of the travelers (the Figure) is understood as being on the side of the continental divide (the primary Reference Object) that is away from the location of the speaker or perspective point (the external secondary Reference Object).

Another strategy for localizing a Figure by means of an external secondary Reference Object works through a fictive **Figure-encountering path** (equivalent to an 'access path,' as characterized in Talmy, 2000, chapter I-2). In this strategy, an external point object can be used as a guide by which to establish a Figure-encountering path, as seen in (41). Locutions of this type indicate that the Figure is located somewhere along the line from the primary Reference Object to the secondary Reference Object.

(41) a. The bike is toward the cemetery from the church.
b. The bike is this way (i.e., toward me) from the church.

Note that this same strategy is also used for an encompassive secondary Reference Object. Thus, in all expressions of the type *John is ahead of/east of/over Mary,* the location of the Figure ('John') is ascertained by – conceptually, perceptually, or with physical motion – beginning at the primary Reference Object ('Mary') as a starting point and then proceeding along a path determined by a form of directedness in the secondary encompassive Reference Object ('ahead in a queue'/ 'toward the east'/ 'upward') until encountering the Figure.

Although two Reference Objects are named in the external secondary Reference Object type, we can still distinguish which object is 'primary' and which is 'secondary' on the basis of syntactic analogy with the encompassive secondary Reference Object type, where this is clear.

(42) a.	*Encompassive type*	X is east of Y	[*Y = primary Reference Object]*
b.	*External type*	X is toward Z from Y	[*Y = primary Reference Object]*

But the distinction begins to blur in the external type, since both Reference Objects receive comparable prominence from their equal expression by overt nominals. Further, the external object and the Figure-encountering path that it determines can be geometrically more complex than just a point and a straight line toward it. In English, virtually the whole range of Ground and path geometries with terms to specify them can also be used as external secondary references.

(43) The bike is across the street/down the alley/around the corner from the church.

Moreover, such geometric indications can be strung together in a sequence to make up a quite complex Figure-encountering path.

(44) The bike is across the street, down the alley, and around the corner from the church.

The implication in locutions of the (43) and (44) type is that the Figure is at the end point of the specified path. To counter this implication, one must add Some special phrase, like *somewhere (along the way).* In reaching locutions such as these, we can perhaps no longer speak of a 'primary' or a 'secondary' Reference Object, but now must speak in terms of a starting point and a multiply-determined path, all together functioning as a Reference Complex by which to localize the Figure.

2.7.3 Reference frame projected out by a secondary reference object

Considering again the case of a pointlike object acting as an external secondary Reference Object, a special further circumstance can hold where the object has an asymmetric geometry. This asymmetric geometry can be conceptualized as radiating out beyond the object, thereby defining a reference frame. Where the object is movable – the usual case – the reference frame is relative to the object's current position and orientation. The commonest object of this sort is a person, especially one of the participants in a speech event. The clearest illustrations emerge where there is no geometric interference from the primary Reference Object – that is, where this object itself has no asymmetry in the relevant dimensions, like a silo or a tree with no intrinsic front, back, right, or left. Thus, in a sentence like

(45) The bike is to the left of the silo.

it is the speaker or hearer whose intrinsic front/back/right/left extends out and defines a framework by which the Figure is localized with respect to the primary Reference Object (the silo).

Notice that once this reference frame is projected out by the external secondary Reference Object, it behaves much like an encompassive secondary Reference Object. In particular, it permits the Figure-encountering strategy. Thus, just as the encompassive *The bike is west of the silo* uses the earth-based east-to-west directionality to outline a fictive path from the silo to the bike, so too the sentence *The bike is left of the silo* relies on the left-to-right directionality of the reference frame projected out from the speaker as external point object, and also outlines a fictive path from the silo to the bike.

Note that, in the preceding section, when the speaker functioned as an external secondary Reference Object, he was treated geometrically as a punctual object assessed solely for his location to serve as a kind of guidepost. But here, the speaker is assessed for her asymmetric geometry projecting out as a reference field.

2.7.4 Asymmetry imputed by a secondary Reference Object onto a primary one

We just saw that the reference frame generated by an external object – the speaker or hearer – can have its left-right (lateral) orientation applied to a primary Reference Object, like a silo, in sentences like *The bike is to the right/left of the silo.* Now what about the front/back orientation? A perfectly consistent extension of the pattern for right/left would be to place the bike on the opposite side of the silo from the speaker/hearer with the prepositional complex *in front of,* as in (46a), and between the speaker/hearer and the silo with the preposition *behind,* as in (46b). The reason that this arrangement should be considered consistent is that the silo's asymmetric assignments would then correspond to those of a standing human: in clockwise succession, front, right, back, left.

(46) a. The bike is in front of the silo.
b. The bike is behind the silo.

This consistent use of the generated reference frame is in fact exactly what some languages, such as Hausa, employ. In English, however, a spatial phenomenon wholly distinct from any seen so far is involved. Rather than simply sitting amidst an externally projected orientational frame, the primary Reference Object has an asymmetric geometry *imputed* to it, one derived by mirror-image reversal from the secondary Reference Object (the speaker/hearer). It, in effect, has acquired its own front and back, and its front now faces that of the donor object. With this additional factor, *The bike is in front of the silo* now means that the bike is *between* the silo and the speaker/hearer, while *The bike is behind the silo* means that the bike is on the *opposite* side of the silo from the speaker/hearer. Notice that this phenomenon takes place only for the front/back axis, not also for the lateral axis, which remains as described earlier. Thus, the clockwise sequence around the silo for English is front, left, back, right.

Hill (1975) has made a cross-cultural study of the difference in the way that these 'in front of'/'in back of' references are conceptualized – with the primary Reference Object as 'facing' or 'aligned' with the speaker or hearer. He has used test situations like placing a glove, a ball, and a bat in a row extending away from the subject and then asking 'What is in front of the ball?' His findings are that two-thirds of schoolchildren and 90 percent of graduate students in America respond as if considering the primary Reference Object to face toward them, while 90 percent of Hausa subjects treat the object as facing away from them – that is, aligned with them.

2.7.5 The range of ways in which Reference Objects localize figures

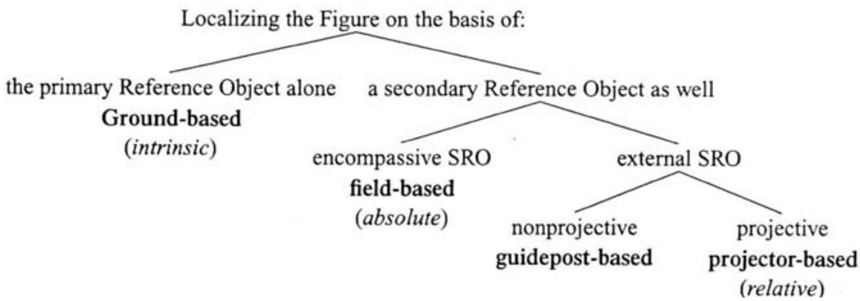
In all, the bases on which the location of a Figure can be characterized with respect to Reference Objects fall into just a few main types. The simplest type involves only a single Reference Object, making appeal to the geometric properties of the Ground object alone, as discussed in sections 2.4 to 2.6. Localization by this type can be said to be Ground based, as in *The bike is near/behind the church.*

The remaining types involve a secondary Reference Object. Where this secondary Reference Object encompasses the primary Reference Object, as discussed in section 2.7.1, the localization can in general be said to be field based. As discussed further below, this field-based type can involve different particular Reference Objects, such as a queue, as in *John is ahead of Mary in line,* or the earth, as in *The bike is east of the church.*

As discussed in section 2.7.2, an external secondary Reference Object can also be used to localize a Figure. We first discuss the case where such an external object is **nonprojective** – that is, it either lacks an asymmetric geometry or, if it has one, its projection is not being used for a localizing function. Such an external object is frequently a geometrically punctual entity whose location is used as a guide by which to characterize the location of the Figure, as in *The bike is on the side of the church toward the cemetery,* or to 'plot' a course for encountering the Figure, as in *The bike is toward the cemetery from the church.* In some cases, the external secondary Reference Object is a geometric complex that offers sequential guidance for plotting the Figure-encountering course, as in *The bike is across the street, down the alley, and around the corner from the church.* The speaker can also function as an external punctual object, often with special locutions for the situation, as in *The bike is on this side of the church.* The use of such a nonprojective external object to localize a Figure will be said to be **guidepost based**.

Finally, as discussed in section 2.7.3, an external secondary Reference Object can have an asymmetric geometry that projects out from it to form a reference frame. The use of such a reference frame for localizing the Figure can be said to be **projector based**. The speaker or some previously established viewpoint frequently serves as the source of the projection, as in *The bike is left of the silo* (from where I'm standing/from the last spot I mentioned).

The terminology of Levinson (1996) can be correlated with the present terminology. Generally, his 'intrinsic' corresponds to the present 'Ground based,' his 'absolute' to the present 'field based,' and his 'relative' to the present 'projector based.' The accompanying figure shows these relationships. His system of terminology, though, appears to have several limitations. It does not recognize or include a term for our 'guidepost-based' system for localizing a Figure. And our 'field-based' system for localizing would seem to capture a generalization missed by his 'absolute' notion. First, our field system covers not only earth-based localizing, but also, for one additional type, queue-based localizing – itself not otherwise recognized by his taxonomy. Second, the term 'field' avoids the problem that his term 'absolute' has, to refer to the same type of localizing system, namely, that this system is often relative. An example is when an astronomer considers earth-based compass points with respect to celestial orientation, or, when a floating aircraft carrier is used to set local orientations even as it shifts relative to the earth's compass points.



NB: The projection of a projector-based system becomes the field of a field-based system.

A set of terms referring to specific Reference Objects can be adopted that crosscuts the preceding terms for type of referencing function. Thus, an **earth-based** system can use the earth and its associated reference frame as a Ground-based type of system for localizing a Figure, as in *I drove east*. Or it can use it as a field-based type of referencing system, as in *I drove eastward from Chicago.* Likewise, a **queue-based** system can function either as a Ground-based system for localizing a Figure, as in *John moved ahead in line*, or as a field-based referencing system, as in *John is ahead of Mary in line.* In a comparable way, a **speaker-based** system can use the speaker as a nonprojective landmark in a guidepost-based system for localizing a Figure, as in *The bike is this side of the silo.* Or it can use the speaker as an object with asymmetric geometry in a projector-based referencing system, as in *The bike is left of the silo* (i.e., as reckoned from where I am standing while facing the silo).

Of course, any particular spatial locution in a language is often capable of use in more than one localizing system. Thus, in this chapter, it is true, we have used the spatial form *behind* to illustrate solely a Ground-based ('intrinsic') system (as in *The bike is behind the church).* And the spatial form *left of* has been used only to illustrate a projective speaker-based ('relative') system (as in *The bike is left of the church (from where I'm standing)*). But in fact, both forms can be used for either localizing system. Thus, *behind,* even when used in the same sentence as just above, can instead be employed in a projective-speaker-based system to refer to a bike located on the opposite side of the church from where I am standing. And *left of,* again in the same sentence as before, can instead be used in a Ground-based system to refer to a bike located at the left flank of the church. Accordingly, in an analysis of any particular spatial example, the usual care needed in semantic work must be taken to ascertain the underlying conceptual schemas that are present, without unduly identifying any specific expression with a unique reading.

2.8 Further distinctions

The descriptions presented so far in section 2 represent just one part of a much broader complex in language for structuring the domain of space-time. A brief outline here can help to indicate further parts of the complex. I have so far identified and analyzed in some detail four of the ramified systems in language, encoded at the fine-structural level, that characterize different kinds of relationships among entities within space or time. There are a number of such systems, but these four are the main ones that involve the conceptual structuring of space and time. I term them schematic systems. These systems are largely independent, with each adding a distinct conceptual dimension to those of the others. Each system offers a range of alternative structural characterizations, among which a speaker chooses so as to convey a particular conceptualization of a scene. The first schematic system – the one that I have termed configurational structure and that the present chapter predominately addresses – specifies geometries: abstract geometric characterizations of entities and their relationships to each other within different reference frames.

While this chapter has so far discussed only those characterizations that apply to physical objects within space, by looking at the distinct dimension of time, we can see that language applies much of the same 'geometric' structuring to that dimension as well, as evidenced by these spatial-temporal homologies in English.

(47)	*Space*	*Time*
a.	A bird sat along the ledge.	I sneezed (once) during the performance.
	a point located on a bounded linear extent	
b.	Birds sat all along the ledge.	I sneezed all during the performance.
	points distributed over a bounded linear extent	
c.	This road goes as far as Chicago.	He slept until she arrived.
	a linear extent bounded by a point at its further end	
d.	This road extends for three miles.	The performance lasted for three hours.
	a bounded linear extent measured for length	

The temporal dimension viewed in its integral functioning with the spatial domain yields the special conceptual complexes of 'stationariness' and 'motion,' only partially dealt with earlier. In analysis of this conjunction, a certain small set of primitive **Motion-aspect formulas** – ones that seem to underlie all more complex characterizations of stasis and movement in association with aspectual structure in language – appears to emerge universally. These formulas can be represented schematically as in (48). In each formula, the initial term is the **fundamental Figure schema** (always a point). A deep preposition written in capitals represents a Vector. And following the Vector is a **fundamental Ground schema**. The appendix to this chapter presents a more rigorous and detailed treatment of this system of formulas.[11]

(48) a. A point BE_{LOC} AT a point, for a bounded extent of time.
(The napkin lay on the bed/in the box for three hours.)
b. A point MOVE TO a point, at a point of time.
(The napkin blew onto the bed/into the box at exactly 3:05.)
c. A point MOVE FROM a point, at a point of time.
(The napkin blew off the bed/out of the box at exactly 3:05.)
d. A point MOVE VIA a point, at a point of time.
(The ball rolled across the crack/past the lamp at exactly 3:05.)
e. A point MOVE ALONG an unbounded extent, for a bounded extent of time.
(The ball rolled down the slope/along the ledge/around the tree for 10 seconds.)
e′. A point MOVE TOWARD a point, for a bounded extent of time.
(The ball rolled toward the lamp for 10 seconds.)
e′. A point MOVE AWAY-FROM a point, for a bounded extent of time.
(The ball rolled away from the lamp for 10 seconds.)
f. A point MOVE ALENGTH a bounded extent, in a bounded extent of time.
(The ball rolled across the rug/through the tube in 10 seconds.)
(The ball rolled 20 feet in 10 seconds.)
f′. A point MOVE FROM-TO a point pair, in a bounded extent of time.
(The ball rolled from the lamp to the door/from one side of the rug to the other in 10 seconds.)
g. A point MOVE ALONG-TO an extent bounded at a terminating point, at a point of time/in a bounded extent of time.
(The car reached the house at 3:05/in three hours.)
h. A point MOVE FROM-ALONG an extent bounded at a beginning point, since a point of time/for a bounded extent of time.
(The car has been driving from Chicago since 12:05/for three hours.)

In these Motion-aspect formulas, the geometries of the Figure and the Ground are represented by the simplest schemas that they can have. But they are not limited to these schemas. The Figure and Ground geometries are free to extend in any dimension or direction that the formula does not pertain to. This freedom can be termed the principle of **extendability in ungoverned directions**. To illustrate, consider formula (48e'), which represents the Figure as an object idealizable as a point, moving toward a Ground object that is also idealizable as a point. These idealizations are in fact appropriate for the referent of a sentence like *The car sped toward the village*. But the formula applies as readily for a Figure that is best idealized as a line, say, one aligned with the path, as in the referent of the sentence *The train sped toward the village*. Further, the Figure can be best idealizable as a line oriented transversely to the path, as in *The front line of troops advanced toward the village*. Or, indeed, such a Figural transverse line can extend into the third dimension to constitute a plane transverse to the path, as in *The cold weather front advanced toward the village*. Or the Figure can be idealizable as a planar object still lying in the original plane, as in *The carpet of floodwater advanced toward the village*. Or, of course, the Figure can be conceptualized as an entire three-dimensional volume, as in

The storm region advanced toward the village. To be sure, the Ground is equally capable of such extensions, as seen in *The car sped toward the border/the cliff wall.*

The principle of extendability in ungoverned directions applies as well even to more specific spatial schemas built upon the Motion-aspect formulas. Thus, consider the schema represented by the English satellite *out* in its sense of 'radial motion', which is ultimately based on formula (48e'). The simplest Figure schema for this Path satellite would seem to be indeed a point, as in *The boat sailed further and further out from the island,* where the Figure's path is conceptualized as radially traversing concentric circles. Such a point can, to be sure, extend into a line aligned with its path, as in *The caravan of boats sailed further and further out from the island.* But such a Figural point can also extend into a line oriented transversely to its path – moreover, one that also forms a circle, as in *The circular wave spread out from the point at which the leaf fell onto the water.* Further, such a line can extend into a planar schema that still lies on the original plane, as in *The oil spread out over the water from where it spilled.* Or the circular line can extend into the third dimension to form a schematic cylinder, as in *The ring of fire spread out as an advancing wall of flames.*

The second schematic system specifies perspective point – the point within a scene at which one conceptually places one's 'mental eyes' to look out over the rest of the scene – and characterizes its location, distance away, and mode of deployment. A scene's geometric structuring, set by the previous schematic system, is largely independent of these perspectival indications. One ready illustration here involves the difference between a stationary distal perspective point with synoptic scope of attention, and a moving proximal perspective point with local scope of attention (as detailed in Talmy, 2000, chapter I-1). The former of these is indicated in a sentence like *There are some houses in the valley* by the use of such closed-class elements as the plural *-s* with its agreeing *are,* the locative preposition *in,* and the presence of a quantifying constituent *(some).* The latter perspectival mode, on the other hand, is expressed in *There is a house every now and then through the valley* by its elements, the singular *a* with its agreeing *is,* the motion preposition *through,* and a temporally distributive constituent *(every now and then),* with the indication that one is to cognize this identical scene as if with a temporal sequence of close up inspections. This latter type, with movement of a perspective point rather than of an object within a scene, is another example of fictive motion, which has already been noted twice, once in (12) for the virtual-motion effect of expressions like *This road extends through the tunnel,* and once in section 2.7.2's discussion of localizing a Figure by means of a Figure-encountering 'path,' as in expressions like *The bike is down the alley from the church.*

It is possible that a treatment of perspective point should also include the obverse of this fictively moving scan over a stationary scene, namely the **freeze-frame** phenomenon, where one fixes on a 'snapshot' taken from the path of an actually moving object. This is seen, for example, in expressions reporting on a courier's progress: *He's through the tunnel!, past the guardhouse!, into the bunker!,* where the path point fixed on is the one that follows immediately after completion of the path indicated by the preposition.

The third schematic system specifies the particular **distribution of attention** to be given to a referent scene from an indicated perspective point. It affords alternative patterns of primary and secondary, and so on, as well as minimal, attention on different elements within essentially the same scene. This system is the one responsible for establishing among selected objects within a scene the roles of Figure, primary Reference Object, and secondary Reference Object, treated at length earlier.

It is also this system, accordingly, that can function to indicate that minimal attention should be directed to some portion of a scene. The system can do so by omitting explicit reference to that portion under conditions where its presence is nevertheless fully implied, as in (49a) where the middle portion of a path is deemphasized, and in (50a) where an obviously necessary agent is excluded from the framing of a scene (as detailed in Talmy, 2000, chapter I-4).

(49)	a.	The crate fell out of the plane into the ocean.	*[beginning and end of path]*
	b.	The crate fell out of the plane, through the air, into the ocean.	*[full path]*

(50)	a.	My cufflink finally turned up at the bottom of the clotheshamper.	*[event alone]*
	b.	I finally turned up/found my cufflink at the bottom of the clotheshamper.	*[event plus agency]*

The attentional system also involves setting the particular level, out of several hierarchically nested levels that can be present, on which to place main focus in attending to a Gestalt – for example, that of a freckled boy, as in (51).

(51)			*Main focus is on:*
	a.	There are freckles on the boy's face.	the level of finest detail
	b.	The boy's face has freckles on it.	the mid-scope level
	c.	The boy has freckles on his face.	the framing level

A fourth schematic system pertains to **force dynamics** – that is, the ways that objects are conceived to interrelate with respect to the exertion of force, resistance to force, the overcoming of such resistance, barriers to the exertion of force and the removal of such barriers, and so on. Such indications, which seem mostly to reflect our kinesthetic/somesthetic sensory modality, are additional to and largely independent of the other three systems' indications, which together mostly reflect our visual modality. This system's operation is seen, for example, in the difference between a force-dynamically neutral expression like *The ball rolled along the green,* which depicts an instance of motion simply as an autonomous occurrence, and a force-implicational expression like *The ball kept rolling along the green,* for which one reading suggests that the ball had a natural tendency toward rest that was being overcome by an external force toward movement (such as a breeze). (See Talmy, 2000, chapter I-7, or This volume, chapter 21, for an extensive treatment.) As this brief outline indicates, the material in section 2 should be taken as only part of a much broader description of language's structuring of space and analogical dimensions.[12]

3 Schematization in the representation of space

We have just seen some of the basic geometric concepts distinguished by the closed-class spatial expressions of language, and we are therefore now in a position to investigate the more abstract properties that govern this representation. As indicated in the introduction, a fundamental character of the way that space is represented at language's fine-structural level is that it is *schematic.* That is, only particular selections of all the aspects present in spatial scenes are actually referred to by linguistic elements, while all the other aspects are disregarded. These remaining aspects can vary indefinitely without any effect on the choice of linguistic elements to represent the scenes. Thus, every fine-structural spatial expression actually represents a family of spatial configurations that all share certain abstractable characteristics.

3.1 The basic properties of individual schemas

The particular schematic abstractions represented by individual spatial expressions, such as English prepositions, can be called *schemas,* and their properties can be investigated at three levels. The first is that of the components that go to make them up. The present chapter is too limited to treat this level adequately, so I simply note here that schemas are largely built up from such rudimentary spatial elements as points, bounded and unbounded lines, bounded and unbounded planes, and the like, and that these elements are governed by properties pertaining to their combination, coordination, cancelability, and so on. The second level, treated in this section (3.1), is that of the properties pertaining to the behavior of whole individual schemas. The third level, treated in section 3.2, involves the relationships that individual schemas have to each other within the larger system of schema usage. (See Herskovits, 1986, 1997, for more on such spatial schematization.)

3.1.1 Idealization

The actual, 'literal' referent of any spatial expression, such as an English preposition, is a particular assemblage of primitive geometric components in the form of an abstract schema. This schema, however, must be conceptually applied to a full, repeatedly detailed referent. The term idealization will refer to this process of 'application,' where a referent spatial entity is conceptually idealized in terms of a schema applied to it. Idealization thus includes the process by which familiar objects, in all their bulk and physicality, are differentially 'boiled down' to match ascribed schemas. The cognitive nature of these processes must yet be worked out for the operation of language in particular, but they will no doubt resemble certain processes of perception and Gestalt formation or those operative in the drawing of stick figures by children (see Talmy, 2000, chapter I-2).

Some typical cases of the linguistic idealization process are the following. Idealization occurs where a physical object with one dimension much greater than the other two, say a pencil or a person or a skyscraper, is conceptualized as a line – as when used with the preposition *along (An ant crawled along the pencil. / The snake slithered down along the performer. / The outside elevator rose along the skyscraper.).* Or it occurs where a bulk form with some concavity in it, such as a birdbath or a volcano, is conceptualized as a planar enclosure of volume – as when used with the preposition *in (the water in the birdbath/the lava in the volcano).* Or it occurs where a roughly equidimensional bulk, like a boulder or a planet, is conceived as a single point – as when used with the preposition *near* or *from (a pelican near/20 feet from the boulder* or *an asteroid near/10,000 miles from the planet).*

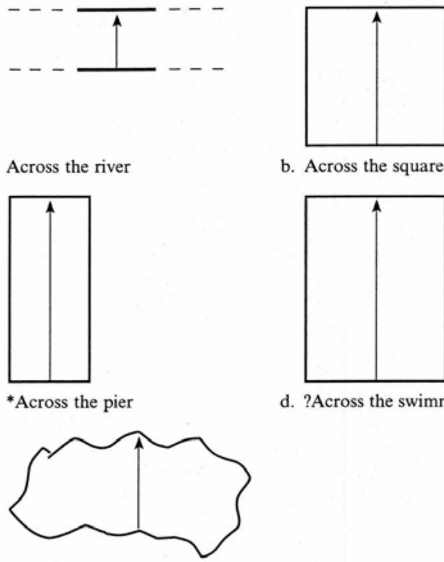
Idealization can be illustrated more fully with the schema specified by *across* in its usage referring to a path of motion. As an approximate verbal characterization (consult the diagrams in (53)), this is:

(52) *Across schema*

(motion of the Figure along the whole length of) a horizontal path line that runs perpendicularly from one edge to the other of a planar Ground object bounded by two opposite parallel edges, where this plane is 'not laterally collapsible.'

The last phrase in this characterization pertains to the relative lengths of the plane's two axes: the axis that is parallel to the plane's defining edges, and the perpendicular axis that is parallel to the Figure's path line. The meaning of the phrase is that the axis running parallel with the two edges cannot be so short, compared to the path-line axis, that it can be conceptually collapsed into that line itself, leaving the plane able to be regarded as one dimensional. Thus, the edge-aligned axis may be indefinitely long, as in the case of a river being crossed, schematized in figure (53a). Or it can be about the same length as that of the path-aligned axis, as with a square field being crossed, diagrammed in (53b). But it *cannot* be relatively short, like the narrow axis of a pier being traversed in the longer direction (53c). Such an arrangement makes the referent object more idealizable as a line that is co-oriented with the path, a configuration for which the schema associated with *along* is more appropriate. The critical range within which the edge-aligned axis becomes 'too' narrow needs consideration. Perhaps in its basic usage, the *across* schema becomes inapplicable where the edge-aligned axis is at all perceptibly shorter than the path-aligned axis, as in the case of an oblong pool being swum in the longer direction, depicted in (53d). But even such a basic usage typically still allows some degree of 'stretch' so as to apply to an only moderately oblong pool, though never to a long pier. Such a stretch is one of the types of schema deformation treated in Talmy (2000, chapter II-5).

(53)



a. Across the river

b. Across the square field

c. *Across the pier

d. ?Across the swimming pool

e. Across the lake

Taken as an abstract whole, the *across* schema thus requires that a physical object be idealizable – relative to a path executed with respect to it – as a plane with certain orientation and boundary conditions and with axes whose relative lengths obey certain constraints. This case thus shows that a schema can act like a filter passable to only some physical objects. That is, it can act as an integrated set of factors that test for an object's reducibility to a particular complex of schematic elements.

3.1.2 Abstractedness

'Abstractedness' is one way to name the complementary property to idealization. While idealization involves finding within a physical object the delineations that correspond to a particular schema, abstractedness involves ignoring the rest of the object. Thus, in the use of *across*, it is of no consequence whether a referent object lacks side boundaries, as in the case of a river (53a above), or has them, as with a square field (53b). Equally irrelevant is whether the plane is a liquid layer (the river) or a solid surface (the court). Thus, the characterizability as a two-edged plane that the *across* schema calls for classes together a multifarious set of objects. The difference between these objects is abstracted away from – hence, can be disregarded for this particular categorization.

3.1.3 Topology

The degree to which language's spatial schemas abstract away from physical characteristics is even greater than suggested so far. Not merely does a schema attend only to geometricized delineations within a physical object. Not merely are physical bulk forms within an object idealized down to the points, lines, planes, and so on of the schema (with the remainder disregarded). But a schema also abstracts away from any specificity as to shape (curvature) or magnitude for these points, lines, and planes – and hence, also from any specificity as to angles or distances between them as they relate within the schema. This sort of further abstraction is characteristic of the spatial relations defined within the mathematical field of topology. It is metric spaces, such as classical Euclidean geometry, that observe distinctions of shape, size, angle, and distance. Distinctions of this sort are mostly indicated in languages by full lexical elements – for example, *square, straight, equal,* plus the numerals. But at the fine-structural level of conceptual organization, language shows greater affinity with topology. (One might further postulate that it was this level – and its counterparts in other cognitive systems – that gave rise to intuitions from which the field of topology was developed.) We can illustrate linguistic topology now under two of its characteristics. See Talmy (2000, chapter I-1) for further discussion of the present approach, and see Petitot and Doursat (1997) for a mathematical treatment of the linguistic topology in this approach.

3.1.3.1 Irrelevance of shape

It is easy to see that spatial elements generally permit wide ranges of shape variation. For example, the use of *in* requires that a Reference Object be idealizable as a surface so curved as to define a volume. But that surface can be squared off as in a box, spheroidal as in a bowl, or irregular as in a piano-shaped swimming pool; it can be open over a whole quadrant as in the preceding examples, or closed to form a complete enclosure as in a shed. It can also be an unbroken solid as in the previous examples, or have gaps, like a cupped hand, an open-work basket, or a house with its doors and windows open. As we see, none of these variations of physical manifestation affect the use of *in*. Likewise, the two edges called for by the *across* schema need not be neat parallel lines. One can also swim 'across' a lake, where the opposed 'edges' are highly curved and full of irregularities, as suggested in diagram (53e).

Freedom of shape applies not only to the Reference Object itself but also to paths characterized with respect to it. Consider *through* in its use referring to a linear path within a medium. Not only is the 'medium' free to range from a fluid ('through the water') to a dispersed aggregate ('through the timber'), but the path can take almost any contour.

(54) I arced/zigzagged *through* the woods.

That is, regardless of whether the path constitutes a straight line, an arc of a circle, or a set of zigs and zags, no change of preposition is called for. *Through* suffices for them all, simply because the abstraction that it refers to is insensitive to such further properties.

3.1.3.2 Irrelevance of magnitude

To a large extent, languages distinguish the same spatial characteristics for small objects and distances as for great ones. This is not simply a necessary fact, one just to be presumed. It would be very easy to imagine that objects capable of fitting in one's hand and broad geographic terrains, say, might have very different spatial characteristics of relevance to humans and that language forms would reflect such differences. Yet, the evidence is that very much the same spatial structures are distinguished all along the size spectrum, a fact that then testifies to the overall unity of our linguocognitive spatial system. To illustrate, consider these two sets of sentences.

(55) a. i. The lamp stood in the box.
ii. The man stood in the barn.
iii. The building stood in the valley.
b. i. The ant crawled across my palm.
ii. The man walked across the field.
iii. The bus drove across the country.

Here, the range in the size of a Reference Object, from a palm to a country, and the corresponding range in the length of the path traveled, are irrelevant to the choice of schema-specifying preposition.

Comparably, the use of the spatial terms *this* and *that* – indicating objects relatively closer to and farther from the speaker – can be equally used in the two sentences in (56).

(56) a. This speck is smaller than that speck.
b. This planet is smaller than that planet.

Again the difference in size between a speck and a planet, and the difference in the distances involved – from millimeters to parsecs – is irrelevant to the use of the spatial terms.

3.2 Relationship among different schemas

We have been looking at the properties of single spatial schemas considered in isolation. But every language makes available not one, but many schemas, all constituting different configurations within the same conceptual domain, that of (objects in) space. What are the principles that govern the speaker's selection from among these schemas to make a particular reference? What are the semantic relations between the different individual schemas? And what relation does the full set of individual schemas bear to the spatial domain as a whole? We now explore these questions.

3.2.1 Alternatives in schematization

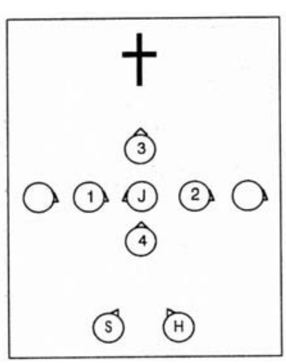
Because of the nature of idealization as applied to a physical entity – that is, where all those characteristics of the entity not pertinent to a particular schema are disregarded as irrelevant – it is generally the case that those very characteristics will include some that *are* relevant to other schemas. Thus, different schemas can usually be applied with equal appropriateness to the same physical configuration, capitalizing on different sets of characteristics contained in the configuration – and, correspondingly, disregarding different sets. We can observe two forms of such alternative schematization.

3.2.1.1 An object participating in different spatial configurations

In one form, a single physical entity can participate in several different spatial configurations and so be subject to alternative schematizations. Thus, a single box as a Ground object can have different Figures bearing different spatial relations to it – say, a dish on it, a ball in it, and a doll 20 feet away from it – whether on different occasions or concurrently. The dish's 'on' relation requires of the box that it have a horizontal plane uppermost on its bulk, but disregards any other features of that bulk – in this case, for instance, it cares not at all that the box has an interior space. By contrast, the ball's 'in' relation requires this latter feature of the box but is neutral to whether or not one of the box's sides (as opposed to its open face) is turned topmost so as to provide a surface for something to be 'on'. The doll's 'away from' relation to the box is indifferent to either of the preceding two spatial conformations and is sensitive only to whether the box's bulk is localized enough, rather than distributed overly much – relative to the separational distance involved – that it can be treated as a single point.

Similarly, a further example here is like the preceding one in that several different Figure objects concurrently bear different spatial relations to a single Ground object by appealing to different aspects of that Ground object's spatial characteristics. What is striking in this new example, though, is that the *same* spatial form – namely, *in front of* – is used to represent all the different spatial relations. It accomplishes this by appealing either to the Ground object alone or to one of several different secondary Reference Objects that are co-present in the same referent complex. This complex – here, a scene within a church – is schematized from an overhead perspective in diagram (57), where circles represent people and the 'noses' show the directions in which the people are facing. In this scene, John ('J') is standing backward in a queue that extends from left to right in the church, and the speaker ('S') and hearer ('H') are close to the entryway. With respect to this complex, the answer to the question *Who is in front of John?* – or, equivalently, the value of the variable in *Someone is in front of John* – can refer to anyone of four different individuals, those designated by numbers in the diagram.

(57)



Here, person 1 is in front of John with respect to the asymmetric geometry intrinsic to John – specifically, with respect to his front – where John alone is taken into consideration as a Reference Object. Person 2 is in front of John – who now is treated as a primary Reference Object with only a schematically pointlike geometry – with respect to the asymmetric geometry of the queue as a secondary Reference Object, specifically, with respect to its left-to-right directedness. Person 3 is in front of John – who again is treated as a point-geometric primary Reference Object – with respect to the asymmetric back-to-front geometry of the church's interior. And person 4 is in front of John – once again a pointlike primary Reference Object – with respect to the asymmetric reference frame projected outward by the speaker-hearer. Note that these distinct geometric assessments can often be linguistically disambiguated by the addition of certain short phrases, as in (58).

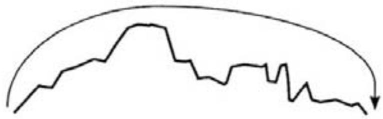
(58) a. Who is in front of John that he is facing? (= person 1)
b. Who is in front of John in the line? (= person 2)
c. Who is in front of John in the church? (= person 3)
d. Who is in front of John from where we are standing? (= person 4)

3.2.1.2 A single spatial configuration open to different schematizations

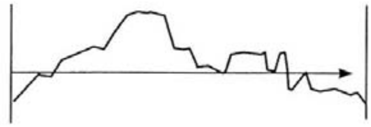
In the second type of case, the same physical configuration without any variation in its contents – say, a particular Figure moving or located with respect to a particular Ground object – is nevertheless open to alternative schematizations. Consider the example of a wheatfield with a man going from one side of it to the other. This configuration is complex enough to allow different schematizations. If we say that the man went *across* the wheatfield, then we are abstracting forth one aspect of the wheatfield complex, the fact that it has a horizontal bounded land parcel, and are disregarding the fact that there is wheat growing atop this land. If, on the other hand, we say that the man went *through* the wheatfield, then the wheatstalks, conceived together as constituting a medium, are abstracted forth from the whole physical complex, and now the presence of a land surface underneath, horizontal and bounded, is irrelevant.

The flexibility afforded by the linguistic processes of idealization and topology allows even further latitude for the imaging of a physical configuration in more than one way. Consider, for example, a cluster of mountains and a path that goes from one edge of the cluster to the opposite edge. If the mountains are thought of in terms of their elevation above the ground, the preposition *over* is best used, coding for a path schema something like that diagrammed in (59a). If, however, the mountain crests are thought of as defining a sort of plateau within which the path resides, then the preposition *across* is wholly appropriate as indicated in diagram (59b). In either case, we should note the immense degree of abstraction from the actual physical details present for such a situation – an index of our cognitive capacity for idealization.

(59)



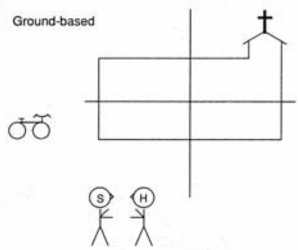
a. over the mountains



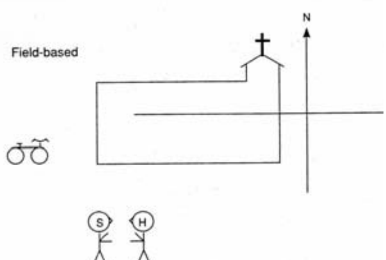
b. across the mountains

Another case of alternativity falls directly out of the analysis of asymmetric geometries in sections 2.5 and 2.6. The arrangement in which an object with an intrinsic asymmetric geometry is situated within the earth-based reference frame and is positioned with respect to a speaker-hearer dyad automatically permits alternative characterizations of location. Thus, the location of a particular bike relative to a church – as depicted in (60) – can be characterized by appeal to the asymmetric geometry of the church as primary Reference Object, with the form *behind* as in (61a). Alternatively, it can be characterized by appeal to the asymmetric geometry of the earth as an encompassive secondary Reference Object, with the form *west of*, as in (61b). Or it can be characterized by appeal to the asymmetric geometry of the speaker as an external secondary Reference Object that projects out a reference frame, with the form *left of*, as in (61c).

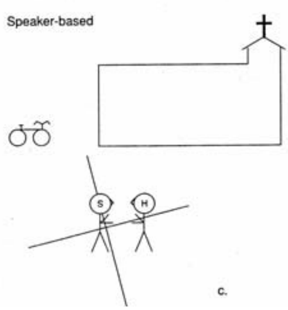
(60)



a.



b.



c.

(61) The bike is $\left\{\begin{array}{l}\text{a. behind the church}\\ \text{b. west of the church}\\ \text{c. left of the church}\end{array}\right\}$.

Two nonobvious examples of alternativity now can round out our characterization. A person standing some five feet away from and pointing to a bicycle in a driveway has the option of saying either *Get this bicycle out of the driveway!* or *Get that bicycle out of the driveway!* The forms *this* and *that,* in effect, set up a conceptual partition in space and suggest that an indicated object is on the same side of the partition as the speaker, or on the opposite side, respectively. The point here is that the single spatial configuration of speaker, bicycle, and driveway allows for the imposition of either of these two partitioning schemas, in accordance with the speaker's conceptualization of the scene.

And, referring to the single situation of a bin full of cabbage heads, one could say either *The cabbage in the bin is all turning brown* or *The cabbages in the bin are all turning brown.* That is, this particular physical configuration allows schematization either as a mass quantity, conceived of without internal differentiation (indicated by use of the grammatical singular for the Figure), or as a set of discrete items, conceptualized with a network of divisional spacing running throughout (as indicated by the grammatical plural form).

In the cases of alternativity just reviewed, it is the speaker that selects one schema over another from those available and applicable, and it is thus the speaker that determines the highlighting of one group of factors or of another. In this choice, the speaker is presumably responding to preferences of emphasis or viewpoint, or to some sense of differential importance or salience among the features of a configuration. But the determiners of, and the degree of consciousness involved in, the selection await investigation.

3.2.2 Culture or language 'preselecting' among alternative schematizations

While in the preceding cases it was in the speaker's province to select among alternative schemas that could all equally be applied to a given spatial situation, in certain cases the culture or the language requires one particular way of looking at the situation over other possibilities. In effect, the option of selecting a preferred emphasis or viewpoint is removed from the speaker in these cases – a linguocultural 'preselection' among the potential alternatives has already been made.

For example, the spatial relations of a passenger to surround-type vehicles like a car or a bus seem enough alike that for either vehicle a speaker should have the option of imaging the passenger as being either *in* the vehicle as a whole, thus invoking an 'enclosure' schema, or *on* some surface within the vehicle (say, its floor or seat), thus invoking a 'platform' schema. But for prototypical reference to vehicular use, English requires that a car be schematized as an enclosure, so that a rider necessarily is *in* this vehicle, or gets *into* or *out of* it, whereas a bus is schematized as a platform, so that a passenger must be *on* it, or get *onto* or *off of* it.

To be sure, this distinction in usage is neither wholly frozen nor unprincipled. Thus, for non-prototypical depictions, a speaker still has the option of saying that a passenger is *in a bus* to emphasize its character as an enclosure, as in *There was an artist in the bus sketching its contours.* And, as Fillmore has pointed out, the use of *on* with a bus depends on its functioning as a vehicle. Thus, speaking of a decomissioned bus in a junkyard, one would say that some children are playing *in* the bus, not *on* it. One might add that a Figure not intending to use the bus as a vehicle readily permits the use of *in,* as in *There was a stray dog/a bomb in our bus.* Furthermore, the English use of *on* or *in* with a vehicle seems generally to mark the distinction between the vehicle's having a walkway (or walking area) or not having one. Thus, a passenger is on an airplane, but in a helicopter; on a ship, but in a boat; on a train, but in a carriage; (usually) on a submarine, but in a diving bell; and, of course, on a bus, but in a car. Thus, the use of *on* with the class of vehicles that has horizontal surfaces that one in fact walks 'on' is motivated by the usual geometric schema of that preposition.

Nevertheless, although the use of *on* responds in a principled way to a geometric factor in a vehicle, there is no a priori reason why that particular factor should, in the requirements of English, take precedence over the fact that the vehicle is also an enclosure. Such a factor and its precedence certainly do not appear in most other languages. Thus, German has also preschematized cars and buses but treats them *both* as enclosures. Accordingly, the point demonstrated by the bus-type case in English is its obligatory requirement in prototypical usage for adopting the platform schema over the enclosure schema, and the preselectivity on the part of English that this shows.

While the preceding case showed a contrast of schematization *within* a single language/culture, some preselections of schematization are so pervasive throughout the local context that they can easily go unnoticed until one steps over to another language/culture. Thus, our linguocultural view of a table has us regard the tabletop as comprising the table's essential geometric character, with the legs merely as incidental appendages. Thus, a ball thrown across from one squatting person to another between the legs of a table is said to be thrown *under* the table. In Atsugewi, by contrast, a table can be regarded as tabletop plus legs all taken together as a volumar configuration, so that the same ball would be said to be thrown *through* the table. The option for such an idealization is not present for English speakers – and may rarely have even been envisioned.

Similarly, we saw above that, to localize a Figure, English affords the option of referring to the geometric asymmetry of the primary Reference Object, or of the earth, or of the speaker, as in *a bike behind/west of/left of the church.* But the option to refer to earth geometry turns out to be available only where the primary Reference Object is permanently positioned, like a church. Localization done with respect to a mobile object, such as a Person, can generally make appeal only to the object's own asymmetric geometry and not also to earth-based compass points.

(62) a. the bicycle just to my right/*just east of me
b. the itch on my right arm/*on my east arm

By contrast with English, the Native American language Wintu is reported to avoid reference to any intrinsic right/left laterality, even for mobile objects, and instead to refer in fact to earth-based geometry. That is, the speakers of this language would in fact say sentences like 'My east arm itches.'[13]

It is difficult to resolve whether 'preselection' – that is, constraints on options in schematization – -is a purely formal aspect of a language's rule system or is always originally due to some psychocultural exigency that has become conventionalized in language usage. Cases of both types may exist. Thus, we would probably want to appeal to the notion of different cultural emphases – specifically, with respect to one's mode of perception – to account for the distinct understandings of the phrase 'in front of' generally found among Americans as opposed to Hausas (section 2.7.4). The case for culturally different emphases is supported by Hill's (1975) observation that individuals' understanding of the phrase is not uniform throughout each culture but is a matter of proportion, one that in fact varies according to age. On the other hand, one might want to ascribe to pure linguistic formalism the fact that the option for viewing cabbage as either a mass or a discrete aggregate – The *cabbage(s) in the bin is (are) all turning brown* (section 3.2.1.2) – is not available for celery, which has only the 'mass' option (that is, without resort to expressions like 'stalks of'), nor for Brussels sprouts, which have only the 'aggregate' option.

(63) a. The celery in the bin is / *The celeries in the bin are
b. *The Brussels sprout in the bin is / The Brussels sprouts in the bin are
– all turning brown

That is, it may seem that at issue here is purely the formal assignment of particular lexical items to one or another noun type (to the 'mass' or the 'count' noun type). Even here, though, the psychocultural question enters. The assignment of lexical items to noun types might not be simply arbitrary, as 'purely formal' implies, but rather might reflect cultural norms of imaging physical material – norms that respond to an object's size, its frequency of occurring together with other like objects, its resolvability into some substance-like homogeneity, and so forth.

3.2.3 Disjunctives of the alternative schematizations

A fundamental characteristic of schematization at the fine-structural level is its **disjunct mode of representation**, rather than a continuous mode of representation. Thus, a language can have nothing like a 'schema continuum' – that is, an array of directly expressible schemas, with each differing from its neighbors by only one feature or feature value in a fairly continuous way. Rather, each language uses a small set of 'quantally' separated schemas with which to represent all possible spatial configurations. Each schema in such a set differs from the others by a *number* of features *simultaneously.* This lack of 'in between' forms is not a flaw in the organization of language, but an apparently necessary – perhaps even superior – design feature that is compensated for by other properties, as discussed later.

The lack of ready expressions for the whole range of interstitial spatial configurations means that a speaker does not have the expressive freedom at the fine-structural level to convey just the right schematization with just the right emphases for her current way of conceptualizing a particular spatial form. At this level, therefore, languages exhibit a failure of precision. Particular instances of such failure can be grouped into two types: cases of overspecificity, where the closest available schemas specify more than what the image in the speaker's mind calls for, and cases of underspecificity, where the nearest schemas specify less than the speaker would like to indicate about her image.

3.2.3.1 Overspecificity of the closest available schema

To illustrate overspecificity, one spatial configuration for which all the prepositionally indicated schemas in English are too specific is the following: a linear path located on only a portion of a roughly horizontal plane without boundaries in the region of consideration. The path can, for example, be that of a man taking a walk, and the plane can be a prairie. How is one to express this configuration using a preposition? One cannot with full appropriateness say *He walked across the prairie* because *across* implies the presence of two opposite borders and a path that spans the full breadth between them – a physical arrangement lacking in the present case. Similarly, one cannot say *He walked along the prairie,* which implies a narrow-strip shape for the plane, nor *He walked over the prairie,* which implies an upbulging curvature to the plane, nor *He walked through the prairie,* which implies the presence of a medium atop the plane (compare the wholly appropriate *He walked through the sage-covered prairie).* Also inappropriate is *He walked around the prairie* (comparable to *He walked around the track),* which implies a narrow-strip plane with a curvature in the horizontal. In fact, the present configuration falls 'in the cracks' between the schemas represented by English prepositions, all of them too specific for it. What would be needed is a new English preposition, say, *aflat* as in *He walked aflat the prairie,* that refers to nothing more property laden than a path located on a horizontal plane.

Another example of a configuration 'in the cracks' in English is a path extending from one end to the other of a narrow-strip-shaped plane, such as a walk from end to end on a pier. It is not wholly appropriate to say here *She walked along the pier* because *along* implies the *absence* of end points to the path. This sentence would normally be understood to involve walking only a conceptually unbounded partial distance along the pier. This interpretation is supported by the fact that the sentence with *along* accepts a temporal expression with *for,* which is compatible with unbounded actions, but not a temporal expression with *in,* compatible with bounded actions: *She walked along the pier for /*in 20 minutes.* Again, a new preposition would be needed to capture the exact configuration involved, perhaps something like *alength,* as in *She walked alength the pier in 20 minutes.*

3.2.3.2 Underspecificity of the closest available schema

An immediate example of the under specificity circumstance can be seen in the earlier case of the 'wheatfield' (section 3.2.1.2). One spatial configuration into which this object can be idealized is a horizontal bounded plane with an associated medium atop it. But there is no single English preposition that captures the relationship of a horizontal path to this relatively complex configuration. A speaker using either of the two closest prepositions, as in *He walked across the wheatfield* or *He walked through the wheatfield,* must choose between omitting reference to the bounded-plane character of the object or to its medium-constituting character. To specify the more complex schematic referent, we would again need a new preposition, perhaps one like that in *He walked throughcross the wheatfield.*

For a more elaborate example, consider the diverse possible configurations of points on a plane. English has two ready expressions to schematize these. One, consisting of a quantifying term plus the preposition *on,* indicates the number of points present but not their spatial distribution:

(64) There is a dot/There are several/some/many/50 dots on the board.

The other expression, involving a simple plural plus the prepositional phrase *all over,* as in *There are dots all over the board,* cannot be used with a quantifier to indicate number. Thus, one cannot say **There are several some/many/50 dots all over the board.* But this prepositional phrase does indicate a certain range of spatial distributions – roughly, those for which every subregion of the plane has at least one point in it, with the size of the subregion used for this assessment depending on the total number of points present. Notice that the *all over* schema does not require a great density of points – at the lower limit, just a few will suffice as long as they have the requisite distribution. Contrariwise, numerosity alone does not ensure that the *all over* schema *will* apply – a multitude of points could be present, but all concentrated in one region of the plane, thus lacking the necessary distribution.

Now, between these two expressions, all possible configurations of points on a plane are encompassed: there are no 'cracks' in the coverage. But this broad applicability is won by giving up greater specificity. There is no direct way to indicate both number *and* all-over distribution at once. And there are no direct expressions to indicate any distribution *other* than the all-over type, such as when points on a plane occur in clusters, or in concentric circles, or in some density gradient. Thus, the schema for each of these two expressions is underspecific – and no other simple expressions exist in English – for the purpose of referring directly to many other particular configurations.

3.2.4 Means for getting 'in between' disjunctive alternatives

We have seen that any language has only a small set of closed-class elements that code for a similarly small set of schemas. These cannot possibly refer directly with precision to the myriad of conceptualizations of spatial configuration that a speaker can have in mind to convey. We must therefore ask what processes there might be by which a listener can come to form some of the same conceptualizations that the speaker has. I point to four such processes here.

3.2.4.1 Canceling features of overspecific schemas

An overspecific schema includes one or more features that are inappropriate to a speaker's understanding of a particular spatial configuration. In a case where *all* the available schemas are overspecific, one procedure available to the speaker is simply to proceed with the use of one of the schemas regardless, without making any additional correctives. The listener's understanding of the spatial configuration, derived in part from the context to that point (see the discussion of 'Image-Constructing Processes' in section 3.2.4.3), can engender a cancellation or suspension of the schema's non-fitting features. Thus, on hearing *She ran across the boulevard for five seconds and then stopped*, a listener can gather from the context that the runner's path did not reach the opposite side of the street. That is, the listener understands that everything about the *across* schema applies to the referent configuration except the feature 'path terminates on opposite border'. Similarly with the earlier 'prairie' example, a speaker could simply settle on using *across* to say *He walked across the prairie* and count on the hearer to suspend all three inappropriate features: 'the plane has two opposite boundaries', 'the path originates on one boundary', and 'the path terminates on the opposite boundary'.

Note that where a schema is too specific for what a speaker *desires* to convey about some spatial configuration but nevertheless is wholly appropriate to it – that is, has no nonfitting features – it cannot be used with the expectation that the hearer will suspend the undesired features. No feature cancellation will occur. To avoid conveying the undesired features, the speaker must use other means. Thus, a speaker wanting to remain unspecific about which of a trip's two end points was the start and which the finish cannot use *from... to*, as in *She drove from San Diego to San Francisco last night,* and expect the hearer to feel ignorant about the direction of the trip. He may instead take advantage of the availability of another spatial expression, namely, *between ... and,* which is neutral with respect to origin and terminus, as in *She drove between San Diego and San Francisco last night.*

Significant to the understanding of language organization is the fact that the use of a word that expresses an overspecific schema, and hence that calls for feature cancellation, can sound forced or awkward. This contrasts with the full acceptability of a word whose schema has been involved in processes of idealization or topological shifts, as described in sections 3.1.1 to 3.1.3. That is, language is apparently so organized that the processes involved in feature cancellation are not as free to operate as are 'flexibility'-type processes, though it must nevertheless be recognized that there is *some* structural provision for them to occur.

3.2.4.2 The use of open-class elements

A major linguistic means for the expression of spatial configurations, outside of the possibilities of the closed-class elements, is in fact afforded by a language's open-class elements. While these may not play a fundamental structuring role at the fine-structural level, they do provide hundreds of particular, sometimes idiosyncratic, characterizations of space. English examples of such forms are nouns like *zigzag* and *spiral,* adjectives like *concentric* and *oblique,* or verbs like *ricochet* and *streak (Paint streaked her cheeks).* Their use can be integrated into the regular constructions involving closed-class elements, as in a sentence like *There's a spiral of dots on the board,* or can figure in distinct constructional types of their own, as in *The board is streaked with dots.*[14]

3.2.4.3 Image-constructing processes in the hearer

At the comprehension end of communication, surely the most important means for arriving 'between' morphemes' disjunct specifications is the hearer's **image-constructing processes** (no purely visual connotation is intended here) – occurring at what was called the 'macroscopic level' in the introduction. Uncovering the nature of these processes is one of the most significant tasks awaiting cognitive-linguistic research. What can be said so far, however, is that the hearer somehow combines the reference ranges of a sequence of grammatical and lexical elements with each other and with her understanding of the world and of the current speech situation in a way that there emerges a fairly detailed image, one taken to be close to what the speaker wanted to convey. The image may go through revisions as more is heard or more is called up from general knowledge. Of note here, though, is that this image will in general be of considerably greater specificity than the explicit linguistic references themselves. For example, person B hearing from person A that *There are dots all over the board* may combine his sense of the configurational range allowed by the *all over* schema with general expectations of how dense such a dotting might be (no one is likely to have applied hundreds of such marks) and with a knowledge of person A's tendency to become upset over minor matters and so to exaggerate, so as to come up with an image of a few chalk marks located here and there over parts of the board.

3.2.4.4 Elaboration of descriptions by the speaker

Within the domain of the speaker, surely the main property of language that enables finer characterization of a spatial configuration is that language permits an elaboration of references made to the same configuration. Such an elaboration can consist simply of a concatenation of descriptive specifications, such as *There are dots all over the board, and they increase in density toward the bottom edge.* Or it can consist of bits of separate indications scattered through a discourse. Two theoretical points stand out about this elaborative property of language.

The first is that while this property may be so taken for granted that it rarely draws explicit recognition, it is not in principle a necessary aspect of linguistic organization. One can imagine a communication system in which every designation of a spatial configuration would be limited to a single characterization by one of a small set of prepositions, and that would be all that could be expressed about that referent. The fact that a speaker can refer repeatedly and from different perspectives to the same referent is a positive, not a neutral, feature of language organization.

Second, these elaborative processes for the speaker are not in principle correlatively linked to the listener's image-constructing processes. The latter are indeed necessary if the former occur – they must gather and integrate into a single image the relevant references scattered through an utterance. But image construction could play a role even with a fixed-format form of expression, for it would be needed to combine even such minimal indications with contextual and general information in a way that yielded a fuller picture. Accordingly, the speaker's elaborative processes are a feature of language organization that is additional to the feature of the hearer's image-constructing processes.

We can take special note of one form of elaboration, nesting, in which the output of one descriptive construction is cycled back as the input to another. We have a clear example of nesting in *There are clusters of dots all over the board.* Here the phrase *clusters of dots,* which is roughly equivalent to the full assertion 'The dots are in clusters,' constitutes a description of a first-level, more local spatial pattern in which certain dots configure. The elements of this pattern, the 'clusters,' can in turn be treated as new units to which a further spatial characterization is applied: That they are 'all over' the board. Thus, the more local configuration is nested within the more global configuration.

A subtler case of nesting also serves as a solution to the earlier 'prairie' example's difficulty of expression. That example's special configuration can now be exactly captured by the locution *He walked along on the prairie.* In this sentence there is an inner characterization 'He walked along'. As it happens, the element *along* here is structurally not a preposition relating a Figure to a Ground (as it would be in *He walked along the pier)* but is a verb satellite that simply indicates a point Figure's line-defining forward progression. This self-subsistent motion event is then characterized as taking place 'on' a prairie, the configuration that nests it. Since *on* makes no requirements as to boundaries for a planar Ground (as *across* does), the new nested locution is perfectly suited for the unbounded prairie case.

Note that because of nesting and the various concatenative forms of elaboration – employing both closed-class and lexical elements – it is possible to characterize extremely intricate spatial configurations, as (65) shows.

(65) There are some clusters of dots near the lower left of the board and streaks of dots all over the rest of the board, with an occasional spiral of dots located here and there.

4 The way language represents meaning, as generalized from the way it structures space

The presentation thus far – a survey of the basic spatial distinctions marked by closed-class elements and the properties that characterize them generally – has achieved, albeit with varying degrees of resolution, a form of descriptive comprehensiveness over one whole semantic domain, that of the structure of space and its contents. Through this purchase on one domain, we can now consider the system of semantic representation that is generally characteristic of language. It is by this system that language breaches an ever-present disparity – that between its finite and relatively small set of fine-structural elements representing an equally small set of disjunct schemas, on the one hand, and the indefinitely large perceptual and conceptual continuum potentially to be referred to, on the other hand. While section 3.2.4 just treated several means built into language for getting 'in between' such disjunct specifications, we further need to begin a description of the *general* character of this representational system.

4.1 Linguistic categories as largely noncontiguous

The traditional view is that any closed-class system in a language – for example, the set of space-characterizing prepositions in English or the set of object-indicating 'numeral classifiers' of Chinese – constitutes for some semantic domain a classificatory system with the following properties. Its categories to a large extent are contiguous (start up near the boundaries at which others leave off), are exhaustive (leave few gaps), are mutually exclusive (exhibit little overlap), and, generally perhaps, are of roughly equal size. An image readily associable with such a conception is a two-dimensional array of adjacent 'pigeonholes' – contiguous and exhaustive of their frame, well-partitioned, same-sized – where any particular item clearly fits into one pigeonhole or another. But this concept's actual applicability requires examination.

4.1.1 Forms with relatively specific reference

This examination is best carried out with respect to a particular semantic gradient. The meanings of the elements of a closed set tend to range along a gradient of specificity from very general to very specific. Examples among English prepositions might be *near* toward the general end of the specificity gradient, and *across* toward the specific end. The more specific a term is, the narrower a band it indicates on a greater number of semantic parameters simultaneously. It is the specific elements of a set that most challenge the traditional classificatory concept and require attention.

To be sure, in some morpheme sets, even the specific terms can exhibit the pigeonhole form of classification, sometimes even over extensive portions of the semantic domain. This behavior is often seen, for example, within a language's sets of personal pronouns, kinship terms, and color terms. Thus, to consider the color domain in English, a term like *pink* – which denotes a rather specific range of colors that are red in hue, moderately high in lightness, and pale in saturation – neighbors the equally specific term *lavender,* from which it differs primarily in the parameter of hue and, along another dimension, neighbors a further specific term, *rose,* from which it differs mainly in lightness. But what characterizes morpheme sets like these is that their semantic domains – like the array of pigeonholes – are determined by only a small number of dimensions or parameters. Thus, the domain of color terms is structured only with respect to hue, lightness, and saturation (plus, in most languages perhaps, a few parameters pertaining to the surface or object bearing the color). For such restricted domains, it is feasible for the number of even fairly specific terms to be quite low and still provide comprehensive coverage of the domain.[15]

By contrast, the majority of semantic domains in language are *n* dimensional, with *n* a very large number. Spatial semantics appears to constitute a domain of this sort. Thus, no fewer than the following 20 parameters are relevant to the domain of spatial configuration as expressed by closed-class elements such as English prepositions and deictics.

(66) a. Partitioning of a spatial configuration to yield a Figure and a Ground
b. Schematic geometry of the Figure object
c. Schematic geometry of the Ground object
d. Symmetry or asymmetry in the geometry of the Figure and of the Ground
e. An object's asymmetric geometry based on its parts or on a directedness within it
f. Number of relevant dimensions in an object's schematic geometry
g. Boundary conditions of an object's schematic geometry
h. An object's geometry as continuous or composite
i. Orientation of the Figure with respect to the Ground
j. Relative distance/magnitude of the Figure compared to the Ground
k. Presence/absence of contact of the Figure with the Ground
l. Figure's distribution of substance relative to that of the ground
m. Presence/absence of self-referentiality for a Figure-Ground configuration
n. Presence/absence of further Reference Objects
o. External projection of a secondary Reference Object's geometry
p. Imputation of asymmetry onto a primary Reference Object
q. Orientation of the Figure or Ground to the earth/speaker/other secondary Reference Object
r. Further embeddings of one Figure-Ground configuration within another or concatenations of one upon another
s. Adoption of a perspective point from which to regard the configuration
t. Change in the location of a Figure or perspective point through time (hence, paths of motion and perspectival scans)

With so many parameters, full domain coverage by fairly specific references would require thousands of distinct vocabulary items, and coverage by *very* specific references would require millions. Such an arrangement is not in principle impossible for a symbol system, but natural languages appear to be under a constraint that limits the number of distinct symbolic elements they can utilize, and in fact never exhibit systems of same-category elements in such numbers. Rather than showing a contiguous array of specific references, languages instead exhibit a smaller number of such references in a scattered distribution over a semantic domain. That is, a fairly specific reference generally does not have any immediate neighbors of equal specificity.

This arrangement can be illustrated with the example in section 2.2.1 of a board lying across a railway bed. The English preposition *across* here designates a rather specific spatial configuration with the nine properties listed in (8), including the requirements that the board be horizontal, be perpendicular to the railway bed's main axis, reach from one side of the railway bed to the other, and be adjacent to, but not in, the plane of the railway bed. Now what if a board bears all but one of these same spatial relations to the railway bed? It could, for example, extend horizontally and perpendicularly from one track to the other but a little distance beneath them (hence be buried in the bed) or above them, but not directly atop them. In such cases, *across* would no longer serve. But there are no equally specific prepositions – such as forms like *acrinss* and *acrupss* – to handle the new spatial configurations. All that English provides to refer to these configurations are such severely underspecific general terms as *in* and *over,* which can be used even if the board is not horizontal, not perpendicular to the tracks, and too short to span them.

There is a large referential distance between *across* and the other specific prepositions of English, such as *around, through, alongside, underneath, past, beside.* Thus, with English prepositions as the exemplar of semantic representation in general, we can say that, for the organization of relatively specific references in language, there appears to be at work a principle different from that of classification in the traditional sense of a contiguous 'pigeonhole'-like partitioning of semantic domains. The principle seems, rather, to be one of *representativeness.* The references are not exhaustive of these domains, but representative of them. In particular, (67) applies.

(67) With its stock of relatively specific morphemic references, a Language must provide a sufficiently distributed and dense (but not too dense) dotting over a semantic '*n*-dimensional conceptual space' – both over individual semantic domains and over the whole of semantic reference.

4.1.2 Forms with relatively general reference

The more general terms of a closed set – for example, the spatial terms *in* and *over,* as used in the preceding railway example – appear to have a special form of functioning, one not much shared by more specific terms, in the way they represent elements of a scene. A key to understanding their functioning is found in the nature of the schematization process. A morpheme never specifies a referent as to the full detail in which it exists in fact, in perception, or in conception, but rather specifies a particular complex of aspects abstracted from the total referent. Nevertheless, a communicator generally wants to convey a complete picture of a referent situation – that is, to engender the emergence of a full image in the mind of an addressee. Such transmission is accomplished in language by a complementary pair of processes: the sender represents the whole of a conceptual complex with only a portion thereof, and the receiver 'fleshes out' or **reconstitutes** the whole from this portion by the operation of her image-constructing processes (section 3.2.4.3). The sender's process, which can be termed **part-for-whole representation**, is a natural concomitant of schematization, and could have been treated in section 3.1 along with the other concomitants, idealization, abstractedness, and topology. As a particular feature of its operation, a speaker, in order to convey some referent *at all,* must at times resort to fastening upon any aspect of that referent for which there is *some* ready-to-hand term available in the language, whether or not that aspect is especially relevant to his larger discourse. Thus, in the railway example, if a board is horizontal, is perpendicular to and spans the railway bed, *and* happens to be buried in it, a speaker has no recourse but to utilize this last aspect, as in the expression *the board in the railway bed,* even if this aspect is wholly irrelevant, in order to designate the presence of the board's complex of spatial relations at all. This, then, would seem to be a major function of the more general terms in a language. Because their specifications are minimal, they refer to aspects present in a broad range of full conceptual complexes and so can be seized on so as to convey those complexes as a whole, in conjunction with the reconstitution process on the receiving side.

4.2 The effect of systemic constraints on language

The properties observed so far in this section – a specificity gradient among closed-class terms; a representative 'dotting,' not a comprehensive classification, exhibited by specific terms; part-for-whole representation as a major function of general terms – can be understood as resulting from several constraints that language is under at once. The character of human communication imposes several requirements: language must be able to represent all of an enormous referential field, express conceptual material of certain kinds with great enough specificity, and convey this information at a fast enough rate. Language might in theory be able to accomplish all this with an inventory of millions of specific terms, except that it appears to be under an additional constraint limiting the total number of distinct symbolic elements it can employ, presumably due to the difficulties of processing the great degree of phonetic discrimination and memory accessing that would be entailed. Moreover, if such terms were uniformly *very* specific, any utterance would require stringing together too many of them to accord with the timing requirement of communication. So language must at least reduce its inventory of specific terms.

But it may not do so without also including a number of general terms, because otherwise the requirement of whole-field coverage would not be satisfied. General terms are necessary for referring to interstitial conceptual material, that between the references of specific terms. Such terms accomplish this largely by indicating one aspect of a more complex concept, in accordance with a process of part-for-whole representation and its complement, reconstitution. On the other hand, language could not abandon specific terms entirely in favor of all general ones because it would then fail the specificity requirement of communication. After all, full-field coverage could be achieved by just a few very general terms. Thus, the five English words *someone, something, do, happen,* and *be,* plus a few grammatical morphemes for tense, modality, and the like, can in construction encompass virtually all conceptual phenomena with sentences like *Someone did something, Something happened,* and *Something is.* But these would lack all necessary specificity. Hence, language needs both specific and general terms.

Further, the same reasoning that has led to this conclusion also requires that the specific terms be well distributed over the whole of semantic reference. For if they were not, there would be large regions covered only by general terms, again insufficient to the requirement of specificity.

One further feature can be pointed out about this distribution of specific references. While there are undoubtedly factors that encourage the positioning of these at certain locations within semantic space – such as a high frequency of occurrence or cultural significance attaching to some specific notions – their locations must nevertheless be to a great extent arbitrary, constrained primarily by the requirement of being representative of the lay of the semantic landscape, as evidenced by the enormous extent of noncorrespondence between specific morphemes of different languages, even where these are spoken by the peoples of similar cultures.

In conclusion, our examination of how language structures space has not only uncovered basic characteristics of a significant cognitive domain as reflected in a major cognitive system, language, but has also shed light on the general nature of conceptual representation in that same system.

5 Appendix: motion-aspect formulas + conformations

This appendix excerpts and updates the treatment in Talmy (1975b) of Motion-aspect formulas. However, the derivational approach that characterizes some portions has been left intact.

The core subset of the Motion-aspect formulas of (48) is shown here in a more symbolic format. These formulas use the following symbols to represent the fundamental Figure and Ground schemas.

$\text{POINT}_{S/T}$:	Specifies an unextended point of space or time.
$_{E}\text{POINT}_{S/T}$:	Specifies an extended point of space or time.
$\text{EXTENT}_{S/T}$:	Specifies an unbounded extent of space or time.
$_{B}\text{EXTENT}_{S/T}$:	Specifies a bounded extent of space or time.

(68) a. a POINT_S BE_{LOC} AT a POINT_S, FOR an $_{B}\text{EXTENT}_T$
b. a POINT_S MOVE TO a POINT_S, AT a POINT_T
c. a POINT_S MOVE FROM a POINT_S, AT a POINT_T
d. a POINT_S MOVE VIA a $_{E}\text{POINT}_S$, AT a POINT_T
e. a POINT_S MOVE ALONG an EXTENT_S, FOR an $_{B}\text{EXTENT}_T$
f. a POINT_S MOVE ALENGTH an $_{B}\text{EXTENT}_S$, IN an $_{B}\text{EXTENT}_T$

In the use of one of these formulas to refer to a particular situation, the fundamental Ground schema is typically elaborated further. Built on it is an additional geometric complex – the **Conformation** – that relates the fundamental Ground schema to the schema for a full Ground object.

Each language lexicalizes its own set of such geometric complexes. An example of such a Conformation in English – one that represents interior location – is shown in (69). In the formulations that follow, such Conformations will be represented as relative clauses on the fundamental Ground schema to indicate its role in elaborating that schema.

(69) a. POINT_S IS OF the INSIDE OF an ENCLOSURE

In a complex structure consisting of a Motion-aspect formula and a Conformation, the expressions for particular full figure and ground objects can be associated with the initial and final geometric schemas, respectively, as in

(70) a. POINT_S BE_{LOC} AT a POINT_S that IS OF THE INSIDE OF an ENCLOSURE
the ball … *the box*

(which ultimately yields *The ball is in the box).* The particular figure and ground objects specified in such a complex structure can be appropriate only if they are capable of being idealized as the geometric schemas in the structure. Thus, (29) can specify a semantically well-formed situation only if 'the ball' is topologically idealizable as 'a point of space' and 'the box' as 'an enclosure'[16].

Thus, even a simple Path-specifying form like English *in* or *across* actually corresponds to a complex structure. In particular, in derivational terms, it arises from the last portion of a Motion-aspect formula together with the first portion of a Conformation. We will now consider six such structures – built from the last portions of (68a) to (68c) together with the first portions of two different Conformations – and sketch the derivations leading from these to the corresponding surface path expressions of English. The last portion of a Conformation (the geometric schema for the full Ground object) is shown only in brackets and is assumed not to participate directly in the derivation.[17]

(71) (A)

	For (68a)	For (68b)	For (68c)
a.	AT a POINT_S that IS OF the INSIDE OF [AN ENCLOSURE]	TO a POINT_S that IS OF the INSIDE OF [AN ENCLOSURE]	FROM a POINT_S that IS OF the INSIDE OF [AN ENCLOSURE]
b.	AT a POINT_S OF the INSIDE OF	TO a POINT_S OF the INSIDE OF	FROM a POINT_S OF the INSIDE OF
c.	AT the INSIDE OF	TO the INSIDE OF	FROM the INSIDE OF
d.	AT IN	TO IN	FROM IN
e.	—	—	FROM OUT
f.	IN AT	IN TO	OUT FROM
g.	*in*	*in (to)*	*out (of)*

Note that the derivations in (71) apply equally well to Russian through the (f) forms.

(71) (B)

a.	AT A POINT_S that IS OF the SURFACE OF [a VOLUME]	TO a POINT_S that IS OF the SURFACE OF [a VOLUME]	FROM a POINT_S that IS OF the SURFACE OF [a VOLUME]
b.	AT a POINT_S OF the SURFACE OF	TO a POINT_S OF the SURFACE OF	FROM a POINT_S OF the SURFACE OF
c.	AT the SURFACE OF	OF the SURFACE OF	OF the SURFACE OF
d.	AT ON	TO ON	FROM ON
e.	—	—	FROM OFF
f.	ON AT	ON TO	OFF FROM
g.	*on*	*on (to)*	*off(-of)*

In deriving further to the surface (g) forms, the deep morphemes IN, OUT, ON, and OFF key in the appropriate Russian prepositions, while the deep Vector morphemes AT, TO, and FROM key in case markers for the governed noun.

(72) f.	IN AT	IN TO	OUT FROM
g.	*v*+-PREPOSITIONAL	*v*+-ACCUSATIVE	*iz* + -GENITIVE
f.	ON AT	ON TO	OFF FROM
g.	*na*+-PREPOSITIONAL	*na*+-ACCUSATIVE	*s* + -GENITIVE

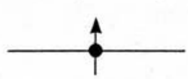
In addition, the (c) forms are represented at the surface in (for one language out of many) Japanese – for example, in *no ue ni* 'at top surface of' (= 'on'), in *no ue ni/e* 'to top surface of' (= 'onto'), and in *no ue kara* 'from top surface of' (= 'off of'). The right-hand (d) forms are represented at the surface in Hebrew in *mē 'al* 'from on' (= 'off of'). The right-hand (e) forms are represented at the surface in older English in expressions like *She ran from out the house.* And the right-hand (f) forms are represented at the surface in modern English – using the word *from* instead of *of* – when they precede a non-nominal expression, as in *Get out from in front of the television.*

We now consider elaborations of the Motion-aspect formulas of (68d) to (68f) in (73), (74), and (75), respectively. In each case, the Motion-aspect formula's Vector and fundamental Ground schema are shown in construction with several different Conformations. For each such construction, a derivational sketch, a pictorial diagram, and an illustrative sentence are given. Although not shown above, the aspect indications that are an intrinsic part of Motion-aspect formulas are included below.

(73) a. VIA a $_{E}$POINT$_{S}$ that IS$_{LOC}$ TO-ONE-SIDE-OF [a POINT] AT a POINT$_{T}$
VIA TO-ONE-SIDE-OF [a POINT] AT a POINT$_{T}$
past [a POINT] AT a POINT$_{T}$

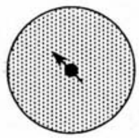
The ball sailed past his head (at exactly 3:00).

b. VIA a $_{E}$POINT$_{S}$ that IS$_{LOC}$ ON and PERPENDICULAR TO [a LINE] AT a POINT$_{T}$
VIA ON [a LINE] AT a POINT$_{T}$
across [a LINE] AT a POINT$_{T}$



The ball rolled across the border (at exactly 3:00).

c. VIA a ${}_{E}$POINT$_{S}$ that IS$_{LOC}$ IN and PERPENDICULAR TO [a PLANE] AT a POINT$_{T}$
VIA IN [a PLANE] AT a POINT$_{T}$
through [a PLANE] AT a POINT$_{T}$



The ball sailed through the pane of glass (at exactly 3:00).

d. VIA a ${}_{E}$POINT$_{S}$ that IS$_{LOC}$ INSIDE and PERPENDICULAR TO [a CIRCLE] AT a POINT$_{T}$
VIA INSIDE [a CIRCLE] AT a POINT$_{T}$
through [a CIRCLE] AT a POINT$_{T}$

The ball sailed through the hoop (at exactly 3:00).

(74) Here and in (75), wherever UP and *up* appear, DOWN and *down* are equally appropriate.

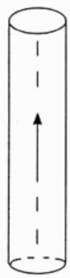
a. ALONG an EXTENT$_{S}$ that IS$_{LOC}$ TO-ONE-SIDE-OF and PARALLEL-TO [a LINE] FOR an ${}_{B}$EXTENT$_{T}$
ALONG TO-ONE-SIDE-OF [a LINE] FOR an ${}_{B}$EXTENT$_{T}$
along[side] (a LINE) FOR an ${}_{B}$EXTENT$_{T}$

She walked along (side) the fence (for 5 minutes).

b. ALONG an EXTENT$_{S}$ that IS$_{LOC}$ ON and PARALLEL-TO [a LINE] FOR an ${}_{B}$EXTENT$_{T}$
ALONG ON [a LINE] FOR an ${}_{B}$EXTENT$_{T}$
along [a LINE] FOR an ${}_{B}$EXTENT$_{T}$

I walked along the path (for 20 minutes).

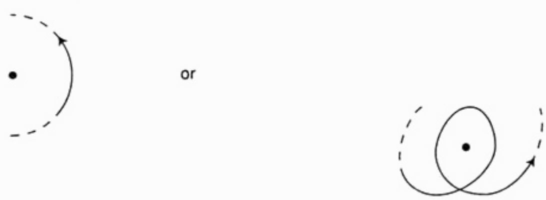
c. ALONG an $EXTENT_S$ that IS_{LOC} INSIDE and PARALLEL-TO [a CYLINDER] FOR an $_BEXTENT_T$
ALONG INSIDE [a CYLINDER] FOR an $_BEXTENT_T$
through [a CYLINDER] FOR an $_BEXTENT_T$



I walked through the tunnel (for 20 minutes).

c′. UP ALONG an $EXTENT_S$ that IS VERTICAL and IS_{LOC} INSIDE and PARALLEL-TO [a VERTICAL CYLINDER] FOR an $_BEXTENT_T$
UP ALONG INSIDE [a VERTICAL CYLINDER] FOR an $_BEXTENT_T$
up [a VERTICAL CYLINDER] FOR an $_BEXTENT_T$
I crawled up the chimney (for 1 minute).

d. ALONG an $EXTENT_S$ that IS_{LOC} RADIALLY TO-ONE-SIDE-OF [a POINT] FOR an $_BEXTENT_T$
ALONG RADIALLY TO-ONE-SIDE-OF [a POINT] FOR an $_BEXTENT_T$
around [a POINT] FOR an $_BEXTENT_T$



I ran around the house (for 20 seconds).
I ran around the house (for 2 hours).

(75) a. ALENGTH an $_BEXTENT_S$ that IS_{LOC} ON, PARALLEL-TO, and COTERMINOUS-WITH [a BOUNDED LINE] IN an $_BEXTENT_T$
ALENGTH ON [a BOUNDED LINE] IN an $_BEXTENT_T$
the length of [a BOUNDED LINE] IN an $_BEXTENT_T$ (no English preposition corresponds to this structure)

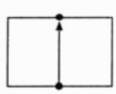
I walked the length of the pier (in 10 minutes).

b. ALENGTH an $_{B}$EXTENT$_{S}$ that IS$_{LOC}$ INSIDE, PARALLEL-TO, and COTERMINOUS-WITH [a BOUNDED CYLINDER] IN an $_{B}$EXTENT$_{T}$
ALENGTH INSIDE [a BOUNDED CYLINDER] IN an $_{B}$EXTENT$_{T}$
through [a BOUNDED CYLINDER] IN an $_{B}$EXTENT$_{T}$

I walked through the tunnel (in 30 minutes).

b′. UP ALENGTH an $_{B}$EXTENT$_{S}$ that IS VERTICAL and IS$_{LOC}$ INSIDE, PARALLEL-TO, and COTERMINOUS-WITH [a VERTICAL BOUNDED CYLINDER] IN an $_{B}$EXTENT$_{T}$
UP ALENGTH INSIDE [a VERTICAL BOUNDED CYLINDER] IN an $_{B}$EXTENT$_{T}$
up [a VERTICAL BOUNDED CYLINDER] IN an $_{B}$EXTENT$_{T}$
I crawled up the chimney (in 3 minutes).

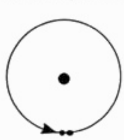
c. ALENGTH an $_{B}$EXTENT$_{S}$ that IS$_{LOC}$ ON and COTERMINOUS-WITH [a BOUNDED PLANE] IN an $_{B}$EXTENT$_{T}$
ALENGTH ON [a BOUNDED PLANE] IN an $_{B}$EXTENT$_{T}$
across [a BOUNDED PLANE] IN an $_{B}$EXTENT$_{T}$



I walked across the field (in 5 minutes).

c′. UP ALENGTH an $_{B}$EXTENT$_{S}$ that IS VERTICAL and IS$_{LOC}$ ON and COTERMINOUS-WITH [a VERTICAL BOUNDED PLANE] IN an $_{B}$EXTENT$_{T}$
UP ALENGTH ON [a VERTICAL BOUNDED PLANE] IN an $_{B}$EXTENT$_{T}$
up [a VERTICAL BOUNDED PLANE] IN an $_{B}$EXTENT$_{T}$
The fly walked up the wall (in 30 seconds).

d. ALENGTH an $_{B}$EXTENT$_{S}$ that IS$_{LOC}$ RADIALLY TO-ONE-SIDE-OF [a POINT] and COTERMINOUS-WITH ITSELF IN an $_{B}$EXTENT$_{T}$
ALENGTH RADIALLY TO-ONE-SIDE-OF [a POINT] IN an $_{B}$EXTENT$_{T}$
around [a POINT] IN an $_{B}$EXTENT$_{T}$



I ran around the house (in 40 seconds).

Notes

1 This chapter is a substantially revised and expanded version of Talmy (1983). The appendix included in this version is a revised excerpt from Talmy (1975b).

I am indebted to Herb Pick, Charles Fillmore, Jennifer Lowood, and Eileen Eastman for their editorial comments on content and style in earlier drafts of this manuscript. And for our discussions over the years on language and space, I want to thank Melissa Bowerman, Charles Fillmore, Annette Herskovits, Ray Jackendoff, Paul Kay, George Lakoff, David Mark, Dan Slobin, and David Zubin.

2 Continued analysis since the publication of Talmy (1983) has appeared in many works, including Levelt (1984; 1996); Zubin and Svorou (1984); Herskovits (1986; 1997); Langacker (1987); Brugman (1988); Vandeloise (1991); and Regier (1992).

3 The linguistic term 'open-class' refers to any set of elements, like noun stems, that is quite large in number and can rather readily add new members. 'Closed-class' is applied to a set of elements – for example, verbal inflections for tense, pronouns, prepositions – that are relatively small in number and fixed in membership.

4 Other linguists working on space have described notions similar – though generally not identical – to these, and have employed different terms for them. Thus, Gruber's (1965) 'theme' and Langacker's (1979) 'trajector' are quite comparable to my Figure, while Langacker's 'landmark' compares with my Ground. Fillmore's (1968) 'Patient' includes, but is more general than, the present Figure notion, but he has no analog to my Ground, as discussed next.

5 The 'virtual motion' referred to here is one type within the elaborate system of 'fictive motion' described in Talmy (2000, chapter I-2), namely, the type termed 'coextension paths.'

6 Because of this semantic range of English *in,* Lakoff and Johnson's (1980) selection of the term 'container' to label the literal and metaphoric meaning of *in* does not well represent this morpheme's coverage and can be misleading. Thus, for example, 'containment' pertains to only a small subset of Atsugewi's distinctions. A better label for the general meaning of *in* might be 'a surround,' so that one could speak of a 'surround metaphor.'

7 Perhaps a version of this pattern underlies prepositional *up* and *down* in English.

(i) up/down: 'up/down along {a linear extent}/ through {a cylinder}

I climbed up the ladder./ I crawled down the chimney.

[as if, e.g., from: I climbed up along the ladder/crawled down through the chimney]

8 On the basis of a broader range of expression in English – such as *on the east side of, on this side of* – the word *side* in one of its usages can be considered a general term for referring to the region adjacent to a particular Reference Object part. Accordingly, the specialized expressions in (25) can be considered equivalent to fuller expressions containing the word *side* as follows:

in front of	= on the front side of
in back of/behind	= on the rear side of
on the right/left	= on the right/left side of

9 The use of *with* and *against* with something like a traffic signal, as in *I crossed the street with/against the light,* probably rests on a conceptualization of the traffic light as a fictive emanation (see Talmy, 2000, chapter I-2). In this conceptualization, the emanation flows out from a red light, but into a green light, which is in view before a pedestrian, and can interact force dynamically with certain cognitive characteristics of the pedestrian.

10 We note again that our term 'Reference Object' is equivalent to and interchangeable with our term 'Ground.' It is used preferentially in the present section only because it may lend itself more suggestively to the descriptions offered.

11 With regard to examples (48g) and (48h), the Spanish prepositions *hasta* and *desde* appear to capture exactly the (g) and (h) notions – for both space and time – of motion or temporal continuation along an extent bounded at only one end, so that *hasta Chicago* means 'as far as/up to Chicago' and *hasta 3.00* means 'until 3:00,' while *desde Chicago* means 'from Chicago and onward' and *desde 3:00* means 'since 3:00'.

12 Part 1 of Talmy (2000) treats the first three schematic systems. Part 2 treats the first schematic system (configurational structure). Part 3 treats the third system (attention). And part 4 treats the fourth system (force dynamics).

13 This phenomenon was perhaps first observed for a language, specifically, for Wintu, by Harvey Pitkin (personal communication). But it has since then been explored in great detail by Levinson (1996b), Pederson (1993), and others in the Cognitive Anthropology Research Group at the Max Planck Institute for Psycholinguistics.

14 To this open-class group in English belong a number of postural verbs that characterize how certain complex geometric objects, including the human body, enter a variety of configurations and, in some cases, relate spatially to further reference objects: *bow, bend, crouch, squat, kneel (on), lie (on), sit (on), stand (on), lean (against), hang (from), huddle (together).*

15 Although the spatial domain has too many parameters to behave like the kinship or color domains, microportions of the domain can exhibit the pattern of contiguous specific classification. Thus, English *across* and *along* together form a two-member subset that schematizes most versions of a path extending over a bounded plane, with the venue of one preposition giving way to that of the other as the plane's ratio of axis lengths changes in magnitude.

16 Note that a single physical object can be idealized into several different geometric schemas. Thus, a particular box is idealized as an enclosure in the situation specified by *The ball is in the box,* but it is idealized as a point in the situation specified by *The box is 20 feet away from the wall.*

17 With regard to (7lAf), in standard American English, *into, onto,* and *off of* can appear without their second element as *in, on,* and *off.* But *out of* cannot do so. At least in some dialects, however, this *can* happen: *I fell out the bed*

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Press Final 27 July 2007

Section VII

Language acquisition, diversity, and change

Introduction. By *Jörg Zinken*

This section covers a diverse range of topics, each of which is a broad field of research in its own right. Nevertheless, the papers in this section are held together in an important respect. All of them illustrate an aspect of recent cognitive linguistic work on language and cognition, which can be summarised as the 'usage-based' perspective. This perspective highlights the importance of investigating linguistic knowledge from the viewpoint of the spatio-temporal reality of language. Given the fundamental place that language use is given in this approach, models of diversity and change become central elements of a theory of language.

Therefore, while the selection of papers in this section can certainly not do justice to the fields of language acquisition, diversity, and language change respectively, we hope that they can fulfil two functions. Firstly, the papers provide state of the art overviews of central aspects of these areas of research. Moreover, they do so from a cognitive linguistic perspective. Secondly, they together give an impression of the empirical and conceptual power of a usage-based approach to language and cognition.

This conceptual power consists, not least, in the challenge that usage-based approaches constitute for the development of theory in cognitive linguistics, and in the cognitive sciences more generally. Usage-based approaches can motivate a discussion on what we want the 'cognitive' in Cognitive Linguistics to mean. Early work in cognitive linguistics was based on concepts imported from cognitive psychology, with its focus on mental representations (see Evans, Bergen, & Zinken, this volume). These concepts were predominantly constitutive of 'cognitivist' theorising in psychology, i.e., the view that cognition happens in a largely self-sufficient machinery inside the individual's head – a view that was itself strongly influenced by Chomsky's understanding of language. While the 'cognitivist' perspective has been highly contentious within cognitive psychology for a long time (see, e.g., Costall & Still, 1987), a view of cognition as a machinery in the individual head is implicit in much cognitive linguistic work, as has sometimes been criticised (see Sinha, 2005).

The essentialist view inherent in such a cognitivist perspective on language is directly addressed by William Croft in his chapter on *'Selection: An utterance-based evolutionary theory of language'*. The essentialist view defines language as a system of abstract rules. These constitute the 'essence' of language that linguistics should identify. This essentialist definition is difficult to reconcile with the ever-changing nature of language. Croft discusses these problems and proposes to radically replace the distinction between an 'essence' and 'surface' manifestations of language by defining a language as the 'population' of actually occurring utterances. In his evolutionary model of language, the utterance is the fundamental unit of analysis, the 'replicator' of conceptual structure. By adopting such a radically usage-based approach to language, Croft integrates change as an integral part for a theory of language, as has been postulated by researchers of language change in the past (Keller, 1994). Croft's approach also encourages discussion of the representationalist view of meaning underlying much of cognitive semantics (see Evans, Bergen, & Zinken, this volume).

While Croft discusses the relation between language and conceptual development from the perspective of theoretical model-building, covering conceptual change on both the (individual) micro- and the (societal) macro-level, the other chapters in this section are dedicated to the relation between language as a social fact and individual conceptualisation.

In his chapter on *'Language and thought online: Cognitive consequences of linguistic relativity'*, Dan Slobin gives an overview of his research on *thinking for speaking*, and places it in a general framework for the study of Whorfian effects of language on cognition. The thinking-for-speaking framework, which has generated a substantial body of empirical work over the last 20 or so years (e.g., Strömqvist & Verhoeven, 1994), is a good example of an alternative to the 'cognitivist' perspective on language and cognition. The cognition that Slobin is interested in is not a detached process carried out beyond the (time-)constraints of the real world, but a process of managing attention and expectations that is part of a larger unit of analysis: situated action, more specifically, verbal behaviour. He shows that online conceptualisation is attuned to the semantic categories that a particular language makes available. Although studies of Whorfian effects focus on the evaluation of effects that linguistic categories might have on *non-linguistic* cognition (see Lucy, 1996), Slobin argues that thinking for speaking needs to be studied as the crucial process that brings such Whorfian effects about.

Whorfian effects in the classical sense of diversity in non-linguistic cognition that is correlated with diversity in semantic categories are addressed in Lera Boroditsky's chapter *'Does language shape thought? English and Mandarin speakers' conceptions of time'*. Boroditsky presents a series of experiments that show such a correlation with respect to conventional figurative expressions used in English and in Mandarin for talking about temporal relations. While English speakers regularly talk about such relations using words that can also refer to horizontal spatial relations, Mandarin speakers also frequently use vertical spatial terms to talk about temporal relations. As Boroditsky shows, this difference in language is correlated with a differential performance of English and Mandarin speakers in reaction time experiments. This research underscores the (again) growing respectability of the view that the language 'data' learners are confronted with do actually play a role in the *construction* of conceptual categories (see Brown, 1958). The usage-based approach that is a common denominator of the chapters in this section might give this perspective additional scientific weight.

The argument that children actively construct semantic categories from the language they grow into is explicitly made by Melissa Bowerman and Soonja Choi in their chapter '*Space under construction: Language-specific spatial categorization in first language acquisition*'. They provide a synthesis of their research into the acquisition of morphemes expressing spatial relations by Dutch and Korean children, in which they could show that children are sensitive from a very early age to the particular spatial relations that are relevant in their respective language. Furthermore, the errors that children make in overextending the meaning of such morphemes form patterns that systematically vary with the differences in meaning across languages. As Bowerman and Choi argue, these results show that children do a lot more in language acquisition than merely matching the 'labels' that language provides with the appropriate, fully-formed concepts.

The usage-based perspective implicit in this research on language acquisition is explicitly addressed by Michael Tomasello in his chapter, '*A usage-based approach to child language acquisition*'. Tomasello synthesises some of his research on child language acquisition, focusing on the acquisition of syntactic categories. He argues that children construct such categories 'bottom-up', starting with local knowledge restricted to particular, frequent constructions ('verb islands'), and only gradually generalising across similar instances to arrive at more abstract categories, such as 'subject' or 'object' (see also Croft's chapter on 'Radical Construction Grammar' in section V). This is a perspective that is at odds with the one that has long been dominant in research on language acquisition, according to which many abstract schemas or 'rules' are already in place when children start learning language (cf. Pinker, 1989). Again, the usage-based perspective here shows its potential as a challenge to cognitivist treatments of language and cognition.

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24 A usage-based approach to child language acquisition

Michael Tomasello

1 Introduction

The modern study of child language acquisition began when developmentalists started to take Linguistics seriously. For many researchers this has meant a top-down approach in which we begin with some more or less formal description of adult language and then investigate the ways in which children's linguistic skills come to conform with that description. Other researchers have taken a more bottom-up approach in which we assume as little as possible about the nature of children's language and then attempt to characterize it in its own terms – based on children's actual use of language at particular developmental periods (in both comprehension and production). Because our characterizations are based on children's language *use*, we may call this a usage-based methodology.

In modern Cognitive and Functional Linguistics the term usage-based has, in addition, a number of more substantive meanings. Most important is the proposition that language structure emerges – both historically and ontogenetically – from language use. In the context of first language acquisition, I take this to mean that children begin their linguistic careers with concrete and specific linguistic constructions, and create abstractions only gradually through repeated acts of language comprehension and production in specific usage events. This perspective is also broadly consistent with a Construction Grammar view in which our account of linguistic competence includes not only the most regular aspects of language structure, but also – and perhaps even as a primary starting point – all of the idioms, fixed expressions, and other quirky aspects of human language use (Fillmore et al., 1988; Kay & Fillmore, 1999).

One especially important proposal of some usage-based theorists is that frequency matters. That is to say, certain linguistic expressions and constructions are used so often that they become entrenched for individuals as holistic units of psycholinguistic processing – regardless of any internal structure they may have in addition (Bybee, 1985, 1995; Langacker, 1987, 1988). Given this focus on usage events – and on the processes of language learning and structure building that occur in usage events, with the frequency of certain kinds of usage events being extremely important – a crucial item on the research agenda of usage-based models of language is, or should be, the study of how human beings build up the most basic aspects of their linguistic competence during childhood.

In this paper I report on recent research in child language acquisition that is broadly compatible with a usage-based approach to language. The points I will attempt to make are the following: (i) children's early language is item-based; (ii) children's earliest creative utterances are grounded in these item-based constructions; (iii) this concrete organization lasts longer than previously suspected and even characterizes children's early complex constructions (sentential complements and relative clauses); and (iv) the processes by which children acquire and abstract across item-based constructions all reflect general processes of human cognition.

2 Verb islands and other item-based constructions

Many researchers believe that young children operate from the beginning with abstract linguistic categories and schemas because they not only follow adult grammatical conventions fairly well, but they also on occasion produce some creative yet canonical utterances that they could not have heard from adults – which means that they must be generating them via abstract linguistic categories or schemas. The most famous example is *Allgone sticky,* as reported by Braine (1971), and indeed such creativity is convincing evidence that the child has some kind of abstract linguistic knowledge. However, recent evidence suggests that, in this example, the only abstract knowledge this child possesses is what kinds of things can be *allgone* – not, for example, what kinds of things may be the subjects or objects of verbs. The general methodological problem is that we can never tell from a single utterance in isolation what is the child's underlying structural knowledge. To determine underlying structural knowledge we must look at *all* of a child's uses – and most especially non-uses – of a whole set of linguistic items or structures.

Using this more systematic method, Tomasello (1992) found that although most of his daughter's early language during her second year of life was 'grammatical', it was also very limited, uneven, and item based. The item based nature of this child's early language was most clearly evident in her use of verbs. Thus, during exactly the same developmental period some semantically similar verbs were used in only one type of sentence frame and that frame was quite simple (e.g., *Cut X*), whereas other verbs were used in more complex frames of several different types (e.g., *Draw X, Draw_on X, Draw X for Y, Z draw on Q*). In addition, morphological marking (e.g., for past tense) was also very uneven across verbs. Within a given verb's development, however, there was great continuity, with new uses almost always replicating previous uses with only one small addition or modification (e.g., the marking of tense or the adding of a new participant role). Overall, by far the best predictor of this child's use of a given verb on a given day was *not* her use of other verbs on that same day, but rather her use of that same verb on immediately preceding days; there appeared to be no transfer of structure across verbs. The hypothesis was thus that children have an early period in which each of their verbs forms its own island of organization in an otherwise unorganized language system (the Verb Island hypothesis), thereby serving to define lexically specific syntactic categories such as 'drawer', 'thing drawn', and 'thing drawn with' (as opposed to subject, object, and instrument) (see also Tomasello & Brooks, 1999).

Using a combination of periodic sampling and maternal diaries, Lieven et al. (1997) found some very similar results in a sample of 12 English-speaking children from 2 to 3 years of age. In particular, they found that children used virtually all of their verbs and predicative terms in one and only one sentence frame early in language development – suggesting that their syntax was built around various particular items and expressions. In fact, fully 92% of these children's earliest multi-word utterances emanated from one of their first 25 lexically based patterns – which were different for different children. Following along these same lines, Pine and Lieven (1997) found that when these same children began to use the determiners *a* and *the* in the 2 to 3 year period, they did so with almost completely different sets of nouns (i.e., there was almost no overlap in the sets of nouns used with the two determiners) – suggesting that the children at this age did not have any kind of abstract category of Determiner that included both of these lexical items. This general finding of the item based learning and use of language has now been replicated in a number of different languages of many different types (e.g., see Pizutto & Caselli, 1992, 1994, for Italian; Serrat, 1997, for Catalan; Behrens, 1998, for Dutch; Allen, 1996, for Inuktitut; Gathercole, Sebastián, & Soto, 1999, for Spanish; Rubina & Pine, 1998, for Portugese; Stoll, 1998, for Russian; and Berman, 1982, 1993, for Hebrew).

Of special note in children's spontaneous speech are so-called overgeneralization errors, because they are things the child has presumably not heard from adults. In the context of a focus on syntax, the overgeneralizations of most interest are those involving basic sentence frames, for example, *She falled me down* or *Don't giggle me*, in which the child uses intransitive verbs transitively (i.e., a verb normally used with a subject only is used with both a subject and an object). Bowerman (1982, 1988) documented a number of such overgeneralizations in the speech of her two English-speaking children, and Pinker (1989) compiled examples from other sources as well. The main result of interest is that these children produced very few of these types of overgeneralizations before about 3 years of age. This developmental pattern suggests again the hypothesis that the construction of abstract linguistic categories and schemas is a gradual process that takes place over many months, and even years, of ontogeny.

The other main method for studying the nature of children's linguistic knowledge involves teaching them novel linguistic items and seeing what they do with them. The idea is that if the child uses the novel item in creative yet canonical ways, we may infer that she has assimilated it to some kind of abstract category or schema. If she does not use it in any creative ways (despite repeated opportunities), but only in ways she has heard from adults, the inference is that there is no abstract system to take up the new element, and the child is simply imitatively learning a specific linguistic item or structure (assuming that there are no performance limitations, involving limited memory or the like, that prevent the child from demonstrating her syntactic competence in the experiment).

Experiments using novel verbs have demonstrated that by 3 to 4 years of age most children can readily assimilate novel verbs to abstract syntactic categories and schemas that they bring to the experiment, for example, taking a verb they have heard only in a passive sentence frame and using it in an active sentence frame (Maratsos et al., 1987; Pinker et al., 1987). But the same is not true for younger children. For example, Tomasello and Brooks (1998) exposed 2 to 3 year old children to a novel verb used to refer to a highly transitive and novel action in which an agent was doing something to a patient. In the key condition the novel verb was used in an intransitive sentence frame such as *The sock is tamming* (to refer to a situation in which, for example, a bear was doing something that caused a sock to 'tam' – similar to the verb *roll* or *spin*). Then, with novel characters performing the target action, the adult asked children the question: *What is the doggie doing?* (when the dog was causing some new character to tam). Agent questions of this type encourage a transitive reply such as *He's tamming the car* – which would be creative since the child has heard this verb only in an intransitive sentence frame. The outcome was that very few children at either age produced a transitive utterance with the novel verb. As a control, children also heard another novel verb introduced in a transitive sentence frame, and in this case virtually all of them produced a transitive utterance – demonstrating that they can use novel verbs in the transitive construction when they have heard them used in that way.

The generality of this finding is demonstrated by a number of similar studies using different modelled constructions and measurement procedures. These studies have used children of many different ages and have tested for a variety of different constructions (see Tomasello, 2000, for a review). Most of the findings concern children's ability to produce a simple transitive utterance (subject-verb-object; SVO), given that they have heard a novel verb only in some *other* sentence frame (e.g., intransitive, passive, imperative, etc.). When all of these findings are compiled and quantitatively compared, we see a continuous developmental progression in which children gradually become more productive with novel verbs during their third and fourth years of life and beyond. It is clear that this overall pattern is not consistent with the hypothesis that children possess abstract linguistic knowledge early in development, but rather it is consistent with a more constructivist or usage-based model in which young children begin language acquisition by imitatively learning linguistic items directly from adult language, only later discerning the kinds of patterns that enable them to construct more abstract linguistic categories and schemas.

The validity of these findings is further corroborated by two control studies that deal with alternative hypotheses. First, it is possible that young children are simply reluctant to use newly learned words in novel ways. However, when even younger children (22 months) are taught novel nouns, they use them quite freely in novel sentence frames (Tomasello et al., 1997). Young children are thus not reticent with all newly learned words, and indeed they seem to form something like a category of 'concrete noun' quite early in development. Second, it might be that children's lack of productivity in the novel verb studies does not have to do with their linguistic knowledge, but only with production difficulties. However, in comprehension tests they perform no better. That is, they are first taught a novel verb in a simple sentence frame (*Look! Tamming! This is called tamming!*), and they are asked to act out a transitive construction with that verb: *Show me: The dog's tamming the cat*. Perhaps surprisingly, children younger than 3 years of age do no better in comprehension than they do in production (Akhtar & Tomasello, 1997). (The study of Naigles (1990) is sometimes taken to be discrepant with these findings, but in fact it is not relevant because the two sentences that were compared in that study were *The duck is glorping the bunny* and *The bunny and the duck are glorping* – with one picture depicting the duck doing something to the bunny and the other depicting the two participants engaged in the same parallel action. The problem is that children might very well have been using the word *and* as an indicator of the parallel action picture; Tomasello & Olguin, 1993).

3 Usage-based syntactic operations

Given that children are acquiring linguistic constructions of various shapes and sizes and degrees of abstraction throughout early development (i.e., building their linguistic inventories), we may now ask about their ability to put these constructions together creatively in order to adapt to the exigencies of particular usage events. Tomasello, Lieven, Behrens, and Forwergk (2000) addressed this issue in a naturalistic study of one 2-year-old child learning English. The novelty was that this child's language was recorded using extremely dense taping intervals. Specifically, the child was recorded in linguistic interaction with her mother for one hour per day, 5 days per week, for 6 weeks – making the taped data roughly 5 to 10 times denser than most existing databases of child language, and accounting for approximately 8 to 10% of all of the child's utterances during this 6 week period. In order to investigate this child's syntactic creativity, all of her 500+ utterances produced during the last one-hour taping session at the end of the 6 week period were designated as target utterances. Then, for each target utterance, there was a search for 'similar' utterances produced by the child (not the mother) in the previous 6 weeks of taping. Was it an utterance she had said before exactly? Was it an utterance based on some highly frequent schema from before but with a new linguistic item in the slot? Was it an utterance pieced together from previously mastered language in some more creative way? Or did the target utterance have no previous precedents in the child's productive language at all?

The main goal was thus to determine for each utterance recorded on the final day of the study what kinds of syntactic operations were necessary for its production, that is to say, in what ways did the child have to modify things she had previously said (her 'stored linguistic experience') to produce the thing she was now saying. We may call these operations 'usage-based syntactic operations' since they explicitly take into account that the child does not put together each of her utterances from scratch, morpheme by morpheme, but rather, she puts together her utterances from a motley assortment of different kinds of pre-existing psycholinguistic units. And so, following the usage-based models of Bybee (1995), Langacker (2000), and Croft (2000), the question was how this child was able to 'cut and paste' together her previously mastered linguistic constructions in order to create a novel utterance in a specific usage event. What was found by this procedure was:

Of the 455 multi-word utterances produced, 78% were utterances that this child had said before during the previous 6 weeks of sampling – in exactly this same form as whole utterances. Many of these were utterance routines like *Thank-You, There-you-go,* etc., but many were simply frequently used multi-word utterances such as *Where's Daddy?*.

Another 18% of the target utterances were things the child had said before but with one minor change, that is, they consisted of an established utterance schema plus other linguistic material 'filled in' or 'added on'. For example, the child had said many scores of times previously *Where's X*, but on the target tape she said *Where's the butter?*, which was new (*butter* having been said on 5 occasions previously in other linguistic contexts). As another example, the child said *I got one here*, which was new. But she had said *I got one* 7 times previously, and she had added *here* onto the end of utterances many scores of times previously.

Only 4% of this child's target utterances were different from things she had said before in more than one way. These mostly involved the combination of 'filling in' and 'adding on' to an established utterance schema. For example, the child said creatively *I want tissue lounge*, which seemingly derived from the utterance schema *I want* <u>*OBJECT*</u> (which she had said over 50 times previously), with a slotting in of the word *tissue* (which she had said 9 times previously in other contexts), and adding on of the word *lounge* (which she had said 3 times previously in other contexts).

There were exactly 3 utterances (less than one-half of one per cent) that could not be accounted for in a relatively straightforward application of this procedure, and 2 of these were heavily scaffolded by the immediate discourse context (i.e., the child took some of her utterance not from her stored linguistic experience but rather from her mother's immediately preceding speech).

It is thus clear that in the vast majority of cases, this child's creative utterances were based directly on things she had said before many times previously. Moreover, in the vast majority of cases, one of the pieces of language on which the child's creative utterance was based was what we called an utterance schema. Utterance schemas were things the child had said before as full utterances with some variation in one (or, infrequently, more than one) slot – such things as *Where's the X?, I wanna X, More X, It's a X, I'm X-ing it, Put X here, Mommy's X-ing it, Let's X it,* and so forth. Importantly, these utterance schemas were things that the child had said before, on average, an estimated 150 times during the previous six weeks, and the other language used in these creative utterances (e.g., to fill the slot) had been said before, on average in one or another context, an estimated 70 times during the previous six weeks (these estimations are aimed at reflecting the child's total experience as projected from our 10% sample). Further evidence for the psychological reality of these utterance schemas derives from the fact that there were virtually no insertions of linguistic material into previously invariant sequential strings within the schemas (e.g., the child never put adverbs or other modifiers into the middle of an established utterance schema) or substitutions of linguistic material into places that did not already have established slots. It is also important that there was almost perfect functional consistency across different uses of these utterance schemas; the child filled the slot with the same kind of linguistic item or phrase (e.g., an object word or a locative phrase) across the six week period of study.

The point is not that children are not creative with language; they are. But initially they are creative only in highly constrained ways. The general picture that emerges is thus as follows. When young children have something they want to say, they sometimes have a set expression readily available and so they simply retrieve that expression from their stored linguistic experience. When they have no set expression readily available, they retrieve linguistic schemas and items that they have previously mastered (either in their own production or in their comprehension of other speakers) and then 'cut and paste' them together as necessary for the communicative situation at hand – what I have called 'usage-based syntactic operations'. Perhaps the first choice in this creative process is an utterance schema which can be used to structure the communicative act as a whole, with other items being filled in or added on to this foundation (Tomasello, 1998a). It is important that in doing their cutting and pasting, children coordinate not just the linguistic forms involved but also the conventional communicative functions of these forms – as otherwise they would be speaking creative nonsense. It is also important that the linguistic structures being cut and pasted in these acts of linguistic communication are a variegated lot, including everything from single words to abstract categories to partially abstract utterance or phrasal schemas.

4 Some more complex constructions

The usage-based approach is also quite revealing in the case of some of children's more complex constructions a bit later in their development. For example, Diessel and Tomasello (in press) looked at 7 children's earliest utterances with sentential complements and found that virtually all of them were composed of a simple sentence schema that the child had already mastered combined with one of a delimited set of matrix verbs (see also Bloom, 1992). These matrix verbs were of two types. First were epistemic verbs such as *think* and *know*. In almost all cases children used *I think* to indicate their own uncertainty about something, and they basically never used the verb *think* in anything but this first-person, present tense form; that is, there were virtually no examples of *He thinks …, She thinks …,* etc., virtually no examples of *I don't think …, I can't think …*, etc., and virtually no examples of *I thought…, I didn't think …*, etc. And there were almost no uses with a complementizer (virtually no examples of *I think that …*). It thus appears that for many young children *I think* is a relatively fixed phrase meaning something like *Maybe*. The child then pieces together this fixed phrase with a full sentence as a sort of evidential marker, but not as a 'sentence embedding' as it is typically portrayed in more formal analyses. The second kind of matrix verbs are attention-getting verbs like *Look* and *See* in conjunction with full finite clauses. In this case, children use these 'matrix' verbs almost exclusively in imperative form (again almost no negations, no non-present tenses, no complementizers), suggesting again an item-based approach not involving syntactic embedding. Thus, when examined closely, children's earliest complex sentences look much less like adult sentential complements (which are used most often in written discourse) and much more like various kinds of 'pastiches' of various kinds of established item-based constructions.

A related study is that of Diessel and Tomasello (submitted) on relative clauses. Using a similar methodology, they found that the earliest relative clauses that English-speaking children learn occur in presentational constructions that are propositionally simple. They consist of a copular clause and a relative that usually includes an intransitive verb. Two types of this construction must be distinguished: (1) The regular presentational relative construction (PRC) in which the relative clause is syntactically separated from the rest of the sentence, and (2) the amalgam construction in which the relative is conflated with the copular clause. Since the amalgam construction is usually the first relative construction that children learn and since the occurrence of this construction becomes very infrequent once the regular PRC has emerged, it can be seen as a precursor to the latter. Both presentational relative constructions express a single proposition, but since the amalgam construction does not include two separate full clauses, it is syntactically denser than the regular PRC. As the children of our study grow older, they begin to use more complex relative constructions in which a relative clause, including an intransitive *or* transitive verb, is attached to a noun in a full-fledged main clause. Such relative constructions contain two propositions expressed in main and subordinate clause. The whole development can therefore be seen as a process of clause expansion: Starting from the presentational amalgam construction, which expresses a single proposition in a structure that is not truly biclausal, children gradually learn the use of complex relative constructions in which two propositions are expressed in two separate full clauses.

The main point is that a usage-based account focused on specific item-based schemas that children learn and use can also account for complex sentences of a type that have traditionally been thought to require extremely abstract and complex syntactic structures. Again, the point is not that children cannot learn and use complex linguistic constructions, only that they do this on the basis of particular pieces of language that they hear and use repeatedly – with abstractions coming only slowly and gradually as children acquire more and more linguistic experience with the many expressions and constructions of their native language.

5 Some thoughts on process

If children are acquiring mainly item-based constructions early in development – and children acquiring different languages acquire different item-based constructions – an important part of the process must be some form of imitative learning. Imitation has been almost banished from the study of child language because it is most often defined as the child repeating verbatim what an adult has just said without understanding its meaning, and indeed this process very likely does not play a central role in language acquisition. But there are forms of social learning called cultural learning in which the learner understands the purpose or function of the behavior she is reproducing (Tomasello, Kruger, & Ratner, 1993). Thus, Meltzoff (1995) found that 18-month-old infants attempted to reproduce the intentional action they saw an adult attempting to perform, even when that action was not carried through to completion, and Carpenter, Akhtar, and Tomasello (1998) found that 16-month-old infants attempted to reproduce an adult's intentional, goal-directed actions, but not her accidental actions. In the case of language, if they are to use a piece of language in an adult-like way, children must understand and reproduce both its surface linguistic form and its underlying communicative function – in the sense of using it in connection with the same communicative intention (Tomasello, 1998b; 1999).

Cultural learning of this type works on multiple hierarchical levels simultaneously, and indeed it must work in this way if the child is to become creative with conventional, culturally based skills. As a nonlinguistic example, a child may see an adult use a stapler and understand that his goal is to staple together two pieces of paper. In some cases, the child may understand also that the goal/function of placing the papers inside the stapler's jaws is to align them with the stapling mechanism inside the stapler, and that the goal/function of pressing down on the stapler is to eject the staple through the two papers – with both of these sub-actions being in the service of the overall goal/function of attaching the two sheets of paper. To the extent that the child does not understand the sub-functions, she will be lost when she encounters some new stapler, for example, one whose stapling mechanism works differently (e.g., does not require pressing down). Only to the extent that the child understands the relevant sub-functions, will she be able to adapt to this new situation creatively (e.g., adjusting her behavior to effect the same outcome with the new stapling mechanism). The comparable linguistic example is that the child hears an adult say 'I stapled your papers' and comprehends not only the utterance and its overall communicative intention, but also, for example, the word *stapled* and its communicative sub-function in the utterance (the contribution it is making to the utterance as a whole), along with the phrase *your papers* and its communicative sub-function in the utterance – with *your* serving a sub-function within that phrase. Again, only if the child performs some 'functionally based distributional analysis' of this type will she be able in the future to use these linguistic elements creatively in novel utterances.

Reconceptualized in this way to include intention reading, my claim is that cultural (imitative) learning is more important in language development, especially in the early stages, than has traditionally been recognized. This is clear in the data reviewed above, which revealed that before their third birthdays children use individual verbs and syntactic constructions in just the way they have heard and understood them being used – with only very limited abilities to go beyond what they have heard. Interestingly, there are two phenomena of child language acquisition that are often taken to be evidence against imitative learning, but which are actually evidence for it – if we look at exactly what children do and do not hear. First, many young children say things like 'Her open it', an accusative subject which they supposedly have not heard from adults. But children hear things like 'Let her open it' or 'Help her open it' all the time, and so it is possible that when they say these things they are simply reproducing the end part of the utterances they have heard. Very telling is the fact that children almost never make the complementary error 'Mary hit I' or 'Jim kissed she' – the reason being that they never hear anything like this anywhere. A similar account can be given for some of the findings going under the general rubric of optional infinitives (Rice 1998). Children hear a very large number of nonfinite verbs right after nominative nouns, especially in questions such as 'Should he open it?' and 'Does she eat grapes?' The child might then later say, in partially imitative fashion: 'He open it' and 'She eat grapes'.

It is also important that children seem to have special difficulties in going beyond what they have heard when they have heard it multiple times, that is, it is entrenched. Thus, Brooks, Tomasello, Lewis, and Dodson (1999) modelled the use of a number of fixed-transitivity English verbs for children from 3;5 to 8;0 years – verbs such as *disappear* that are exclusively intransitive and verbs such as *hit* that are exclusively transitive. There were four pairs of verbs, one member of each pair typically learned early by children and used often by adults (and so presumably more entrenched) and one member of each pair typically learned later by children and used less frequently by adults (less entrenched). The four pairs were: *come-arrive, take-remove, hit-strike, disappear-vanish* (the first member of each pair being more entrenched). The finding was that, in the face of adult questions attempting to induce them to overgeneralize, children of all ages were less likely to overgeneralize the strongly entrenched verbs than the weakly entrenched verbs; that is, they were more likely to produce *I arrived it* than *I comed it*. This finding suggests not only that children say what they hear, but that the more they hear it the more it seems to them that this is the only way it can be said.

The imitative learning and entrenchment of particular linguistic forms cannot be the whole story of language acquisition, however, since children do at some point go beyond what they hear from adults and create novel yet canonical utterances. As noted above, they do this first by creating 'slots' in otherwise item-based schemas. It is not known precisely how they create these slots, but one possibility is that they observe in adult speech variation in that utterance position and so induce the slot on the basis of 'type frequency'. In general, in usage-based models the token frequency of an expression in the language learner's experience tends to entrench an expression – enabling the user to access and fluently use the expression as a whole (Langacker, 1988; Krug, 1998; Bybee & Schiebman, 1999) – whereas the type frequency of an expression (i.e., the number of different forms in which the language learner experiences the expression or some element of the expression) determines the creative possibilities, or productivity, of the construction (Bybee, 1985, 1995). Together, these two types of frequency – along with the corresponding child learning processes – may explain the ways in which young children acquire the use of specific linguistic expressions in specific communicative contexts and then generalize these expressions to new contexts based on various kinds of type variations they hear – including everything from type variation in a single slot to type variation in all of the constituents of a construction. The extent of type variation needed for different kinds of productivity is not known at this time, and indeed after a certain point in development it may be that type variation in the slots of constructions becomes less important as these slots come to be more precisely defined functionally.

Another possibility – not mutually exclusive but rather complementary to the above – is that abstract constructions are created by a relational mapping across different verb island constructions (Gentner & Markman, 1997). For example, in English the several verb island constructions that children have with the verbs *give, tell, show, send*, and so forth, all share a 'transfer' meaning and they all appear in a structure: NP+V+NP+NP (identified by the appropriate morphology on NPs and VPs). The specific hypothesis is thus that children make constructional analogies based on similarities of both form and function: two utterances or constructions are analogous if a 'good' structure mapping is found both on the level of linguistic form and on the level of communicative function. Precisely how this might be done is not known at this time, but there are some proposals that a key element in the process might be some kind of 'critical mass' of exemplars, to give children sufficient raw material from which to construct their abstractions (Marchman & Bates, 1994).

In either case, the main point is that young children begin by imitatively learning specific pieces of language in order to express their communicative intentions, for example, in holophrases and other fixed expressions. As they attempt to comprehend and reproduce the utterances produced by mature speakers – along with the internal constituents of those utterances – they come to discern certain patterns of language use (including patterns of token and type frequency), and these patterns lead them to construct a number of different kinds of (at first very local) linguistic categories and schemas. As with all kinds of categories and schemas in cognitive development, the conceptual 'glue' that holds them together is function; children categorize together things that do the same thing (Mandler, 1997). In this case, children understand as instances of the same kind of linguistic units those that serve 'the same' or 'similar' communicative functions in utterances.

6 Conclusion

If grammatical structures do not come directly from the human genome, as the above-reported data suggest they do not, and if children do not invent them *de novo*, as they clearly can not, then it is legitimate to ask: Where do grammatical structures come from? The answer is that, in the first instance, they come from processes of grammaticalization in language history. That is to say, at some point in human evolution, *Homo sapiens* evolved the ability to communicate with one another symbolically (Deacon, 1998). When human beings communicate symbolically with one another in extended discourse interactions, the stringing together of symbols begins to become grammaticalized, for example, content words such as nouns and verbs become function words such as prepositions and auxiliaries, and loosely concatenated symbols acquire syntactic relationships involving constituency and dependency. These transformations of linguistic structure occur as a result of social-interactive processes in which (i) speakers try to abbreviate linguistic expression as much as they can, and (ii) listeners try to make sure that speakers do not go so far in this direction that the message becomes incomprehensible. Grammaticalization processes are well-attested in the written records of numerous languages in their relatively recent pasts, and it is a reasonable assumption that the same processes were at work in the origin and early evolution of language, turning loosely organized sequences of single symbols into grammaticized linguistic constructions (Traugott & Heine, 1991; Givón, 1995; Slobin, 1997).

But grammaticalization by itself is not enough because it does not account for the abstractness of linguistic structures. Abstractness, as Chomsky recognized in even his earliest writings, must be contributed by the minds of individual children as they acquire the use of particular pieces of particular languages. It is possible – albeit very difficult – to imagine that children make this contribution by simply linking an innate universal grammar with the particular structures of the particular language they are learning. However, it is also possible – and more in accord with recent data – to imagine that children make this contribution in more extended developmental processes in which they apply their general cognitive, social-cognitive, and vocal-auditory processing skills to the historical products of grammaticalization (Tomasello, 1995, 1998c, 1999). Overall, then, we may hypothesize that human language originated ultimately from a species-unique biological adaptation for symbolic communication, but the actual grammatical structures of modern languages were humanly created through processes of grammaticalization during particular cultural histories, and through processes of cultural learning, schema formation, and structure combining during particular human ontogenies.

The study of language acquisition has always tagged along behind models from Linguistics – because to study how children acquire something we should first know what that something is. The new usage-based models of Cognitive and Functional Linguistics offer some exciting new perspectives for developmentalists because they are concerned with the actual psychological processes by means of which individuals comprehend and produce utterances. But cognitive and functional linguists have something to learn from developmental psycholinguists as well. If we are interested in people's 'stored linguistic experience', and how they use that experience in acts of linguistic communication, it would seem relevant to investigate systematically the processes by which linguistic experience is built up and used in human ontogeny.

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25 Space under construction: language-specific spatial categorization in first language acquisition

Melissa Bowerman and Soonja Choi

1 Introduction

Does language influence nonlinguistic cognition, and do different languages influence it in different ways? Testing these classical Whorfian questions presupposes speakers who are old enough to have mastered the relevant aspects of their language. For toddlers in the very early stages of linking meanings to language forms, we need to ask another question: do the concepts initially associated with language arise solely through nonlinguistic cognitive development, or are they formulated, at least in part, under linguistic guidance?

Establishing where children's early meanings come from – the relative contributions of nonlinguistic cognition and exposure to language – is important to the debate about the Whorfian hypothesis because it provides clues to how flexible – hence how potentially malleable – children's cognitive structuring of their physical and social world is. If the concepts children bring to the language acquisition task are so salient and prepotent that language is simply molded around them, linguistic influences on nonlinguistic cognition seem less likely. Put differently, the more robustly children organize their world according to certain categories of meaning and not others, independently of language, the more resistance language would have to overcome to bring about any restructuring of mental life. On the other hand, if children readily take on the structuring of meaning displayed in the input language, this suggests a receptivity to patterns of conceptual organization introduced from outside that makes Whorfian effects more plausible.

Until recently, opinion among developmentalists came down almost unanimously on the side of nonlinguistic cognition as the driving force behind children's early word meanings. The dominance of this position is due in part to its compatibility with the universalist/cognitivist climate that has reigned more generally in psychology and linguistics over the last 30 years (see Bowerman, 1989, 2000, for an overview). During the prelinguistic period, children have been portrayed as busy establishing a repertoire of basic notions of objects, actions, causality, and spatial relations. As they begin to want to communicate, they are seen as searching for the linguistic forms that allow them to express their ideas (e.g., Nelson, 1974; Slobin, 1973). Alternatively (a more recent trend), they are depicted as trying to discover which concept, from among those already available to them, is the one an adult intends by her use of a word (e.g., Gleitman, 1990). Within this universalist/cognitivist perspective, there is little room for Whorf.

In the last decade, however, new ways of thinking about the relationship between language and cognition have emerged. Most basically, long-standing arguments for semantic universals – which had been a cornerstone of the universalist/cognitivist approach – have been challenged by a renewed interest in language diversity. Languages are undoubtedly constrained in their expression of meaning, but they are by no means uniform: in every conceptual domain, there are significant differences in the categories of meaning to which words, bound morphemes, and grammatical patterns are linked. Where languages differ, human cognition must be correspondingly flexible, and there is no reason to suppose that just one mode of construal is easiest or most obvious for children (Brown, 1965, p. 317). Indeed, as we will discuss, recent comparisons of children learning different languages show that children adopt language-specific principles of categorization by as early as the one-word stage. Evidence for early mastery of language-specific categories does not, of course, show that the linguistic categories, once acquired, exert an influence on nonlinguistic cognition, but it does set the stage for this possibility. Consistent with this, studies over the last few years have offered new evidence for a variety of Whorfian effects, as discussed in some of the chapters of Gentner and Goldin-Meadow (2003).

In this chapter, we explore developmental perspectives on the Whorfian hypothesis in the domain of spatial cognition and language. Space may seem like an unpromising domain in which to investigate cross-linguistic semantic variation and its effects on children: spatial words have in fact often been used as prime evidence for the claim that early words map directly to prelinguistic concepts (e.g., Slobin, 1973), and the human ability to perceive and mentally represent spatial relationships is undeniably supported and constrained by a host of universal influences, both biological and environmental (e.g., vision, posture, front-back body asymmetry, and gravity – Clark, 1973). Recent research shows, however, that languages diverge strikingly in the way they organize spatial meanings – for example, in the spatial frames of reference they use (Levinson, 1996, 2003; Pederson et al., 1998) and in how many and what kinds of spatial relationships they recognize (Ameka, 1995; Bowerman, 1989, 1996a,b; Bowerman & Choi, 2001; Bowerman & Pederson, in preparation; Brown, 1994; Choi & Bowerman, 1991; Wilkins & Hill, 1995).

This variation raises challenging questions for developmentalists. By the time toddlers learn their first words, they already have a practical grasp of many aspects of space, including when objects will fall, what objects can contain other objects, and the path objects can follow in moving from one place to another (Baillargeon, 1995; Needham & Baillargeon, 1993; Spelke et al., 1992). They are also sensitive to certain categories of spatial relationships, such as left-right, above-below, and between (Antell & Caron, 1985; Behl-Chadha & Eimas, 1995; Quinn, 1994, in press; Quinn et al., 1999). What happens, then, when they are confronted with a language-specific organization of space? Do powerful prelinguistic concepts of space initially hold sway, causing children to use the spatial words of their language in accordance with universal 'child basic' spatial meanings (Slobin, 1985)? Or do children take on the imprint of the local language from the beginning?

As with most starkly drawn conflicts between nature and nurture, the answer is not simple: both nonlinguistic cognition and language seem to influence early spatial semantic development, often in interaction. In the following sections, we first briefly summarize evidence for the contribution of nonlinguistic cognition. We then review recent crosslinguistic findings suggesting a role for the linguistic input as well: children use and understand spatial words according to language-specific categories from a very young age. Early sensitivity to linguistic organization might mean that children can construct semantic categories on the basis of the input, but in itself it is not decisive: perhaps it means only that children are good at choosing among alternative concepts made available by non-linguistic cognition. Further evidence for the existence of a construction process, however, comes from error data: patterns of correct and incorrect usage of spatial words differ across languages, and they do so systematically, in ways that suggest that children try to make sense of the distribution of the words in the speech they hear. Category construction of course requires a learning mechanism, and some raw perceptual or conceptual building materials for the mechanism to work on. Our discussion of these elements brings us back to the Whorfian question, and we present evidence from a new study showing that learning a language can affect nonlinguistic spatial cognition by selectively maintaining or discouraging sensitivity to spatial distinctions that are, or are not, relevant to that language. We conclude with a brief sketch of a plausible learning process that could lead to these effects.

2 Universality and language specificity in early spatial semantic development

2.1 Evidence for the role of cognition

All around the world, children's first spatial words are applied to the same kinds of events: putting things into containers and taking them out, separating things and trying to put them back together, piling things up and knocking them down, donning and doffing clothing, opening and closing objects, climbing on and off laps and furniture, being picked up and put down, and posture changes like standing up and sitting down. Consistent with these preferred topics, early-acquired spatial words revolve around relationships of containment (e.g., for English, *in, out),* accessibility *(open, close, under),* contiguity and support (*on, off),* verticality *(up, down),* and posture *(sit, stand).* Only later come words for proximity *(next to, between, beside),* and still later words for projective relationships *(in front of, behind)* (Bowerman & Choi, 2001; Bowerman, de León, & Choi, 1995; Choi & Bowerman, 1991; Johnston & Slobin, 1979; Sinha et al., 1994). This sequence of development is consistent with the order of emergence of spatial concepts established through nonlinguistic testing by Piaget and Inhelder (1956), and this correspondence led to the hypothesis that cognitive development sets the pace in spatial semantic development. The idea was that as new spatial concepts mature, children look for linguistic forms to express them with (Johnston & Slobin, 1979; Parisi & Antinucci, 1970; Slobin, 1973).

Further evidence for the role of nonlinguistic spatial cognition has come from children's under- and overextensions of spatial forms. Words that in adult speech can be used for both motion and static relationships e.g., *up, down, in, out)* tend at first to be restricted to motion (Smiley & Huttenlocher, 1995). Words for the relationships 'in front of' and 'behind' are initially applied only to things in front of or behind the child's own body; later they are extended to a wider range of reference objects with inherent fronts and backs (e.g., *behind the car);* and still later they are extended to nonfeatured objects *(behind the bottle)* (Johnston, 1984). Words applied to actions involving separation are often broadly overextended (e.g., *open* for pulling two Frisbees apart) (Bowerman, 1978; Bowerman, de León, & Choi, 1995; Clark, 1993). Researchers have assumed that systematic deviations from adult usage patterns indicate that children are relying on their *own* concepts, since – to the extent that they are guided by concepts introduced through *adult* speech – their usage should be more or less correct (see Clark, 2001, on the reasoning). Later on (section 3) we will argue that comparisons of error patterns across languages in fact provide strong evidence for the construction of categories under linguistic guidance. But when children do make errors, their generalizations often proceed along shared cognitive 'fault lines'; for example, overextended words for separation in different languages converge on rather similar classes of events.

2.2 Evidence for the role of language

Although on first impression children learning different languages seem to approach spatial encoding in a similar way, closer inspection reveals significant differences. Much of the evidence for crosslinguistic variation in early semantic categorization comes from our work comparing children learning English and Korean (Bowerman & Choi, 2001; Choi & Bowerman, 1991; Choi et al., 1999). Before showing examples, we must sketch some important differences in how English and Korean classify space. We focus first on 'topological' path words applied to motions "in," "out," "on," 'off', and so on, and, within this domain, we restrict ourselves to caused rather than spontaneous motion. Later we will look also at the expression of paths 'up' and 'down.' Following Talmy (1985), we refer to the moving or moved object as the *figure* and the object with respect to which it moves as the *ground.*

2.2.1 Spatial categorization in adult English and Korean

In talking about placement of one object with respect to another, English speakers make a fundamental distinction between putting a figure into an enclosure, container, or volume of some kind *(put [throw, stuff, etc.]* IN*)* and putting it into contact with an exterior (i.e., flat or convex) surface of the ground object *(put [set, smear, etc.]* ON*).* This classification is illustrated in Figure 1.

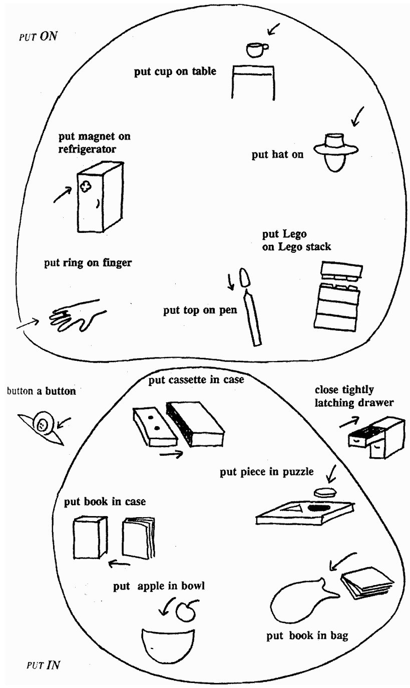

Figure 1: Categorization of some spatial events in English.

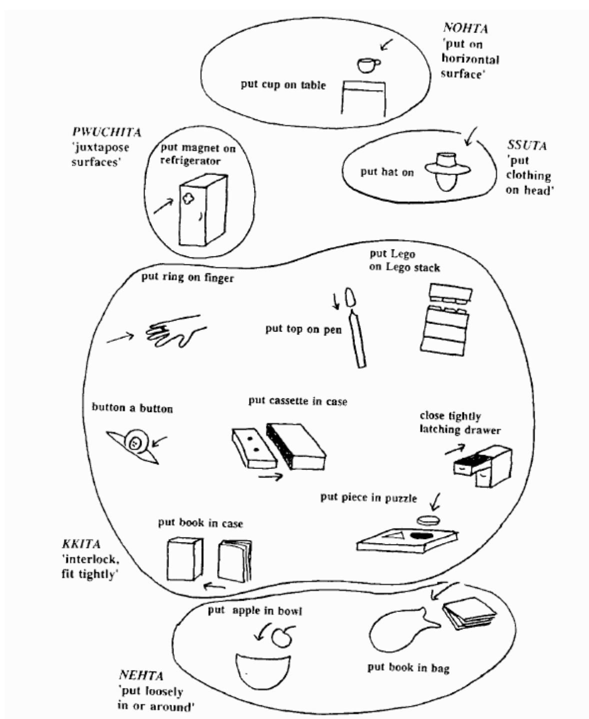

Figure 2: Categorization of some spatial events in Korean.

The same semantic space is partitioned differently in Korean (figure 2).[1] Notice in particular that *kkita* (see middle of figure 2), a very early-learned verb, picks out a path category having to do with bringing three-dimensional objects with complementary shapes into an interlocking, tight-fit relationship (a comparison of figure 2 with figure 1 shows that *kkita* crosscuts the categories of *put in* and *put on,* and extends to some situations that are considered neither 'putting in' nor 'putting on'). This everyday verb has no English counterpart.[2]

The crosscutting of the domain of *put in* by *kkita* means that what English treats as a unified category of 'containment' events is, for speakers of Korean, subdivided (see bottom of figure 2): tight-fit containment events like putting a book into an exactly matching box-cover, described with *kkita,* are treated as a different class of actions from loose-fit containment events like putting an apple into a bowl or a book into a bag, described with *nehta.*[3] The category of *nehta* encompasses not only loose containment events but also loose encirclement events, such as putting a loose ring on a pole (not shown). Just as Korean breaks down the category of English *put in,* it also subdivides the domain of *put on* (top of figure 2). Here, the partitioning is more extensive: attaching a figure to the exterior surface of a ground object with a complementary three-dimensional shape (e.g., putting a top on a pen or a Lego block on a stack of Legos) falls into the 'tight-fit' category of *kkita,* while juxtaposing objects with flat surfaces (e.g., magnet on refrigerator) is *pwuchita,* depositing a figure on a roughly horizontal surface (e.g., cup on table) is *nohta,* and putting a clothing item on the head is *sinta* (distinguished from putting clothing on the *trunk – ipta,* and *feet – sinta).*

Notice that all the words shown in figures 1 and 2 are applied to *topological* relationships – situations of the sort encoded in English by words like *in, on, together,* and *around* or their opposites – but they focus on topological properties of different kinds. For instance, *put* IN requires the figure to end up in an interior space or volume of the ground, but is indifferent to whether the fit between figure and ground is tight or loose. *Kkita,* in contrast, cares centrally about the fit between a figure and a ground with complementary shapes, but is indifferent to whether this fit is obtained by insertion, covering, surface attachment, or encirclement.

2.2.2 Spatial categorization in the spontaneous speech of learners of English and Korean

If children initially associate spatial words with a universal set of basic concepts of space, these differences between English and Korean should not matter: learners of the two languages should interpret and categorize the spatial events of their world in a similar way. But in a study of the spontaneous speech of children age 1 – 3 years, we found that language-related differences such as those shown in figures 1 and 2 were in place by as early as 17 – 20 months (Choi & Bowerman, 1991). As soon as the children used the words productively for both familiar and novel situations,[4] learners of English distinguished systematically between actions involving containment *(in)* and those involving surface contact/support *(on),* regardless of fit, while learners of Korean ignored this distinction in favor of a discrimination between tight fit and various loose-fit and loose contact events along the lines shown in figure 2. The Korean-speaking children also distinguished, like adults, between putting clothing on the head, the trunk, and the feet – all *(put)* ON for the learners of English. Although figures 1 and 2 show only acts of 'joining' objects (putting in, on, etc.), acts of separation are also treated differently in adult English and Korean, and the children showed sensitivity to these distinctions as well: for example, learners of English discriminated between *out* of a container and *off* a surface, while learners of Korean used *ppayta* 'remove from tight fit' (the opposite of *kkita), kkenayta* 'remove from loose containment' (the opposite of *nehta),* and *pesta* 'remove clothing item' (from any body part). In short, when the children talked about spatial events, they classified them in language-specific ways. (Of course, this does not mean that they never made errors from the adult point of view. Errors will be discussed in section 3.)

2.2.3 Elicited production

Spontaneous speech data offer valuable clues to children's early semantic categories, but comparisons across children and across languages are often indirect, since children do not talk about exactly the same events. To allow for more exact crosslinguistic comparisons and quantitative analysis, we designed an elicited production study to examine how speakers of English, Korean, and an additional language, Dutch, encode actions of joining and separating objects (Bowerman, 1996a; Choi, 1997). In a playlike setting, we elicited descriptions of a wide range of actions from 10 adult speakers of each language and 10 children in each of three age groups ranging from 2 to 3½ years. The actions included putting objects into tight and loose containers and taking them out, attaching and detaching things in various ways, putting objects down on surfaces, opening and closing, hanging and 'unhanging,' buttoning and unbuttoning, and putting on various clothing items and taking them off.

To compare the linguistic classification systems of speakers from different language and age groups, we examined which actions they used the same expressions for and which ones they distinguished. The logic is like that used in analyzing sorting task data: actions described in the same way are like stimuli sorted into the same pile; actions described in different ways are like stimuli sorted into different piles. The data can be represented in similarity matrices (for all actions taken pairwise: does the person use the same expression? different expressions?), and these can be analyzed with techniques suitable for similarity data, such as multi-dimensional scaling or cluster analysis (see Bowerman, 1996a). If language learners initially map spatial words onto a universal set of basic spatial notions, children at least in the youngest age group (2 – 4 years) could be expected to classify events more like same-age children learning other languages than like adult speakers of their own language. If they classify more like same-language adults, this means that their word use is guided by categories that are already language specific, even though perhaps not yet entirely adultlike.

The outcome of the analyses was clear: from the youngest age group on up, the children grouped and distinguished the actions significantly more like adult speakers of their own language than like same-age children learning the other two languages. As in their spontaneous speech, the children learning English, like the adults in this study, distinguished systematically between events of containment (e.g., putting toys into a suitcase, small cars into a box, and a piece into a puzzle, all described as *[put]* IN*)* and events of contact/support/surface attachment (e.g., putting a suitcase on a table, a Lego on a Lego stack, a ring on a pole, and clothing onto various body parts, all called *[put]* ON*)*. In contrast, the children learning Korean – also as in their spontaneous speech and like the adults in this study – subdivided events of containment depending on whether they were loose (e.g., toys into suitcase, cars into box: *nehta* 'put loosely in/around') or tight (e.g., piece into puzzle: *kkita* 'interlock, fit rightly'), and they grouped tight containment events with tight surface attachment or encirclement events (e.g., joining Legos, putting a cap on a pen or a close-fitting ring on a pole) (all *kkita)*. They also used different verbs, as is appropriate, for putting clothing on the head, trunk, and feet. This study shows that by at least 2 to 2 ½ half years of age, children learning different languages classify space in strikingly different ways for purposes of talking about it.

2.2.4 Early comprehension

The studies just discussed establish that learners achieve language specificity very early. But how early? Do they discover the spatial semantic categories of their language only in the early phases of actually *producing* spatial words, or do they begin to work on them even earlier, in pre-production language *comprehension?* To explore this question, we designed a crosslinguistic preferential looking study to compare very young children's comprehension of two early-learned words with overlapping denotations: *put in* for learners of English and *kkita* 'interlock, fit tightly' for learners of Korean (Choi et al., 1999). This study showed that children understand these categories language-specifically at least by 18 to 23 months (the only age group tested): hearing *put in* (embedded in various carrier phrases) directed our English-learning subjects' attention toward events involving containment, regardless of tightness of fit, whereas hearing *kkita* pulled our Korean-learning subjects' attention toward events involving tight fit, regardless of containment. This looking pattern is illustrated in Figure 3 for two of the four event pairs used.

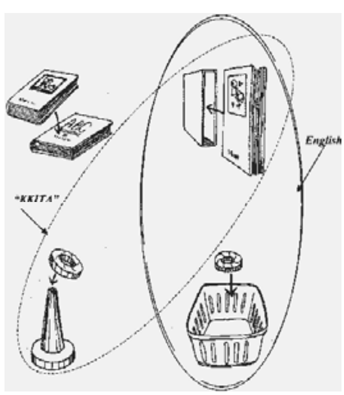

Figure 3: Two pairs of scenes used to test comprehension of English *put in* and Korean *kkita* in Choi et al., 1999, showing the language-specific looking patterns obtained.

Most of the children were not yet producing the target word for their language, according to parental report, which suggests that sensitivity to language-specific spatial categories begins to develop in comprehension even before production sets in. This finding allows us to reconcile two observations that have previously seemed to conflict. On the one hand, children often generalize spatial words rapidly to a wide range of referents in their production – a finding that has been taken as evidence that the words express meanings that originate in nonlinguistic cognition (e.g., McCune-Nicolich, 1981; Nelson, 1974). On the other hand, as soon as children use spatial words productively, they use them to pick out language-specific categories of meaning – a finding that suggests guidance from the input language. How can both things be true? The results of our comprehension study suggest that generalization in early production can be both rapid and language specific because children start to work out the categories in comprehension before production begins.

2.2.5 Additional evidence for language specificity in early spatial language

Containment and support are not the only spatial domains that are treated differently by children learning different languages. Another important area of diversity is the expression of *vertical motion.* In English, the commonality among diverse events involving motion 'up' and 'down' is captured with the path particles *up* and *down,* which can be combined with many different verbs (e.g., *go/climb/slide* UP/DOWN, *pick* UP, *put* DOWN, *sit/stand* UP, *sit/lie* DOWN, *look* UP/DOWN). English-speaking children grasp the abstract spatial meaning of these morphemes very early. *Up* and *down* figure among their first relational words, emerging sometimes by as early as 12 to 14 months and typically by 16 to 17 months (Bloom, 1973; Choi & Bowerman, 1991; Gopnik, 1980; Greenfield & Smith, 1976; Nelson, 1974; Smiley & Huttenlocher, 1995). Some children restrict them initially to spontaneous and caused movements of their own body, while others generalize them immediately across a wide range of referents (see Choi & Bowerman, 1991, pp. 100ff., for discussion); by the end of the second year of life, however, children typically use them freely for a variety of 'vertical motion' events, both familiar and novel. A few examples from a little girl between 13 and 16 months: *down* as she tried to climb down from a counter and as a request to be taken down from it, while she sat at the top of a slide preparing to slide down, when dumping yarn into a wagon, when setting books on the floor, and when trying to take a small chair down from on top of a low table (Choi & Bowerman, 1991).

Korean lacks all-purpose 'up' and 'down' morphemes, and the encoding of events involving vertical motion develops very differently in learners of this language (Choi & Bowerman, 1991). Children learning Korean talk about events involving vertical motion using a large variety of verbs, which enter their speech piecemeal between the ages of about 17 and 24 months and are used appropriately for relatively specific categories of action, either spontaneous (intransitive verbs) or caused (transitive verbs): for example, first *anta* 'hold/carry in arms' and *epta* 'hold/carry on back' as requests to be picked up, and *ancta* 'assume a sitting posture' (either 'up' or 'down'), *nwupta* 'lie down', and *ileseta* 'stand up' for posture changes; later *ollita* 'cause to ascend' and *naylita* 'cause to descend' for putting objects on a raised surface or taking them down; still later *olla kata* 'ascend go' (= go up) and *naylye kata* 'descend go' (= go down) for spontaneous vertical movements like negotiating stairs or climbing on and off furniture. If learners of Korean recognize a common element of vertical motion 'up' or 'down' across these events, this is not apparent in their word use; for example, they do not overextend *ollita* 'cause to ascend' to requests to be picked up or helped to stand up.

Like children learning Korean, children learning Tzeltal and Tzotzil, sister Mayan languages spoken in the Chiapas highland of Mexico, use no all-purpose words for vertical motion 'up' or 'down,' but distinguish a variety of posture changes, ways of being picked up and carried, and falling. They are also quick to get the hang of a number of verbs that distinguish language-specific categories of positioning: for example, *nuj* 'be located face down/upside down', *kot* 'be located standing on all fours', *pak'* 'be located on the ground', and *kaj* 'be located on a high surface' (Tzotzil), and *pach* 'be located, of an upright bowl-shaped object' (Tzeltal) (Brown, 2001; de León, 1999, 2001). A favorite early verb for children learning Tzotzil is *xoj*, which specifies actions in which an elongated object ends up encircled by a ring- or tube-shaped object: This verb – which picks out a topological category different again from those of English *put in* and *put on* and Korean *kkita* – is used appropriately at a very young age for actions that result in a 'ring-and-pole' configuration regardless of whether it is the 'ring' or the 'pole' that is moved: for example, putting a ring on a pole or a pole through a ring, an arm in a sleeve, a leg in a trouser-leg, a head through an opening in a shawl, a chick in a blouse pocket, and a coil of rope over a peg (Bowerman, de León, & Choi, 1995).

2.2.6 Summary: universality and language specificity

Previous work has suggested that early spatial concepts are universal, with children mapping the spatial morphemes of their language directly to such presumably basic notions as containment, contact and support, and vertical motion 'up' and 'down,' after these become available in the course of nonlinguistic cognitive development. It is true that children initially concentrate on words for various kinds of topological relationships and for events involving vertical motion, and this focus is presumably conditioned by cognitive factors. But within these bounds, the meanings of children's early spatial words are by no means universal, and the ways they differ are consistent with differences in the target languages' partitioning of these semantic domains.

3 Do children construct semantic categories of space? Evidence from error patterns

Does early language-specific variation in children's semantic categorization of space mean that learners are capable of using linguistic input to actively construct spatial categories that they might otherwise not have had? This is one possible explanation for the findings, but it is not the only one. An alternative is that children's early nonlinguistic repertoire of spatial concepts is more extensive than has been assumed, including not only the notions of containment and support corresponding to English *in* and *on,* but also a notion of tight fit or interlocking corresponding to Korean *kkita,* and presumably further concepts corresponding to the categories of early-learned spatial words in other languages (Mandler, 1992, 1996; see Bloom, 2000, pp. 250 – 254, for discussion). Under this scenario, children's task would not be to construct a concept to account for a word's pattern of use in the input, but to select, from among the concepts already available to them, the one that adult speakers intend when they use the word (see Gleitman, 1990, for similar assumptions about the early acquisition of verb meanings).

As Bloom notes, 'this alternative is plausible only to the extent that one doesn't have to posit a new set of nonlinguistic spatial notions for every language we look at; the variation that exists should be highly constrained'; ideally, there should also be 'evidence for these putatively nonlinguistic spatial categories in babies' (2000, p. 252). At present, spatial semantic development has been investigated in too few languages to establish just how constrained the list of notions would be (although it is worth noting that so far, each new language examined has turned up new candidates, such as Tzotzil *xoj* 'put into a 'ring-and-pole' configuration', and Tzeltal *pach* 'be located, of an upright bowl-shaped object'). Evidence on babies' spatial categorization will be discussed in section 5.

Interesting additional clues to whether language learners simply choose from among preexisting concepts, or can actively construct semantic categories from early on, come from errors in children's use of spatial words (Bowerman, 1996a; Bowerman & Choi, 2001; Choi, 1997). Recall, for example, that children often overextend words for 'separating' objects. These errors have typically been interpreted as evidence for a direct reliance on nonlinguistic concepts of space – that is, on children's sense that events of certain kinds are so similar that they should be described with the same word even though adults may describe them using different words (Bowerman, 1978; Griffiths & Atkinson, 1978; McCune & Vihman, 1997). If this view were correct, we could expect a very strong convergence across children learning different languages on the makeup of the categories picked out by their early uses of 'translation equivalent' words. But this is not the case: whether or not children overextend a particular word, and the exact shape of their extension patterns, turn out to differ across languages in ways that are closely related to semantic and statistical properties of the target language. Errors with *open* and its translation equivalents provide a good illustration. These errors have been reported in children's spontaneous speech in English and several other European languages (Bowerman, 1978; Clark, 1993). Typical are examples from a child who used *open* between about 16 and 21 months not only for canonical actions on doors, windows, boxes, and the like, but also for separating two Frisbees, unscrewing a plastic stake from a block, spreading the handles of nail scissors apart, taking the stem off an apple, a piece out of a jigsaw puzzle, a handle off a riding toy, and a shoe off a foot, and also for turning on an electric typewriter, a light, and a water faucet (Bowerman, 1978). Similar errors occurred in our crosslinguistic elicited production study (section 2.2.3): children from 2 to 3 half years learning English or Dutch often overextended *open* (Dutch *open[-maken]* 'open make]') to actions like pulling Pop-beads and Lego blocks apart, undoing a Velcro fastening, and taking the top off a pen or a shoe off a foot.

Children learning Korean, in contrast, scarcely make this error. In our elicited production study, there was only one such overextension *(yelta* 'open' for unhooking two train cars); and in the spontaneous speech data examined in Choi and Bowerman (1991), there were none. How to explain this difference? A plausible answer points to differences in the breadth and makeup of the categories in the 'opening' domain in Korean versus English (and Dutch) (Dutch *open* 'open' has an extension similar to that of English *open).* As shown in figure 4, actions that fall uncontroversially into the *open* category in English are split up in Korean into a number of more specific categories, many of which include events that would not be described as 'opening' in English: opening doors, boxes, bags, and the like (*yelta,* the verb most similar to *open*); opening objects with two parts that separate symmetrically (a clamshell, a mouth, a pair of shutters or sliding doors) *(pellita);* opening things that spread out flat (a book, hand, or fan) *(phyelchita);* and so on.

The possible effect of these differences on learners is suggested by a simple experiment by Landau and Shipley (1996), which tested how children generalize names for novel objects. Two different novel objects – the 'standards' – were placed in front of 2- and 3-year-old children. Children in the same label condition heard the same name applied to both standards ('This is a blicket ... and this is a blicket'). Children in the different label condition heard different names ('This is a blicket ... and this is a steb'). Now the children were shown, one by one, four test objects, which had been 'morphed' so that they were intermediate in shape along a continuum between the two standards. When asked, for each test object, 'Is this a blicket?,' children in the same label condition accepted *blicket* at ceiling for all test objects, but children in the different label condition accepted it decreasingly as the test objects grew less like the first standard and more like the second. Landau and Shipley conclude that hearing identical labels can induce children to "fill in' the gap between even very different exemplars, probably guided by the assumption that members lying on the hypothetical similarity line between standards are also members of the category' (p. 446). Hearing different labels, in contrast, leads children to set up a boundary somewhere on the gradient between the two exemplars.

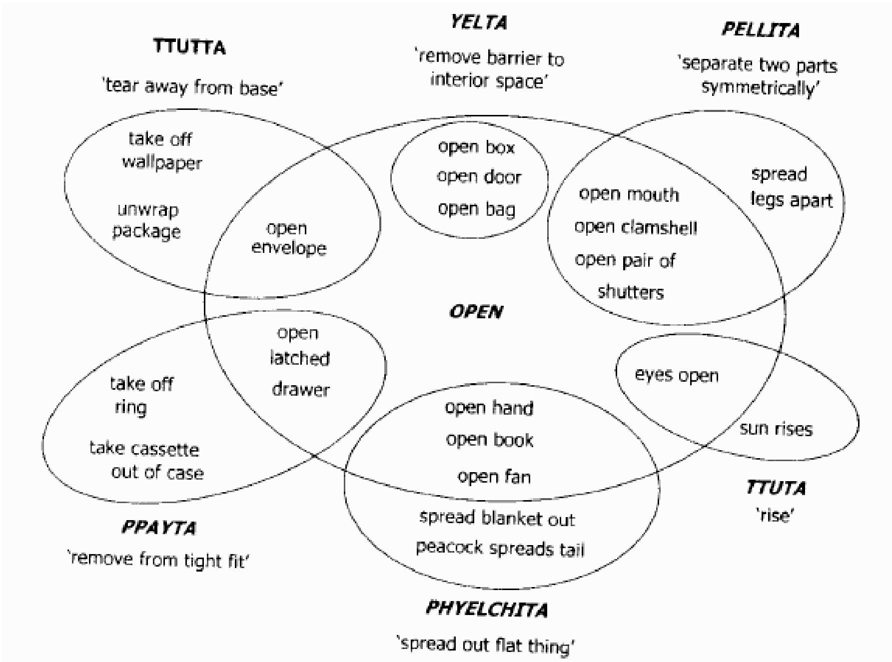

Figure 4. Categorization of 'opening' in English and Korean.

To apply the logic of this experiment to the treatment of candidate 'opening' actions, children learning English and Dutch are in the same label condition: they are invited, on hearing *open* applied to so many different kinds of actions, to generalize very broadly;[5] object details like having symmetrically moving parts or being able to spread out flat are taken to be irrelevant to the meaning of the word. Children learning Korean, on the other hand, are in the different label condition: hearing a different word at every juncture dampens the inclination to generalize *velta,* the word for the most prototypical 'open' events.

But Korean learners do have another word, also shown in figure 4, that they overgeneralize to many events of 'separation': *ppayta* 'un-interlock; remove from tight fit' (this is the opposite of *kkita* 'interlock, fit tightly', although it is more tolerant in what it counts as a 'tight fit'). Is this then simply another word for the same concept to which learners of English and Dutch (over)extend *open*? It is not. Critically, although the extensions of Korean *ppayta* and English or Dutch *open* overlap in children's speech, they show clear language-related differences (Bowerman & Choi 2001); this is especially obvious in the distribution of responses in our elicited production task.

Learners of Korean who participated in this task, like the adults, used *ppayta* most frequently and consistently for *separating fitted, meshed, or interlocked objects with a bit of force* (e.g., pulling Pop-beads or Lego blocks apart, taking the top off a pen, prying an audiocassette out of its case). From this core meaning, they sometimes overextended it to separations involving other objects or object parts that were somehow 'engaged' with each other, even if not tightly fitted (e.g., opening a box or suitcase, taking Legos out of a bag, 'unsticking' adhering and magnetized objects, and taking off clothing); in these uses, however, *ppayta* competed with other, more appropriate words in the children's speech.

In contrast, uses of *open* by learners of English and Dutch in this task – as in the speech of the adult participants – centered on *separation as a means of making something accessible* (e.g., opening a box, suitcase, or cassette case to get at something inside; cf. also the predominant uses in children's spontaneous speech for opening doors, windows, etc. – Bowerman, 1978). From this core, *open* was extended relatively rarely to separating objects such as Pop-beads or Legos and to taking off clothing (these actions were much more often called *[take]* OFF by the learners of English), or to taking things out of containers (much more often called *[take]* OUT*)*. Spontaneous speech data (Bowerman, 1978; Clark, 1993) show that English learners also overextend *open* to events where something is made accessible with little or no separation of 'engaged' elements, such as turning on an electrical appliance or water faucet, pulling a chair away from a table, bending a knee to reveal a toy hidden behind it, and sliding a T-shirt up to peek at the belly beneath. Korean learners do not use *ppayta* for these events, presumably because its primary use in adult speech has to do with the physical disconnection of engaged elements, and not (in contrast to adult English *open)* with making something accessible.

Examples like these suggest that even very young children are closely attuned to the way words are distributed across events in the speech they hear, and that their word meanings can be influenced by factors such as the number and semantic makeup of competing forms, the frequency and consistency with which a form is used for events of various types, and (not illustrated here, but see Bowerman, 1996a) the presence or absence of polysemy in a word's meaning. These are the kinds of factors that have been singled out in 'usage-based' approaches to language, which stress the dynamic properties of linguistic knowledge and posit that speakers of all ages can induce schemas and continually restructure them in response to (possibly shifting) patterns in the linguistic input (e.g., Bybee, 1985, 1991; MacWhinney, 1987). This view of category construction lends itself well to computational modeling of schema induction, and indeed, Regier (1997) has successfully modeled some of the differences between young learners of English and Dutch in the elicited production study discussed here and in section 2.2.3.

Category construction of course requires both a learning mechanism and raw materials (perceptual or conceptual sensitivities) that can be structured into new configurations. Let us consider these requirements in turn.

4 Mechanisms of category construction

In an earlier era, when it was more usual to suppose that different languages make use of different concepts and that language input has something to do with the formation of new concepts, Roger Brown described the process of lexical development as 'the Original Word Game.' In this game,

> the tutor names things in accordance with the semantic custom of his community. The player forms hypotheses about the categorial nature of the things named. He tests his hypotheses by trying to name new things correctly. The tutor compares the player's utterances with his own anticipations of such utterances, and, in this way, checks the accuracy of fit between his own categories and those of the player. He improves the fit by correction. (1958, p. 194)

In this formulation of the learning process, one of the critical problems that Brown was trying to solve was the fact that 'everything in the world is susceptible of multiple categorizations' (1958, p. 225). This means that even if children know what a word refers to in a particular context (i.e., have solved 'Quine's problem' of identifying the referent), they cannot be certain how to identify additional instances of the same category. The ambiguity is reduced when the word is encountered again in other contexts: 'a speech invariance is a signal to form some hypothesis about the corresponding invariance of referent' (1958, p. 228). In today's intellectual climate, we would resist the implication that children formulate and test their hypotheses consciously, or that improving the fit between hypothesis and target category requires explicit correction. Still, Brown's characterization of how children could form categories under linguistic guidance retains a strong intuitive appeal. What is lacking, however, is an explicit specification of the learning procedure.

A modern approach to learning with the potential to capture Brown's insights more precisely is *structure-mapping* (Gentner, 1983, 2003; Gentner & Loewenstein, 2002; Gentner & Markman, 1997; Gentner & Namy, 1999; Gentner & Rattermann, 1991). Structure-mapping theory, which focuses on the acquisition of relational concepts by learners of any age, posits that relational abstractions can emerge in the course of *comparing* exemplars. In the process of comparing, the learner tries to align structured conceptual representations with each other and to identify the ways in which they are similar and different. Alignments are typically shallow at first, suggests Gentner, based primarily on similarities in the objects that play a role in the situations being compared (we come back to this shortly). But with successive opportunities to compare situations in which the objects vary, alignments based on more abstract similarities in the *relationships* among the objects are discovered. Studies have suggested that the process of comparing can call attention to abstract relational similarities that otherwise go unnoticed (Kotovsky & Gentner, 1996; Loewenstein & Gentner, 2001).

In experiments, comparisons leading to relational abstractions have been stimulated in a variety of ways – for example, by presenting subjects with successive exemplars of a candidate relationship or explicitly asking them to compare instances (Gentner & Loewenstein, 2002; Gentner & Namy, 1999). Gentner hypothesizes that one stimulant to comparison with tremendous importance for children's development is *hearing the same word applied to different situations* (cf. Brown, 1958, p. 210: repetitions of a word across contexts 'will orient the player toward contemporaneous stimuli and will tell him when the important non-linguistic stimuli recur'). Note that specific instantiations of the concepts encoded by words typically occur at different times, often embedded in very different contexts, and are in no other way flagged as being somehow 'the same.' Being prompted to compare situations that are called by the same word – for example, events labeled *open* or *take off,* or behaviors described as *cruel* or *generous* – could lead learners to search for and extract cross-situational commonalities that are considered important in their society. The word that promotes the comparison of instances, suggests Gentner, also provides a convenient label for the relationship that the flagged situations share, and this makes the relationship more accessible the next time it is relevant.

Notice that in our earlier discussion (section 3) of why children learning English and Dutch overextend their word for prototypical 'opening' events, while children learning Korean do not, we already made an implicit appeal to a process of comparison. There, we suggested that in using the word *open,* English-speaking adults in essence invite children to generalize broadly: by flagging a set of events as diverse as opening a door, opening the eyes, and opening a book, they implicitly prompt children to *compare* them in search of some commonality. Depending on the semantic categories of the language, the set of events singled out for comparison will differ, so the scope of the learner's final categories will differ. For example, to arrive at a concept that accounts for the distribution of *open* in English, learners must ignore the identity and many of the properties of the objects involved in the events labeled *open,* and bring into focus an abstract relationship that has to do with making something accessible. In contrast, to grasp the meanings of the 'opening' verbs in Korean, children must recognize that certain object information is critical – for example, that uses of *pellita* all involve objects with two parts that are separated symmetrically (mouth, clamshell, sliding doors that meet in the middle, pair of legs) and that uses of *phyelchtia* all involve objects that can be spread out flat (book, hand, fan, picnic cloth) (see Figure 4).

Many of Gentner's experiments in domains other than language acquisition have suggested that it is difficult for learners to disregard object information in favor of a relational commonality – that abstraction proceeds stepwise, first to situations that are closely similar to the original exemplars and only later to situations involving very different kinds of objects. Counter to this, we have often been impressed, in our work on the acquisition of relational words, at how quickly children make conceptual leaps to contexts quite different from those in which a word has been modeled (see, e.g., the broad overextensions of *off, open,* and other relational words discussed in Bowerman, 1978, 1980). In our view, the learning of relational words can proceed in either direction: either by stepwise extension from known exemplars (abstraction; expanding the domain of an initially underextended word) or by adding critical information that was initially overlooked (differentiation; narrowing the domain of an initially overextended word).[6] Regardless of directionality, what is crucial is the process of comparison, and it seems plausible that language – here, the way spatial words are distributed across referent events in the speech children hear – guides learners in discovering what needs to be compared, and so can influence the final makeup of learners' semantic categories.

5 Raw ingredients for category construction: what are infants' spatial sensitivities?

Obviously, a serious theory of learning cannot conjure up concepts out of nothing. Even a theory like structure-mapping, which posits that deep relational structures that are not known a priori can be disembedded over time from a morass of surface detail, must presuppose that learners have the wherewithal to set up initial representations of situations and that they are sensitive to certain properties and dimensions along which situations can be compared. Establishing exactly what these building materials consist of (e.g., domain-general sensitivities to perceptual properties? domain-specific sensitivities, such as 'semantic primitives' for space? more abstract inborn conceptual knowledge?) is one of the most challenging and controversial questions facing developmentalists today (see, e.g., Fodor, 1975; Landau & Jackendoff, 1983; Mandler, 1992, 1996; Spelke et al., 1992, for some different views on the problem). In the domain of space, one critical source of evidence for investigating these issues is information about what kinds of spatial distinctions and similarities are salient to infants *before* they acquire spatial words.[7]

5.1 Containment, support, and tight fit

Casasola and Cohen (2002) have recently examined the prelinguistic status of three categories of central interest to us: CONTAINMENT (English *in),* SUPPORT (English *on,* encompassing both support from beneath, as in *Put the cup on the table,* and surface attachment, as in *Put this Lego block on that one),* and the INTERLOCKING/TIGHT-FIT category associated with Korean *kkita,* which crosscuts 'in' and 'on' relations. Two groups of infants from an English-speaking environment, 9 – 11 months (prelinguistic stage) and 17 – 19 months old (early linguistic stage), were habituated to four videotaped actions showing events of putting varied objects into either a containment, a support, or a tight-fit relation.[8] Four test trials followed: (1) familiarized objects being put into the familiar relation (one of the habituation events again), (2) familiarized objects put into a novel relation, (3) novel objects put into the familiarized relation, and (4) novel objects put into a novel relation. At both ages, infants who had been habituated to the containment relation discriminated reliably (as determined by assessing which events caused their attention to revive) between this relation and another (a support event) regardless of whether the objects depicting the relation were familiar or novel. But at neither age did the babies who had been habituated to the support or tight-fit relation discriminate between the familiar relation and the novel relation (a tight containment event for the support condition and a loose containment event for the tight-fit condition). The younger babies in the support and tight-fit conditions reacted only to the novel objects, not to the relationships. The older babies discriminated between familiar objects in the novel versus familiar relation, but they did not look longer at novel objects in the novel relation than at novel objects in the familiar relation; apparently they had not picked up on the support or tight-fit property shared by all the habituation events they had witnessed.

In sum, this study provides evidence that prelinguistic infants are sensitive to a category of 'containment' events, but not to the categories of 'support' and 'tight-fit' events, at least as operationalized here. Of course, further studies using other techniques may still reveal such sensitivities. But for the moment – as also noted by Casasola and Cohen – this outcome leaves open the possibility that these two categories are constructed in the course of learning the meaning of English *on* or Korean *kkita*.[9]

5.2 Tight versus loose containment

Discovering a shared property of 'tight fit' that transcends containment events requires being able to distinguish, *within* the containment category, between putting things into containers that fit tightly (e.g., a book into a fitted box-cover: Korean *kkita)* versus into containers that fit loosely (e.g., an apple into a bowl: Korean *nehta;* see figure 2). To explore whether prelinguistic infants are sensitive to these subcategories of containment, McDonough, Choi, and Mandler (in press) tested infants 9,11, and 14 months of age from both English- and Korean-speaking environments.

The study employed a modified version of the familiarization-novelty preference procedure used by Behl-Chadha and Eimas (1995) and Quinn (1994) to study the categorization of left-right and above-below in young infants. Babies were first shown six pairs of videotaped scenes of putting one object into another. Half were familiarized with *tight-fit* containment events (the tight-IN condition), and the other half with *loose-fit* containment events (loose-IN); in both conditions, a wide range of figure and ground objects were used. After familiarization two test trial pairs were shown, identical for children in the two conditions: one member of each test pair showed putting yet another novel object into yet another tight-fitting container (a novel relation for children in the loose-IN condition); the other member showed putting this same novel object into a loose-fitting container (a novel relation for children in the tight-IN condition).[10]

Infants from both language environments and in all three age groups (9, 11, and 14 months) looked longer at the test scenes showing an additional instance of the *familiar* relation than at the test scenes showing an instance of the *novel* relation, regardless of which relation – tight-IN or loose-IN – they had been familiarized on.[11] These results show that babies in this age range can discriminate between tight and loose containment events. Thus, sensitivity to the tightness of a containment event – handy if you happen to be growing up in a Korean-speaking environment – is accessible to preverbal children.[12]

5.3 Summary on infant spatial sensitivities, and a caveat

To summarize, studies of infant cognition using the habituation/familiarization paradigms show that already in the first year of life, babies are sensitive to three categories of spatial events that are relevant to the spatial words we have been considering: 'containment' (Casasola & Cohen, 2002; section 5.1) and two subcategories of containment, 'tight' versus 'loose' (McDonough, Choi, & Mandler, in press; section 5.2). There is as yet no evidence for sensitivity to a *kkita-style* category of 'tight three-dimensional fit' that encompasses both tight-fit containment and events of surface attachment/covering/encircling, nor for an *on*-style category of support that encompasses both placing things loosely on surfaces and juxtaposing surfaces by attachment, covering, or encirclement. It is important to recognize that although these studies show a prelinguistic sensitivity to certain categories, they do not establish just when or how the categories emerged. The infants' grasp of the categories might already have been firmly in place before the experiments began – available when needed. Also possible, however, is that the infants became sensitized to the categories *in the course of the experiment.*

Recall that, according to structure-mapping theory (Gentner, 2003; Gentner & Namy, 1999), an appreciation for an abstract relational similarity often emerges through the process of *comparing* situations and trying to align them with one another. Language is, by hypothesis, one good way to prompt comparison, but it is not the only one. Assuming that infants have attained a certain minimal level of cognitive 'readiness' (also of course necessary before the language-guided learning of a new category could take place), being shown successive actions all instantiating the same candidate event category (e.g., 'containment' or 'tight containment') during the familiarization phase of an experiment might prompt babies to discover an abstract relational similarity they had not previously recognized.

Results from the domain of early speech perception (Maye, Werker, & Gerken, 2002) show that babies are in fact astonishingly sensitive to the statistical distribution of the stimuli they encounter in the familiarization/habituation phase of a study. Babies 6 and 8 months old were exposed for only 2.3 minutes to one of two frequency distributions of the same set of speech sounds ranging along a continuum from /ta/ to /da/: a *bimodal* distribution (the most frequently presented sounds were clustered at the /ta/ and /da/ ends of the continuum, with fewer from in between) and a *unimodal* distribution (the most frequently presented sounds were the ones intermediate on the continuum, with fewer from either pole). On the test phase of the study, only the infants in the bimodal condition discriminated tokens from the endpoints of this same continuum; babies in the unimodal condition did not.

Applying the reasoning to the 'containment' studies, we can imagine that familiarization/habituation to a set of containment events that are all 'tight' or all 'loose,' as in McDonough, Choi, and Mandler's study, may – analogously to the bimodal condition used by Maye, Werker, and Gerken – cause the child to (temporarily?) set up a relatively narrow category (either tight or loose containment), thereby promoting discrimination of these events from events of the opposing degree of fit. In contrast, familiarization/habituation to a range of containment events that encompasses *both* tight and loose instances, as in Casasola and Cohen's study, may – analogously to the unimodal distribution – lead to formation of a single, more abstract category, which can be discriminated as a whole from events belonging to still another category, such as support.

Clearly, more research is needed to determine how much the categories to which preverbal infants show sensitivity can be manipulated by changing the exact makeup of the familiarization stimuli: high malleability would suggest a strong potential for rapid online learning, while low malleability would suggest that children rely in this experimental paradigm on category distinctions that are already available to them.

6 Does learning language-specific spatial semantic categories affect nonlinguistic cognition?

Let us now return to the Whorfian question: does learning the spatial semantic categories of our native language influence how we think about space? If the requirement to learn the meanings of the words in their language causes children to form concepts of space that they would not otherwise have had, then in this minimal sense language can be said to affect cognition. But inquiries into the Whorfian hypothesis usually rightly hold out for more: for evidence that even when people are *not* talking or listening to speech, the structure of their language influences their cognition – for example, their perceptual sensitivities, their non-linguistic similarity judgments, their recall accuracy, or their problem-solving strategies.

It is by no means necessary that the semantic spatial categories of a language affect the way its speakers deal with space nonlinguistically. In a domain other than space, Malt et al. (1999) showed that when speakers of English, Spanish, and Chinese were asked to label a set of containers (bottles, jars, etc.), the three language groups classified very differently from one another, but when they were asked to compare objects and judge how similar they were to one another, their classifications were much more alike. Whorfian effects have, however, been documented in tasks having to do with space (see the frame-of-reference studies discussed in Levinson, 1996, 2003; Pederson et al., 1998) and for nonlinguistic categorization in domains other than space (Lucy, 1992; Lucy & Gaskins, 2001, 2003). So the potential for Whorfian effects on nonlinguistic spatial categorization remains open.

To explore whether the spatial semantic categories of English versus Korean affect speakers' nonlinguistic sensitivities, McDonough, Choi, and Mandler (in press) extended the familiarization-novelty preferential looking task described in section 5.2, which tested tight and loose containment, to *adult* speakers of these languages. The adults were simply asked to watch the video scenes. Their gaze behavior, like that of the babies, was videotaped, and the amount of time they spent watching the familiar versus novel events on the test trials was compared. Recall that 9- to 14-month-old babies in both language communities looked significantly longer at the test scenes showing the relation they had been familiarized on, regardless of whether it was tight or loose containment, thereby showing that they are sensitive to this distinction. Adult speakers of Korean behaved in exactly the same way. Adult speakers of English, in contrast, looked equally long at the two members of each test pair; they showed no sensitivity to the distinction between tight and loose containment. These data suggest that the distinction between tight and loose containment events, if English speakers recognize it at all, is far less salient to them than it is to Korean speakers. This is a real Whorfian effect.[13]

Even if English-speaking adults do not notice the distinction between tight and loose containment events in the course of casual viewing, could they do so if prompted to compare and contrast the events more explicitly? Immediately after participating in the preferential looking task just described, the adult subjects in McDonough, Choi, and Mandler's study took part in an oddity task. Four of the actions they had just seen on the looking task were acted out for them with real objects: three came from the familiarization trials and one was a test pair action depicting the novel relation. For example, participants who had just been in the tight containment familiarization condition were now presented with three instances of tight containment events (putting a Lego person in a Lego car, a book in a matching box-cover, and a cork in a bottle) and one instance of a loose containment event (putting sponge letters in a large bowl). The experimenter performed the four actions one by one, just as in the video scenes, and then asked the participant, 'Which is the odd one?' After making their selection, participants were asked to explain it.

Across the two conditions, significantly more Korean- than English-speaking adults based their choice on degree of fit (80% vs. 37%). Almost two-thirds (63%) of the English speakers selected on the basis of object properties (e.g., texture, size, or function of the object) – for example, 'This one is made of glass,' 'This is a tall object.' Thus, even when they were explicitly asked to compare a set of events all involving containment, the English speakers were relatively insensitive to the tight-versus loose-fit distinction; their attention was drawn much more to the properties of the objects.

These differences in sensitivity to tight versus loose containment of course mirror the differences in the semantic categories of the two languages. When talking about putting one thing into another, Korean speakers must assess how tight the containment relationship is so that they can choose appropriately between *kkita* 'interlock, fit tightly' and *nehta* 'put loosely in/around'. English speakers *can,* of course, also talk about this distinction if it is really important to do so (as we have been doing throughout this chapter, with the aid of imprecise translations plus examples to illustrate what we mean), but they rarely need to worry about it: for everyday purposes, an all-encompassing *(put)* IN is sufficient.

7 Conclusions

Taken together, the studies discussed in sections 4 – 6 suggest a developmental sequence in the acquisition of language-specific categories of space that goes something like this. (Of course, there is no reason to suppose that space is the only conceptual domain in which this process is at work.)

Before embarking on the language acquisition task, infants notice many different properties of specific spatial situations. Some of these properties may already take a relatively abstract form and so immediately be recognized as applying to a number of different situations ('containment' might be a case in point). Other properties may be more embedded in the contexts in which they occur (e.g., 'attachment in the Lego fashion' might be seen as distinct from 'attachment in the cap-on-pen fashion'), so that infants are slow to recognize potential cross-contextual similarities among these situations unless they are prompted in some way to compare them.

In cases like this, an important stimulant to comparison can be hearing the same word. As the child encounters successive uses of the word, she 'tries' (although this process is presumably rarely if ever conscious) to align the referent situations and work out what they have in common. Sometimes she may already have a suitable concept in her cognitive tool kit, but may simply not have noticed that it is applicable to some of the situations. Other times there is no existing concept that does the job, and the child has to construct a new one to account for the distribution of the word. (The qualifications mentioned in note 5 of course apply here too.)

As semantic categories are formed, the speaker becomes increasingly skilled at making the rapid automatic judgments they require; for example, Korean speakers implicitly monitor how tight the fit is in contexts of putting one object into contact with another, since the choices they have to make when talking about such events depend on it. These linguistically relevant sensitivities achieve and maintain a high degree of standing readiness (see also Slobin, This Volume). Sensitivities that are not needed for the local language may diminish over time (although presumably they do not always do so). Loss of sensitivity seems especially likely in the case of distinctions that not only are irrelevant to the lexical and grammatical distinctions of the local language, but also crosscut the distinctions that *are* relevant, since attending to linguistically irrelevant distinctions might interfere with developing the automaticity that is needed for the linguistically relevant ones.

This sketch of semantic development, based on the research reviewed in this chapter, has some striking parallels to the view of early speech sound perception that has been built up over the last couple of decades. In the first months of life, infants have been shown to be sensitive to a large variety of phonetic distinctions, both those that play a role in their language and those that do not. By the end of their first year, infants have reorganized their pattern of speech sound discrimination around the phonetic structure of their native language, and they have lost sensitivity to some of the contrasts their language does not use (Best, Mc-Roberts, & Sithole, 1988; Kuhl et al., 1992; Polka & Werker, 1994; Streeter, 1976; Werker & Tees, 1984, 1999). Though loss of sensitivity to phonetic contrasts has been the phenomenon most thoroughly documented and discussed, there is also evidence that linguistic experience can *increase* sensitivity to certain distinctions (Aslin et al., 1981; Polka, Colantonio, & Sundara, 2001).

Just how deep the parallels go between early speech perception and the early development of semantic categories is not yet clear. For instance, does the decline in English speakers' sensitivity to the distinction between tight and loose containment demonstrated by McDonough, Choi, and Mandler (in press) come about quickly, as soon as language-specific principles of categorizing containment in English are learned, or does this happen only later? Are declines in sensitivity to semantic distinctions as persistent, even in the face of new experience, as declines in phonetic sensitivity, or are they easily reversed? There is clearly much work to be done here. One thing, however, is becoming clear: just as infants are geared from the beginning to discover underlying phonological regularities in the speech stream, so too are they born to zero in on language-specific patterns in the organization of meaning.

Notes

We thank Jürgen Bohnemeyer and Dan Slobin for helpful comments on earlier drafts of this chapter, and Jürgen Bohnemeyer for suggesting the title 'Space under Construction.'

1 In Talmy's (1985, 1991) typological classification of the characteristic ways languages express path meanings, English is a 'satellite-framed' language – a language that expresses path meanings primarily through particles, prepositions, or affixes (cf. *go* IN/OUT/UP/DOWN/ACROSS and *put* IN/ON/TOGETHER, *take* OUT/OFF/APART). In contrast, Korean is a 'verb-framed' language – a language that expresses path primarily through verbs with meanings suggested by English verbs such as *enter, exit, ascend, descend, insert, extract* (these verbs are not 'native' to English, but are borrowed from Romance, where they represent the dominant pattern).

2 Sometimes *fit* is suggested to us as the English counterpart of *kkita,* but *fit* does not fit: in one way it is too general and in another too specific. Too general because for *kkita,* but not *fit,* figure and ground must have complementary shapes *before* the action is carried out, and the fit requires at least a slight degree of three-dimensional engagement (thus, *kkita* cannot be used in contexts like 'Does this belt fit?' or 'This bandage is too small to fit over the wound'). Too specific because *fit* is typically used only when the degree of fit is the point at issue, and not for actions like putting a cassette into its cassette case or the cap on a pen. Relatively low frequency English words like *interlock, mesh, couple,* or *engage* come a bit closer, but the first two suggest the involvement of more than one projecting part from each object, and the second two evoke the notion of a connecting link between two entities, such as train cars, so it is absurd to use them for putting a book into a tight box-cover or a cap on a pen – perfectly normal uses for *kkita.* The meaning of *kkita* can, of course, be approximated in English by combining words into phrases such as *tight fit,* as we have done in this chapter, but such phrases are inexact and cumbersome, and, as ad hoc compositions, they are not part of the permanent stock of semantic categories of English.

3 Conversely, of course, from the Korean point of view, the English insistence on honoring containment relations wherever applicable means that a commonality is missed between diverse events involving snug fit, regardless of whether the figure ends up 'in,' 'on,' or in some other relation to the ground.

4 It is important to look for evidence of productivity (e.g., uses of a word for novel referents, including referents for which adults would not use it). This is to rule out an interpretation for early language-specific word use that does not require crediting children with knowledge of language-specific categories: that children simply repeat

what they have often heard adults say in particular contexts. (See Choi & Bowerman, 1991, p. 110, for discussion.)

5 The range of exemplars across which generalization can take place is presumably constrained by both the child's level of cognitive development and the conceptual 'stretch' required to bridge the gap. For instance, the meaning associated with *in front of* and *behind* will not at first include projective relationships based on speaker perspective (as in *The glass is in front of the plate)*, even though uses for such relations occur in the input, because the child cannot yet understand them (Johnston, 1984). And the meaning of *on* for young English speakers is unlikely to encompass both spatial applications and manipulations with lights and other electric appliances; more probably, these uses of *on* are acquired independently.

6 See Regier (1997) for relevant discussion of how a semantic category can initially be formulated too broadly but later narrowed. In a computational model of the learning of some of the spatial words used by learners of English and Dutch in the elicited production study discussed in sections 2.2.3 and 3, Regier shows that words that are initially overextended will gradually retreat to their conventional adult boundaries if the learning model is equipped with a weak sensitivity to the Principle of Mutual Exclusivity (Markman, 1989): the idea that a referent object or event should have only one name.

7 A number of important studies have explored infants' ability to *reason* about spatial situations of the kind we are interested in – for example, whether they show surprise when confronted with impossible events of containment or support (e.g., Baillargeon, 1995; Caron, Caron, & Antell, 1988; Hespos & Baillargeon, 2001; Needham & Baillargeon, 1993). But this research does not fundamentally address how infants *categorize* these events – for example, which events they perceive as 'the same' even when they are instantiated with different objects. In the following discussion, we will focus on studies of spatial categorization.

8 For example, children in the *containment* condition repeatedly saw four containment events, two 'loose' (putting an animal into a basket, putting a car into a container) and two 'tight' (candle into same-shaped cookie-cutter, green peg into yellow block), until they reached the habituation criterion. Children in the *support* condition similarly saw two 'loose' and two 'tight' habituation events. For children in the *tight fit* condition, the four habituation events comprised the two 'tight' containment events used in the containment condition and the two 'tight' support events used in the support condition; these events would all be described in Korean with the verb *kkita*. The study thus tested sensitivity to crosscutting event categories.

9 One reason why the tight-fit category of *kkita* might be difficult to form is suggested by the results of a study by Baillargeon and Wang (2002). These authors compared infants' ability to reason about 'containment' versus 'covering' events, both of which involved the same objects: a short, snug container and a cylindrical object taller than the container. In the containment event, the infant watched as the cylinder was lowered into the container until it could no longer be seen; in the covering event, the container, shown in an inverted position, was lowered over the cylinder until the cylinder could no longer be seen. Both events are impossible, and for the same reason: the container is shorter than the cylinder. But children do not apply the same reasoning when faced with the two scenarios: they show surprise at the impossible containment event already by 7½ months, but they are not surprised by the impossible covering event until 12 months. What babies know about containment events, then, does not initially transfer to covering events, and this means, conclude Baillargeon and Wang, that 'containment'

and 'covering' are, for them, distinct event categories. Intriguingly, *both* Baillargeon and Wang's containment and covering events would be described with the Korean verb *kkita,* as long as the cylinder and container fit each other precisely. If babies indeed see events of the two types as strictly different, it may be hard for them to spontaneously spot a property they can share, such as snug three-dimensional fit in the case of the cylinder and container. Perhaps here is a place where linguistic input – hearing the same word applied to seemingly disparate events – can prompt toddlers to discover a commonality that might otherwise go unnoticed. That is: children would try to align events whose initial representations are disparate, revolving around 'containment' versus 'covering,' to discover what they have in common, and in so doing they would discover 'three-dimensional tight fit.'

10 The children in the tight-IN condition saw actions of putting (1) nesting cups into nesting cups, (2) shapes into matching holes in a shape box, (3) Lego people into fitted niches in cars, (4) toy keys into locks, (5) books into fitted box-covers, (6) corks into bottles. The children in the loose-IN condition saw actions of putting (1) Lego people into the bed of a truck, (2) shapes into jewelry boxes, (3) pom-poms into candy molds, (4) pencils into a pencil cup, (5) shapes into a long basket, (6) Bristle-blocks into a cloth bag. The test pairs were (a) putting sponge letters into matching holes in foam mats versus into loose bowls, and (b) putting pegs into tight niches in variously shaped blocks versus into loose containers. The figure was held constant across the two scenes of each test pair to minimize the possibility that children would look longer at one of the scenes than the other because they preferred its figure, rather than because they preferred the relationship depicted; the color, size, and shape of the ground objects were also held as constant as possible.

11 Given the typical preference pattern found in studies with similar designs (e.g., Behl-Chadha & Eimas, 1995; Quinn, 1994), it may seem surprising that the infants looked longer at the familiarized relation than at the novel one. Hunter and Ames (1988) have shown that preference for familiarity over novelty is related to both task complexity and familiarization time: the more complex the task and/or the shorter the familiarization time, the greater the preference for familiarity; conversely, the easier the task and/or the longer the familiarization time, the greater the preference for novelty. The progression through a familiarity-to-novelty preference sequence is independent of age, although older participants may shift from familiar to novel with relatively more complex stimuli or relatively shorter familiarization times than younger participants. The experiment comparing tight and loose containment differed from those mentioned above in both task complexity and duration of familiarization time. The stimuli were far more complex (dynamic events rather than static pictures, with objects that changed from scene to scene in color, size, shape, and texture), and babies were familiarized to these stimuli for a preset number of trials, rather than habituated (i.e., shown instances of the same relation until they lose interest). Discovering what the familiarization scenes had in common may thus have been difficult, and babies may still have been intrigued to detect yet another new event that fit the category they were busy with.

12 Hespos and Spelke (2000) demonstrate sensitivity to a distinction between tight and loose containment even earlier (5 months). However, the containment scenes used in their study all involved simple containers and contained objects that – aside from the difference in tightness – were identical, so it is unclear whether babies of this age can yet generalize the distinction across objects as diverse as those used in McDonough, Choi, and Mandler's stimuli. (See Casasola & Cohen, 2002 and Quinn, in press, for evidence that, in habituation/familiarization studies of infant spatial categorization, babies at

first distinguish a novel spatial relation from a familiarized one only when the objects in the novel-relation test trials are the *same objects* they saw in the familiarization phase; only later can they discriminate between the two relations even when the objects change. Only the latter behavior is evidence for sensitivity to a spatial *category.)*

13 Studies purporting to show Whorfian effects are often criticized because, even though the task is ostensibly nonlinguistic, subjects might covertly be using language: for example, when asked to make judgments about the similarities and differences among stimuli, they might decide to group things together that they call by the same name. This explanation is not cogent for this experiment, however. Subjects were simply asked to watch the videos, and they were not expecting any memory tests or judgments about what they had seen; it is unlikely that they were covertly labeling the events they were shown and deciding to look longer at events with one label than at events with another.

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26 Does language shape thought? Mandarin and English speakers' conceptions of time*

Lera Boroditsky

Does the language you speak shape the way you understand the world? Linguists, philosophers, anthropologists, and psychologists have long been interested in this question. This interest has been fueled in large part by the observation that different languages talk about the world differently. Does the fact that languages differ mean that people who speak different languages think about the world differently? Does learning new languages change the way one thinks? Do polyglots think differently when speaking different languages? Although such questions have long been issues of interest and controversy, definitive answers are scarce. This paper briefly reviews the empirical history of these questions and describes three new experiments that demonstrate the role of language in shaping habitual thought.

The doctrine of Linguistic Determinism – the idea that thought is determined by language – is most commonly associated with the writings of Benjamin Lee Whorf. Whorf, impressed by linguistic diversity, proposed that the categories and distinctions of each language enshrine a way of perceiving, analyzing, and acting in the world. In so far as languages differ, their speakers too should differ in how they perceive and act in objectively similar situations (Whorf, 1956). This strong Whorfian view – that thought and action are entirely determined by language – has long been abandoned in the field. Particularly effective in undermining the strong view was work on color perception demonstrating that the Dani (a tribe in New Guinea) had little trouble learning the English set of color categories, despite having only two words for colors in their language (Heider, 1972; Rosch, 1975, 1978; but see Lucy & Shweder, 1979; Kay & Kempton, 1984).

Although the strong linguistic determinism view seems untenable, many weaker but still interesting formulations can be entertained. For example, Slobin (1987, 1996) has suggested that language may influence thought during 'thinking for speaking.' Languages force us to attend to certain aspects of our experience by making them grammatically obligatory (e.g., gender, temporal extent, etc.). Therefore, speakers of different languages may be biased to attend to and encode different aspects of their experience while speaking. In a similar vein, Hunt and Agnoli (1991) reviewed evidence that language may influence thought by making habitual distinctions more fluent.

Since Rosch's work on color, several lines of research have explored domains that appear more likely to reveal linguistic influences than such low-level domains as color perception. Among the evidence are cross-linguistic differences in the object-substance distinction in Yucatec Mayan and Japanese (e.g., Imai & Gentner, 1997; Lucy, 1992), effects of grammatical gender distinctions in Spanish (Sera, Berge, & del Castillo, 1994), cross-linguistic differences in spatial thinking (e.g., Bowerman, 1996; Levinson, 1996), and evidence suggesting that language influences conceptual development (e.g., Markman & Hutchinson, 1984; Waxman & Kosowski, 1990).

1 Limitations of recent evidence

Although the evidence so far is suggestive, there are serious limitations common to most recent studies of linguistic determinism. First, speakers of different languages are usually tested only in their native language. Any differences in these comparisons can only show the effect of a language on thinking for that particular language. These studies cannot tell us whether experience with a language affects language-independent thought such as thought for other languages, or thought in non-linguistic tasks.

Second, comparing studies conducted in different languages poses a deeper problem: there is simply no way to be certain that the stimuli and instructions are truly the same in both languages. This problem remains even if the verbal instructions are minimal. For example, even if the task is non-linguistic, and the instructions are simply 'which one is the same?', one cannot be sure that the words used for 'same' mean the same thing in both languages. If in one language the word for 'same' is closer in meaning to 'identical,' while in the other language it's closer to 'relationally similar', speakers of different languages may behave differently, but due only to the difference in instructions, not because of any interesting differences in thought. There is no sure way to guard against this possibility when tasks are translated into different languages. Since there is no way to know that participants in different languages are performing the same task, it is difficult to deem the comparisons meaningful.

A third limitation is that even when non-linguistic tasks (such as sorting into categories, or making similarity judgments) are used, the tasks themselves are quite explicit. Sorting and similarity judgment tasks require participants to decide on a strategy for completing the task. How should I divide these things into two categories? What am I supposed to base my similarity judgments on? When figuring out how to perform a task, participants may simply make a conscious decision to follow the distinctions reinforced by their language. For this reason, evidence collected using such explicit measures as sorting preferences or similarity judgments is not convincing as non-linguistic evidence.

Showing that experience with a language affects thought in some broader sense (other than thinking for that particular language) would require observing a cross-linguistic difference on some implicit measure (e.g., reaction time) in a non-language-specific task. The studies described in this paper do just that. They show an effect of first-language thinking on second-language understanding using the implicit measure of reaction time. In particular, the studies investigate whether speakers of English and Mandarin Chinese think differently about the domain of time even when both groups are 'thinking for English.'

2 Time

How is the domain of time learned, represented, and reasoned about? Certainly some elements of time are apparent in our experience with the world. From experience, we know that each moment in time only happens once, that we can only be in one place at one time, that we can never go back, and that many aspects of our experience are not permanent (i.e., faculty meetings are not everlasting, but rather begin and end at certain times). In other words, our experience dictates that time is a phenomenon in which we, the observer, experience continuous unidirectional change that may be marked by appearance and disappearance of objects and events. These aspects of conceptual time should be universal across cultures and languages. Indeed, this appears to be the case. In order to capture the sequential order of events, time is generally conceived as a one-dimensional, directional entity. Across languages, the spatial terms imported to talk about time are also one-dimensional, directional terms such as *ahead/behind*, or *up/down*, rather than multi-dimensional or symmetric terms such as *narrow/wide,* or *left/right* (Clark, 1973; Traugott, 1978). Aspects of time that are extractable from world experience (temporally bounded events, unidirectional change, etc.,) appear to be universal across cultures and languages.

However, there are many aspects of our concept of time that are not observable in the world. For example, does time move horizontally or vertically? Does it move forward or back, left or right, up or down? Does it move past us, or do we move through it? All of these aspects are left unspecified in our experience with the world. They are, however, specified in our language, most often through spatial metaphors. Across languages people use spatial metaphors to talk about time. Whether they are looking *forward* to a brighter tomorrow, proposing theories *ahead* of their time, or falling *behind* schedule, they rely on terms from the domain of space to talk about time (Clark, 1973; Lehrer, 1990; Traugott, 1978). Those aspects of time that are not constrained by our physical experience with time are free to vary across languages and our conceptions of them may be shaped by the way we choose to talk about them. This paper will focus on one such aspect of time and will examine whether different ways of talking about time lead to different ways of thinking about it.

2.1 Time in English

In English, we predominantly use front/back terms to talk about time. We can talk about the good times *ahead* of us, or the hardships *behind* us. We can move meetings *forward*, push deadlines *back*, and eat dessert *before* we're done with our vegetables. On the whole, the terms used to order events are the same as those used to describe asymmetric horizontal spatial relations (e.g., 'he took three steps *forward*' or 'the dumpster is *behind* the store').

2.2 Time in Mandarin Chinese

In Mandarin, front/back spatial metaphors for time are also common (Scott, 1989). Mandarin speakers use the spatial morphemes *qián* – 'front' and *hòu* – 'back' to talk about time. Examples in Figure 1 show parallel uses of *qián* and *hòu* in their spatial and temporal senses. Example sentences and their English glosses were taken from Scott (1989).

(1) SPACE

zài zhuōzi qián-bian zhàn-zhe yī ge xuésheng
there is a student standing in front of the desk

TIME

hǔ nián de qián yī nián shì shénme nián?
what is the year before the year of the tiger?

(2) SPACE

zài zhuōzi hòu-bian zhàn-zhe yī ge lǎoshi
there is a teacher standing behind the desk

TIME

dàxué bìyè yǐ-hòu wǒ yòu jìn le yánjiūyuàn
after graduating from university, I entered graduate school

Figure 1: Example spatial and temporal uses of front/back terms qián and hòu in Mandarin and their English glosses.

What makes Mandarin interesting for present purposes is that Mandarin speakers also systematically use vertical metaphors to talk about time (Scott, 1989). The spatial morphemes *shàng* – 'up' and *xià* – 'down' are frequently used to talk about the order of events, weeks, months, semesters, and more. Earlier events are said to be *shàng* or 'up', and later events are said to be *xià* or 'down'. Examples in Figure 2 show parallel uses of *shàng* and *xià* to describe spatial and temporal relations (examples taken from Scott, 1989).

Although in English vertical spatial terms can also be used to talk about time (e.g., 'hand *down* knowledge from generation to generation' or 'the meeting was coming *up*'), these uses are not nearly as common or systematic as is the use of *shàng* and *xià* in Mandarin (Chun, 1997a, 1997b; Scott, 1989).

(1) SPACE

māo shàng shù
cats climb trees

TIME

shàng ge yuè
last (or previous) month

(2) SPACE

tā xià le shān méi yǒu
has she descended the mountain or not?

TIME

xià ge yuè
next (or following) month

Figure 2: Example spatial and temporal uses of up/down terms *shàng* and *xià* in Mandarin and their English glosses.

In summary, both Mandarin and English speakers use horizontal terms to talk about time. In addition, Mandarin speakers commonly use the vertical terms *shàng* and *xià*[1].

3 Does language shape thought?

So, do the differences between the English and Mandarin ways of *talking* about time lead to differences in how their speakers *think* about time? This question can be expanded into two separate issues: (1) does using spatial language to talk about time have short-term implications for on-line processing?, and (2) does using spatial language to talk about time have long-term implications?

3.1 Does metaphor use have implications for on-line processing?

Recent evidence suggests that people don't just *talk* about time in spatial terms, but that they also use their spatial knowledge to *think* about time. Boroditsky (2000) showed that people are able to reuse relational information made available by spatial primes to think about time. For example, priming a particular perspective for thinking about space biased how people later interpreted an ambiguous question about time. Also, spatial relational information was found to be just as useful for thinking about time as temporal information – in answering questions about time, subjects benefited equally from a spatial prime (129 msecs benefit) as from a temporal prime (130 msecs benefit).

It appears that spatiotemporal metaphors do have implications for on-line conceptual processing.

3.2 Does metaphor use have long-term implications for processing?

How could one's choice of spatiotemporal metaphors affect thinking about time in the long-run? Boroditsky (2000) argued that spatial metaphors can provide relational structure to those aspects of time where the structure may not be obvious from world experience (e.g., whether time should be vertical or horizontal). Using spatial metaphors to describe time encourages structural alignment between the two domains and may cause relational structure to be imported from space to time. The mechanism for this type of metaphoric structuring may be the same as that used in analogical inference (Gentner, Bowdle, & Wolff, in press; Gentner & Wolff, 1997). Language-encouraged mappings between space and time may then come to be stored in the domain of time. That is, frequently invoked mappings may become habits of thought. For example, because English speakers often use horizontal metaphors to talk about time, they might grow to think about time horizontally even when not explicitly processing a spatio-temporal metaphor (e.g., when understanding a sentence phrased in purely temporal terms like *earlier* and *later*). For the same reasons, Mandarin speakers might grow to think about time vertically.

Experiment 1 was designed to test whether using spatial metaphors to talk about time can have both immediate and long-term implications for how people think about time. Mandarin and English speakers were asked to answer a spatial priming question followed by a target question about time. The spatial primes were either about horizontal spatial relations between two objects (see Figure 3a), or about vertical relations (see Figure 3b). After solving a set of two primes, participants answered a TRUE/FALSE target question about time. Half of the target questions were designed to test the immediate effect of metaphors on processing, and so used a horizontal spatiotemporal metaphor (e.g., 'March comes *before* April.'). If horizontal spatiotemporal metaphors are processed by activating horizontal spatial knowledge, then people should be faster to understand such a metaphor if they've just seen a horizontal spatial prime (Figure 3a) than if they've just seen a vertical prime (Figure 3b). The other half of the target questions were designed to test the long-term effects of metaphor use on thinking about time, and so did not use a metaphor, but instead used the purely temporal terms *earlier* and *later* (e.g., 'March comes *earlier* than April'). If the metaphors frequently used in one's native language do have a long-term effect on how one thinks about time, then even when people are not trying to understand a metaphor (e.g., when deciding whether 'March comes *earlier* than April') they may still use spatial knowledge to think about time in a way that is consistent with (and encouraged by) the particular metaphors popular in their language.

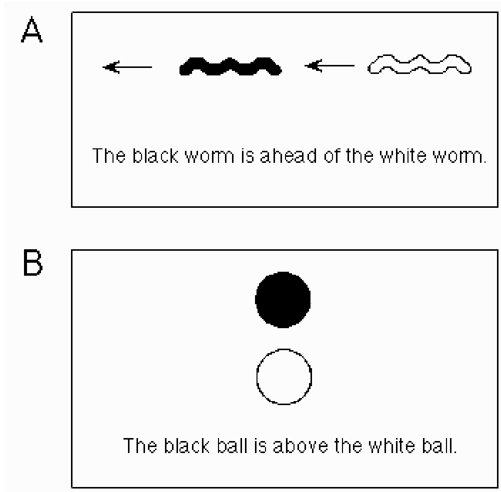

Figure 3a: Example of a horizontal spatial prime used in Experiments 1 and 3.

Figure 3b: Example of a vertical spatial prime used in Experiments 1 and 3.

If one's native language does have a long-term effect on how one thinks about time, then Mandarin speakers should be faster to answer purely temporal target questions (e.g., 'March comes *earlier* than April') after solving the vertical spatial primes than after the horizontal spatial primes. English speakers, on the other hand, should be faster after horizontal primes because horizontal metaphors are predominantly used in English. Since both English and Mandarin speakers completed the task in English, this is a particularly strong test of the effect of one's native language on thought. If Mandarin speakers do show a vertical bias in thinking about time even when they are 'thinking for English,' then language must play an important role in shaping speakers' thinking habits.

4 Experiment 1

4.1 Method

4.1.1 Participants

Twenty-six native English speakers, and twenty native Mandarin speakers participated in this study. All participants were graduate or undergraduate students at Stanford University, and received either payment or course credit in return for their participation. All of the Mandarin speakers had Mandarin as their first language. It was also their only language until at least the age of six, with a mean age at the onset of English acquisition of 12.8 years.

4.1.2 Design

Participants answered spatial prime questions followed by questions about time. Primes were spatial scenarios accompanied by a sentence description and were either horizontal (see Figure 3a) or vertical (see Figure 3b). Targets were statements about time: either *before/after* statements (e.g., 'March comes *before* April'), or *earlier/later* statements (e.g., 'March comes *earlier* than April'). Each participant completed a set of 6 practice questions and 64 experimental trials. Each experimental trial consisted of two spatial prime questions (both horizontal or both vertical) followed by one target question about time. The experimental trials were arranged such that the first prime question was FALSE, the second was TRUE, and the target question was TRUE. Participants were not told that the experiment was arranged into such trials, and because randomly arranged filler trials were extensively interspersed throughout the experiment, participants were not able to figure out the trial structure in the course of the experiment. Participants answered each target question twice – once after each type of prime. The order of all trials was randomized for each participant. Overall, the experiment had a fully crossed within-subject 2 (prime-type) X 2 (target-type) design with native language as the only between-subjects factor.

4.1.3 Materials

A set of 128 primes and 32 targets, all TRUE/FALSE questions, was constructed.

4.1.3.1 Primes

One hundred and twenty-eight spatial scenarios were used as primes. Each scenario consisted of a picture and sentence below the picture. Half of these scenarios were about horizontal spatial relations (see Figure 3a), and the other half were about vertical spatial relations (see Figure 3b). Half of the horizontal primes used the 'X is *ahead* of Y' phrasing and half used the 'X is *behind* Y' phrasing. Likewise, half of the vertical primes used the 'X is *above* Y' phrasing and half used the 'X is *below* Y' phrasing. Primes were equally often TRUE and FALSE. All of these variations were crossed into eight types of primes. In addition, the left/right orientation of the horizontal primes was counterbalanced across variations.

4.1.3.2 Targets

Sixteen statements about the order of the months of the year were constructed. Half used the front/back terms *before* and *after* (e.g., 'June comes *before* August'), and half used the purely temporal terms *earlier* and *later* (e.g., 'August comes *later than* June'). All four terms were used equally often. All target statements were 'TRUE'.

4.1.3.3 Fillers

Sixteen additional statements about months of the year were used as fillers. These statements were similar in all respects to the targets except that all of the filler statements were 'FALSE'. Filler statements were constructed by reversing the relation in each of the target statements. Filler time questions (along with filler spatial scenarios drawn randomly from the list of all spatial primes) were inserted randomly in-between experimental trials to ensure that participants did not deduce the trial structure of the experiment. Responses to filler trials were not analyzed.

4.1.4 Procedure

Participants were tested individually. All participants were tested in English with English instructions. Questions were presented on a computer screen one at a time. For each question, participants needed to respond TRUE or FALSE as quickly as possible (and within a five second deadline) by pressing one of two keys on a keyboard. Response times were measured and recorded by the computer. Participants received no feedback for the experimental trials.

4.2 Results

As predicted, English and Mandarin speakers were affected differently by the spatial primes. Both English and Mandarin speakers answered spatiotemporal *before/after* questions faster after horizontal primes than after vertical primes (see Figure 4a). This confirms the earlier findings that spatial knowledge can be used in the on-line processing of spatiotemporal metaphors. However, when it came to purely temporal *earlier/later* questions, English and Mandarin speakers looked very different (see Figure 4b). As predicted, English speakers answered purely temporal questions faster after horizontal primes than after vertical primes. This pattern was predicted by the preponderance of horizontal spatial metaphors used to describe time in English. The data from Mandarin speakers looked quite different. When answering questions phrased in purely temporal *earlier/later* terms, Mandarin speakers were faster after vertical primes than after horizontal primes. This pattern was predicted by the fact that in Mandarin vertical metaphors are often used to talk about time. Descriptive statistics and analyses are reported below.

Only responses to target time questions were analyzed. Response times exceeding the deadline, incorrect responses, and those following an incorrect response to a priming question were omitted from all analyses (7% of all responses were omitted). Error rates did not differ by native language (7.1% for English speakers and 6.9% for Mandarin speakers) or prime type (7.3% after horizontal primes, and 6.7% after vertical primes). Both English and Mandarin speakers made slightly more errors on *earlier/later* targets (8.6%) than on *before/after* targets (5.4%), χ^2=4.82, p<.05. Separate 2 (prime type) X 2 (target type) repeated measures ANOVAs were conducted for data from English and Mandarin speakers.

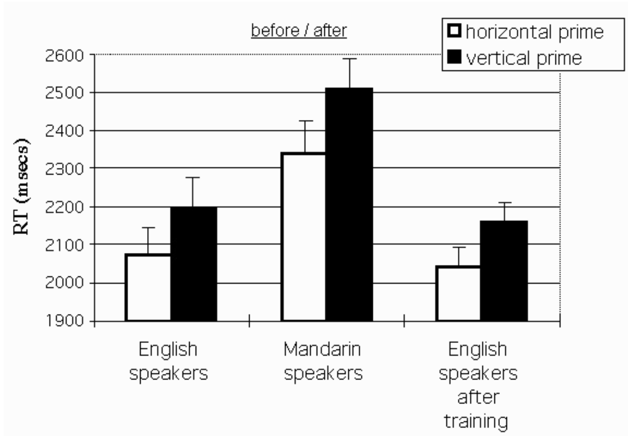

Figure 4a: Experiments 1 and 3: response times to spatiotemporal before/after questions about time following either a horizontal or a vertical prime are plotted for English speakers, Mandarin speakers, and English speakers who had been trained to talk about time vertically.

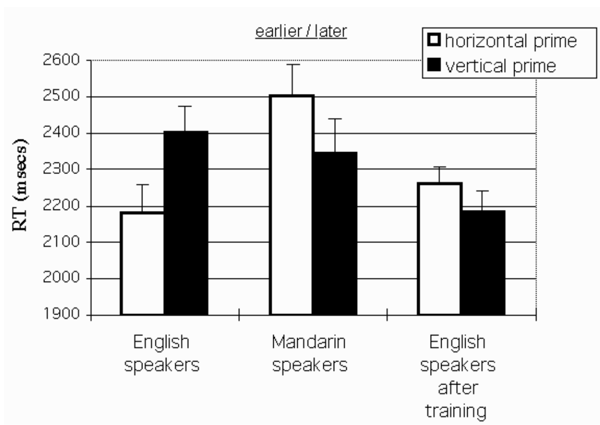

Figure 4b: Experiments 1 and 3: response times to purely temporal earlier/later questions about time following either a horizontal or a vertical prime are plotted for English speakers, Mandarin speakers, and English speakers who had been trained to talk about time vertically.

4.2.1 Native English speakers

As predicted, Native English speakers answered time questions faster after horizontal primes (2128 msecs) than after vertical primes (2300 msecs), F (1, 25) = 13.76, $p < 0.01$. Reaction times were also shorter for questions phrased in *before/after* terms (2135 msecs) than for those phrased in *earlier/later* terms (2294 msecs), F (1, 25) = 8.23, $p<.01$. This difference is most likely due to an uninteresting difference in reading time between the two types of targets; *earlier/later* targets were one to two syllables longer than the *before/after* targets. There was no interaction between prime-type and target-type, F (1,

25) = .75, $p = 0.40$. English speakers were faster to solve all questions about time if they followed horizontal primes than if they followed vertical primes.

4.2.2 Native Mandarin speakers

Overall, Mandarin speakers answered time questions just as quickly after horizontal primes (2422 msecs) as after vertical primes (2428 msecs), $F(1, 19) = .01$, $p=.92$. However, there was a big difference in how primes affected response times to the two types of targets. Like the English speakers, Mandarin speakers answered the *before/after* target questions faster after horizontal primes (2340 msecs) than after vertical primes (2509 msecs). When it came to the purely temporal *earlier/later* targets, however, the pattern was exactly reversed. Unlike the English speakers, Mandarin speakers solved purely temporal targets faster after vertical primes (2347 msecs) than after horizontal primes (2503 msecs). These differences were confirmed as an interaction between prime-type and target-type, $F(1, 19) = 4.55$, $p<.05$.

4.2.3 Comparing English and Mandarin speakers

Overall, English speakers were not significantly faster to answer target questions than Mandarin speakers (2214 msecs and 2425 msecs respectively), $F(1, 44) = 2.01$, $p=.16$. The effect of prime was different for the two language groups; there was an overall effect of prime for English speakers but not for Mandarin speakers, $F(1, 44) = 4.89$, $p<.05$. The critical predicted difference between the two language groups was in the interaction of prime and target. This difference was confirmed as a three-way interaction in a 2_{prime} X 2_{target} X 2_{language} ANOVA, $F(1, 44) = 5.24$, $p<.05$.

4.3 Discussion

In this experiment, native English and native Mandarin speakers were found to think differently about time. This was true even though both groups were tested in English. English speakers were faster to verify that 'March comes *earlier* than April' after horizontal primes than after vertical primes. This habit of thinking about time horizontally was predicted by the preponderance of horizontal spatial metaphors used to talk about time in English. The reverse was true for Mandarin speakers. Mandarin speakers were faster to verify that 'March comes *earlier* than April' after vertical primes than after horizontal primes. This habit of thinking about time vertically was predicted by the preponderance of vertical time metaphors in the Mandarin. In short, it appears that habits in language encourage habits in thought. Since Mandarin speakers showed vertical bias even when thinking for English, it appears that language-encouraged habits in thought can operate regardless of the language that one is currently thinking for.

These results suggest that experience with a language can shape the way one thinks. Experiment 2 was designed to further test the relationship between language experience and patterns in thinking. How much, and in what ways does learning new languages influence one's way of thinking? Mandarin-English bilinguals were tested in a task similar to that described in Experiment 1. All of the participants were Mandarin-English bilinguals whose first language was Mandarin. In order to be able to assess the effects of second-language learning on thought, this group of participants was chosen to vary much more in how early in life they began to learn English than did the participants in Experiment 1. If learning new languages does change the way one thinks, then participants who learned English early on or had more English experience should show less of a 'Mandarin' bias to think about time vertically.

5 Experiment 2

5.1 Method

5.1.1 Participants

Twenty-five Mandarin-English bilinguals (with varying degrees of experience with Mandarin and English) participated in this study. All participants were graduate or undergraduate students at Stanford University, and received payment in return for their participation. Participants ranged in age from 18 to 28 years, (*M*=23.4 yrs, SD=2.5 yrs). All participants had acquired Mandarin prior to English. They varied in the age at which they first began to learn English (Age of Acquisition) from 3 to 13 years of age (*M*=9.4 yrs, SD=3.3 yrs). All had at least 10 years Exposure to English (current age minus Age of Acquisition) (*M*=14.0 yrs, SD=2.3 yrs).

5.1.2 Design

Just as in Experiment 1, participants answered spatial priming questions followed by target questions about time. Primes were spatial scenarios accompanied by a sentence description and were either horizontal (see Figure 5a) or vertical (see Figure 5b).

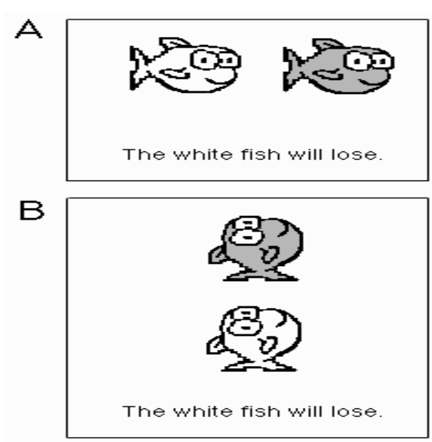

Figure 5a: Example of a horizontal spatial prime used in Experiment 2.

Figure 5b: Example of a vertical spatial prime used in Experiment 2.

Unlike Experiment 1, all targets were *earlier/later* statements about time (e.g., 'March comes *earlier* than April'). Because the critical measure was the amount of vertical bias in response to the *earlier/later* targets, the *before/after* targets were not included in this experiment. Each participant completed 80 experimental trials, and 240 filler questions. Each experimental trial consisted of two spatial prime questions (both horizontal or both vertical) followed by one target question about time. Participants were not told that the experiment was arranged into such trials, nor did they figure it out in the course of the experiment. They answered each target question twice, once after each type of prime. The order of all trials was randomized for each participant.

5.1.3 Materials

A set of 96 primes and 40 targets, all TRUE/FALSE questions, was constructed.

5.1.3.1 Primes

Ninety-six spatial scenarios were used as primes. Each scenario consisted of a picture and sentence below the picture. Half of these scenarios were about horizontal spatial relations (see Figure 5a), and the other half were about vertical spatial relations (see Figure 5b). The left/right and up/down orientation in horizontal and vertical primes respectively was counterbalanced. Half of the primes used the 'X will win' phrasing and half used the 'X will lose' phrasing. Primes were equally often TRUE and FALSE. All of these variations were fully crossed.

5.1.3.2 Targets

Forty statements about the order of the months of the year were constructed. All of these statements used the purely temporal terms *earlier* and *later* (e.g., 'March comes *earlier* than April'). Both terms were used equally often. All target statements were 'TRUE'.

5.1.3.3 Fillers

Forty additional statements about months of the year were used as fillers. They were similar to the targets in all respects except they were 'FALSE'. This was done to insure that participants were alert and did not simply learn to answer 'TRUE' to all questions about time. Filler time questions (along with filler spatial scenarios drawn randomly from the list of all spatial primes) were inserted randomly in-between experimental trials to ensure that participants did not deduce the trial structure of the experiment. Responses to filler questions were not analyzed.

5.1.4 Procedure

Participants were tested individually. All were tested in English with English instructions. The procedure was the same as in Experiment 1.

5.2 Results and discussion

The bias to think about time vertically was greater for Mandarin speakers who started learning English later in life. Surprisingly, vertical bias appeared independent of the length of Exposure to English.

Vertical Bias was calculated for each participant by subtracting their mean RT for targets following a vertical prime, from that for targets following a horizontal prime (mean Vertical Bias = 54 msecs). Each participant also received a score on two predictor variables: Age of Acquisition of English, and Years of Exposure to English. As before, response times exceeding the deadline, incorrect responses, and those following an incorrect response to a priming question were omitted from all analyses (10.9% of all responses were omitted). Error rates did not differ by prime type (10.7% after horizontal primes, and 11.0% after vertical primes).

As predicted, the Age of Acquisition of English was positively correlated with Vertical Bias with r=.47, p<.01[2].

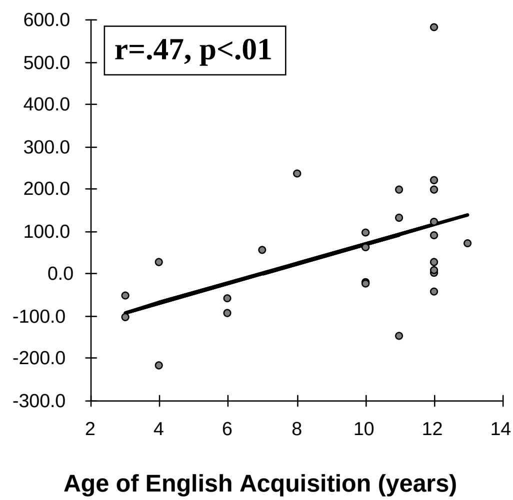

Figure 6: Experiment 2: results from 25 Mandarin speakers. Vertical bias in msecs is plotted as a function of age of acquisition of English in years. Vertical bias equals the difference in reaction time between targets following horizontal primes and targets following vertical primes.

Participants who started learning English at a younger age showed less Vertical Bias (a less 'Mandarin' way of thinking) than participants who started learning English later in life (see Figure 6). That is, the longer a child was speaking only Mandarin, the greater his or her Vertical Bias score in English. Interestingly, the Length of Exposure to English did not predict Vertical Bias, r=-.12, p=.29. Acquiring thinking habits promoted by a language (assessed here as Vertical bias) appears to depend primarily on how early one starts to learn that language, and not on the amount of exposure to that language.

This dissociation is particularly surprising since (as would be expected for college-age participants) the Age of Acquisition and the Length of Exposure were highly correlated with r=-.66, $p<.01$.

The partial correlations between Vertical Bias and these two factors followed the same pattern as the full correlations. After controlling for the effect of Length of Exposure, there was still a strong correlation between Vertical Bias and Age of Acquisition with r=.52, $p<.01$. There was still no significant correlation between Vertical Bias and Length of Exposure after the effect of Age of Acquisition had been controlled for, r=.29, $p=.17$.

These findings bear a conspicuous resemblance to those reported by Johnson & Newport (1989) regarding the acquisition of grammatical proficiency in a second language. In accord with the current results, grammatical proficiency in a second language is better the earlier the immersion in that language, but is nearly independent of the length of exposure to it (Johnson & Newport, 1989). It is striking that the acquisition of semantic biases (here measured as Vertical Bias) is affected by the same variables as the acquisition of basic language skills like grammatical proficiency.

Participants were also asked to provide an intuitive rating of how often they 'think in Mandarin' as compared to English on a scale of 1 to 5 (1=*I think almost always in English*, 5=*I think almost always in Mandarin*). This introspective measure was also correlated with Vertical Bias, r=.37, $p<.05$, though not as strongly as Age of Acquisition. Once the effect of Age of Acquisition was controlled for, this introspective measure was no longer correlated with Vertical Bias, r=-.08, $p=.36$. It is reasonable to suppose that the Age of Acquisition is the causal variable driving both Vertical bias and this introspective assessment.

Overall, Mandarin speakers who learned English later in life were more likely to think about time vertically. The propensity to think about time vertically was related to the length of pure Mandarin experience (before any English was learned), but not to the length of English experience.

Although these results strongly suggest an effect of language on habitual thought, there is still one concern. The difference in time metaphors used in English and Mandarin is clearly not the only difference between English speakers and Mandarin speakers. Other cultural factors could conceivably have led to the observed differences. One important factor to consider is that of writing direction[3]. Whereas English is written horizontally from left to right, Mandarin is traditionally written in vertical columns that run from right to left. Beyond writing direction, there may be many cultural differences between native English and native Mandarin speakers that may have lead to the differences observed in Experiment 1. Experiment 3 was designed to minimize differences in non-linguistic cultural factors while preserving the interesting difference in language.

In Experiment 3, native English speakers learned to use vertical spatial terms (*above*, *below*, *higher than*, and *lower than*) to talk about time. For example, they learned to say that 'cars were invented *above* fax machines' and that 'Wednesday is *lower than* Tuesday.' The use of the vertical terms *above/below* and *higher than/lower than* in this training was similar to the use of *shàng* and *xià* in Mandarin. Earlier events were always said to be *above* or *higher than*, and later events were always said to be *below* or *lower than*. This training was designed to alter (temporarily) the English speakers habit of thinking about time horizontally by making the vertical metaphor highly available in memory. After the training, participants completed exactly the same experiment as in Experiment 1. If it is indeed language (and not other cultural factors) that led to the differences between English and Mandarin speakers in Experiment 1, then the 'Mandarin' linguistic training given to English speakers in Experiment 3 should make their results look more like those of Mandarin speakers than those of English speakers.

6 Experiment 3

6.1 Method

6.1.1 Participants

Seventy Stanford University undergraduates, all native English speakers, participated in this study for course credit.

6.1.2 Materials and design

Participants were told they would learn 'a new way to talk about time.' They were given a set of five example sentences that 'used this new system' (e.g., 'Monday is *above* Tuesday' or 'Monday is *higher than* Tuesday') and had to figure out on their own how the system worked. The new system used *above/below* and *higher than/lower than*. Events closer to the past were always said to be *above* or *higher than*, and events closer to the future were always said to be *below* or *lower than*. Participants were then tested on a set of 90 questions that used these vertical terms to talk about time (e.g., 'Nixon was president *above* Clinton' or 'WWII happened *lower than* WWI'). These test questions were presented on a computer screen one at a time, and participants responded TRUE or FALSE to each statement by pressing one of two keys on the keyboard.

Half of the participants learned a system that used the terms *above* and *below*, and half learned a system that used *higher than* and *lower than*. Two different training systems were used in order to equate syntactic similarity between the training phrases and the two types of targets used in this experiment. The *above/below* phrasings were syntactically similar to the *before/after* targets, and the *higher than/lower than* phrasings were similar to the *earlier than/later than* targets. This was done to make sure that any differential transfer from the training phase to the experiment would not be due to simple syntactic priming.

Immediately after the training, participants went on to complete the experiment described in Experiment 1. After the initial training, all materials, instructions, and procedures were identical to those used in Experiment 1.

6.2 Results and discussion

After the short training, results of native English speakers looked more like those of Mandarin speakers than those of untrained English speakers. Results are summarized in Figure 4.

Unlike untrained English speakers in Experiment 1, trained English speakers were not faster to answer time questions after horizontal primes (2151 msecs) than after vertical primes (2170 msecs), $F(1, 68) = .53$, $p=.47$. However, just as was the case with Mandarin speakers, primes affected response times differently for the different targets. For *before/after* targets, response times were shorter after horizontal primes (2040 msecs) than after vertical primes (2156 msecs). For purely temporal *earlier/later* targets, however, the pattern was exactly reversed; response times were shorter after vertical primes (2185 msecs) than after horizontal primes (2262 msecs). These differences were confirmed as an interaction between prime-type and target-type, $F(1, 68) = 10.25$, $p<.01$.

There were no differences between the two training types. This confirms that the effect of training was not simply that of syntactic priming. Also, just as observed for untrained English speakers, response times were shorter for questions phrased in *before/after* terms (2098 msecs) than for those phrased in *earlier/later* terms (2223 msecs), $F(1, 68) = 11.03$, $p<.01$. As before, this difference is most likely due to an uninteresting difference in reading time between the two types of targets; *earlier/later* targets were one to two syllables longer than the *before/after* targets.

6.2.1 Comparing trained and untrained English speakers

Mean response times did not differ between trained and untrained English speakers, but the effect of prime was different for the two groups; there was an overall effect of prime for untrained English speakers but not for trained English speakers, $F(1, 94) = 4.69$, $p<.05$. The critical predicted difference between the two groups was in the interaction of prime and target. This difference was confirmed as a three-way interaction in a $2_{prime} \times 2_{target} \times 2_{training}$ ANOVA, $F(1, 94) = 5.65$, $p<.05$. These are the very same differences as were observed between English and Mandarin speakers in Experiment 1.

6.2.2 Comparing trained English speakers and Mandarin speakers

Overall, trained English speakers answered targets faster than Mandarin speakers (2161 msecs and 2425 msecs respectively), $F(1, 88) = 4.68$, $p<.05$. This was the only difference between the two groups. None of the differences observed between English speakers and Mandarin speakers in Experiment 1 were present after English speakers had been trained to talk about time in a 'Mandarin' way.

Overall, English speakers who were trained to talk about time using vertical terms, showed a pattern of results very similar to that of Mandarin speakers. These results confirm that, even in the absence of other cultural differences (e.g., writing direction), differences in talking do indeed lead to differences in thinking.

7 General discussion

One's native language appears to exert a strong influence over how one thinks about abstract domains like time. In Experiment 1, Mandarin speakers relied on a 'Mandarin' way of thinking about time even when they were thinking about English sentences. Mandarin speakers were more likely to think about time vertically when deciding whether 'March comes *earlier* than April'. This result is predicted by the way Mandarin talks about time; the fact that vertical terms are commonly used to talk about time predicts that Mandarin speakers would find it more natural to construct a vertical time-line when thinking about purely temporal relations. English speakers were more likely to think about time horizontally because horizontal spatial terms predominate in English temporal descriptions.

Experiment 2 showed that the acquisition of semantic biases (such as a habit of thinking about time vertically or horizontally) decreases with the age at which second-language exposure begins. Further, the acquisition of semantic biases is affected by the same variables as the acquisition of basic language skills.

In Experiment 3, native English speakers who had just been briefly trained to talk about time using vertical terms produced results very similar to those of Mandarin speakers. This finding confirms that the effect observed in Experiment 1 was driven by differences in language, and not by other cultural differences. Learning a new way to talk about a familiar domain can change the way one thinks about that domain. Taken together these findings make a strong case for language shaping habitual thought.

However, there is an interesting discrepancy between the findings described here on time and those of Rosch and colleagues on color. Why would there be such strong evidence for universality in thought for domains like color perception, but quite the opposite for time? One possibility is that – since color perception predates language both in evolution and in development – children's perceptually-based concepts (like colors) may be relatively fixed before they learn language.

A second possibility is that language is most powerful in determining thought for domains that are more abstract, that is, ones that are not so reliant on sensory experience. Gentner and Boroditsky (in press) have argued that the effect of language should be most apparent in the conceptualization of relations (typically encoded by verbs and spatial prepositions) as opposed to objects. Whereas object-concepts are easily individuable from perceptual experience, learning the extent and generality of a relational concept requires considerable experience with language. In one study, adults watched silent films of mothers talking to their children and tried to guess what was being said (Gillette, Gleitman, Gleitman, & Lederer, in press). Given only the silent film, adult participants were able to correctly guess nouns three times more often than verbs (45% and 15% correct respectively). Further, concrete activity verbs like 'push' were much more easily guessed from silent observation than from the syntactic frames in which they were used (50% and 15% respectively), whereas verbs that denote more abstract activities like 'think' were much more easily guessed from syntax than from observation (90% and 0% respectively).

In general, the referents of abstract terms are difficult or impossible to pick out just from observing the context in which they are used. Imagine trying to learn to pick out instances of 'idea', 'tomorrow', or 'justice' just from immediate interaction with the physical world. One consequence of this is that, in acquiring their first language, children take longer to learn relational terms than object-reference terms (because more language-experience is needed to parcel out relational concepts) (Au, Dapretto, & Song, 1994; Gelman & Tardif, 1998; Gentner, 1982; Gentner & Boroditsky, in press; Macnamara, 1972; Nelson, 1973)[4]. Another consequence is that the lexicalization of abstract and relational concepts varies cross-linguistically much more than that of concrete object concepts. It appears that acquiring abstract concepts requires experience with language, and that the eventual form of these concepts is largely shaped by the language experience.

But how does language affect thought? Let us again consider the domain of time. How do spatiotemporal metaphors affect thinking about time? Spatial metaphors can provide relational structure to those aspects of time where the structure may not be obvious from world experience (Boroditsky, 2000). In the case of space and time, using spatial metaphors to describe time encourages structural alignment between the two domains and may cause relational structure to be imported from space to time. The mechanism for this type of metaphoric structuring may be the same as that used in analogical inference (Gentner, Bowdle, & Wolff, in press; Gentner & Wolff, 1997). Language-encouraged mappings between space and time come to be stored in the domain of time. Hence, when spatiotemporal metaphors differ, so may people's ideas of time.

Language can be a powerful tool for shaping abstract thought. When sensory information is scarce or inconclusive (as with the direction of motion of time), languages may play the most important role in shaping how their speakers think.

Notes

* This research was funded by an NSF Graduate Research Fellowship to the author. Foremost, I would like to thank Jennifer Y. Lee who has made countless contributions to this research and has been an invaluable source of information about the Mandarin language. I would like to thank Barbara Tversky, Gordon Bower, and Herbert Clark for many insightful discussions of this research, and Michael Ramscar for comments on an earlier draft of this paper.

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1 The closest English counterparts to the Mandarin uses of *shàng* and *xià* are the terms *next (following)/last (previous)* and *earlier/later*. *Earlier* and *later* are similar to *shàng* and *xià* in that they use an absolute framework to determine the order of events. In Mandarin, *shàng* always refers to events closer to the past, and *xià* always refers to events closer to the future. The same is true in English for *earlier* and *later* terms. This is not true, however, for the other English terms for time. Terms like *before/after*, *ahead/behind*, and *forward/back* can be used not only to order events relative to the direction

of motion of time, but also relative to the observer. When ordering events relative to the direction of motion of time, we can say that Thursday is *before* Friday. Here, *before* refers to an event that is closer to the past. But, we can also order events relative to the observer, as in 'The best is *before* us.' Here, *before* refers to an event closer to the future. The same is true for *ahead/behind* and *forward/back*. *Qián* and *hòu*, the horizontal terms used in Mandarin to talk about time, also share this flexibility. Unlike *before/after, ahead/behind*, and *qián/hòu,* terms like *earlier/later* and *shàng/xià* are not used to order events relative to the observer. For example, one cannot say that 'the meeting is *earlier* than us' to mean that it is further in the future. *Earlier/later* and *shàng/xià* are absolute terms.

2 There was one outlier participant with an unusually high vertical bias of 582 msecs. The removal of this outlier only served to increase the correlation between Vertical Bias and Age of Acquisition to $r=.50$, $p<.01$.

3 Although this difference is interesting, it cannot explain the results of Experiment 1. The writing direction explanation would predict that – since Mandarin is written vertically – Mandarin speakers should always be faster to answer time questions after vertical than after horizontal primes. This prediction was not borne out by data. Mandarin speakers showed an interaction (faster after vertical primes for earlier/later sentences, but faster after horizontal primes for before/after sentences), and not the main effect predicted by writing direction. Writing direction cannot be responsible for the differences observed in this experiment.

4 See Gopnik and Choi (1995), Choi and Gopnik (1995), and Tardif (1996) for counterevidence to this claim, and Gentner and Boroditsky (in press) for discussion.

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27 Language and thought online: cognitive consequences of linguistic relativity

Dan I. Slobin

The voluminous literature on linguistic relativity has concerned itself primarily with the search for influences of particular languages on nonlinguistic cognition ***in situations in which language is not being used, overtly or covertly***. This represents a long tradition in which anthropologists, psychologists, and linguists have sought to relate grammatical and semantic systems of a language to the worldview or epistemology or culture of the community of speakers of the language. For example, Lucy has proposed a set of requirements for studies of linguistic relativity. He stipulates that such research 'should assess the cognitive performance of individual speakers ***aside from explicitly verbal contexts*** and try to establish that any cognitive patterns that are detected also characterize ***everyday behavior outside of the assessment situation***' (Lucy, 1996, p. 48, emphasis added). In this view, 'cognition' is seen as a collection of concepts and procedures that come into play regardless of whether an individual is engaged in verbal behavior – speaking, listening, or verbal thinking. Such research is directed towards what Lucy calls 'an independent cognitive interpretation of reality' (Lucy, 2000, p. xii). A rather different approach to 'cognition' is provided by investigators who concern themselves with language ***use*** and cultural ***practice***. For example, Gumperz and Levinson, introducing *Rethinking linguistic relativity* (1996, p. 8), underline the importance of 'theories of use in context,' including formal semantic theories (e.g., Discourse Representation Theory, Situation Semantics) and pragmatic theories (Relevance Theory, Gricean theories), along with research in sociolinguistics and linguistic anthropology. In the present paper, I begin with the fact that human beings spend a large portion of their time in linguistic behavior of one sort or another – that is, we are creatures that are almost constantly involved in preparing, producing, and interpreting verbal messages. Accordingly, research on linguistic relativity is incomplete without attention to the cognitive processes that are brought to bear, ***online***, in the course of using language.

1 Thinking for speaking

In research on narrative productions across languages, it has become clear to me that 'we encounter the contents of the mind in a special way when they are being accessed for use' (Slobin, 1987, p. 435). That is, there is a process of 'thinking for speaking' in which cognition plays a dynamic role within the framework of linguistic expression:

> The activity of thinking takes on a particular quality when it is employed in the activity of speaking. In the evanescent time frame of constructing utterances in discourse, one fits one's thoughts into available linguistic forms. A particular utterance is never a direct reflection of 'objective' or perceived reality or of an inevitable and universal mental representation of a situation. This is evident within any given language, because the same situation can be described in different ways; and it is evident across languages, because each language provides a limited set of options for the grammatical encoding of characteristics of objects and events. 'Thinking for speaking' involves picking those characteristics that (a) fit some conceptualization of the event, and (b) are readily encodable in the language. (Slobin, 1987, p. 435)

The online effects of language on thought processes have been noticed by psychologists, although not seen as centrally important to the classical issues of language and cognition. For example, Pinker (1994, p. 58) writes that 'there is no scientific evidence that languages dramatically shape their speakers' ways of thinking' and that the Sapir-Whorf hypothesis is 'wrong, all wrong' (p. 57). But he has also noted:

> Whorf was surely wrong when he said that one's language determines how one conceptualizes reality in general. But he was probably correct in a much weaker sense: one's language does determine how one must conceptualize reality when one has to talk about it. (Pinker, 1989, p. 360)

In Levelt's (1989) production model, the 'Conceptualizer' sends a 'preverbal message' to the 'Formulator.' Levelt considers semantic differences between languages in this model:

> A final issue to be raised is whether messages must, to some degree, be ***tuned*** to the target language. Will a message for an English Formulator have to differ from one that is fed into a Dutch Formulator, merely because of language-specific requirements? The answer … is positive: Using a particular language requires the speaker to think of particular conceptual features. (Levelt, 1989, p. 71)

Pinker, Levelt, and others, however, stress that online thinking while speaking is an encapsulated process, with no consequences beyond speech time. Comparing particular English and Dutch verb constructions, Pinker concludes that 'it seems unlikely that the Dutch conceive of [the underlying meanings] differently from us, except at the moment that they have to express them in words' (1989, p. 358). And Levelt, comparing deictic terms across languages, concludes: 'It is highly unlikely … that English and Dutch speakers ***perceive*** distance to ego differently than Spanish and Japanese speakers. But when they prepare distance information for expression, English and Dutch speakers must represent that information in their messages in a bipartite way, whereas Spanish and Japanese speakers must use a tripartite code' (1989, pp.

103–104). In brief, thinking-for-speaking effects are weak, not dramatic, and have no further implications for perception or conceptualization of objects and events.

It is, of course, exceptionally difficult to determine how people 'really' represent situations to themselves; furthermore, 'weak, undramatic' effects are not without scientific interest. I wish to argue that serious study of ***language in use*** points to pervasive effects of language on selective attention and memory for particular event characteristics. As I've argued in greater detail elsewhere (Slobin, 1996a, 2000), whatever effects language may have when people are not speaking or listening, the mental activity that goes on while formulating and interpreting utterances is not trivial or obvious, and deserves our attention.

Utterances are not verbal filmclips of events. An event cannot be fully represented in language: linguistic expression requires schematization of some sort. Every utterance represents a selection of characteristics, leaving it to the receiver to fill in details on the basis of ongoing context and background knowledge. Part of the background is a knowledge of what is obligatory or typical of the language being used. If I tell you about my 'friend' in English, you will expect that sooner or later you will discover the sex of the friend, because you know that third-person pronouns in English indicate gender. If I go on and on to refer only to 'my friend' or 'they' you will begin to suspect that I have reason to conceal the person's gender. However, if we have the same conversation in a language that has no gendered pronouns, such as Turkish or Chinese or Hungarian, you probably will not have such suspicions. When speaking English, my thinking for speaking – my Conceptualizer – is tuned to gender and its communicative significance, and your 'listening for thinking' is similarly tuned. We are not concerned with real world cognition here, but rather with the ongoing construction of mental representations. Our basic cognition of gender does not change when we switch languages, as far as I know, although our social and cultural cognition may well change. Communication is embedded in culture, and much of culture is carried – indeed, constructed – by language. Therefore the definition of cognition should not be restricted to phenomena of the physical world alone. Imagine, for example, that the political balance in the United States shifts, and Spanish becomes the official language. Americans now would have to know – in every encounter – who is *tú* and who is *Usted*. That is, the language would force our attention to fine points of status and intimacy that we have not had to resolve in using the universal English *you*. (I leave it to the reader to decide if such a demonstration of linguistic relativity would count as 'dramatic.' However, consider the ways in which the language of personal pronouns, honorifics, and discourse markers shapes social cognition and interaction across human societies.) These are, of course, thought experiments. And one can argue that it is trivially obvious that a speaker or listener has to attend to those semantic features that are encoded in the grammatical and lexical elements of a particular language in order to learn and use that language.

I propose that more rigorous demonstrations are possible, showing widespread 'ripple effects' of habitual attention to linguistically-encoded event characteristics. Several criteria are required for thinking-for-speaking research. I'll use the label 'thinking for speaking,' but the framework embraces all forms of linguistic production (speaking, writing, signing) and reception (listening, reading, viewing), as well as a range of mental processes (understanding, imaging, remembering, etc.). Thus there will also be examples of 'thinking for translating,' 'listening for understanding,' 'reading for imaging,' and so forth. Thinking-for-speaking research has the following characteristics:

1 A selection of languages and a semantic domain that is encoded with some frequency in all of the languages;

2 The semantic domain is encoded by special grammatical constructions or obligatory lexical selections in at least some of the languages under comparison;

3 The domain is relatively more codable in some of the languages to be compared;

4 A selection of discourse situations in which the semantic domain is regularly accessed.

Point 2 ensures that the domain is one that is ***habitually*** encoded in some of the languages. However, it allows for habitual encoding either by grammatical means (morphological elements, construction types) or obligatory lexemes, such as the compass-point terms or landmark terms used for spatial orientation in many languages (Levinson, 1996a, 1996b, forthcoming; Pederson et al., 1998). 'Obligatory' is taken to mean that the dimension in question cannot be regularly referred to without the expression in question. Point 3 is concerned with relative 'codability' of the domain – that is, ease of expression of the relevant categories. A more codable expression is more ***accessible*** in psycholinguistic terms – that is, it is short, and/or high frequency, and generally part of a small set of options in a paradigm or small set of items. Thus, a concept expressed by a single verb is more codable than a phrase or clause (e.g., *run* versus *while running*); a concept expressed by one of a small set of terms in a closed set (such as 'uphill', 'downhill', 'across') is more codable than one expressed by choices from a larger and more open set (such as 'to your left', 'to my left', 'toward town', 'in front of the tree', etc.). Note also that grammatical constructions (Goldberg, 1995) can provide codable means of expression, such as the English Caused-Motion Construction.

2 Descriptions of motion events

My 'parade case' of thinking for speaking is the encoding of motion events.[1] This is a semantic domain that is important in all languages, and it is one that exhibits distinctive types of lexicalization patterns crosslinguistically. The essence of a motion event is change of location – in Talmy's terms, ***path***. Following Talmy (1991, 2000), languages tend to encode the path of motion in one of two ways: either in a verb ('enter', 'exit', etc.) or in an associated particle or 'satellite' ('in', 'out'). A simple example is provided by English and French:

(1) (a) The dog went ***in***to the house.
(b) *Le chien est **entré** dans la maison.*
'The dog ***entered*** the house.'[2]

English 'frames' path by means of a satellite (*in*); French 'frames' path by means of a verb (*entrer*). English is a 'satellite-framed' language (S-language); French is a 'verb-framed' language (V-language). Path is highly codable in both languages. However, the languages differ in codability with regard to another dimension of motion events – ***manner*** of motion:

(2) (a) The dog ***ran*** into the house.
(b) *Le chien est entré dans la maison* ***en courant***.
'The dog entered the house ***by running***.'

Manner is highly codable in English, because it is carried by the main verb. Every clause requires a verb, and it is just as easy to say *go in* as *run in*. I will argue that English-speakers get manner 'for free,' and make widespread communicative and cognitive use of this dimension. In French, by contrast, manner is an adjunct – an optional addition to a clause that is already complete. French-speakers indicate manner when it is at issue, but otherwise do not mention it. I will try to show that, as a consequence, they are less sensitive to this dimension overall.

The typological distinction between S- and V-languages is quite widespread, apparently independent of language family, geographical area, and culture. In the research summarized here, the two types of language are represented by the following sample:

Satellite-framed (S-languages)
Germanic: Dutch, English, German, Icelandic, Swedish, Yiddish
Slavic: Polish, Russian, Serbo-Croatian, Ukrainian
Finno-Ugric: Finnish, Hungarian
Sino-Tibetan: Mandarin Chinese

Verb-framed (V-languages)
Romance: French, Galician, Italian, Portuguese, Spanish
Semitic: Moroccan Arabic, Hebrew
Turkic: Turkish
Basque
Japanese

Signed languages: American Sign Language, Sign Language of the Netherlands

The claims made for English and French above hold for all of these languages (except for signed languages, where path and manner are expressed simultaneously, and both dimensions appear to be accessible and cognitively salient). S-languages allow for an economical expression of manner of motion in the main verb of a clause. Apparently as a consequence, these languages make habitual use of manner verbs when encoding motion events, and have developed large lexicons with many fine-grained distinctions of manner, in comparison with smaller and less differentiated manner lexicons in V-languages. One can say that the semantic space of manner of motion is 'highly saturated' in S-languages, in comparison with V-languages. For example, French *bondir* doesn't distinguish between the manners of motion encoded in English by *jump, leap, bound, spring, skip, gambol*; Spanish *escabullirse* can be translated as *creep, glide, slide, slip, slither*. A detailed study of 115 English manner-of-motion verbs found only 79 French counterparts, many of them of low frequency in comparison with English manner verbs (Jovanović & Kentfield, 1998). By contrast, a similar study of Russian and English showed these two S-languages to be comparably saturated on this dimension (Dukhovny & Kaushanskaya, 1998).

On the basis of comparing a number of S- and V-languages, across a range of age and discourse types, I hypothesize a set of cognitive consequences of differential encoding of manner of motion:

If a language provides fine-grained, habitual, and economical expression of manner of motion:

- References to manner of motion will occur frequently, across genres and discourse contexts.
- Manner-of-motion verbs will be acquired early.
- The language will have continuing lexical innovation in this domain, including extended and metaphorical uses.
- Speakers will have rich mental imagery of manner of motion.
- Manner of motion will be salient in memory for events and in verbal accounts of events.

In brief, the proposal is that habitual, online attention to manner has made it especially salient in S-language speakers' conceptualizations of motion events.

2.1 Salience of manner of motion

Languages of both types, satellite- and verb-framed, have verbs of manner of motion, but we have already seen that V-languages tend to have fewer such verbs. In addition, such verbs occur less frequently in speech and writing in V-languages. (For convenience, these verbs will be referred to simply as 'manner verbs' from here on.) Greater frequency of use of terms that encode a semantic domain probably indicates that the domain is salient and conceptually articulated in the minds of speakers. Various sorts of evidence point to this conclusion, and I will schematically summarize findings from a range of published and unpublished studies.[3]

2.1.1 *Ease of lexical access*

When asked to list manner verbs in a one-minute time frame, English speakers listed far more verbs than French speakers, both in terms of tokens per individual and types per group of informants. In addition, French speakers found it hard to limit themselves to manner verbs, listing non-manner verbs such as *descendre* 'descend, go down' and *traverser* 'cross, traverse'; English speakers showed no such intrusions. Furthermore, when English speakers were asked to list ***all*** types of motion verbs, only 13% were non-manner verbs. Many of the manner verbs that were listed are highly expressive, making fine-grained distinctions that are often not present in V-languages. For example, the following verbs were provided five or more times by a group of 70 Berkeley undergraduates: *crawl, dance, drive, fly, hop, jog, jump, leap, mosey, prance, run, saunter, shuffle, skip, sprint, walk*. Overall, this group produced 107 different manner verbs.[4] As shown in footnote 4, these verbs are sufficiently accessible to be elicited in one minute, indicating that the underlying concepts are readily available to English speakers. Such results indicate that manner of motion is a salient lexical domain for English speakers.[5]

2.1.2 *Conversational use*

Similar crosslinguistic differences in attention to manner appear in spontaneous conversation. Intransitive verbs of human motion were checked in two-hour transcripts of conversations in Spanish and Turkish, both V-languages. The vast majority of verbs were simple path verbs, with no manner (97% of tokens in Spanish, 98% in Turkish). In both languages, the only manner verbs used were equivalents of *walk* (*caminar* and *pasear* in Spanish; *yürümek* in Turkish). In comparable British and American samples, 34 types of manner verbs were used, again indicating the salience of manner in English.[6]

2.1.3 *Use in oral narrative*

Narratives have been elicited in a large number of languages, from ages 3 through adulthood, using a wordless picture book, *Frog, where are you?* (Mayer, 1969). (Research on 'the frog story' in five languages is summarized in Berman and Slobin [1994].) Using this method, semantic content and plot structure are controlled across languages and ages. Again, S-language speakers – at all ages – use manner verbs more frequently (tokens) and with greater lexical diversity (types). For example, consider data from three unrelated V-languages – Spanish, Turkish, and Hebrew, in comparison with three different S-languages – English, Mandarin, and Russian (Hsiao, 1999; Özçalışkan & Slobin, 1999). Narrators were children in the age range 3– 11 and adults. The figures show the proportion of manner verbs out of all motion verbs in the narratives, followed by the mean number of manner verbs used by adults.

LANGUAGE	PERCENTAGE OF MANNER VERB USE (ALL AGES COMBINED)	MEAN NUMBER OF MANNER VERBS PER NARRATOR (ADULTS)
V-languages		
Spanish	20%	3
Turkish	25%	4
Hebrew	30%	4
S-languages		
English	45%	7
Mandarin	62%	11
Russian	69%	16

Although there are differences within the two typological groups, it is clear that S-language speakers use manner verbs more frequently when describing events in the frog story. It is possible to talk about manner of movement in all of these languages, but apparently this dimension is a more regular part of thinking for speaking in S-languages.

2.1.4 Use in written narrative

Thinking for writing. The same patterns of attention to manner in S- and V-languages are found in novels across a range of languages. One might assume that writers of creative fiction would be relatively free of the sorts of linguistic constraints presented by typological differences in lexicalization patterns. Yet attention to manner of motion varies regularly with the type of language, apparently independent of obvious cultural factors of literary tradition and areal contact. In ongoing studies of 'thinking for writing,' my students and I have been examining novels written in several V-languages – Spanish, French, Turkish, Hebrew – in comparison with S-language novels in English, German, and Russian. Overall, S-language novels have greater type and token frequencies of manner verbs in situations in which human movement is described.

For example, the following figures show the rates of use of manner verbs in describing self-motion of characters in novels in several languages. Percentages show the proportion of verbs of human movement that are manner verbs.[7]

LANGUAGE	MANNER VERB USE
V-languages	
Spanish	19%
Turkish	21%
S-languages	
English	41%
Russian	56%

One might think that novelists in V-languages would have recourse to other means of drawing attention to manner of movement, in addition to manner verbs. Consider, for example, adverbs of manner (*slowly, quietly*); descriptions of motor behavior and body condition (*not looking where he went*; *sweating heavily and exhausted*); descriptions of inner states (*agitated, joyful*); descriptions of environmental conditions that affect manner of movement (*the snow was thick; the road was muddy*). To be sure, novelists do use such additional means of providing information about manner of movement. But even when all of these options are considered, the large relative differences between the two language types remain unchanged. S-language writers, overall, give their readers more information – explicit and inferential – about the manners in which their protagonists move about (Özçalışkan & Slobin, 2000c).

Thinking for translating. Translators working between the two language types face problems in dealing with manner. For example, in a sample of novels translated from English into Spanish, only 62% of the original English manner verbs appeared in the translation, while in translations from Spanish to English, 95% of the original Spanish manner verbs were retained (Slobin, 1996b, plus more recent data).[8] In fact, English translators generally ***add*** manner descriptions, apparently finding the Spanish original too bland for English readers: 100% of Spanish non-manner motion verbs were replaced by manner verbs in English translations.

Compare the following solutions to translation problems in the two directions:

(3) (a) ENGLISH TO SPANISH:
He ***stomped*** from the trim house…
Salió *de la pulcra casa…*
['He ***exited*** from the trim house…']

(b) SPANISH TO ENGLISH:
…luego de diez minutos de asfixia y empujones, ***llegamos*** *al pasillo de la entrada*
'…after ten minutes of asphyxiation and pushes, ***we arrived*** at the entry-way'
…after ten minutes of nearly being smothered or crushed to death, we finally ***fought our way*** to the exit

These examples are typical of translations between English and Spanish, as well as translations between English and Turkish – quite a different sort of language, but demonstrating the same V-language characteristics. Note that in (3b) the English translator has added not only manner of motion (*llegar* 'arrive' → *fight one's way*), but has also increased the vividness of the description overall (*asfixia y empujones* 'asphyxiation and pushes' → *nearly being smothered or crushed to death*). This is not a whim of an individual translator, but rather a quite general interest in manners of action in S-languages. Consider, for example, English verbs of manner of speaking (*whisper, murmur, scream, yell, shout, bellow…*) or verbs of manner of object destruction (*shatter, crumble, crumple, rip, shred, smash…*). More broadly, there may be thinking-for speaking effects across a number of domains, reflecting widespread attention to manner of acting – at least in English, and probably in other S-languages as well.

2.1.5 Building semantic domains in acquisition

Roger Brown (1958), in describing early lexical acquisition, aptly referred to words as 'lures to cognition.' In the 'Original Word Game,' the child 'must discover the stimulus attributes governing the tutor's verbal behavior' (p. 210). Melissa Bowerman has long argued that language guides the child to form language-specific semantic categories:

> I argue that children are prepared from the beginning to accept linguistic guidance as to which distinctions – from among the set of distinctions that are salient to them – they should rely on in organizing particular domains of meaning. (Bowerman, 1985, p. 1285)

With regard to manner of motion, the two language types differ in drawing the child's attention to this domain overall, as well as to semantic distinctions within the domain. In acquiring an S-language, in contrast to a V-language, the child has to pay attention to semantic dimensions that distinguish the many types of manner verbs that are encountered in the input. Children learning S-languages employ a large manner verb lexicon in the preschool period. For example, British, American, and Australian preschoolers (age 2–5) in the available CHILDES corpora for English use the following 34 types of verbs of manner of self-movement: *bump, chase, climb, crawl, creep, dance, float, flop, fly, hike, hop, jog, jump, march, paddle, pounce, race, roll, run, rush, scoot, skip, slide, slip, sneak, step, swim, tread, trip, trot, walk, wiggle*. By contrast, Spanish, French, and Italian preschoolers in CHILDES corpora use a limited set of such verbs, almost all of them relatively 'non-expressive' in relation to English – mainly the equivalents of *climb, dance, fly, jump, run, swim, walk* (Chouinard, 1997; Mucetti, 1997). That is, while S-language children are learning to distinguish expressive nuances of manner – such as *hop* versus *jump*, or *hike, jog, race, run, trot* – V-language children are learning broad categories of basic types of motor patterns, such as *run* versus *walk*. As a consequence, it seems reasonable to conclude that S-language children have been guided by their native language to pay attention to manner of motion and to construct a set of systematic semantic categories in this domain.

This conclusion is echoed by Levelt, who has written about the development of the Conceptualizer and the Formulator in childhood:

> In learning the language, the speaker (the child) must surely have realized that the language requires him to attend to certain perceptual or conceptual features when he encodes a message. … But although conceptualizing and grammatical encoding ***are*** interacting for the language-acquiring child, the mature speaker has learned what to encode when preparing a message for expression. He knows by experience whether his language requires a category of medial proximity, number, tense, object shape, or whatever is needed, and he will select the appropriate information in building his preverbal messages. It is no longer necessary for the Conceptualizer to ask the Formulator at each occasion what it likes as input. … The language-specific requirements on semantic structure have become represented in the Conceptualizer's procedural knowledge base. (Levelt, 1989, pp. 104–105)

Thus the child begins by 'listening (and watching) for understanding,' gradually learning to think for speaking. In the end, thinking for speaking becomes automatized, yet still relative to the particular language. Language-specific patterns can be established quite early, as shown in the work by Choi and Bowerman (1991) on very young children's differing spatial concepts in Korean and English, as well as in the frog-story research, where differences in narrative style between speakers of S- and V-languages are clearly present in the preschool period.[9]

Note, also, that both the lexicon and the grammar are at play in thinking for speaking, although traditional Whorf-Sapir discussions focus on obligatory grammatical distinctions. Gumperz and Levinson (1996) underline the cognitive effects of acquiring both systems of language:

> [I]f one is to speak a language which makes certain distinctions obligatory, one simply ***must*** have categorized experience in appropriate ways (i.e., have noticed how states or events were structured on the relevant parameters) (p. 33). … [T]he lexical level can also have deep cognitive effects, by requiring distinctions to be noticed and memorized at the time of experience, in case the need arises for later description. (p. 11)

We will return to the latter point, which leads from thinking for ***present*** speaking to thinking for ***potential*** speaking. But first, there are several more indications of the salience of manner of motion in S-languages.

2.1.6 Innovative and expressive uses of manner-of-motion verbs

The history of English verbs shows that manner of motion was already an elaborated semantic domain in Old English, with many new verbs being added ever since. For example, the *Oxford English Dictionary* lists the following as intransitive verbs of human motion that were innovated in the 19th century: *barge, clomp, cruise, dodder, drag oneself, ease, goose-step, hustle, leapfrog, lope, lunge, lurch, mosey, meander, race, sashay, scoot, scurry, skitter, smash, stampede, stomp, waltz, zip*. Clearly, this is a domain that continually attracts the attention of English speakers.

It is also a domain that plays an important role in reporting events – in the news media, novels, and conversations. Newspapers in English-speaking countries make use of such verbs for vivid reporting, such as the following examples:

(4) 'Sometimes the gunfire drives them to ***flee*** again, ***crawling*** under the coiled wire at the back of the compound and ***scaling*** the hillside in search of some other place to hide.' (*New York Times*)

(5) 'Although there have been thousands of aftershocks, yesterday's was big enough to send frightened people ***scurrying*** out of their homes to safe, open spaces.' (*San Francisco Chronicle*)

Not only are manner verbs used to provide graphic descriptions of motion, but they also serve to provide evaluations of the person who is moving, as in the following examples:

(6) 'Solomon Moss had never applied for a loan before and he had no idea of what to expect when he walked into Louhen's Quick Cash here. He bit his lip, ***waltzed*** up to the counter and asked to borrow $100.' (*Washington Post*)

(7) 'Dalia Itzik [Labor Party member of the Knesset], who wore a short, tight, very secular suit … ***sashayed*** past.' (*New York Times*)

In these examples, the writer uses manner verbs to call forth particular images of moving figures, relying on the reader to access a conceptualization of the type of motion suggested – and thereby an evaluation of the moving figure as well. It is also common to use the manner-verb lexicon metaphorically, to add an evaluative dimension to descriptions of various sorts of nonliteral motion and change of state. For example, two countries are reported as '***shambling*** into a confrontation'; a political campaign '***stumbles*** on roadblocks'; prices can '***drift***,' '***soar***,' '***lurch***,' or '***plunge***.' The force dynamics of bodily movement serve as metaphors for political and economic events (Narayanan, 1997), drawing upon fine-grained categories established in the minds of S-language speakers. Similar expressive and metaphorical uses of manner verbs are found in news reports and novels in other S-languages, such as Mandarin (Yu, 1998) and Dutch; however, they are relatively infrequent in Turkish (Özçalışkan, in preparation) and other V-languages.

2.1.7 Mental imagery

Such differences in extended uses of manner verbs suggest another online cognitive effect of language, which we might call 'reading/listening for imaging.' Most experimental research on linguistic relativity has dealt with language ***production***, but many conceptual effects of language occur in the course of ***reception***. We receive a great deal of our information about events through news reports, personal narratives, and hearsay. In all of these situations, verbal cues alone provide information for building up a mental representation of the event in question. Users of S-languages are habitually exposed to more elaborate and vivid descriptions of motion – actual and metaphorical. And it may well be that their mental imagery for described events – in comparison with users of V-languages – contains more information about manners of movement and change of state, along with the evaluative conclusions that can be drawn from such information.

Suggestive evidence for this proposal comes from reading accounts of the same event in newspapers written in different languages. For example, it is my impression that events reported in English and Dutch seem to be more active, dynamic, or violent than reports of the same events in French, Spanish, or Turkish. These impressions have been confirmed by native speakers of those languages. For example, compare the following three reports of an attempt by French troops to block a Greenpeace demonstration against a French nuclear test in the Pacific:

(8) ENGLISH: 'Squads of troops … ***stormed*** the Greenpeace flagship Rainbow Warrior… 15 commandos ***clambered*** on board… Greenpeace defied warnings not to ***breach*** the 12-mile exclusion zone to ***power*** across the lagoon in Greenpeace dinghies.' (*The Guardian* [London])

(9) FRENCH: '*Les commandos de marine* ***arraisonnent*** *le Rainbow Warrior… Le Rainbow Warrior est passé à la offensive dès l'aube,* ***franchissant*** *la limite des eaux territoriales françaises…*'
'The marine commandos ***took control of*** the Rainbow Warrior… The Rainbow Warrior switched over to the offensive at dawn, ***crossing*** the limits of French territorial waters…' (*Le Figaro* [Paris])

(10) SPANISH: *'Pero cada vez que una embarcación se atreve a* ***atravesar*** *la zona de exclusion…'*
'But each time that an embarkation dares to ***cross*** the exclusion zone…' (*ABC* [Madrid])

While all changes of location are given with manner verbs in English (*storm, clamber, breach, power*), the two Romance languages use only path verbs ('board', 'cross'), and devote less attention to movement overall. These differences hold up across a sample of news stories in these languages.

A small experiment (Slobin, 2000) has begun to confirm the impression that there are major differences in mental imagery between speakers of S- and V-languages. I gave English and Spanish speakers passages to read from novels, later asking them to report mental imagery for the protagonist's manner of movement. The examples were from Spanish novels, in which manner verbs were not used, but in which the author had provided information about the nature of the terrain and the protagonist's inner state, allowing for inferences of manner. English speakers were given literal translations of the Spanish texts. For example, in a selection from Isabel Allende's *La casa de los espíritus* (*The house of the spirits*), the following information was provided as part of a long paragraph:

(11) SPANISH ORIGINAL: '*Tomó sus maletas y echó a* ***andar por el barrial y las piedras de un sendero*** *que conducía al pueblo.* ***Caminó*** *más de diez minutos, agradecido de que no lloviera, porque* ***a duras penas podía avanzar con sus pesadas maletas*** *porese camino y comprendió que la lluvia lo habría convertido en pocos segundos en un lodazal intransitable.*'

ENGLISH VERSION: 'He picked up his bags and started to ***walk through the mud and stones of a path*** that led to the town. He ***walked*** for more than ten minutes, grateful that it was not raining, because ***it was only with difficulty that he was able to advance along the path with his heavy suitcases***, and he realized that the rain would have converted it in a few seconds into an impassable mudhole.'

Not surprisingly, almost all English speakers reported mental imagery for the manner in which the protagonist moved, using manner verbs such as *stagger, stumble, trudge*, as well as more elaborate descriptions, such as: 'he dodges occasional hazards in the trail'; 'he rocks from side to side'; and 'slowly edges his way down the trail.' Surprisingly, only a handful of Spanish speakers from Mexico, Chile, and Spain provided such reports. The vast majority reported little or no imagery of the manner of the protagonist's movement, although they had clear images of the muddy, stony path and the physical surroundings of the scene. They reported having seen a series of static images or still pictures ('more like photographs'). Bilinguals tested in both languages systematically reported more mental imagery for manner of motion, and less for physical surroundings, when reading in English, in comparison with Spanish.

2.2 Salience of paths and landmarks

The differences between S- and V-languages are also reflected in relative attention to path segments and landmarks – that is, sources, goals, and other objects encountered along a trajectory (Slobin, 1997). I will not summarize these patterns here, but will simply emphasize that lexicalization patterns play a role in determining the degree of attention to ***all*** event components, resulting in specific forms of narrative style and mental imagery that characterize event descriptions in the two language types. Briefly, V-language narratives are more concerned with establishing the physical and emotional settings in which people move, often allowing both path and manner to be inferred, whereas S-language narratives attend to both manner of movement and successive path segments. As one consequence, it seems that V-language speakers conceive of manners of motion as activities that take place in specified geographical regions, while S-language speakers 'seem to conceive of manner and directed motion as ***a single conceptual event***, making it difficult to have a mental image of one without the other' (Ohara, 2000; Slobin, 2000, p. 132).

2.3 Language and thought online in the domain of motion events

To summarize, a large collection of different kinds of data strongly suggests that users of S- and V-languages attend differently to the components of motion events while producing or interpreting linguistic communications about motion. For S-language speakers, manner is an inherent component of directed motion along a path, and the semantic space of manner is highly differentiated. For V-language speakers, manner is much less salient and attention is focused on changes of location and the settings in which motion occurs. The determining linguistic factor seems to be the availability of a main-verb slot for manner verbs in S-languages, in contrast to a main-verb slot for path verbs in V-languages.[10] S-language speakers are thereby habituated to making frequent online decisions about the type of manner involved in motion events. A number of phenomena indicate that manner is a salient and differentiated conceptual field for such speakers, in comparison with speakers of V-languages. In summary, for S-language speakers:

- Manner verbs are easily accessed in a listing task.
- Manner verbs are frequently used in conversation, oral narrative, and written narrative.
- Speakers readily access many different types of manner verbs, attending to fine-grained distinctions between similar manners of movement.
- A large portion of the manner-verb lexicon is used in the preschool period, requiring learners to differentiate between types of manner.
- Meanings of manner verbs are readily extended for purposes of evaluation and metaphorical descriptions of events and processes.
- Listeners and readers tend to build up detailed mental images of manner of movement in reported events.

3 Spatial descriptions

Similar evidence of linguistic influences on online attention is provided by the rich collection of studies of spatial relations carried out by members of the Cognitive Anthropology Research Group of the Max Planck Institute for Psycholinguistics in Nijmegen (e.g., Levinson, 1996a, 1996b; Pederson et al., 1998). One component of this research distinguishes between languages that rely on ***relative*** versus ***absolute*** orientation in describing locations of objects. Relative systems are familiar to speakers of European languages: we tend to locate objects by reference to the position and orientation of the viewer of a scene (e.g., 'to the left of the house,' 'in front of the tree'). In absolute systems, reference is made to a fixed bearing, such as compass points or landscape features (e.g., 'west of the house,' 'north of the tree').[11] Perhaps a third of the world's languages use absolute systems, in which, for example, one would say, 'There's a rabbit north of the tree', or 'seaward from the tree', rather than 'behind the tree'. In order to use an absolute system, you always have to know where you are in relation to the fixed external referent points. That is, online production and interpretation of utterances requires attention to those points, and users of such languages must constantly update their locations accordingly. This is perhaps one of the most powerful thinking-for-speaking effects that has been demonstrated. Even when you are in a windowless room, or traveling in a bus in the dark, you must know your location relative to the fixed points in order to talk about events and locations.[12] As we will see, online attention of this sort also has consequence for cognitive processes that occur outside of acts of speaking or understanding.

4 Memory for reported events

It is unlikely that people experience events in their lives differently because of the language they speak. But events quickly become part of a personal narrative, and then language can begin to shape those memories. As pointed out above, many of the events that we remember were encountered ***only*** through narrative – that is, human beings are voracious producers and consumers of news and stories. The mental representations that are built up in the process of 'listening/reading for understanding' are likely to bear the traces of the language in which the event was reported, giving rise to effects such as those in the mental imagery experiment. It has long been known that verbal instructions and questions can influence recall, as shown most dramatically in research on eyewitness testimony (e.g., Loftus, 1979). In fact, people can have vivid memories of events that they had experienced only in the form of a verbal account. Piaget provided a particularly graphic case of what he called 'memories which depend on other people' (1962, pp. 187–188). He described a vivid and detailed childhood memory in which his nurse had prevented a man from kidnapping him. However, when he was 15, the nurse confessed that she had made up the story of the kidnap attempt. Piaget concluded: 'I therefore must have heard, as a child, the account of this story, which my parents believed, and projected it into the past in the form a visual memory, which was a memory of a memory, but false. Many real memories are doubtless of the same order.' Research on 'source monitoring' by Marcia Johnson and her collaborators (e.g., Johnson, Hashtroudi, & Lindsay, 1993) provides a detailed picture of the factors that determine people's ability to assess the sources of their memories, knowledge, and beliefs. As Johnson et al. point out (p. 13): 'Movies, television, books, magazines, newspapers – all are sources of fictional information that may, under some circumstances, be treated as reliable information.' It is quite likely that the language in which information is presented – both fictional and documentary – plays a role in the ways in which information is stored and evaluated. However, we still lack crosslinguistic research on such issues as eyewitness testimony and source monitoring, so the question of linguistic relativity in memory for reported events remains open.

5 Memory for events for later reporting

In order to report an event you must have paid attention to linguistically-relevant components of that event while you experienced it. At first glance, this seems trivially obvious. When you report an encounter with a friend in a language with gender pronouns, you must have remembered the sex of the friend. But, of course, you would remember that aspect regardless of your language. However, when reporting an encounter in English, you may not remember if your friend approached you from the South, or in the direction of a distant landmark such as a mountain or the sea, as you would if you spoke a language that required this sort of absolute orientation. That is, you can only include those elements in the verbal account that you noticed while experiencing the reported situation. As Gumperz and Levinson have pointed out (1996, p. 27): '…thinking in a special way for speaking will not be enough. We must mentally encode experiences in such a way that we can describe them later, in the terms required by our language.' Thus, those event components which must be attended to in thinking for speaking must also be mentally stored for future speaking. As noted earlier, thinking for ***present*** speaking becomes part of ***potential*** speaking. Here we have evidence for the classical Whorfian quest for covert effects of language on nonverbal cognition. The Nijmegen research has rigorously demonstrated such effects in a large number of nonlinguistic tasks, carried out across a range of linguistic and cultural communities. Pederson et al. make this point forcefully:

> Far more than developing simple habituation, use of the linguistic system, we suggest, actually forces the speaker to make computations he or she might otherwise not make. Any particular experience might need to be later described, and many are. Accordingly many experiences must be remembered in such a way as to facilitate this. Since it seems, based on our findings, that the different frames of reference cannot be readily translated, we must represent our spatial memories in a manner specific to the socially normal means of expression. That is, the linguistic system is far more than just an ***available*** pattern for creating internal representations: to learn to speak a language successfully ***requires*** speakers to develop an appropriate mental representation which is then available for nonlinguistic purposes. (Pederson et al., 1998, p. 586)

6 A framework for thinking-for-speaking research[13]

Spatial conceptualization has provided a rich arena for research on possible linguistic effects on online thinking and memory. Space turns out to be a domain that can be construed in quite different ways in different languages, although there are clearly underlying universals. Temporality is another such domain. For example, frog-story research shows different patterns of attention to such temporal factors as duration, boundedness, and simultaneity (Aksu-Koç & von Stutterheim, 1994; Slobin, 1996a). We have yet to determine the range and types of domains that are susceptible to online linguistic shaping of the sort proposed here. Diversity in linguistic coding provides the basic data for speculations about relativity, and habitual use of linguistic forms (see Fuchs & Robert, 1997). That is, in the online tasks of producing and interpreting messages, attention is directed to the necessary analysis and categorization of experience. Most of the data presented in this paper rely on an inferential argument: Speakers of typologically different languages vary in their linguistic construals of events, across a wide range of situations of language use. There seem to be quite clear differences in habitual ways of talking about the sorts of events that all human beings experience and care about. More elusive have been clear demonstrations that these sorts of online attention may also have long-term and pervasive effects on mental representation and conceptual processes. The most successful attempts, thus far, come from research on absolute orientation (Pederson et al., 1998), number (Lucy, 1992), deixis (Bickel, 2000;

Danziger, 1994; Hanks, 1990, 1996), and motion (summarized in this paper). What is needed for a full picture of linguistic relativity and determinism is systematic exploration of areas of mental life in which thinking for speaking can be demonstrated as having effects on how people experience those events that they are likely to talk about later ('anticipatory effects'), matched with demonstrations of cognitive effects after events have been experienced ('consequential effects'). Schematically, there are three time frames that must be considered in a full research program.

- **EXPERIENCE TIME:** This is the time of prelinguistic or nonlinguistic coding, when ***anticipatory effects*** of language may play a role. That is, the individual must attend to those event dimensions that are relevant for linguistic coding.

- **SPEAKING TIME:** This is the time of ***thinking for speaking*** and ***listening for understanding*** – that is, the time in which linguistically codable dimensions must be accessed and attended to.

- **TESTING TIME:** This is the time for nonlinguistic assessment of attention to codable dimensions – that is, the testing of ***consequential effects***: tests of recall, recognition, and inference.

Crosslinguistic and typological analysis provides us with candidates for research, but the challenge is to select those coded dimensions which are likely to have anticipatory and consequential effects. Only parts of the full scheme have been sketched out, and only with regard to a few domains of experience. However, I have argued here that – while researchers work at filling in the larger picture of anticipatory and consequential effects of language – the effects at speaking time present the critical interface between language and cognition.

7 Speaking, thinking, and cultural practice

The various thinking-for-speaking phenomena summarized in this paper seem to be independent of culture. The division between S-languages and V-languages is based entirely on lexicalization patterns. For example, France and Spain would seem to be closer, culturally, to England and Germany than to Turkey and Japan, yet the findings reported here make the opposite grouping. Similarly, Chinese does not group with Korean and Japanese, but rather with Germanic and Slavic languages with regard to salience of manner of motion. The Nijmegen research on spatial orientation also points to linguistic, rather than cultural determinants. For example, two Mayan languages (Tzeltal, Tzotzil) use absolute orientation, while two other Mayan languages (Mopan, Yucatec) do not. The research also excludes geographical determinism, because the various orientation types are scattered across a range of terrains. For example, Belhare, spoken in the Himalayas, has a different spatial system than Swiss German, spoken in the Alps (Bickel, 2000).

Examples such as these are methodologically appealing, in that they make it possible, to some extent, to collapse across cultures. However, acts of communication always take place in a cultural context, and cultural practices are part of the online processes that include thinking and speaking. Anyone who has lived in more than one language knows that each language is not only a system for coding objects and events, but is also a system that – in its use – constitutes interpersonal and intrapersonal values, expectations, and dispositions. Susan Ervin-Tripp (Ervin, 1964) has provided a rare empirical demonstration that bilinguals reveal different 'personalities' in using each of their languages – or at least that 'a shift in language [may be] associated with a shift in social roles and emotional attitudes' (p. 506). She gave a personality test (the TAT) to fluent French-English bilinguals. The TAT elicits stories in response to pictures, and subjects told stories about each picture in both French and English. Ervin-Tripp found that bilinguals provided significantly different personality profiles when responding to the same picture in French versus English. For example, French stories showed more withdrawal and autonomy, whereas English stories showed greater need for achievement. Here we go far beyond individual components of a language, finding that use of a language, as a whole, may invoke the cultural norms and practices in which it is embedded.

An important and growing body of work in anthropological linguistics provides more fine-grained demonstrations of ways in which culture and language co-constitute each other in ongoing processes of speaking and engaging in cultural practices. I will cite just a few of many such pathbreaking studies.

Hanks has studied ***deixis***, writing a book with a title that provides a clear picture of the approach: *Referential practice: Language and lived space among the Maya* (1990). Using both linguistic and ethnographic data, he shows that:

> Maya deixis is related in basic and very significant ways to a range of other orientational systems in the Maya world. These include cultural understandings of the human body, the social organization of the household and domestic space, cardinal point orientation, agricultural practices whereby the land is transformed and goods produced, and the ritual enactments corresponding to all of the foregoing. (Hanks, 1990, p. 8)

Bickel (1997, 2000), working on deixis in a quite different linguistic and cultural context, also deals with 'the grammar of space and sociocultural practice' (2000, p. 176). He documents grammaticization of spatial deixis throughout Belhare grammar, as well as demonstrating central roles of spatial location and orientation in a range of cultural practices, including design of houses and social relations. Bickel notes that thinking-for-speaking phenomena should not be sought in individual minds alone:

> Correlations between language and cognition often attest to a unidirectional link from public language to private thinking. Correlations between linguistic and cultural patterns, however, suggest mutual influence, since both speaking and social behavior are publicly shared activities that are transmitted across

> generations. Thus, language and nonlinguistic practice together construct a relativized cognitive ground. From this perspective, Whorfian effects do not obtain between modules of isolated minds, but are fundamentally embedded in a *habitus* of public practice. (Bickel, 2000, p. 185)

Danziger (1996) shows that the Mopan Maya use similar frames of reference in spatial language and kinship relations. She points out that particular grammatical structures apply to both domains, emphasizing that 'the experience of using language in social interaction therefore helps to engender culturally-specific modes of thinking' (p. 67). That is, thinking for speaking in similar fashion across domains – spatial and cultural – reinforces habitual ways of thinking about relations in general.

Finally, John Gumperz (e.g., 1982, 1996) has long argued that uses of specific linguistic forms in conversation serve as contextualization cues to the presuppositions and ideologies that are inherent in any conversational exchange. He and Levinson conclude: 'It follows that we cannot think of a 'world-view' as inherent in a language, somehow detached from all the practices established for its use' (Gumperz & Levinson, 1996, p. 230).

The attempt to find thinking-for-speaking effects of particular linguistic forms is thus part of a much larger framework of online communication, negotiation, and action. What all of these processes have in common, however, is that they are ***processes*** – that is, they unfold in time and are shaped in use. It is difficult, in a language like English, to conceptualize dynamic interactions of ever-changing forces that nevertheless exhibit distinct patterns. In fact, note that all of the available terms seem to be nouns. With effort, we may be able to go beyond this sort of English speaking for thinking, as we attempt to develop dynamic models of 'language, thought, and culture.'

Notes

1 I have presented thinking-for-speaking data on motion events in a number of places, and only give schematized findings here. More detailed discussion of data on manner of movement can be found in Slobin (2000); discussion of path and landmarks is in Slobin (1997); child language data are in Berman and Slobin (1994). A full list of references includes: Batra, 2001; Chouinard, 1997; Dukhovny & Kaushanskaya, 1998; Hsiao, 1999; Jovanović & Kentfield, 1998; Jovanović & Martinović-Zić (in press); Martinović-Zić & Jovanović (in press); Mucetti, 1997; Özçalışkan, 2000, in preparation; Özçalışkan & Slobin, 1999, 2000a, 2000b, 2000c; Slobin, 1987, 1996a, 1996b; Slobin & Hoiting, 1994.

2 The Latinate form of 1b is available in English, but is not the everyday expression. Thinking-for-speaking research is concerned with the habitual means of encoding used by speakers of a language.

3 Where there is no citation to a written report, reference is made to unpublished data that I have gathered together with students at Berkeley, along with collaboration with Harriet Jisa in Lyon, France, and Aura Bocaz, in Chile.

4 The following verbs were listed by the students: amble, barge, bike, bounce, bound, canter, caravan, careen, charge, chase, climb, coast, crawl, creep, dance, dart, dash,

dawdle, dive, drag, drift, drive, edge, fall, flit, flitter, float, fly, gallop, glide, hike, hop, hurry, inch, jaunt, jet, jog, jump, leap, limp, lollygap, lope, march, meander, mosey, pace, pedal, plod, pony, prance, promenade, race, ramble, ride, roll, rollerblade, run, rush, sail, sashay, saunter, scale, scamper, scoot, scurry, scuttle, shoot, shuffle, skate, ski, skip, skitter, slide, slink, slip, slither, somersault, speed, spin, sprint, stalk, step, stomp, stride, stroll, strut, stumble, swagger, sweep, swim, swing, thrust, tiptoe, toboggan, traipse, trap, trot, truck, tumble, twirl, waddle, walk, waltz, wander, wiggle, zip, zoom.

5 Similar results come from ongoing research in which speakers are asked to label videoclips of human movement. Thus far, only English data are available (Batra, 2001). For example, a clip of someone moving about in a slow, tired manner elicited the following range of verbs from a group of 26 English speakers: *loaf, meander, mope, pace, saunter, slouch, slump, stroll, sulk, trudge, walk, wander.* The stimuli are currently being used in Argentina, Spain, and Turkey, eliciting manner verbs in Spanish, Basque, and Turkish – with the expectation that those languages will demonstrate a lower level of lexical diversity than English.

6 The following 34 types of manner verbs were used in English conversations, again indicating the availability of this domain: clamber, climb, crawl, dash, dive, drag oneself, drift, drive, flee, float, flop, fly, glide, hike, jump, leap, march, poke, plunge, run, rush, slide, sneak, stagger, step, stride, stumble, toddle, totter, trot, trudge, walk, wander, zoom.

7 This sample was picked to cut across language families: Romance, Turkic, Germanic, Slavic. From each novel, 20 trajectories were selected at random, defined as a description of the motion of a protagonist from a resting position until coming to rest at a new position where a plot-advancing event takes place. The novels represented in the table are: **Spanish:** Allende, Carpentier, Cela, Donoso, García Márquez, Muñoz Molina, Rulfo, Sabato, Vargas Llosa; **Turkish:** Atay, Başar, Fürüzan, Karasu, O. Kemal, Y. Kemal, Livaneli, Pamuk, Tekin; **English:** Anaya, Byatt, Derbyshire, du Maurier, Fowles, Hemingway, Lessing, McCullers, Steinbeck; **Russian:** Aksenov, Dostoevskij, Gorbunov, Gorkij, Neznanskij, Vainers.

8 The English novels were: Anaya, Fowles, Hemingway, Lessing, McCullers, Steinbeck; the Spanish novels were: Allende, Cela, Donoso, García Márquez, Sabato, and Vargas Llosa. Similar patterns appear in a smaller sample of translations between English (Hemingway, McCullers, Steinbeck) and Turkish (Karasu, Kemal, Pamuk): 68% of English manner verbs were retained in Turkish translation, while 80% of Turkish manner verbs were retained in English translation. English translators, working from either Spanish or Turkish originals, often replaced V-language manner verbs with more expressive or dynamic manner verbs in English (47% of translated manner verbs from Spanish, 35% of translated manner verbs from Turkish); by contrast, Spanish and Turkish translators never amplified English manner verbs in translation. Similar findings are related for a sample of Spanish translations of 50 novels written in English (Mora Gutiérrez, 1998). In brief, translations into English 'up the ante' for manner expression, while translations out of English reduce the level of manner description.

9 In related research, Naigles and co-workers are finding evidence for typological preferences in the learning of new words in experimental contexts. English- and Spanish-speaking adults were presented with novel motion verbs in situations in which the verb could refer to either path or manner of motion. Naigles and Terrazas (1998) found that English speakers were more likely to attribute manner meanings, while Spanish speakers were more likely to attribute path meanings. Hohenstein and Naigles (2000)

have replicated these findings for monolingual English- and Spanish-speaking 7-year-olds (but not for 3-year-olds). These findings suggest that, in learning a language, the child develops expectations about the dominant lexicalization patterns of the language, and uses these expectations as the basis of acquiring the meanings of new lexical items. Naigles et al. (1998, p. 547) suggest that language-specific lexicalization patterns should enable children 'to *fast-map*, or quickly and accurately associate a new verb with its meaning.'

10 This is somewhat of a simplification, because manner verbs are allowed for some kinds of path descriptions in V-languages, while excluded from paths that cross a boundary or terminate in a change of state (Aske, 1989; Slobin, 1996b, 1997; Slobin & Hoiting, 1994). What is important for the present argument is that there are no such restrictions on the use of manner verbs in S-languages, resulting in different habitual styles of event description for the two language types.

11 For simplicity of presentation, I omit the third system of spatial description – ***intrinsic*** orientation – which makes use of inherent properties of objects, such as fronts and backs.

12 Similar crosslinguistic, typological differences are reported for the use of ***gestures*** that accompany speech, showing differential attention to relative and absolute spatial relations, according to the type of language spoken, as well as differential attention to manner and path in S- and V-languages (Kita, 2000; Kita, Danziger, & Stolz (in press); Levinson, forthcoming; McNeill, McCullough, & Duncan, forthcoming; Özyürek & Kita, 1999; Özyürek & Özçalışkan, 2000; and chapters in McNeill (2000).

13 This framework was formulated in a discussion at the Max Planck Institute for Psycholinguistics in Nijmegen in 1993. The participants were P. Brown, W. Levelt, S. Levinson, J. Lucy, D. Slobin, and D. Wilkins.

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28 Linguistic selection: an utterance-based evolutionary theory of language change*

William Croft

> There is as far as I am aware no storage or coding mechanism for linguistic transmission equivalent to DNA. (Lass, 1990, p. 96)

> People reject selection models in conceptual change out of hand because they have a simplistic understanding of biological evolution. (Hull, 1988, p. 402)

1 Introduction

The first epigram is taken from Lass' quite valid adaptation (exaptation?) of an important concept in recent evolutionary theory, exaptation, and its application to historical linguistics, that is, linguistic evolution. In the section from which the epigram has been excerpted, however, Lass attempts to distinguish his – reputable – adoption of a concept from biology for use in the theory of linguistic evolution, from other people's – disreputable – efforts to do what seems to be the same thing. Lass writes: 'while claiming that the notion of exaptation seems useful in establishing a name and descriptive framework for a class of historical events, I remain fully aware (even insistent) that languages are not biological systems in any deep sense' (Lass, 1990, p. 96). However, Lass makes a different argument in the following paragraph in his paper. It is not that languages ARE biological systems. It is that languages and biological systems are instances of a more general phenomenon whose essential traits consist of (among other things) a population, variants, survival/extinction of lineages, and selection of individuals. Lass then cites a biologist, Dawkins, whose name will come up again below, in support of this hypothesis.

If so, then it is quite legitimate to address the claim in the first epigram. If Lass' claim (that there is no equivalent of DNA in linguistic evolution) is true, then are linguistic and biological evolution really instances of the same thing? Does DNA play an essential role in the theory of evolution developed by biologists – developed in far greater detail than the theory of language change in linguistics? If so, then the role in evolutionary theory that is played by DNA in biological systems must have a counterpart in linguistic systems. Lass argues against a literal translation: that there is a genetic basis to the phenomena of linguistic evolution; language change does not occur through biological genetic mutation and selection. This should be obvious. But that does not necessarily mean that there is no functional equivalent to DNA in linguistic evolution.

In this paper, I argue that there is an equivalent to DNA in linguistic evolution, and that it is the utterance. Both the existence of an analogue to DNA and the entity I am proposing as the analogue will at first strike most linguists as surprising, and even bizarre. But this is where the second epigram comes in. Hull, a biologist who became a philosopher of science but not without continuing to make contributions to systematics and evolutionary theory, develops a generalized theory of selection which subsumes both biological and conceptual evolution. The theory that Hull describes can be applied to linguistic evolution as well. An essential role in this theory is assigned to a function most typically centered on DNA in biological evolution. I will argue that this function is most typically centered on the production and comprehension of utterances in linguistic evolution. It should be clear from the wording of the preceding sentence that the DNA-utterance analogy is going to be quite indirect – and not the one that Lass rightly rejects. That will, I hope, suffice to allow the reader to read onward with the hope that this idea will bear fruit.

2 The population theory of species

One of the major advances of the so-called 'evolutionary synthesis' is the replacement of the 'essentialist' theory of species by the 'population' theory of species (Dobzhansky, 1937, Mayr, 1942, cited in Hull, 1988, p. 102; see also Mayr, 1982). In the essentialist view, each species has essential structural properties that identify it, and could for instance be used in their taxonomic classification. The essentialist view ran into great problems due to various sorts of structural variation among species, including high degrees of structural variation among individuals in a population and also among different life-stages in an individual in a population (for example, a caterpillar and the butterfly it turns into). Essentialist views also mixed in odd ways with pre-Darwinian theories of evolution. Since the structural properties of an organism were the essence of that species, it was possible for a species to go extinct and in principle 'be reborn': if a new species evolved with the same structural essence as an extinct one, then it would be the same species since it possessed the same essence.

Darwin's evolutionary theory provided the basis for a completely different view of species (though apparently Darwin himself was not entirely clear about this; see Hull, 1988, p. 213, fn. 2). A species consists of a population of interbreeding individuals. This property – interbreeding – is the essential property the individuals have in common. Individuals can vary in enormous ways in physical structure (and behavior), but as long as they form a population in the evolutionary sense, they are members of the same species. This is a radically different view of the species as a conceptual category. The category definition is based on a specific set of individuals, and category membership is defined in terms of how the individuals interact with each other, not by any specific traits associated with all and only the individuals in the category.

A population may split into two or more parts, often through geographical isolation, and no longer interbreed. In fact the two populations may diverge in structure and behavior such they could no longer interbreed even if brought together again. At this point one would say that the original species has split into two daughter species. (I follow Hull, 1988, and Hennigian systematics in general, by assuming the old species no longer exists after such a split, thereby avoiding the problem of deciding which of the daughter species is 'really' the continuation of the parent species. As a preview to what is ahead, note that linguists also give daughter languages different names from the parent language, and generally assume the daughter language is a 'new' language.)

In the population view, a species is a spatiotemporal individual, not an eternal essence. The population is circumscribed by the region in time and space collectively occupied by the individual members of the species. The 'beginning' of a species is defined by its branching off in a speciation process, and its end by either its extinction or its fission into two or more new species in speciation: 'Just as the name 'Gargantua' [an individual gorilla] denotes a particular organism from conception to death, '*Gorilla gorilla*' denotes a particular segment of the phylogenetic tree' (Hull, 1988, p. 215). A species, like an individual organism – or a language – is a historical entity in the population view. In the essentialist view, a species is not a spatiotemporal individual: it is a kind, whose instantiations may be particular individuals, but the kind is not spatiotemporally bounded itself. In the population view, only entities as abstract as 'species [in general]', and certain theoretically defined subpopulations of a species such as 'demes [in general]' or 'geographical races [in general]' are kinds. Any particular species, deme or geographical race is a spatiotemporal individual.

If the population theory of species is distinct from the essentialist theory of species, then one would expect to find cases where there are mismatches in the world between species defined in terms of reproductively isolated populations and species defined in terms of essential structural properties. In fact, this is the case (see e.g. Hull, 1988, p. 104). Sibling species are two reproductively distinct species whose 'essential' structural description overlaps to such an extent that on an essentialist definition, they would be the same species. Polytypic species, on the other hand, are species that are structurally so heterogeneous that an essentialist would be hard put to categorize them as a single species, yet they form an interbreeding population (in terms of gene flow).

It should be clear at this point to anyone who has read an introductory linguistics or sociolinguistics textbook that exactly the same mismatches exist among languages. These are the standard examples of the problem in defining 'language' and 'dialect'. 'Sibling languages' are two linguistic varieties that are structurally so similar that they are considered to be 'dialects of the same language', yet are perceived by the speakers – or at least by one group of speakers – as distinct languages. Examples (of varying degrees of controversiality) include Macedonian and Bulgarian, Danish and Norwegian, Serbian and Croatian (in the past few years), possibly Hindi and Urdu and Russian and Ukrainian, and many instances of neighboring languages in traditional, small, decentralized, nonliterate societies (see for example the discussion in Dixon, 1980, pp. 33–40). In some cases this perception is not reciprocal: many ordinary Bulgarians tend to see Macedonian as a dialect of Bulgarian, and many ordinary Russians see Ukrainian as a dialect of Russian, but the reverse does not hold. Of course, this reflects different perceptions about the social and political separateness of the communities that speak these linguistic varieties.

'Polytypic languages', on the other hand, are linguistic varieties that are structurally so different that linguists would characterize them as different languages, yet their speakers perceive them as dialects of the same language. Examples include the Chinese 'dialects', and many diglossic situations, e.g. the modern Greek H and L varieties and Modern Arabic, or the postcreole continua in for example Jamaica or Guyana. The structural diversity of traditional dialects of English, German, Italian and other western European languages may be instances of a lower degree of polytypy, depending on the degree to which their speakers identify themselves as 'speakers of English, German, etc.', albeit 'substandard' speakers.

The parallels between the definitions of languages and species should be obvious. The linguistic or structural definition of a language – if two varieties share enough structure in common (phonology, grammar or morphosyntax, lexicon), then they should be classified as part of the same language – corresponds to the essentialist definition of a species. Chambers & Trudgill (1980) offer an alternative social definition of language in terms of heteronomous and autonomous varieties: an autonomous variety is perceived by its speakers as a distinct language, no matter how similar it is structurally to some other variety, and a heteronomous variety is perceived by its speakers as being the same language as that of another variety, no matter how structurally distinct those varieties are.

The social definition of language closely corresponds to the population definition of species, although it is based on speaker perceptions rather than actual communicative interaction. The genuine equivalent is that a language, socially defined, is defined by actual communicative interaction. This does not imply that every speaker of a socially-defined language speaks with every other speaker of that language, any more than every organism of a species mates with every other organism of that species in its lifetime (see below); it merely implies that every speaker perceives every other speaker as someone s/he should be able to communicate with by using what they perceive as 'the same language'.

If we pursue an evolutionary theory of language following the lead of the evolutionary theory of biology, then we must take the population, that is, social definition of a language as the basic one. However uncomfortable a structuralist may feel about the social definition of a language, in terms of causal mechanisms of language speciation, choosing the social definition is the right decision. Sibling species are likely to diverge morphologically as their reproductive isolation continues (cf. Hull, 1988, pp. 66–67, discussing Mayr's theory of speciation). Likewise, sibling languages are likely to diverge structurally as their communicative isolation persists. A polytypic species may break up if the gene flow is interrupted, or possibly become more homogeneous or at least maintain itself as a single language. A polytypic language may break up if its social unity is broken – this appears to be what is happening in the distinct modern Arab nations. Or it may survive as a single language as in China, possibly becoming more homogeneous as with the loss of the traditional dialects of western European languages. Social and communicative isolation leads to structural divergence; social and communicative intercourse leads to a maintenance of the status quo, or even convergence (which itself is a result of tighter social cohesion and mobility).

The last two paragraphs have surreptitiously introduced the linguistic equivalent to reproductive isolation: communicative isolation. Linguistic interbreeding is communication – not unlike the notion of 'mutual intelligibility', but defined in terms of actual communicative interaction rather than potential communicative interaction (which is an essentialist concept, based on the structural similarity of the linguistic varieties).

It is worth describing the two other sorts of biological populations mentioned earlier in this section in a little more detail. A species is a population of interbreeding individuals. A geographical race is a subpopulation of a species which is defined geographically, and often has structurally diverged to a slight extent, but presumably not so far as to prevent interbreeding. A deme

> consists of organisms in sufficient proximity to each other that they all have equal probability of mating with each other and producing offspring, provided they are sexually mature, of the opposite sex, and equivalent with respect to sexual selection. To the extent that these conditions are met, the organisms belonging to a deme share in the same gene pool. Of course, in natural populations, some mating occurs between adjacent demes, and not all organisms within a single deme have precisely equal probability of mating, but the isolation between demes is met often enough and well enough for demes to play an important role in biological evolution. (Hull, 1988, p. 433)

These different types of populations are also relevant to the notions of 'language', 'dialect' and 'speech community', defined in terms of communicative interaction and social identity rather than in the essentialist terms of linguistic structure. I have already taken the position that a language should be defined in population terms just as species generally are. A geographical race is a traditional geographical dialect: defined geographically, slightly divergent structurally, but not enough presumably to prevent communication (i.e. intelligibility) or to provide a separate sociolinguistic identity (assuming we are not dealing with sibling languages).

A deme is related to one definition of the complex notion of a speech community. In fact, 'speech community' as it is broadly used is perhaps the linguistic equivalent of a biological population. A speech community can be defined as broadly as all of English, no matter where it is spoken, in an intermediate level such as Hiberno-English, or as narrowly as a particular fairly cohesive social network such as the one analyzed by the Milroys in Belfast (Milroy, 1987). The social network corresponds most closely to a deme: a group of people who are most likely to communicate with each other, and not so much with those outside the network. One can describe the results of the Milroys' research in Belfast quite well by paraphrasing the Hull quote and making the appropriate substitutions of sociolinguistic terms for biological ones:

> a social network consists of speakers in sufficient proximity to each other that they all have equal probability of communicating with each other, if they have some reason to linguistically interact. To the extent that these conditions are met, the speakers belonging to a social network share in the same language. Of

> course, in natural speech communities, some communication occurs between adjacent social networks, and not all individuals within a single social network have precisely equal probability of communicating with each other, but the isolation between social networks is met often enough and well enough for social networks to play an important role in language change.

In fact, there appears to be a parallel between the divergence of languages that are communicatively isolated (usually through migration) and the role of 'founder populations' in speciation. Conversely, maintaining and strengthening communicative interactions appears to hold languages together, or cause convergence in situations such as postcreole continua, just as a high enough degree of interbreeding maintains the integrity of a biological population and the identity of the gene pool shared by the individuals.

The metaphor found in the phrase 'intercourse' (sexual or linguistic) is not an accident. This parallel should make the DNA-utterance equivalence to be introduced in §4 a little more plausible. But first we must review certain recent developments in the theory of selection in biology.

3 The generalized theory of selection

The theory of selection provided by the neo-Darwinian synthesis has been the subject of criticism and modification in recent decades. One criticism directed towards the neo-Darwinian theory of selection is the role of adaptation in selecting individuals in the population. Other mechanisms besides the standard adaptive one have been proposed. One such mechanism is exaptation, which Lass took in his raid on evolutionary theory: some trait which evolved for one purpose, or evolved for no apparent purpose at all, is 'exapted' to serve some other function which bestows a competitive advantage on its possessor (cf. Greenberg's, 1991, 'regrammaticalization' as well as Lass, 1990). This particular application of evolutionary theory to historical linguistics seems quite appropriate, and is another argument for the position that each instantiates a generalized theory of evolution.

We will concern ourselves here with another, perhaps more profound critique of the theory of selection, that concerning the 'unit of selection'. In the standard view, it is the organism that is the 'unit of selection'. Selective processes, of whatever sort, operate on the level of the fitness of the organism. Although it is genetic material that is ultimately replicated and then generates a new organism in reproduction, it is the organism which is ultimately selected in the evolutionary process, by virtue of its (successful or unsuccessful) interaction with its environment.

This view, the 'organism selectionist' view, was challenged by (among others) Dawkins (1976). Dawkins argued that it was the gene itself that was selected for. Selection can be described only in terms of favoring or disfavoring gene frequencies in populations. 'According to Dawkins, in sexually reproducing organisms only short segments of the genetic material have what it takes to be selected. Organisms are simply survival machines constructed by genes to aid them in their single-minded quest for replication' (Hull, 1988, p. 211).

However, the complications do not end there. Others have argued that selection may occur at other levels as well. For instance, it has been argued that selection might occur at the species level, or even at higher taxonomic levels. For example, the geographical range of a higher taxon makes it likelier to survive a mass extinction, no matter how many species are contained in the taxon (Hull, 1988, p. 220, citing Jablonski, 1986, 1987). It has also been suggested that a species may possess a population structure that favors its evolutionary survival. Still worse complications ensue when we abandon our zoöcentric view of evolution and ask ourselves at what level of organization does natural selection operate for cloned groups of plants and single-celled organisms (Hull, 1988, pp. 416–17).

Returning to the gene vs. organism selectionist debate, Hull argues that there has been a convergence in the two approaches as they have refined their positions: 'as Mayr (1978a, p. 52 [an organism selectionist – WAC]) has emphasized tirelessly, 'Evolution through natural selection is (I repeat!) a two-step process'…According to the terminology that Dawkins (1982a, 1982b [a gene selectionist – WAC]) now prefers, evolution is an interplay between replicator survival and vehicle selection' (Hull, 1988, p. 217; see also pp. 412–18). The two steps involve two processes, replication of individuals and selection of individuals through interaction with their environment. However, in the paradigm case, these two individuals are not the same: it is genes that are replicated and organisms that are selected – which ensures the survival of their genes. Hull argues that the debate between gene selectionists and organism selectionists is largely a matter of emphasis as to which process is more important. But both processes are necessary, and it appears that prominent advocates on both sides of the debate accept this.

Hull himself has contributed to this debate. He borrows the term 'replicator' from Dawkins and chooses a different term, 'interactor', from Dawkins' term 'vehicle' (which Hull believes renders the role of the interactor more passive than it actually is, and is a consequence of Dawkins' gene selectionist bias). From this, Hull constructs a general analysis of selection processes which he also applies to conceptual evolution. The basic components of Hull's theory of selection are quoted below (Hull, 1988, pp. 408–409; his emphasis):

> *replicator* – an entity that passes on its structure largely intact in successive replications.
>
> *interactor* – an entity that interacts as a cohesive whole with its environment in such a way that this interaction *causes* replication to be differential.
>
> *selection* – a process in which the differential extinction and proliferation of interactors *causes* the differential perpetuation of the relevant replicators.
>
> *lineage* – an entity that persists indefinitely through time either in the same or an altered state as a result of replication.

There are two particular features of these definitions that must be emphasized. The first is emphasized by Hull in the immediately following passage. A replicator must not simply replicate its structure; the replicated structure must also be able to replicate its own structure. That is, one must be able to have a replication of a replication of a replication…This leads to the creation of lineages. It also allows for an indefinite sequence of differences in replication that can lead to very different structures from the original replicator.

The second feature is equally important. Hull emphasizes that causality is involved in the selection process. In fact, as a careful examination of his definitions demonstrates, there are in fact two different causal mechanisms that Hull proposes. One mechanism causes replication to be differential, that is, it creates the new variants in the first place. That is hypothesized to result from the interaction of the interactor with its environment. The other mechanism causes differential perpetuation of (different) replicators, that is, it propagates some variants 'at the expense of' others. This process is hypothesized to result also from the interaction of interactors as a group with their environment, specifically, the survival of some interactors and the extinction of others.

Hull makes another important proposal: that his general analysis of selection processes applies not just to the gene-organism levels in biological evolution, but may apply to other levels as well. If the population structure of a species can be heritable, then species might be able to function as replicators. Genes may be interactors as well as replicators, since they interact with their cellular environment at the molecular level. Although Hull expresses some doubts as to whether organisms and species can function as replicators, he suggests that it is possible, and cannot be ruled out absolutely (for organisms, see pp. 409 and 415; for species, see pp. 219 and 419). His main point, though, is that a generalized model of selection must be cut loose from the hierarchy of levels of biological organization. As we will see, this is just as true in linguistics as in biology, although there has not been a well-articulated theory of selection in linguistics.

A final and crucial aspect of Hull's general theory is that selection operates only on spatiotemporally bounded individuals (Hull, 1988, p. 215). 'Individual' is taken in the broad sense here, so that spatially discontinuous entities (such as populations) are individuals as well, as long as the collection of entities is spatiotemporally bounded. Thus, taking the population view of species, a particular species is an individual: it has a beginning and an end temporally and it is also bounded spatially. Particular organisms and genes are also individuals; so is a collection of plants growing from a single root stock; so are other population-based entities such as demes.

More controversially, so are concepts for Hull. In order to understand how scientific theories evolve, concepts must be treated as spatiotemporal individuals, in fact lineages of ideas replicated from one scientist to another. Hull argues that it is the concept that is the replicator, that is, the equivalent to the gene in the classic biological gene-organism selection process (Hull, 1988, p. 441). As with organisms, ideas can change with each replication from scientist to scientist, even though they form a single lineage, since replication can be differential. Two similar concepts with distinct lineages are distinct concepts, even if they seem alike from an essentialist point of view. The 'same' concept as 'discovered' by another scientist without knowledge of the conceptual lineage of the first scientist is, in Hull's view, a different concept, belonging to a different conceptual lineage. It is true that conceptual lineages may converge if the two scientists criticize each other and refine their ideas in response to those criticisms. Again this is parallel to biological evolution – it is called reticulation and it occurs frequently among plants and other organisms.

For Hull, scientific concepts are the replicators, while the scientists are the interactors. The environment that scientists interact with are their empirical observations and their fellow scientists. Their interaction with their environment causes the differential replication of concepts (new or modified ideas), and their differential propagation (the adoption or ignoring of those ideas among scientists) causes the differential perpetuation of the relevant replicators (the ideas embodied in their theory). This is Hull's theory of conceptual evolution – scientific change – in a nutshell. It applies the generalized theory of selection to conceptual evolution in an interesting way, treating concepts rather than scientists as the basic components of scientific change. In fact, Hull's theory of conceptual evolution can be seen as an instance of the theory of language change to be argued for in the next section: it can be considered a theory of semantic change in a certain specialized register, scientific language.[1] We now turn to the more general theory of language change.

4 The generalized theory of selection applied to linguistic evolution.

4.1 The main instantiation of selection in language change.

We begin by presenting some definitions that closely resemble the definitions of these terms used in nonformal linguistic theories, formal linguistic theories and philosophical theories of language, but differ from them in certain critical respects.

An **utterance** is a particular instance of actually-occurring language, as it is pronounced, grammatically structured, and semantically interpreted in its context. This definition more or less conforms to the standard philosopher's definition of 'utterance' (as opposed to 'sentence' or 'proposition'), with the additional specification of its phonological and morphosyntactic peculiarities. However, it does not correspond quite so exactly with 'sentence' as used in formal language theory, since it includes all 'levels' of linguistic structure, in particular its particular pronunciation and meaning in context as intended by the speaker and interpreted by the listener. It also differs from both the philosopher's utterance and the formal language theorist's sentence in that only actually-occurring tokens count as utterances in our sense. It is critical to the theory of language change that utterances be actually-occurring language, since only actually-occurring language is spatiotemporally bounded, a prerequisite for the population theory of evolution we are applying here.

A **language** is the population of utterances in a speech community. This definition appears to be quite deviant from the structuralist notion of a language as a system of contrasts of signs. However, the structuralist notion of a language as a system of signs is the embodiment of essentialist thinking (see §4.3 for more discussion), and a population approach is necessary (and in my view, desirable) for attacking the problem of the nature of language. Thus, our definition actually more closely resembles the formal language theory definition of a language as a set of sentences. But it differs from formal language theory definition in two important respects. First, our definition does not denote the set of all and only the sentences that are generated (in the technical sense of that term) by a formal grammar. It is the set of actual utterances produced and comprehended in a particular speech community. Again, this restriction conforms with the biological definition of a population: it is a set of actual individuals, not a set of 'possible' individuals – whatever that would mean. And the set as a whole is a spatiotemporal individual, as described above. The second respect in which our definition of a language differs from the formal language theory view is that a language is a population of utterances, not sentences (see the preceding paragraph).

A **grammar** is the cognitive structure in a speaker's mind that contains that speaker's knowledge of their language, and is the structure that is used in producing and comprehending utterances. This definition is also based on the formal language notion of 'grammar' but deviates from it just as our definition of language does. First, the grammar is not generative in the technical sense of 'generate' as 'generate a language, i.e. characterize a set of admissable sentences'. This is because the grammar does not generate the language as described in the preceding paragraph in the technical sense of 'generate'; it cannot, because the language is not all 'possible' sentences or even all 'possible' utterances. On the other hand, the grammar (in our definition) does generate the language in the informal, casual reproductive sense of 'generate': it is what a speaker uses in producing (some of) the utterances of a language.

Second, the grammar must include the 'processing' involved to produce and comprehend utterances. Hence, it will not correspond to only the competence module postulated by formal syntacticians; it must include any processing modules as well. I will follow the usual cognitive linguistic view that a single, more or less integrated cognitive structure both 'contains our knowledge of the language' and is used for actually producing and comprehending utterances of the language. Whatever one's linguistic theory is however, we must make clear that our definition of a grammar is a real, individual, psychological entity, not an abstraction that does not have a psychological (or physical) existence. In other words, a grammar as defined here is also a spatiotemporally bounded individual.

Now we may apply the generalized theory of selection to language. Recall that Hull argues that one should not expect interactors and replicators to be found at only one level in the organization of life. Nor should we expect the same in language (see §4.3). In fact, though, Hull points out that the paradigm case of an interactor is the organism, and the paradigm case of a replicator is the gene (embodied by DNA). Likewise, we will begin by restricting our attention to the paradigm cases of interactor and replicator in linguistic selection.

It seems fairly uncontroversial that the paradigm case of a linguistic interactor is the speaker, or more precisely, the speaker's grammar (after all, a speaker may be multilingual, and we would want to distinguish the two or more languages s/he speaks and the grammatical knowledge that produces them). The speaker – or rather, the grammar – interacts as a cohesive whole with its [his/her] environment, that is, the experience that the speaker wishes to communicate, the listeners and the social context of the speech event, and the perceptual-cognitive-motor mechanisms for the interface between the grammar and the environment (including the speech event). These represent the interactor's environment, and represent the external functional factors often referred to by functionalist linguists (see Croft, 1995b). This is why the grammar must be a real mental structure: it must be able to interact with a real physical/mental/social environment.

Before we can say that 'this interaction *causes* replication to be differential', we must identify the replicator. And here we arrive at the main point of this paper. The replicator is the utterance. An utterance is an instance of a linguistic structure: a passive clause, say, or a closed syllable, or a particular encoding of a predicate-argument relation. The grammar – the speaker's knowledge of the language – was acquired through hearing other utterances instantiating these linguistic structures. When a speaker produces an utterance, s/he replicates that structure. When another speaker hears that utterance and produces another one, the structure is replicated again – recall that 'in order to function as a replicator, an entity must have structure and be able to pass on this structure in a sequence of replications' (Hull, 1988, p. 409). (Compare this to Hull's view of the replication of concepts as they are taught from one scientist to another, or by a scientist to a student.)

By this point, this idea should not sound as bizarre as it may have sounded in §1. It seems counterintuitive; at first glance, a more appropriate analogy appears to be between the grammar as the genotype and the utterance as the phenotype (but see §4.2.3). But the proposal here is also parallel to Hull's application of the theory of selection to conceptual change, where the concept rather than the scientist is the replicator (though in fact the proposal here has a different conceptual lineage, as noted in footnote 1). The plausibility of the proposal in this paper is reinforced by the analysis of the causal mechanisms in linguistic selection.

4.2 The causal mechanisms

Hull requires that there be a *causal* relation between the interactor's interaction with its environment and the differential replication of replicators. It is not enough for interaction to take place and also for differential replication to take place. Likewise, there must be a *causal* relationship between the differential 'extinction and proliferation' of interactors and the 'differential perpetuation of the relevant replicators'. These two causal relations are a critical component of a substantive theory of language change. Here I outline hypotheses regarding these two causal relations (these are described in greater detail in Croft, 1995a). Specifically, I argue that the first causal relation – the one that causes differential replication – is basically cognitive in character, and the second causal relation – the one that drives selection – is essentially social.

4.2.1 The mechanisms of differential replication in language use

In a number of papers, Ohala (1981, 1983, 1989, 1992) has proposed a mechanism that leads to differential replication of phonemes (to put it in our terms), which he calls the 'listener-based theory of sound change'. Very briefly summarized, Ohala's idea is this. Due to the complex interaction of the phonetic properties of the production of utterances, any given segment of the speech signal will possess some properties that are attributable to the phoneme – a higher-order cognitive entity – being produced at that point in time by the speaker, and some properties that are attributable to coarticulation effects of neighboring (or not so neighboring) phonemes, or to other acoustic events in the context. The listener must figure out which is which in order to reproduce (i.e., replicate) the proper sequence of phonemes. The listener makes mistakes, misattributing properties to the 'wrong' phonemes. Ohala describes two such processes, hypocorrection (attributing a contextual feature to the inherent phonological makeup of the segment) and hypercorrection (attributing an inherent phonetic feature to the context). If the listener makes such an error, s/he may then produce – replicate – a slightly different variant. In this way, replication can be differential.

In Croft (1995a) I argue that a similar mechanism can be used to account for syntactic change of various types, though it is described there as a type of reanalysis rather than as the production of 'errors' (that being a sociolinguistic attitudinal judgement). The meanings of individual words in a syntactic construction and the context of utterance all interact in complex ways in expressing the meaning of the whole in particular instances. For example, we may think we know what the following sentence means as a whole based on our knowledge of the meanings of the parts, and some 'neutral' contextual assumptions:

> He is barely keeping his head above the water. (Langacker, 1988, p. 16)

However, Langacker provides a gruesome but equally appropriate context of use: 'imagine a race over the ocean by helicopter, where the contestants must transport a severed head, suspended by a rope from the helicopter, from the starting line to the finish; a contestant is disqualified if the head he is carrying ever dips below the water's surface' (Langacker, 1988, pp. 16–17). The fact that this utterance may accommodate both the 'normal' interpretation and Langacker's suggested interpretation – as well as an infinite set of others (Searle, 1979) – illustrates the complexity of the listener's task in factoring out the semantic contributions to the meaning of the whole utterance provided by each individual word, by its role in the construction, and by the extralinguistic context. Analogous to the listener's phonological task, the listener's syntactic/semantic task is quite difficult, and may lead to reanalysis in subsequent utterances produced by the listener – that is, differential replication of syntactic structures. (In addition to hypoanalysis [analogous to Ohala's 'hypocorrection'] and hyperanalysis [cf. Ohala's 'hypercorrection'], I identify errors of metaanalysis – the swapping of inherent and contextual semantic features – and cryptoanalysis – the introduction of an explicit form to indicate a covert implicit function; see Croft, 1995a.)

The utterance-based model of reanalysis proposed in Croft (1995a) is an example of the grammar as interactor, and the phoneme (or lexeme or syntactic construction, in the extensions proposed in Croft, 1995a) as replicator. The grammar interacts with the environment, namely the perceptual input and its interpretation in context, in a certain way that causes differential replication (in the case of the various kinds of reanalysis).

Another, very different source of differential replication is interference in bilingualism, as it is presented by Weinreich (1953). A bilingual individual will have the grammars of two (or more) varieties in their head, i.e. two theoretically separate cognitive structures. Weinreich proposes that bilingual speakers engage in 'interlingual identification' – the identification of counterparts, phonological, syntactic or semantic, in the two language systems by means of 'external' phonetic or conceptual similarities. Interlingual identification can occur even though the role of the identified elements differs in the two linguistic systems. Interlingual identification occurs external to the two linguistic systems; this is a very important point.

Once the interlingual identification – a cognitive process – is made, the path is clear for interference effects – another cognitive process. That is, characteristics of one language's system appear in utterances that are intended to be in the other language, e.g. a 'foreign' pronunciation or a 'wrong' use of a lexical item or grammatical structure. In other words, interference leads to differential replication of utterance structures – phonemes, lexemes or grammatical structures 'brought over' from the other grammar in the speaker's head. Weinreich gives an example of the use of the "have' perfect' for the simple past in Silesian Polish based on the German construction: *ja to mam sprzedane* 'I have sold it' (Weinreich, 1953, citing Vendryes, 1921; cf. German *ich habe es verkauft*). This process takes place through the interplay of properties external to the system (in fact, derived from the other system) and properties within the linguistic system.

In Croft (1995a) I argue that there is also a phenomenon of intraference via intralingual identification. Elements in a single grammar also possess similarities based on shared phonetic or conceptual properties external to the language system. These phonetic and/or conceptual similarities between elements of a single grammar – similarities external to the linguistic system – can lead to intraference effects similar to the interference found in multilingual speakers' language use. For example, at some point in the history of English the *going to V* construction came to be used in a way that it had not been used before, namely to indicate future time reference without any movement on the part of the speaker. At the point of the creation of this new form-function pairing (*going to V* as a 'simple' future), the intralingual identification of the future time reference of a motion-with-intention-of-future-action event with the future time reference of an event without preceding motion led to the novel use of *going to V*, that is, differential replication of the *going to V* construction with a slightly different semantic function than it had been found with previously. (This use has now been propagated in English by selection, a different causal process; see §4.2.2).

Intraference is another source of differential replication of utterances. There is a third source of differential replication of utterances: the very phenomenon of repetition itself (cf. Haiman, 1994). Its best-known manifestation is what can be called the periphrasis-fusion-erosion cycle, of which grammaticalization is a chief example (see

Keller, 1994, pp. 18–14 for a particularly succinct characterization). Repetition, that is, replication of utterances in use, leads to the fixation or fusion of certain expressions in a particular function; the fixed expression is reduced or eroded, both phonologically and syntactically, over further replications (this is Zipf's law); finally, novel periphrastic forms are employed for the function, perhaps for expressive reasons (e.g., Lehmann, 1985, p. 314–316), but more probably to avoid misunderstanding (e.g., Keller, 1994, pp. 109–110). Other types of language changes, such as loss of emphatic value, the attenuation of extreme degree adverbials, and pejoration, are also the result of repetition. In language use, replication can be differential simply by its very nature.

In general, the causal mechanisms discussed briefly in this section all describe means by which functional properties external to the linguistic system – phonetic and conceptual relations – can affect the production of utterances which proceeds otherwise by computations within the linguistic system (i.e. by applying 'the rules of the grammar'). The general claim here is that external or functional (in this sense) explanations are intended to explain innovations – differential replication – only.

4.2.2 The mechanisms of selection in language use

Differential replication leads to the existence of variants – different ways of saying the same thing, different at the phonological, lexical or syntactic levels. These variants can be grouped together as linguistic variables in the sociolinguistic sense of that term (assuming for now that these variants belong to the same language; Weinreich, Labov, & Herzog, 1968, Labov, 1972). Variants of a linguistic variable are variants of the structures found in utterances, following our assumption that utterances are replicators. Selection is the process by which the differential perpetuation of replicators is caused by 'the differential extinction and proliferation of interactors', according to Hull's definition. What exactly is selection in language?

Clearly, it is not (just) the differential extinction and proliferation of speakers themselves that lead to the differential perpetuation of the linguistic structures found in utterances. Linguistic forms, and languages themselves, die without their speakers having to die. Instead, the speakers give up their language and shift to another; or gradually stop using one form and favor another. Thus, it is something about the grammars that leads to the differential perpetuation of utterance structures, that is, of the variants in a linguistic variable. This is where sociolinguistics comes back into the picture. The variants in a linguistic variable have social values associated with them. Speakers select variants to use – that is, to replicate – in particular utterances on the basis of their social values – overt or covert prestige, the social relation of the speaker to the interlocutor, etc.; the precise mechanisms are disputed, but the evidence seems clear. This causes 'the differential perpetuation of the relevant replicators' as described by Hull.

How is it that the 'differential extinction and proliferation of interactors', as Hull puts it, causes this? Hull's phrasing is due to the relationship between organisms, the paradigm interactors, and genes, the paradigm replicators: the perpetuation of genes is directly dependent on the survival of the organisms that contain them. The proper equivalent is that the perpetuation of a particular utterance structure is directly dependent on the survival of the cognitive structures in a grammar that are used by the speaker in producing utterances of that structure. I suggest that the interactive-activation model used by cognitive grammar and by Bybee (1985) provides a mechanism by which cognitive structures can 'survive' – become entrenched in the mind – or 'become extinct' – decay in their entrenchment. The shift in proportions of the variants of a linguistic variable in usage are reflected by shifts in degrees of entrenchment of those variants in the grammars of speakers. This shift is a result of the sociolinguistic significance of those variants for individual speakers, but the global effect is an adjustment of their activation value, or even their entrenchment at all, in a speaker's grammar.

Linguistic research founded on activation models considers token frequency as one of the most important factors in entrenchment. Since token frequency is precisely the differential perpetuation of utterances, this implies a feedback effect in the selection process. This may be one reason why languages are as conservative as they are, and why arbitrary, dysfunctional structures are maintained across so many generations of replication: the feedback loop makes it difficult for an innovation to spread, since it will not be the result of an entrenched form. However, if this were the only source of differential entrenchment, it would render the spread of an innovation impossible. It seems reasonable to suppose that the sociolinguistic properties of variants would lead to changes in activation and hence entrenchment quite independent of token frequency effects. In this way, an innovation can be selected by virtue of its sociolinguistic properties.

4.2.3 Summary: a unified model of linguistic variation and change

In Croft (1995b), I argue that 'external functional factors' – the phonetic and conceptual factors appealed to by functionalist linguists – are responsible only for the origin or actuation of a linguistic change, while sociolinguistic factors are responsible for the diffusion of that change through the population (but see footnote 2). Hull's general analysis of selection processes provides a further theoretical grounding for this division of labor. The distinction between interaction causing differential replication and selection causing differential perpetuation of the relevant replicators is the distinction I made in Croft (1995a, b) between the origin and the propagation of a language change.

Hull's analysis also places in relief the weaknesses of the functional-typological and sociolinguistic theories of language evolution taken separately. Each provides one of the two necessary causal mechanisms but not the other.[2] Fortunately, each theory provides the mechanism the other lacks. The two theories can be unified because they are both variationist – i.e., population-based – and utterance-based or usage-based theories of language. That is, the mechanisms proposed by (external) functionalism and sociolinguistics operate in the process of language use (or 'discourse' as many functionalists call it) – that is, the population of utterances which makes up a language as we have defined it.

Another important aspect of the unified functionalist-sociolinguistic model is that all of the causal mechanisms for linguistic evolution involve the interplay of factors external to the 'linguistic system' (presumably embodied by the grammar as we have defined it) and the system itself. The external factors represent the environment of the interactor (i.e. the grammar); differential replication and selection both result from the interaction of the interactor with its environment.

It should also be noted that there are two significant disanalogies between biological and linguistic evolution. It has been assumed that functional adaptation is one of the primary determinants of biological selection at the organism level (see Hull, 1988, pp. 221, 300 for remarks suggesting that adaptation still plays a significant role in biological evolution). Differential replication of genes, on the other hand, is a more or less random process involving (rarely) mutation and (much more commonly, in sexual species) recombination of DNA (although gene selectionists would argue for adaptive selection at the gene level)[3]. In linguistic evolution, under the model we have just proposed, external functional motivation that is presumably adaptive for the purpose of communication (e.g., iconic and economic motivation for the form-meaning mapping) is the cause of differential replication, not selection. Selection appears to be governed largely if not exclusively by social forces that have little or nothing to do with functional adaptiveness for communication.

The second significant disanalogy between biological and linguistic evolution has to do with the relationship between the replicator and the interactor, other than the causal relationship leading to differential replication of the replicator. In biology, an organism is described as having a phenotype, the physical and behavioral properties of the organism which are expressed, that is are at least partially determined, by its genotype. In linguistics, we say that a grammar generates an utterance, or that a speaker expresses an utterance of the language. That is, it appears that in some sense, the genotype – the replicator – 'produces' the phenotype – the interactor – in biology; but the grammar – the interactor – 'produces' the utterance – the replicator – in linguistics. This disanalogy has probably contributed to the notion that language change occurs through speaker's grammars (child language acquisition) rather than through language use (cf. Weinreich, Labov, & Herzog, 1968).

These disanalogies do not weaken the generalized theory of selection and evolution proposed by Hull. Neither Hull nor I are making random, convenient or opportunistic analogies between biology and our respective fields of research. Hull is constructing a generalized theory of selection that stands above disciplinary boundaries (which themselves are simply artifacts of the development of university departments in the 19th century – see Smith [1990] – and have no natural reality). Hull illustrates its instantiation in biological evolution and applies it to conceptual evolution, thereby producing a theory of conceptual change in science. I am applying the same theory to language change, thereby producing an utterance-based or usage-based theory of language change. Hull's theory does not predict the spurious 'analogies'. All it specifies are certain causal relationships between replicator, interactor and environment. It does not specify what kind of causal mechanims are involved, nor does it specify other sorts of causal relationships that may hold between the three entities involved in selection. Other cross-disciplinary theories will be necessary to account for these differences in causal relationships and mechanisms between biology and language.

4.3 Linguistic lineages and utterance structure

In the model of linguistic selection given in §§4.1–4.2, a lineage is the temporal individual resulting from replication. A typical linguistic lineage is a word etymology: all the replications of the word, which usually is replicated in an altered state over a long enough period of time – sound change, semantic change, syntactic change, etc. In fact, a word etymology is probably the prototypical case of a linguistic lineage; but sounds and grammatical constructions form lineages as well. They are the primary objects of the study of phonological and syntactic change respectively. Another lineage that has become of great interest in recent historical linguistics and diachronic typology are the lineages that result from grammaticalization of a word or construction. These are often lineages for whole syntactic constructions, not just individual lexemes or morphemes. Recall that Hull points out that lineages can go on indefinitely, in principle at least, although the species which contains it may terminate through its breakup into daughter species. Likewise, an etymology or an instance of grammaticalization extends indefinitely, even though it may be traced back through different languages – Old English, proto-Germanic, proto-Indo-European, and further back. Likewise the lineage can be traced forward, say to Australian English, or even to Cape York Creole English (see §6).

All of this may sound like a return to the 19th century view that 'every word has its history', a view attacked by structuralist linguistics, which argued that the linguistic system functions as a whole. Indeed, the focus of attention on the grammaticalization of individual constructions in modern historical linguistics appears to hark back to the 19th century view. How true is this? And how right?

First, it should be pointed out that utterances are themselves very complex, and imply a complex organization of the grammar even in the utterance-based approach. Replication of an utterance involves replication of phonemes, lexical items and syntactic constructions. All of these levels are independent though obviously related. The retention of the *f/v* alternation in *life/lives, knife/knives* etc. after the loss of the intervocalic fricative voicing process shows that lexical items have a degree of integrity in replication that prevented the loss of the alternation when the phonological system of English changed. In other words, the phonological and lexical levels are independent of each other in linguistic evolution. The contracted forms of the English auxiliaries and *not* in certain syntactic constructions, contrary to general (i.e., exceptionless) phonological patterns and contrary to the phonological integrity of the individual words, demonstrates the independent existence of the syntactic constructions as replicable entities from the phonological organization of utterances. That is, the phonological and syntactic levels are independent. And the very numerous examples of idioms such as *tell time*, which are still a part of English although the verb *tell* no longer has the word sense 'count', demonstrates the independence of syntactic constructions as replicable entities from the lexical items that make them up. This shows that the syntactic and lexical levels are independent as well.[4]

The morphological structure of words is also an independently replicable level. Morphological structure is independent from phonology, as is shown by morphologically-conditioned phonological rules such as the English plural and 3rd singular -*s* alternations. Lexical replication can be independent of morphological replication, as seen in semantically specialized or otherwise lexically restricted uses of morphemes that are distinct from the productive pattern, or have survived the loss of the productive pattern, a dramatic case being the *shade/shadow* distinction, formerly part of the Old English case system. Finally, it may be that syntax is independent of morphology, if one can identify morphemes unique to a construction, or with functions unique to a construction. This is made more difficult in that a constructionally-restricted free morpheme such as the *the*'s in the comparative conditional construction (*the more the merrier*), which is etymologically distinct from the determiner *the*, are treated as lexical items rather than morphemes. It should not come as news to linguists that phonology, morphology, lexicon and syntax are independent levels in a hierarchy of greater inclusiveness; indeed, these facts about lineages in linguistic evolution reveal that this basic structure of grammatical organization still holds in the evolutionary model of language change advocated here.

Sometimes the distinctions between these hierarchical levels are not always clear, for example in the reduction from an independent word to a bound morpheme, the fusion of two morphemes, the morphologization of an exceptionless phonological rule, or the semantic specialization of words in idioms or morphemes in particular words. This fact has occasionally been used to argue against the independence of these linguistic levels. But this fact does not invalidate the independence of these levels in replication: 'Yes, conceptual evolution can occur at a variety of levels, and, no, the levels are not sharply distinguishable. But by now it should be clear that exactly the same state of affairs exists in biological systems' (Hull, 1988, p. 424). There is no incompatibility in believing in the independence of phonology, morphology, lexicon and syntax, and believing that lineages can move from one level to another over time.

Clearly, syntactic constructions are the highest order structure; but lexical items, morphemes and phonemes are to a very great extent independent units with their own largely independent replication sequences. So the replication of an utterance involves a complex interaction of different structures in a grammar (in the sense of 'grammar' used here). This is no different from biological evolution, or for that matter conceptual evolution. Hull writes, 'If ever anyone thought that genes are like beads on a string, recent advances in molecular biology have laid that metaphor to rest' (Hull, 1988, p. 218), and 'in both biological and conceptual evolution, replicators exist in nested systems of increasingly more inclusive units. There are no unit genes or unit ideas' (Hull, 1988, p. 449). In fact, the production of an utterance involves an extremely complex recombination of elements from a great range of utterance parents, far more complex than the two-parent recombination in sexual reproduction of biological organisms.

Second, there is nothing in the evolutionary view of language being proposed here that a priori denies the possibility of the linguistic system, or a language as a whole, as a replicator or interactor. As in biological evolution, replication and interaction can occur at different levels of the hierarchical organization of language. It is possible, indeed likely, that linguistic evolution occurs at other levels of linguistic organization. However, just as the strongest case for selection appears to be at the lowest level of biological organization (where organisms are interactors for the replication of genes), I believe that the strongest case for processes of linguistic selection are at the lowest level of linguistic organization, where grammars are interactors for the replication of utterance structures. That is probably why grammaticalization has become a major focus of historical linguistics and typology – and should remain so. Nevertheless, there is some evidence for selection processes at higher levels of organization. This evidence is the topic of the next section.

5 Other levels of selection in linguistic evolution?

5.1 Systemic functional explanations

One of the main sorts of claims for a selection process for the linguistic system as an organic whole are the sorts of 'functionally'-driven language changes advocated by Martinet (1952) and others. Push-chains and drag-chains are supposed to represent the righting of a linguistic structural system that is asymmetrical in some sense. We will call this the 'systemic functional' account of language change. This hypothesis must be translated into the terms of the general analysis of selection processes. We must identify the replicators, the interactors and the selection process. The replicators are the grammars – not abstract systems, but concrete cognitive structures. The Martinet model basically proposes that the interaction of interactors with their environment is such that preserving contrasts in the system causes the differential perpetuation of different grammars: the grammars that are systemically 'symmetrical' will survive, and the others will not.

This model suffers from both theoretical and empirical problems. First, the theoretical problems. There is no causal mechanism for the differential replication of grammars in the first place; only a causal mechanism for selection is provided. Why would a symmetrical system become unbalanced in the first place? Second, it is not clear what the interactors are, where variation lies, or where the selection process takes place. Finally, there is no obvious motivation in the behavior of speakers – the ones with the grammars – to select a grammar on the basis of systemic symmetry. At least the selection mechanism we have provided for our account in §4.2.2, in terms of social forces, has a high degree of a priori plausibility as well as empirical support.

Turning to empirical problems, the systemic functional process account has been questioned. Labov (1994) argues that there is no evidence for systemic functional explanations, at least at the phonological level. For example, many phonological systems allow for 'gaps' in their segment inventories, as in the following inventory from Beja (Cushitic), taken from Maddieson (1984, p. 316):

-	t	-	ˇt	-	k	k^w	?
b	d	-	≥d	-	g	g^w	
-	-	dÛ	-	-	-	-	
f	s	ʃ	-	-	-	-	
m	n	-	-	-	-	-	
w	-	-	-	j	-	-	

In syntax/lexicon, there are many cases of overlapping forms (partial synonymy) in grammaticalization, which implies the nonexistence of push-chains (this argument is made by Haspelmath, 1993). For example, Haspelmath's study of the typology and grammaticalization of indefinite pronouns revealed many overlapping forms in the basic functions that Haspelmath identified, such as the Finnish indefinites used in interrogative constructions (Haspelmath, 1993, p. 287):

Soitt	-i	-ko	**joku**?
call	-PAST.3SG	-Q	someone

Soitt	-i	-ko	**kuka-an**?
call	-PAST.3SG	-Q	who-INDEF

'Did someone/anyone call?'

Finally, there is good reason to believe that at the syntactic level, true 'gaps', that is, expressive gaps, are extremely rare and do not drive language change. Let us consider one specific case to illustrate the empirical problems of systemic functional explanations of the language change. On the face of it, the 'creation' of new 2nd person plural forms in various dialects of English (*you guys, you all/y'all, youse, you'uns, you lot*, etc.) appears to be 'filling a gap' in the pronoun paradigm of English that was created by the replacement of the familiar (formerly singular) *thou* by the formal (formerly plural) *you* in all of its 2nd person uses. The creation of new 2nd person plural forms would be an example of a 'drag-chain' process leading to the selection of a new symmetric grammatical system – if it weren't for the retarding effect of the prestige of Standard English on language change. Of course, the model proposed in §4.2.2 predicts exactly this 'retarding' effect, because the social forces strongly favor Standard English over the colloquial varieties that have developed the new 2nd person plural forms.

Let us set that fact aside for the time being. A more serious problem is that there has never really been a gap in the system, in communicative terms. A speaker of English could always use some form to denote 2nd person plural, either the highly grammaticalized *you*, now also used for the singular, or an ungrammaticalized locution such as the quantified *all of you* or the appositional *you people*, or a term of address such as *ladies and gentleman*. The utterance-selection model would account for the new forms as instances of a grammaticalization chain: certain semantic domains (admittedly, for reasons not yet fully explained) naturally give rise to innovations that are phonologically and syntactically more integrated, or more 'grammaticalized' as it is usually called. Plurals, especially pronoun plurals, are prime candidates for grammaticalization because of their highly 'grammatical' semantic character. What we see in colloquial varieties of English is differential replication accounted for by grammaticalization, and selection presumably occurring for social reasons other than adherence to the standard (note the variety of 2nd person plural forms in the different dialects, and also that some speakers use multiple forms).

The systemic functional and grammaticalization accounts make different predictions for the cross-linguistic distribution of this grammaticalization process. The systemic functional account would predict that the creation of new plural personal pronoun forms would occur generally in systems with a gap at that point in the pronominal paradigm – ideally, always and only in such systems. The grammaticalization account predicts that this process can and does happen independently of whether such a gap exists. There are many pronominal systems across the world's languages that have gaps in pronominal number. Ingram's (1978) summary of pronominal systems based on Forchheimer's (1953) survey indicates approximately 20% of languages have gaps in number.[5] The relatively high number of pronoun systems with gaps suggests that systems with gaps are not that unstable, as the systemic functional explanation would predict. On the other hand, there are cases where new plural forms arose where old ones existed, and the new plural morphemes are even added onto the old plural forms (as has happened in many Turkic languages for the 1st and 2nd person pronouns). In fact, the commonality of both of these latter processes, replacement and reinforcement as they are standardly called in historical linguistics, counts strongly against the systemic functional hypothesis.

5.2 Evolution of morphological paradigms

There is instead an alternative account of the evolution of paradigmatic relations, at least for morphological paradigms, developed by Bybee (1985), for which she has amassed substantial typological, diachronic, developmental and psycholinguistic evidence. In this model, the evolution of paradigms is governed mainly by two properties, semantic 'relevance' (roughly, the degree of interaction of the meaning of the stem with the meaning of the inflection in semantic composition) and token frequency. Both of these properties are external to the linguistic system as it is usually defined, the former associated with communicative function and the latter with performance or use.

In Bybee's model, the cognitive structure of the mind, including the principles of semantic relatedness and entrenchment as determined by token frequency, is the interactor, and the morphological paradigm (not the utterance, which is a syntagm not a paradigm) is the replicator. The cognitive structure of the mind interacts with its input, which is language use. Language use involves both the meaning that is communicated on particular occasions, and the token frequency of words (with their meanings), derived across multiple utterances. In learning the language, the speaker's mind replicates the cognitive structure of the morphological paradigm in the speaker's head (though its effects occur beyond the initial acquisition of the paradigm, as Bybee's psycholinguistic experiments with adults demonstrate). The new speaker (that is, his/her mental structures) produces new occurrences of language use which can lead to the replication of the cognitive structure of the morphological paradigm in another speaker's mind. This leads to the replication sequences which are a necessary part of Hull's definition of a replicator: a replicator produces a new 'copy' which can in turn produce another 'copy' – that is, a lineage.

The mechanisms that Bybee proposes for the selection of morphological paradigms – semantic 'relevance' and token frequency – are different from the types of grammaticalization processes that lead to the creation of new forms in the selection of utterances. Bybee's theory and grammaticalization theory describe selection processes operating at different levels of linguistic organization: the former applies to grammatical systems, the latter to utterances. Of course, the higher-level selection process for morphological paradigms interacts with the lower-level selection process for utterances, since language use is involved in the interaction of the relevant interactors with the environment. The same is certainly true for biological systems: if population structures can be replicated, then their replication is in part dependent on the selection processes that operate at lower levels of biological organization, by virtue of the part-whole relation that holds between the different levels.

Nevertheless, the replication process is indirect: the actual structure of the mental representation is not replicated directly; instead it emerges as the language is learned. A parallel problem is found with organisms as replicators: the structure of the descendant organism is not replicated directly, only indirectly through the gamete. And the structure of the replicated organism is not a very accurate replica of the parents; in fact it is at best a combination of the parents' structures. These problems with 'replication' of the organism lead Hull to question the organism as a replicator (Hull, 1988, p. 415), and perhaps should lead us to question the paradigm as a replicator, even using Bybee's theory.

Another problem that remains is that there is no propagation mechanism associated with linguistic selection at this level. Bybee does not argue that speakers whose grammars conform more closely to her principles have a linguistic selective advantage conferred upon them, for instance. Instead, the mechanism of selection at this level is most likely the same mechanism posited for the utterance-level selection process, namely the social factors that are postulated by sociohistorical linguists. This fact also might suggest that perhaps the mechanism of differential replication of morphological paradigms may also be reducible to that for utterances. On the other hand, biologists who argue for populations and species as units of selection usually assume that adaptation is the selection mechanism at these higher levels as well as at the organism level; so employing the same mechanism for selection at a higher level in linguistics may not pose any serious theoretical problems. Clearly, the status of higher-level units of selection is an open issue in biology as well as linguistics, and the consequences of Hull's view have yet to be drawn out.

5.3 Typological conspiracies and communicative motivation

Another possible example of selection at the level of the linguistic system are what I call 'typological conspiracies' (Croft, 1990, pp. 197–202), such as the interaction of relative clause accessibility constraints and 'grammatical relation changing rules' described by Givón (1979). In typological conspiracies, two different types of syntactic constructions interact in such a way to ensure that a full range of meanings can be expressed in relative clause constructions. In Croft (1990), I argued that typological conspiracies are the manifestation of 'communicative motivation', the need for a language to be a general-purpose communication system. This is the same principle alluded to in the alternative account of the 2nd person plural forms offered in §5.1.

Communicative motivation is a distinct type of functional motivation from iconic and economic motivation (Haiman, 1983, 1985). Communicative motivation operates at a higher level of linguistic organization than iconic and economic motivation, which operate at the lowest level of selection (utterance form). Iconic and economic motivation are essentially syntagmatic functional principles, about the structure of individual utterances, while communicative motivation is a paradigmatic functional principle, about the communicative completeness of a linguistic system, that is, a grammar. Hence, like Bybee's model of morphological paradigms, the replicator is the grammar. The interactor is the speaker, and the interaction process is communication. The mechanism for differential replication is communicative motivation. As with the attempt to flesh out Bybee's model of morphological change in §5.2, communicative motivation also requires a selection mechanism, and once again the only plausible one is the sociolinguistic mechanism found in utterance selection; the remarks concluding that section also apply here.

5.4 Selection at the language level: language birth/death

Finally, one might be able to apply the selection model to whole languages. Something like selection goes on: languages die, and in fact this has been a serious issue for contemporary linguistics just as extinction has been a serious issue for contemporary biology. Once again, one must identify the replicator, the interactor and the relevant causal mechanisms for differential replication and selection at the level of a whole language. The following description may be a workable application of Hull's general theory of selection processes to language birth and death.

The interactor is the society as a whole. The relevant organic structures that the society possesses are the social domains of language use and their interrelationships (Fishman, 1972a). Fishman (1972b) suggests a concrete mechanism for selection. He proposes that language maintenance in multilingual communities is supported by a sharp differentiation of social domains (and presumably, their stability over time). If there is no sharp differentiation, or if the structure of social domains is disrupted (e.g. by the impact of

European invaders and colonizers), then one language may invade the social domain of the other and ultimately replace it. The interaction of the society with its environment – other societies with which it comes into contact mostly, but possibly also its physical environment – thus leads to the survival/extinction of languages. The interactor – the society – can also cause differential replication. For instance, a speech community's interaction with its environment as we have defined may lead to it altering the language through borrowing, coinage, calquing and creation of new constructions, and development of a written style in order to extend the language to new registers (domains) – or by not doing so, allowing another language to occupy that social niche instead.

It should be emphasized that this is a process of social evolution. The processes described by Fishman are essentially social: contact between societies (including immigration and conquest), and changes in the organization of domains of social interaction. These social processes happen to have linguistic consequences because of how languages are identified with the societies that speak them, or are identified with particular social domains in a multilingual society.

This may be pushing the selection model too far. After all, in the standard neo-Darwinian model, competition between species is usually reduced to competition between organisms belonging to those species, and selection is said to operate at that level only: '[Species] compete, but probably competition between organisms of the same and different species is more important than competition between one species and another species' (Ghiselin, 1987, p. 141, cited in Hull, 1988, p. 219). It may be that the social processes that I have described in the preceding paragraph in choosing which language to use in a society can be better analyzed as choices made by speakers in replicating individual utterances, summarized over time.

Nevertheless, some biologists argue for selection at the species level, arguing that species have a population structure that can be replicated. Likewise, the proliferation of European standard languages at the expense of indigenous languages may be due in part to their 'sociolinguistic structure', that is, the fact that they already possess the full array of social registers (including vocabulary, writing systems and the technology to back it up). The sociolinguistic structure of the European standard languages is replicated when indigenous groups 'join modern civilization'. That is, the European standard languages proliferate in the indigenous groups' society and the indigenous languages go extinct.

It should go without saying that the analysis of the facts of language death and language shift in terms of selection at the language level should not be given an evaluative interpretation such that the indigenous languages are 'inferior'. That would be social Darwinism. Consider again the biological parallel. European species such as starlings and Mediterranean annual grasses have invaded and eliminated North American songbird species and perennial bunchgrasses respectively. Biologists do not assume that this fact demonstrates that the native American species are 'inferior'. On the contrary, biologists are on the vanguard of the movement to save endangered species, and linguists should be on the vanguard of the movement to save endangered languages.

6 Language contact, creolization and phylogenetic reticulation

Thomason and Kaufman (1988) offer a unified approach to problems of language contact and 'genetic linguistics', by which they mean the transmission of language through generations of speakers. The problem posed by language contact phenomena is that they appear to violate the 'family tree' model of genetic relationships among languages. The 'family tree' model assumes that all languages have a unique parent from which they derive most of their linguistic elements – phonological, morphological, syntactic, lexical – by more or less regular processes of language change. Parent languages may have multiple daughter languages but daughter languages can have only one parent. This latter proposition in fact differs from a family tree, since children have two parents. However, it fits the standard – but as we will see, oversimplified – view of a phylogenetic tree in biological evolution: a parent species may have multiple daughter species, but a daughter species is descended from only one parent species.

The (oversimplified) phylogenetic model does not hold for all of the linguistic elements of most if not all languages. Many languages have linguistic elements that are not derived from their official parents, but instead through language contact, that is, they are transmitted from other languages whose speakers have been in linguistic contact with the speakers of the language in question. Thomason and Kaufman offer a model which elaborates and sharpens the traditional distinction between borrowing and shift (substratum interference). Borrowing 'is the incorporation of foreign features into a group's native language by speakers of that language' (Thomason & Kaufman, 1988, p. 37). Borrowing typically though not always involves the adoption of a whole sign or symbolic unit, that is, borrowing involves adopting the form and the associated function of a particular linguistic item. Socially, it generally involves contact and bilingualism with an outside group but not the abandonment of the language itself. Shift or substratum interference on the other hand does result from a population of speakers giving up their former native language and adopting another one: 'substratum interference…results from imperfect learning during a process of language shift' (Thomason & Kaufman, 1988, p. 38). Linguistically, shift involves the adoption of phonological or grammatical or semantic structures from the former language in the new language (that is, 'errors' – differential replications! – of the nonnative speakers become the conventions of the new language that results from shift).

Thomason and Kaufman argue that the linguistic results of borrowing vs. shift are distinct, and one can identify degrees of linguistic effects of contact ranging from moderate to radical. Moderate borrowing involves the adoption of (largely nonbasic) lexical items. This sort of borrowing can become progressively more extreme, to the extent that in the most radical cases of borrowing large amounts of grammatical morphology are borrowed as well. Moderate shift includes substratum effects such as the adoption – more precisely, retention from the former native language – of phonological features (e.g. the retroflexion in the phonology of Indo-Aryan languages) and calqued syntactic constructions in many languages. More intensive shift effects involve the retention of even more phonological and grammatical patterns to the point that substantial amounts of the phonology and grammar of the new language are not from its 'parent'. It should be pointed out here that each language contact situation is unique and complex (as Thomason and Kaufman amply illustrate), and complex combinations of aspects of language borrowing and language shift are found in most actual language contact situations.

Thomason and Kaufman deal with pidginization and creolization separately from shift. They argue that 'abrupt creolization', whose existence has been hotly debated, is an instance of language shift, albeit radical language shift without normal transmission in their sense of that term. However, they argue that 'pidgins themselves do not arise through a process of language shift' (Thomason & Kaufman, 1988, p. 49), not even abnormal language shift, to the 'target language' that provided most of the vocabulary for the pidgin (also called the lexical source language). In fact, pidgin genesis does not even involve the loss of the native language of the speakers of the languages other than the lexical-source language; it is normally a second language for its speakers, for trade or other contact situations.

Instead, Thomason and Kaufman suggest that what is going on in many cases of pidginization is not necessarily one group of speakers attempting very imperfectly to acquire the language of the other, but of mutual accommodation, aiming for some mutually intelligible contact language (Thomason & Kaufman, 1988, p. 174). They also suggest that the role of simplification of the target language by its native speakers plays a more significant role in the formation of contact languages than has previously been assumed (Thomason & Kaufman, 1988, pp. 175–77) – so that mutual accommodation involves not the target language per se, but a simplified version thereof. Finally, their mutual accommodation theory accounts for features of the pidgin that are due to the 'substrate' languages. The evidence for their mutual accommodation theory is the presence of structures in pidgins that are typologically 'marked' (that is, not the expected universal or default structure) that can be traceable to their substrate languages. In conclusion, they point out that there are many similarities between pidginization and shift, both in the sociolinguistic context – 'in both cases, speakers are engaged in a learning process whose ultimate goal…is to talk to speakers of some other language(s)' (Thomason & Kaufman, 1988, p. 193) – and its linguistic effects.

What are the conclusions that are drawn for phylogenetic relationships among languages that have some linguistic features due to contact? Thomason and Kaufman make a sharp distinction between cases of 'normal' transmission and 'abnormal' transmission, the latter including pidginization. This distinction is attributable to their theory of phylogenetic relationships among languages:

> …a claim of genetic relationship entails systematic correspondences in all parts of the language because that is what results from normal transmission: what is transmitted is an entire language – that is, a complex set of interrelated lexical, phonological, morphosyntactic, and semantic structures…*a language can not have multiple ancestors in the course of normal transmission*. To be sure, mixed languages in a nontrivial sense exist, but by definition they are unrelated genetically to the source(s) of any of their multiple components. (Thomason & Kaufman, 1988, p. 11, their emphasis)

The 'mixed languages' they refer to are those languages that result from cases of radical borrowing, abrupt creolization and pidginization. Thomason and Kaufman argue that none of these languages have genetic relations, that is, no linguistic genetic parents.

How does Thomason and Kaufman's theory of language contact and phylogenetic relationship compare to the model of language change proposed in this paper? Two points can be made at the outset. First, Thomason and Kaufman's theory of phylogenetic relationship assumes an essentialist theory of language, namely, that it has a coordinated set of structures, phonological, morphosyntactic and semantic, such that if its apparent descendants are lacking in enough of these structures, then it no longer can be considered a member of that language group. However, closer examination reveals that their essentialist claim is restricted to normal transmission, where the 'family-tree' model of phylogenetic relations generally holds. And even in the context of normal transmission, Thomason and Kaufman do not argue that there is a specific linguistic trait that is essential; instead they are arguing probabilistically that enough linguistic traits in enough aspects of the language are replicated in normal transmission. Still, this is a weaker variant of an essentialist model and hence differs from the population model of a language adopted here.

The more contentious issue is their choice to describe mixed languages as having no linguistic genetic parents instead of having multiple linguistic genetic parents; they describe the development of genuinely mixed languages as 'nongenetic' (Thomason & Kaufman, 1988, p. 108). This leads to the second point. If we take 'genetic' as referring to the process of evolution described by the generalized theory of selection as proposed by Hull and as applied to language change in this paper, then we can see the development of mixed languages as genetic in the sense used in this paper, that is, mixed languages can be placed in a phylogeny. The difference is that they do have multiple parents, contrary to the 'family tree' model.

However, having a unique parent is not a necessary property of the phylogenies allowed in Hull's generalized theory of selection. In fact, they are not a necessary property of biological phylogenies either. Hull calls this 'cross-lineage borrowing' (note that the term 'borrowing' here is construed more broadly than in linguistics):

> cross-lineage borrowing of the most extreme sort does occur in biology. Apparently, viruses can pick up genes from their hosts and transport them from host to host not only within a single biological lineage but also between distantly related lineages. In addition, considerable gene exchange takes place between separate biological lineages, especially in plants; and I repeat, if a theory of biological evolution is to be adequate, it must apply to both plants and animals. Of course, if too much borrowing occurs between two lineages, they cease being distinct and merge into one, an occurrence that again is not all that uncommon among plants. (Hull, 1988, p. 450)

In fact, complete merging of lineages is common enough in biological evolution that the term 'reticulation' has been coined to describe the resulting phylogeny.

If we turn now to our model of linguistic selection in which the equivalent to the gene is the utterance, then we can trace lineages of linguistic forms and languages in radical borrowing, abrupt creolization and pidginization. As we argued in §4.3, utterances are not atomic units any more than there are unit genes in biology. Hence, in any utterance in which most of the utterance's lineage can be traced through one language (where a language is a population of utterances), but the lineage of part of the utterance – say, a particular word including perhaps some of its phonology – can be traced through another language which has been in contact with the first language, then cross-lineage borrowing has occurred. This is simply the etymology of a borrowed word. Likewise, in any utterance where some aspect of the utterance's structure – for instance, its word order – can be traced to a substrate, then that lineage can be traced to a language other than its official linguistic genetic parent.

Moving from etymologies to genetic relationships among languages, two important differences between the utterance-based model and Thomason and Kaufman's model become apparent. First, in the former transmission is defined as the transmission of utterances through their (possibly differential) replication in language use, whereas for Thomason and Kaufman transmission is the transmission of a grammar (in the sense of speaker's knowledge of the whole language) from one generation of speakers to the next. Transmission of a grammar may be 'abnormal' or 'broken' in processes such as extreme borrowing, abrupt creolization and pidginization, but in all cases transmission of utterance structures differs only in degree. Second, and more important, a language is a population of utterances in the utterance-based model, whereas for Thomason and Kaufman a language is a set of components of a grammar (phonology, morphosyntax, lexicon). In 'abnormal' transmission, a language in Thomason and Kaufman's sense is drastically altered, and in conjunction with their essentialist definition of a language, no genetic parent can be established.

The difference between 'normal' and 'abnormal' transmission in terms of replication of utterances is that in 'abnormal' transmission, that is mixed languages, the structures come from two different languages, that is, two different otherwise communicatively isolated populations of utterances. But there is nothing in principle that prohibits us from constructing a phylogeny with borrowing. A biological phylogeny of plants must allow for borrowing across species and even for reticulation; there is no reason why a linguistic genetic classification may not as well. There is nothing wrong with saying that the phylogeny of Middle and Modern English involves a 'genetic' contribution from French (and Latin and German and many other languages) – 'genetic' in the sense of having lineages derived from those other languages – even though we would still say the primary parent of Middle/Modern English is Proto-Germanic.

In fact, I believe the most interesting question is whether the genuinely mixed languages represent a complete merger of the two parent languages, in the sense of a phylogenetic reticulation of plant species. And Thomason and Kaufman's model of the types of linguistic features that are adopted in progressively more radical borrowing, and are retained from the substrate language in progressively more radical shift, and are employed in pidginization, suggests that there remains a significant degree of asymmetry between the 'genetic' contributions of the various parent languages in almost all cases.

Thomason and Kaufman propose a borrowing scale for the types of linguistic elements that are likely to be borrowed (Thomason & Kaufman, 1988, pp. 74–76). They identify five stages, none of which do they suggest involves a break in the genetic relationship between the borrowing language and its parent. Only radical borrowing 'off the scale' involves no genetic relationship in their view. Although a detailed description of their stages is not possible here, a few of their generalizations can be mentioned. Lexical borrowing is more likely than borrowing of grammatical morphology. Within the lexicon, nonbasic vocabulary is more likely to be borrowed than basic vocabulary, and content words more likely than function words; basic vocabulary and most function words are likely to be borrowed only at stage 3 of their 5 stages. Within the grammar, derivational morphology is more likely to be borrowed than inflectional morphology (both presumably becoming productive through massive vocabulary borrowing); and word order changes are more likely than restructuring of syntactic categories and the introduction of novel inflectional categories.

If we examine Thomason and Kaufman's examples of borrowing that is so extreme that they deny any genetic relationship for the resulting language, it is clear that one can determine which language did the borrowing from a historical perspective: Ma'a is (or was) a Cushitic language that borrowed radically from neighboring Bantu languages; Mednyj Aleut is/was an Aleut language that borrowed radically from Russian; Michif is/was a Cree language that borrowed radically from French; and Kormatiki Arabic is/was an Arabic dialect that borrowed radically from Cypriot Greek. In concluding this section, Thomason and Kaufman state:

> The fact that particular structures can be traced to particular source languages also has an important retrospective consequence: given a total lack of sociohistorical information, it should be easier to discover the route by which a language like Ma'a developed than to unravel the history of, say, Saramaccan [a creole – WAC] (Thomason & Kaufman, 1988, p. 109)

That is, given the lineages of individual grammatical structures, the borrowing scale provides an asymmetric valuation of the two 'genetic contributions' to these mixed languages, in which in particular it is most likely that the basic vocabulary will retain the largest contribution from the language that would traditionally be called the linguistic genetic ancestor. In fact, the names of the languages in question often reflect this: Mednyj *Aleut*, Kormatiki *Arabic*. Hence it seems reasonable to say not only that the mixed languages listed at the beginning of this paragraph do have genetic ancestors, namely the two input languages, by virtue of the replicator lineages found in their utterance structures; but also that one of those two languages has a privileged status as the 'primary' parent. Thomason and Kaufman's rejection of this conclusion is due to their essentialist definition of a language in terms of grammatical systems, which we have replaced with a population definition of language as a set of (actual) utterances.

The situation with abrupt creolization and pidginization is more complex, mainly because unlike the cases of radical borrowing, more than two putative parent languages are usually involved. As mentioned above, Thomason and Kaufman argue that abrupt creolization – the creation of a creole without an intervening pidgin stage – is a case of radical language shift. They point out that in terms of vocabulary, the abrupt creoles are straightforward cases of shift to the European lexical-source language; in our terms, the lineages of the individual words can be easily traced to the European language. As for the grammar, it obviously does not have as easily traceable a lineage. Thomason and Kaufman propose that mutual accommodation, the same mechanism as they propose for pidginization, is involved. It is worth quoting their argument in full, since the usage-based model of how abrupt creolization and pidginization takes place fits very well with the usage-based evolutionary model of language change I am advocating here:

> thrown into a new multilingual community and given a new vocabulary which they must learn, people will make guesses about what their interlocutors will understand as they try to talk to one another. Those guesses that promote intelligibility will be the 'right' guesses. To begin with, the grammar of the emerging creole will be a direct reflection of the shared 'right' guesses made by the shifting speakers…If this is the pattern for shifting speakers' efforts to communicate, as we believe, then the structure of the emerging creole will be a function of the structures of its developers' native languages.

That is, the lineages of the utterances will be traceable to the various parent languages; most of the words will be traceable to the lexical-source language, while other structures in the utterance will have varied sources.[6] The fact that the structure of the emerging creole is a function, rather than a direct adoption, of the structures of the developers' native languages, can be accounted for by the fact that replication may be differential. In fact, Thomason and Kaufman's mutual accommodation model employs the same sort of mechanism to cause replication of the utterance structure to be differential: the interactor interacting with their environment, that is, the speaker using their knowledge of the language(s) involved in communicative interaction.

Again, by accepting the population definition of a language, we may allow for the multiple parentage of abrupt creoles; but again, we may also note the unique status of one of those parents, namely the language that provides the bulk of the vocabulary. It may not be an accident that the language which is the source of the vocabulary, especially the basic vocabulary, is the 'privileged' parent in both radical shift and radical borrowing.

A similar story may be told of pidgins (it is assumed that the creoles which are descended from pidgins are the descendants of the pidgins in the phylogenetic sense). In the case of pidginization, there is another stage of the process that causes Thomason and Kaufman to distinguish pidginization from language shift: pidginization often involves simplification or modification of the lexical-source language, and is a restricted register that does not replace the native language of the speaker. In addition, the process of mutual accommodation described above takes place, particularly with respect to their morphosyntactic structure. Thomason and Kaufman present a large number of examples of pidgins, particularly trade pidgins, where the structures employed are a subset and simplification of the structures found in their multiple parent languages.

The process of simplification means that the 'language' that the speakers are aiming at is not a carbon copy of the native language from which the simplified forms are derived. However, their source, that is, the lineage of the pidgin utterances using those simplified structures, is found in the native languages, and the simplification involves differential replication.[7] Again, the cause for differential replication is the interactor interacting with its environment: the speaker chooses to simplify – differentially replicate – the linguistic structures of his/her native language in order to communicate successfully and appropriately (simplification can serve the purpose of social distancing as well as facilitating communication, cf. Thomason & Kaufman, 1988, pp. 174–77).

As with radical borrowing and radical shift, even in most cases of pidginization, there appears to be a 'privileged' parent language, namely the one that contributes the bulk of the vocabulary, or at least the larger proportion of the basic vocabulary. There is, however, at least one case of a pidgin where neither of the parent languages has this privileged status. Russenorsk, a trade pidgin between Russians and Norwegians, appears to have approximately equal lexical contributions from the two languages (Holm, 1989, p. 621; he notes that this is an 'unusual feature' of Russenorsk). In this case at least, we have a mixed language with two parents of equal linguistic status, at least with respect to vocabulary.

The mechanisms for abrupt creolization and pidginization that Thomason and Kaufman propose fit well into the usage-based evolutionary model of language I am advocating here. The only difference between my analysis and theirs is that I believe one can include even genuinely mixed languages in a phylogeny of languages, as long as one allows for multiple parentage. Even with radical borrowing, abrupt creolization and pidginization, one can identify the parents of genuinely mixed languages, and by using a population definition of a language, assign it multiple parents. And even in these cases, one parent almost always (though not necessarily always) has a 'privileged' status that is similar to the parent language in 'normal' genetic linguistic relationships. Nevertheless, Russenorsk and perhaps the other mixed languages discussed by Thomason and Kaufman may represent genuine cases of phylogenetic reticulation as described by Hull.[8]

7 Conclusion

The theory of linguistic selection presented in this paper provides an evolutionary model of language. I say 'language' here rather than 'language change' as in the title, because the model makes arguments for and predictions about the organization of grammar, grammar as a cognitive entity, linguistic form and its phonetic and conceptual substance, the relationship between form, function and linguistic interaction, and aspects of the social life (and death) of languages and the peoples that speak them. The theory of linguistic selection could potentially be a catalyst to reintegrate the badly fragmented subdisciplines of linguistics such as sociolinguistics, syntax and semantics, psycholinguistics, and historical linguistics.

Even its shortcomings offer an opportunity for the reintegration of linguistics. I have said little about language acquisition, the linguistic development of individuals. This is clearly an important aspect of the evolutionary process that has been left out. But Hull observes also that embryology – the physical development of organisms – is an acute gap in contemporary theories of evolution and selection in biology, and this wrong must be righted eventually (Hull, 1988, p. 202, 218).

If these ideas prove to be interesting to linguistics (spawning conceptual lineages, perhaps), it also suggests that there is value in cross-fertilization of scientific disciplines. The development of theories such as Hull's generalized theory of selection and their application across scientific fields may prove as fruitful for those fields as the ever more refined analyses of ever smaller subdomains of individual disciplines have been; or perhaps more so.

8 Postscript

This chapter is a reprint of the first published presentation (1996) of the evolutionary framework for language change that was later presented in depth in *Explaining language change: an evolutionary approach* (Croft, 2000) and a number of shorter publications (Croft, 1997, 1999, 2002, 2003, 2005, to appear a). Croft (to appear b) is an overview of the framework and its application to historical linguistic issues; Baxter et al. (under review) is an initial mathematical model of aspects of the framework. In the evolutionary framework, language change is argued to emerge in language use. Language change, like other evolutionary change, is change by replication: each time we speak, we replicate linguistic structures from prior utterances. Language change is a two-step process: the production of novel variants in an utterance (innovation or altered replication), and the differential selection of available variants to produce in an utterance (propagation or differential replication). The evolutionary framework is thus a usage-based model; in fact, it is the usage-based model of language taken to its logical conclusion. This postscript describes some revisions and extensions of the evolutionary framework since this chapter was originally published.

Two basic concepts from this chapter were clarified in *Explaining language change* and later work. The term 'differential replication' is used by Hull and Dawkins to describe only the second step in the two-step process of language change. Neither philosopher uses a term to describe the process of the generation of variation in the replication of replicators. I coined the term 'altered replication' to describe the creation of novel variants in the first step of the process (Croft, 2000, p. 23). The mechanisms described in section 4 of this chapter are mechanisms for altered replication, not differential replication.

In the evolutionary framework, the utterance is the locus of replication, parallel to the genome (the strand of DNA) in the basic instantiation of the generalized theory of selection in biology. In this chapter, I did not explicitly identify the actual replicator, though it is described at the end of section 4.1. The replicator is a token of linguistic structure (phoneme, morpheme, word, construction) in an utterance. In *Explaining language change,* I coined the term 'lingueme' to describe the linguistic replicator.

The discussion of mechanisms for innovation (altered replication) in grammar mentioned in section 4.2.1 cites an unpublished conference presentation; the content was eventually published in chapters 4–6 of *Explaining language change.* The four types of form-function reanalysis (hypoanalysis, hyperanalysis, metanalysis, and cryptanalysis) and the mechanisms of interference and intraference are all essentially hearer-based mechanisms for grammatical innovation, parallel to Ohala's listener-based mechanisms of sound change cited in section 4.2.1. But there are also speaker-based mechanisms of sound change, namely the fact that speakers always produce phonetic variation in uttering a particular phoneme (Ohala, 1989; Pierrehumbert, 2003). One would expect to find a parallel speaker-based mechanism of grammatical innovation. If one conceives of grammar as structures produced in order to verbalize experience, then it becomes clear that the verbalization of similar experiences produces grammatical variation. In Croft (2005), I present evidence that grammatical variation in the verbalization of experience is the source of much grammatical change.

Section 5 of this chapter examines several possible cases in which the replicator and the interactor in language change may be different from the canonical situation, where the replicator is the lingueme and the interactor is the speaker (or the speaker's grammar). In *Explaining language change,* the usage-based theory of change in morphological paradigms (see section 5.2) is analyzed as instances of lingueme intraference (Croft, 2000, pp. 148–51). The mechanism of communicative motivation (see section 5.3) is a consequence of the speaker (interactor) interacting with her environment, namely what she wants to talk about and the people she wants to say it to. It is the interactor's interaction with its environment that causes differential replication, and altered replication as well. In other words, language change seems to largely take place in terms of the speaker interacting with her environment causing differential replication of linguemes. I have not yet identified any clear case of any other linguistic entities playing the roles of replicator or interactor in language change.

Section 6 of this chapter is elaborated in chapter 6 of *Explaining language change.* There I distinguish between true borrowing, where both form and meaning are replicated from the 'donor' language, and what goes under the terms 'calquing', 'loan translation' and 'structural borrowing', where form only (such as word order) or meaning only (such as calling a door 'the house's mouth') is replicated from the 'donor' language. A lingueme containing both form and meaning is termed a 'substance' lingueme, whereas a lingueme containing meaning only or form only is a 'schematic' lingueme. In Croft (2003), I examine further examples of language contact, and argue that the asymmetry in the sources of the substance linguemes in various types of so-called 'mixed' languages can be linked to the social identity aimed at by the speech community.

As section 7 notes, the evolutionary framework has the potential to reintegrate the fragmented field of linguistics (see also Croft, to appear b); it also has the potential to extend cognitive linguistics beyond its central concern with the mental representation and processing of grammatical knowledge.

Notes

* The central idea of this paper (the idea introduced at the end of §1) first occurred to me when taking a course in sociolinguistics from Charles A. Ferguson at Stanford University in 1984. I didn't know enough biology at the time to figure out whether it made any sense. It had to wait until the work described in Croft (1995a,b) and my encounter with Hull (1988) allowed it to germinate. I dedicate this paper to Fergie, a gentle iconoclast and inspiring figure.

1 In fact, Hull makes some extremely insightful observations on the nature of linguistic meaning (Hull, 1988, pp. 7–10, 294–96). One of Hull's more important insights can be gleaned from this quotation:

> Science is a conversation with nature, but it is also a conversation with other scientists. Not until scientists publish their views and discover the reactions of other scientists can they possibly appreciate what they have actually said. No matter how much one might write and rewrite one's work in anticipation of possible responses, it is impossible to avoid all possible misunderstandings, and not all such misunderstandings are plainly 'misunderstandings'. Frequently scientists do not know what they intended to say until they discover what it is that other scientists have taken them to be saying. (Hull, 1988, p. 7)

2 Milroy & Milroy (1985) speak of 'speaker innovation', which would at first sight appear to be a mechanism for differential replication, but in fact they begin with multiple variants already available, and describe how the innovations diffuse speaker by speaker, rather than social group by social group as in previous sociolinguistic research. That is, they are still describing a mechanism for selection, although at the level of inter-individual relations rather than intergroup relations – a very important advance for sociolinguistic theory, I should add.

However, it is possible that 'functional' (phonetic or conceptual) factors are involved in selection as well. Most variationist sociolinguistic studies demonstrate that phonological, lexical and grammatical factors as well as social factors correlate to a highly significant degree in determining patterns of distribution (i.e. replication) of variants. Unfortunately, most discussion of the interplay between social and 'functional' factors in sociohistorical linguistics only consider 'systemic functional' factors, which are quite different from the 'external functional' factors that are supported by empirical cross-linguistic facts (see §5.1).

3 Hull would analyze this as selection occurring at a different level of biological organization. If it were shown that external functional factors play a role in linguistic selection, a view generally opposed by sociolinguists, then it may be argued that this fact represents selection at a different level of linguistic organization. Or it may show that there are selection processes other than sociolinguistic ones.

4 Construction grammarians who are reading this, after endorsing this section's assumption of a construction-based approach to syntax (which is indeed necessary for this model of syntactic evolution) may object to the syntax-lexicon distinction I am making here. Langacker argues for a syntax-lexicon continuum. I am casting the syntax-lexicon distinction as the distinction between a complex whole and its component parts, not as two separate modules; see the following paragraphs for a reconciliation of these two positions.

5 However, since Forchheimer and Ingram were interested in different kinds of pronominal systems, their sample overstates the proportion of different kinds of systems, particularly the 'asymmetric' ones. An areally and genetically more balanced survey performed by Matthew Gordon (personal communication) suggests that a more accurate percentage of pronominal systems with gaps in number is around 10% – still a significant minority.

6 In fact, the 'genetic' contribution appears to be dependent on the proportion of native speakers in the creolizing community; Thomason and Kaufman cite a number of examples from the pidgin and creole literature showing how differences in proportion of lexical source language speakers and of various substrate speaker populations affect the structure of the resulting creole.

7 As Thomason and Kaufman point out: 'And – to comment on an all-too-frequent misconception – simplification of the lexical source language by people who did **not** know it could play no role at all, because you can't simplify what you don't know. Even in cases where there is a target language, only its speakers can simplify it' (Thomason & Kaufman, 1988, p. 178, emphasis theirs).

8 It should be pointed out that my goals and Thomason and Kaufman's goals in defining genetic relationships among languages differ considerably. Thomason and Kaufman's purpose in defining a nongenetic relationship for mixed languages is the (non)use of mixed languages in comparative reconstruction, not the development of a theory of language change, utterance-based or otherwise.

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Mayr, E. (1982). *The growth of biological thought: Diversity, evolution, inheritance.* Cambridge, Mass: Belknap Press.

Milroy, L. (1987). *Language and social networks* (2nd ed.). Oxford: Basil Blackwell.

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Ohala, J. J. (1981). The listener as a source of sound change. In C. S. Masek, R. A. Hendrick, & M. F. Miller (eds), *Papers from the parasession on language and behavior* (pp. 178–203). Chicago: Chicago Linguistic Society.

Ohala, J. J. (1983). The origin of sound patterns in vocal tract constraints. In P. F. MacNeilage (ed.), *The production of speech* (pp. 189–216). New York: Springer.

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Ohala, J. J. (1992). What's cognitive, what's not, in sound change. In G. Kellermann & M. D. Morrissey (eds), *Diachrony within synchrony: Language history and cognition* (pp. 309–55). Frankfurt: Peter Lang.

Pierrehumbert, J. B. (2003). Phonetic diversity, statistical learning and acquisition of phonology. *Language and Speech*, 46, 115–154.

Searle, J. (1979). Literal meaning. *Expression and meaning* (pp. 117–136). Cambridge: Cambridge University Press.

Smith, P. (1990). *Killing the spirit: Higher education in America.* New York: Viking.
Thomason, S. G., & Kaufman, T. (1988). *Language contact, Creolization and genetic linguistics.* Berkeley and Los Angeles: University of California Press.
Vendryes, J. (1921). *Le langage*. Paris.
Weinreich, U. (1953). *Languages in contact: findings and problems.* The Hague: Mouton.
Weinreich, U., Labov, W., & Herzog, M. I. (1968). Empirical foundations for a theory of language change. In W. P. Lehmann & Y. Malkiel (eds), *Directions for historical linguistics* (pp. 95–195). Austin: University of Texas Press.

Annotated further reading

If you would like to find out more about some of the topics addressed in this Reader, the following listing provides suggestions for follow-up reading. We have restricted our selection to published books (including both monographs and edited volumes). The reading list is annotated and divided into three sections: General Introductions to Cognitive Linguistics, Works of General Reference, and Specific Topics and Theories.

General introductions to cognitive linguistics

Croft, W., & Cruse, A. D. (2004). *Cognitive Linguistics*. Cambridge: Cambridge University Press.

A recent introduction to cognitive linguistics. Particularly good coverage of lexical semantics and constructional approaches to grammar, although less detail on other aspects of cognitive linguistics.

Evans, V., & Green, M. (2006). *Cognitive Linguistics: An Introduction*. Mahwah, NJ and Edinburgh: Lawrence Erlbaum Associates/Edinburgh University Press.

The most comprehensive general introduction to the field. Each chapter provides a detailed annotated reading list and exercises. Also includes chapters which compare cognitive linguistic theories with other theoretical frameworks.

Lee, D. (2001). *Cognitive Linguistics: An Introduction*. Oxford: Oxford University Press.

The most accessible of the general introductions, focusing on general ideas rather than detail. The selection of topics covered, is, nevertheless, a little uneven.

Ungerer, F., & Schmid, H.-J. (1996). *Introduction to Cognitive Linguistics*. London: Longman.

Very clear explanations of the areas presented, particularly on prototype and basic level objects research. However, the coverage is rather one-sided focusing on cognitive semantics at the expense of cognitive approaches to grammar. The book is also now over 10 years old.

Works of general reference

Evans, V. (2007). *Glossary of Cognitive Linguistics*. Edinburgh: Edinburgh University Press.

A glossary of over 350 specialist terms used in cognitive linguistics.

Geeraerts, D., & Cuyckens, H. (to appear). *Oxford Handbook of Cognitive Linguistics*. Oxford: Oxford University Press.

A major reference work containing original encyclopedia-like articles by leading experts. Provides comprehensive coverage of all the key areas of cognitive linguistics.

Janssen, T., & Redeker, G. (1999). *Cognitive Linguistics: Foundations, Scope and Methodology*. Berlin: Mouton de Gruyter.

An edited volume containing original articles by a selection of leading cognitive linguists. The articles address the theoretical and empirical basis of cognitive linguistics, and cognitive linguistic theories.

Specific topics and theories

Blending theory

Coulson, S. (2000). *Semantic Leaps: Frame-Shifting and Conceptual Blending in Meaning Construction.* Cambridge: Cambridge University Press.

An important study on the role of conceptual blending in language comprehension.

Fauconnier, G., & Turner, M. (2002). *The Way We Think: Conceptual Blending and the Mind's Hidden Complexities*. New York: Basic Books.

The definitive introduction to conceptual blending by the two architects of the theory. Highly accessible.

Categorisation

Lakoff, G. (1987). *Women, Fire and Dangerous Things: What Categories Reveal About the Mind*. Chicago: University of Chicago Press.

One of the classic texts in cognitive linguistics. Lakoff makes the case for a novel theory of cognitive models in order to account for recent findings in human categorisation. Also provides a philosophical framework for research in cognitive linguistics which remains influential.

Taylor, J. (2003). *Linguistic Categorization*, 3rd edition. Oxford: Oxford University Press.

Provides a highly accessible account of cognitive linguistic approaches to typicality effects and fuzzy categories as manifested in language.

Cognitive grammar

Langacker, R. (1987/1991). *Foundations of Cognitive Grammar*, Volumes I and II. Stanford, CA: Stanford University Press.

Volume I of Langacker's two-volume edifice lays out the theoretical assumptions of his theory. Volume II applies the theoretical architecture to a range of grammatical phenomena. These volumes are among the most important in cognitive linguistics.

Taylor, J. (2002). *Cognitive Grammar*. Oxford: Oxford University Press.

An excellent textbook introduction to Langacker's theory.

Cognitive psycholinguistics

Dąbrowska, E. (2004). *Language, Mind and Brain: Some Psychological and Neurological Constraints on Grammar*. Edinburgh: Edinburgh University Press.

An excellent and highly accessible overview and review of the cognitive linguistic position with respect to key issues in psychologuistics, including language acqusition, lateralisation and modularity. Also includes a review of cognitive linguistic criticsims of Chomsky's Universal Grammar hypothesis.

Cognitive lexical semantics

Cuyckens, H., & Zawada, B. (2001). *Polysemy in Cognitive Linguistics*. Amsterdam, NJ: John Benjamins.

An edited collection of original articles presenting contemporary work and views on modelling lexical polysemy in cognitive linguistics.

Cuyckens, H., Dirven, R., & Taylor, J. (2003). *Cognitive Approaches to Lexical Semantics*. Berlin: Mouton de Gruyter.

An excellent representative selection of original articles relating to contemporary approaches to cognitive lexical semantics.

Nerlich, B., Todd, Z., Herman, V., & Clarke, D. D. (2003). *Polysemy: Flexible Patterns in the Mind*. Berlin: Mouton de Gruyter.

Another recent collected volume of papers on linguistic polysemy. However, the strength of this volume, in addition to including excellent review articles by the editors and John Taylor, also includes contributions from a range of scholars, including those who work in frameworks outside cognitive linguistics.

Tyler, A., & Evans, V. (2003). *The Semantics of English Prepositions: Spatial Scenes, Embodied Experience and Cognition*. Cambridge: Cambridge University Press.

The most detailed cognitive linguistic study of English spatial relations. The book makes the case for the experiential basis of prepositional meanings and their extensions. It also provides an account of polysemy as conceptual in nature.

Conceptual metaphor and metonymy

Barcelona, A. (2003). *Metaphor and Metonymy at the Crossroads: A Cognitive Perspective*. Berlin: Mouton de Gruyter.

A collection of original articles addressing the relationship between metaphor and metonymy. Several of the articles reflect the growing conviction in cognitive linguistics that metonymy may be as, or even more, foundational than metaphor.

Dirven, R, Pörings, R. (2002). *Metaphor and Metonymy in Comparison and Contrast*. Berlin: Mouton de Gruyter.

A collection reproducing seminal and influential articles relating to conceptual metaphor and metonymy.

Gibbs, R. (1994). *The Poetics of Mind*. Cambridge: Cambridge University Press.

Presents psycholinguistic evidence for the conceptual basis of figurative language phenomena such as metaphor.

Lakoff, G., & Johnson, M. (2003). *Metaphors We Live By*, 2nd, revised edition. Chicago: University of Chicago Press.

This book, now a classic, and originally published in 1980, launched much of the recent interest in metaphor.

Lakoff, G., & Johnson, M. (1999). *Philosophy in the Flesh: The Embodied Mind and its Challenge to Western Thought*. New York: Basic Books.

An updating of Lakoff and Johnson's seminal ideas on conceptual metaphors and the notion of embodied cognition.

Kövecses, Z. (2002). *Metaphor: A Practical Introduction*. Oxford: Oxford University Press.

An accessible textbook introduction to Conceptual Metaphor Theory.

Gibbs, R., & Steen, G. (1999). *Metaphor in Cognitive Linguistics*. Amsterdam, NJ: John Benjamins.

An edited collection of original papers broadly reflecting the nature and scope of recent research within the framework of Conceptual Metaphor Theory.

Constructional approaches to grammar

Croft, W. (2002). *Radical Construction Grammar*. Oxford: Oxford University Press.

Presents Croft's theory of Radical Construction Grammar.

Goldberg, A. (1995). *Constructions: A Construction Grammar Approach to Verbal Argument Structure*. Chicago: University of Chicago Press.

A classic. Makes a compelling case for a constructional approach to grammar employing verbal argument constructions as a test case.

Östman, J.-O., & Fried, M. (2005). *Construction Grammars: Cognitive Grounding and Theoretical Extensions*. Amsterdam, NJ: John Benjamins.

An edited collection of original papers addressing theoretical and methodological issues relating to constructional approaches to grammar.

Cultural linguistics

Palmer, G. (1996). *Toward a Theory of Cultural Linguistics*. University of Texas Press.

In this book Palmer makes a compelling case for applying cognitive linguistics to cultural aspects of language, arguing for a theory of cultural linguistics.

Embodiment and conceptualization

Nuyts, J., & Pederson, E. (1997) (eds). *Language and Conceptualization*. Cambridge: Cambridge University Press.

An important collection of articles on the relationship between language and conceptual processes.

Varela, F., Thompson, E., & Rosch, E. (1991). *The Embodied Mind*. Cambridge, MA: MIT Press.

One of the first book-length treatments in cognitive science which made the case for the centrality of embodiment for cognition. Remains extremely important and is highly accessible.

Empirical approaches

Gonzalez-Marquez, M., Mittelberg, I., Coulson, S., & Spivey, M. J. (eds) (2007), *Empirical Methods in Cognitive Linguistics*. Amsterdam, NJ: John Benjamins.

A recent edited volume comprising original articles by prominent cognitive linguists and psychologists. The collection both makes the case for empirical methods in cognitive linguistics and represents the state-of-the-art.

Image schemas

Hampe, B. (2005). *From Perception to Meaning: Image Schemas in Cognitive Linguistics*. Berlin: Mouton de Gruyter.

An outstanding recent contribution to image schema theory. An edited collection of papers by leading scholars presenting a range of often conflicting positions on the nature of image schemas.

Johnson, M. (1987). *The Body in the Mind: The Bodily Basis of Meaning, Imagination and Reason*. Chicago: Chicago University Press.

One of the classic texts in cognitive linguistics. Provides the first detailed treatment of image schemas.

Mandler, J. (2004). *The Foundations of Mind: Origins of Conceptual Thought*. Oxford: Oxford University Press.

An important study by a leading developmental psychologist. Mandler describes how image schemas derive from perceptual experience in pre-linguistic infants.

Language acquisition and language use

Barlow, M., & Kemmer, S. (2000) (eds). *Usage-Based Models of Language*. Stanford, CA: CSLI Publications.

An important collection of original aricles which provide various perspectives on how best to model knowledge of language in terms of usage-based factors.

Tomasello, M. (2003). *Constructing a Language: A Usage-Based Theory of Language Acquisition*. Cambridge, MA: Harvard University Press.

An important recent synthesis of empirical findings relating to first language acquisition. Presents the case for a usage-based perspective on language acquisition.

Language and conceptual structure

Evans, V. (2004). *The Structure of Time: Language, Meaning and Temporal Cognition*. Amsterdam, NJ: John Benjamins.

Investigates the relationship between lexical and conceptual structure in the domain of time.

Talmy, L. (2000). *Toward a Cognitive Semantics*, Vol. I and II. Cambridge, MA: MIT Press.

Brings together, and updates, Talmy's classic papers in which he explores how language encodes various aspects of conceptual structure including space, force-dynamics and motion.

Language change

Croft, W. (2000). *Explaining Language Change: An Evolutionary Perspective*. London: Longman.

A seminal work by one of the most original thinkers currently working in cognitive linguistics. Croft presents a usage-based theory of language change which applies insights from the generalised theory of natural selection to language.

Sweetser, E. (1990). *From Etymology to Pragmatics: Metaphorical and Cultural Aspects of Semantic Structure*. Cambridge: Cambridge University Press.

Another highly influential and now classic text in cognitive linguistics. Sweetser uses ideas from metaphor theory and image schema theory in order to account for semantic aspects of grammatical change.

Linguistic diversity and relativity

Gentner, D., & Goldin-Meadow, S. (2003). *Language in Mind: Advances in the Study of Language and Thought*. Cambridge, MA: MIT Press.

A recent collection of original papers by some of the most prominent cognitive scientists who work on cross-linguistic diversity and the relationship between language, mind and thought.

Gumperz, J., & Levinson, S. (1996) (eds). *Rethinking Linguistic Relativity*. Cambridge: Cambridge University Press.

An important collection of articles from the mid 1990s which did much to revitalise the linguistic relativity debate. Of particular importance are articles by Bowerman, Lucy, Levinson, and Slobin.

Levinson, S. (2003). *Space in Language and Cognition*. Cambridge: Cambridge University Press.

Presents a synthesis of over a decade's research on cross-cultural studies on the representation of space. Levinson uses his research as a platform to argue for the pervasive effects of cross-linguistic variation on non-linguistic cognition.

Mental spaces theory

Dancygier, B., & Sweetser, E. (2005). *Mental Spaces in Grammar: Conditional Constructions*. Cambridge: Cambridge University Press.

Presents a theoretical account of conditional constructions using the framework of mental spaces theory.

Fauconnier, G. (1994). *Mental Spaces*. Cambridge: Cambridge University Press.

This is a revised edition of Fauconnier's classic book, first published in English in 1985. Presents a ground-breaking theory of semantic reference, successfully resolving many semantic phenomena which had bedevilled formal approaches.

Fauconnier, G. (1997). *Mappings in Thought and Language*. Cambridge: Cambridge University Press.

In this volume Fauconnier updates and extends his theory of mental spaces. He also introduces his collaborative work with Mark Turner on Conceptual Blending.

Fauconnier, G., & Sweetser, E. (1996). *Spaces, Worlds and Grammar*. Chicago: University of Chicago Press.

An edited volume consisting of original articles which address various semantic and grammatical issues making use of Fauconnier's theory of mental spaces.