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- Language as a window into cognitive processes;
- The relationship between linguistic structure and cognitive processes;
- Linguistic influences on thought in different cultures.
COGNITIVE LINGUISTICS IN THE YEAR 2010

Laura A. Janda
Universitetet i Tromsø, Norway

ABSTRACT

Cognitive linguistics emerged as a movement in the mid-1980s. Although in some sense it represents a new direction for linguistics, cognitive linguistics also builds upon venerable traditions, re-connecting the discipline with its past rather than severing ties and striking off in a revolutionary direction. Originally inspired by work by psychologists on the structure of human categorization in the 1970s, cognitive linguistics has maintained its commitment to psychological and neurological plausibility. Cognitive linguistics views linguistic cognition as indistinguishable from general cognition and thus seeks explanation of linguistic phenomena in terms of general cognitive strategies, such as metaphor, metonymy, and blending. Grammar and lexicon are viewed as parts of a single continuum and thus expected to be subject to the same cognitive strategies. Significant developments within cognitive linguistics in the past two decades include construction grammar and the application of quantitative methods to analyses.

Keywords: history of cognitive linguistics, radial category, prototype, metaphor, metonymy, blending, construction grammar, quantitative analysis.

PREAMBLE

Ten years ago I was asked to write a position piece on cognitive linguistics for Slavists. It was the year 2000, and, like scholars all across the disciplinary spectrum, Slavic linguists felt the urge to revisit past achievements and assess future challenges. The major intellectual issue of the day was negotiating the available linguistic theories, and preventing adherents of opposing camps from backing so far away from each other that communication was cut off. My job was to write an article that would open a door to cognitive linguistics for my colleagues.

The original article had two strokes against it: it was targeted to the narrow audience of linguists working on Russian and closely related languages, and it was never published in print form. But despite these facts, this article became the most widely read and quoted piece in my list of publications, serving as the introductory article in university courses on cognitive linguistics. In its present form, this article has been refocused to address not just Slavists, but
all linguists, and indeed all people interested in how languages work. I thank IJCL for the opportunity to revisit this article and to publish it in a print volume.

In addition to addressing a wider audience, the present article describes significant developments that have taken place in our field in the course of the past decade, integrating them into the discussion of cognitive linguistics in general. These developments include the blossoming of construction grammar and increased focus on empirical methods. In addition, there has recently been more attention paid to cognitive linguistics by scholars working in related fields such as psychology, typology, and robotics.

Although this article is intended as an introduction to the field, it is also a personal story. I was tremendously lucky to get involved with cognitive linguistics before any of us really knew what it was or what would become of it. In 1982, at the prompting of a visiting Bulgarian lecturer, I wandered into a presentation on metaphor by George Lakoff at the UCLA business school (in those days his ideas were not welcome in a linguistics department). By the end of the talk, I knew that I would use Lakoff’s model to analyze the Russian prefixes I was struggling with. This chance event led me to write one of the first dissertations in cognitive linguistics. But you will not find the term “cognitive linguistics” anywhere in my dissertation, since it had not yet been coined. The only existing literature at that point were Rosch’s (1973a-b, 1978; Mervis and Rosch 1981) works in psychology, plus some linguistic studies inspired by Rosch (Fillmore 1975, 1978, 1982; Kay and McDaniel 1978; Coleman and Kay 1981; Lakoff 1977). Lakoff and Johnson’s (1980) *Metaphors We Live By* was a novelty then, and Ronald Langacker generously gave me a draft of his *Foundations of Cognitive Grammar*, which was published in two volumes five and eight years later. I very literally had the good fortune of being in the right place at the right time, and of meeting the right people who helped me out at a critical moment in my career. This account is entirely autobiographical, one person’s view of how our field has evolved and where it is now.

1. **INTRODUCTION**

A curious thing happened to me in the 1990s. For several years, I had been teaching a course in cognitive linguistics at the University of North Carolina. A graduate student from the linguistics department who had taken my course in cognitive linguistics six years earlier came and knocked on my door. The son of a famous German linguist, with all the benefits of both European and American educations, this young man was unusually erudite and a pleasure in class because of the comparisons he could draw among linguistic traditions. Still, it was evident that he had been politely sitting through the course in order to chalk up a required elective; he clearly felt no affinity toward the subject matter.

Suddenly he reappeared, tremendously animated, speaking so fast I could barely follow him. His dissertation, an analysis of resultative constructions, had run into a series of dead-ends, eventually exhausting all the syntactic theories available, and, despite himself, everywhere he looked he was seeing semantic prototypes and their effects. Then came the confession:

“I never really thought I would take cognitive linguistics seriously.”

I could only smile and reply, “Welcome back.”
Fortunately I had just returned from a biennial meeting of the International Cognitive Linguistics Association with a treasure trove of handouts and email addresses, so I was able to bring him up to date on the latest relevant achievements and put him in contact with key scholars. A few days later he came back to thank me; his dissertation was now off and rolling again. In the intervening years, this former graduate student, Hans C. Boas, has completed his dissertation, achieved tenure as Associate Professor of Germanic Linguistics at the University of Texas, and become a leading scholar in construction grammar.

With some variations, this is a scenario I’ve been a party to several times before. My own dissertation was a problem in search of a framework almost two decades ago, when quite by accident I stumbled upon an embryonic movement without even a name or a bibliography. Yet the concepts were so compelling and the model so useful, that I have never escaped their attraction, and gave up trying long ago.

1.1. Some History

It wasn’t an easy birth. Initially viewed as a “soft and fuzzy” California intruder, cognitive linguistics was not warmly embraced by mainstream American linguistics. During the early years, abstracts using the framework were routinely rejected from LSA programs, grant proposals were sidelined, our book series was shunned by Oxford U Press, and even as recently as the 1990s, cognitive linguists were still being denied tenure on the grounds that their work was “too controversial” or “could not be considered linguistics at all”. Yet what began in the early eighties as a wedding of intuitive data analyses (Brugman 1988, Casad 1982, Lindner 1981) with powerful linguistic concepts (Lakoff and Johnson 1980, Langacker 1987 and 1991a), by 1989 had grown into an international organization (http://www.cognitivelinguistics.org/) with its own journal and book series. Today the International Cognitive Linguistics Association has nearly 450 members, and over 500 registered for our most recent biennial international conference. Over a dozen affiliate organizations have sprung up, representing North America and nations across Europe and Asia, and most of these organizations also boast their own conference and publication series.

2. RELATIONS TO OTHER DISCIPLINES

The original impetus for cognitive linguistics came from the pioneering research of psychologist Rosch (1973a, 1973b, 1978) on the nature of human categorization. Throughout its history, cognitive linguistics has maintained a lively dialog with allied disciplines such as psychology, anthropology, neurobiology, motor control, artificial intelligence, philosophy, and literary criticism. ICLA meetings regularly include plenary lectures delivered by scholars from these other disciplines to foster cross-fertilization. These events invariably expose the many ways in which the conclusions of cognitive linguistics corroborate results obtained in a wide spectrum of academic inquiries. Cognitive linguistics is most certainly not an exotic endeavor off on its own disconnected tangent, but rather a framework that interacts responsibly with a community of academic allies. Although this does not mean that cognitive linguistics can make any claim to psychological reality (diagrams are just artifacts, we do not
presume that anyone actually thinks by means of such items), it does mean that cognitive linguistics strives in an informed way to create analyses that are at least psychologically (biologically, neurologically, etc.) plausible. Ultimately our responsibility as linguists to reflect what is known about human cognition by other disciplines is more important than any formal apparatus, however elegant, that might distract us from this goal.

The relationship between cognitive linguistics and psychology remains vital; a landmark in the dialog between cognitive linguists and psychologists is the 2003 volume edited by Gentner and Goldwin-Meadow, and Gibbs (1994) has provided a steadfast connection between our two disciplines. Some of the most current evidence of how cognitive linguistics and psychology connect to each other can be seen in the works of Boroditsky (2001, 2003) and Casasanto (2008, 2009; Casasanto and Boroditsky 2008). Typology and language acquisition have been steady companion disciplines, due to shared appreciation of variation in language, as opposed to a quest for universals; Bowerman, Croft, Haspelmath, Levinson, and Tomasello (Bowerman and Choi 2003; Bowerman and Levinson 2001; Croft 1999, 2003; Haspelmath 1997a-b; Levinson and Meira 2003; Majid et al. 2004; Tomasello 1992, 2003) have all provided valuable cross-linguistic perspectives that support the framework of cognitive linguistics. A recent reminder of the importance of typology to cognitive linguistics is Evans and Levinson 2009. In the past few years scholars in robotics have developed an interest in language evolution and have discarded modular, rule-based models for dynamic models of category acquisition (see Steels 2010 and more discussion in 4.4 below). As we make our way along the path of cognitive linguistics, we have always been in good company, and the number of fellow-travelers seems to be waxing rather than waning.

3. RELATIONS TO OTHER THEORIES AND THE HISTORY OF LINGUISTICS

I’ve argued elsewhere (Janda 1993b, Janda 1999b; cf. also Geeraerts 1987) that cognitive linguistics gives us an opportunity to reconnect the threads of the history of linguistics and heal the gashes that marked our field in the twentieth century. This does not mean that cognitive linguistics is some sort of theoretical “throw back”, a reinvention of tired old wheels already rejected. On the contrary, thanks to its continuance of time-honored intellectual pursuits (the form-meaning relationship, the coherence of linguistic and non-linguistic cognition, the assertion that language is the most immediate artifact of human thought, etc.), cognitive linguistics invites us to draw on the wealth of accumulated achievements in the history of linguistics and move forward on this path, rather than bushwhacking off in some other direction. In many parts of the world, the path of cognitive linguistics is compatible with local theoretical frameworks. For example, during the Cold War era Eastern European linguists in general and Russian linguists in particular were largely isolated from theoretical discussions in the West, and turned their energies inward, developing their own home-grown traditions. The indigenous Russian Meaning<->Text framework and other semantic theories that emerged under these conditions are remarkably parallel to cognitive linguistics (cf. the assertion to this effect in Raxilina 1998), and as a result, cognitive linguistics is quite popular in Russia as well as in other Eastern European countries, particularly Poland, the Czech Republic, and Macedonia. Our colleagues in
Western Europe have likewise been quick to embrace this framework, and cognitive linguistics is well-represented in the publications of linguists working in England, Norway, Sweden, Germany, and Austria. Representation in Japan has been strong throughout the 20-year existence of the International Cognitive Linguistics Association, and the past decade has witnessed the blossoming of our field in Korea and China as well. Consequently cognitive linguistics serves as an intellectual meeting place for linguists from various continents, facilitating discourse and collaboration.

4. BASIC CONCEPTS

Cognitive linguistics did not arise fully-formed from a single source, it has no central “guru” and no crystallized formalism. It is a concatenation of concepts proposed, tested, and tempered by a variety of researchers. The people whose work has been most influential in the creation of this framework include Brugman, Casad, Croft, Dąbrowska, Fauconnier, Goldberg, Johnson, Lakoff, Langacker, Lindner, Sweetser, Talmy, Taylor, Tomasello, Tuggy, and Turner; some of their classic works are cited in the references. This framework is anything but static. As it grows, cognitive linguistics continues to present us with fresh ideas and new means for interacting with other disciplines. A significant innovation in the mid 1990s was the study of blends (see 4.6 below). The late 1990s saw the advent of construction grammar (see 4.7 below). Since approximately 2000 empirical methods have emerged as core tools for analysis in the field (see 5.1 below), and recently robotic language evolution models based on radial categories and construction grammar have appeared (see 4.4 below).

The fact that cognitive linguistics can point to no definitive text or single authority does not mean that it is a trackless wilderness of shifting sands. There is a set of core concepts and goals, most of which are shared by most cognitive linguists, as well as by the philosophers, psychologists, and other scholars who have collaborated on the development of this framework. These concepts are not the product of an imposed theory, but have instead emerged from empirical observation corroborated across languages and disciplines. Rather than being a random hodgepodge, these concepts mutually support one another and have coalesced into a theory firmly grounded in fact. Overall, cognitive linguistics tends to lean more strongly toward data than toward theory, and it tends to expect that the latter can be gradually elaborated from the former. Early analyses of intricate arrays of natural language data performed by Brugman (1988), Casad (1982), and Lindner (1981) were formative in the development of cognitive linguistics, and the best research in this framework continues to use observations of data to tweak and refine the theory.

The above-cited ICLA website states that “[The cognitive linguistic] perspective subsumes a number of concerns and broadly compatible theoretical approaches that share a common basis: the idea that language is an integral part of cognition which reflects the interaction of cultural, psychological, communicative, and functional considerations, and which can only be understood in the context of a realistic view of conceptualization and mental processing.” In 4.1-4.7 I outline the most enduring and widely held concepts of cognitive linguistics. These concepts (and many more) are elaborated in more detail in Geeraerts and Cuyckens 2007 and a series of textbooks and collected volumes devoted to cognitive linguistics (Achard and Kemmer 2004, Croft and Cruse 2004, Dąbrowska 2004, de
4.1. The Status of Linguistic Cognition

For a cognitive linguist, linguistic cognition simply is cognition; it is an inextricable phenomenon of overall human cognition. Linguistic cognition has no special or separate status apart from any other cognition. This means that we expect patterns of cognition observed by psychologists and neurobiologists to be reflected in language. Furthermore, the various phenomena of language are not cognitively distinct one from another. Although it is often useful and convenient for linguists to talk about various “levels” or “modules” of language, these distinctions are perceived by cognitive linguists to be artificial. The truth is that all the “parts” of language are in constant communication, and indeed are really not “parts” at all; they are a unified phenomenon operating in unison with the greater phenomena of general consciousness and cognition. Linguists have frequently observed that the borders between traditional linguistic phenomena can be crossed. Phonology, for example, can be affected by morphology, semantics, syntax, and pragmatics; and syntax has likewise been shown to be vulnerable to the workings of phonology, semantics, and pragmatics. The fact that these items are not pristinely discrete is perhaps not news, but for a cognitive linguist this type of evidence is expected, pursued, and focused on rather than being relegated to the status of something marginal and unimportant.

4.2. The Status of Meaning

All the various phenomena of language are interwoven with each other as well as with all of cognition because they are all motivated by the same force: the drive to make sense of our world. Making sense of what we experience entails not just understanding, but an ability to express that understanding, and indeed these two projects inform each other: our experience is formative to expression (see 4.4 below), but it is also the case that our expressive resources have some influence on how we perceive our experiences. Of course language does most of the heavy lifting (and the finer handiwork) in this job of expression that is so important to cognition. All phenomena of language are mobilized for this task, and all are therefore driven by the need to express meaning. Meaning underwrites the existence of all linguistic units and phenomena, none of which are semantically empty. Meaning is therefore not tidily contained in the lexicon, but ranges all through the linguistic spectrum, because meaning is the very energy that propels the motor of language. Grammar is an abstract meaning structure that interacts with the more concrete meanings of lexicon. Grammar and lexicon are not two discrete types of meaning, but rather the extreme ends of a spectrum of meaning containing transitional or hybrid types (functor words like prepositions and conjunctions are examples of hybrids that carry both lexical and grammatical semantic freight). From the supra- and segmental features of phonology through morphology, syntax, and discourse pragmatics, all of language shares the task of expressing meaning. This includes even idioms and “dead
metaphors”, which remain motivated within the system of a given language, and whose motivation can be made explicit

4.3. The Status of Prediction

Linguistics is a field with an almost desperate desire to be an exact science. Science and precision have unparalleled status in our society, for they command respect and authority. The operational definition of a scientific result hinges upon proving that the result can be repeated; i.e., it is predictable. The reality for linguistics is however very different from that of the physical sciences. Historical linguistics and dialectology provide plenty of evidence that even when you are starting from more or less the same place (or even exactly the same place) linguistically, you can end up with an amazing variety of results. We have to face the fact that linguistics is really a field in which none of the experiments have adequate controls, there are way too many variables, and all the data is contaminated. It doesn't make much sense for us to depend entirely on the metaphor LINGUISTICS IS AN EXACT SCIENCE to structure our inquiry. As Croft (1999) has pointed out, if linguistic phenomena were truly predictable, there wouldn’t be any variation, and variation is one of the best-documented phenomena we know.

By accepting these facts, cognitive linguistics neither disintegrates into a morass of arbitrary chaos, nor does it give up all aspirations to scientific inquiry. Cognitive linguistics does not subscribe to a strictly dualistic understanding of the concepts predictable vs. arbitrary or objective science vs. subjective interpretation. Just because a phenomenon is not entirely predictable doesn't mean that it is entirely arbitrary, and one should expect a dynamic relationship between data and interpretation. Cognitive linguistics searches for the motivations that drive linguistic phenomena, recognizing that sometimes several variants are equally motivated, and the choice of which one succeeds is a language-specific convention that cannot be fully predicted. Though the motivations vary (and often a given phenomenon may be multiply motivated in the system of a given language), at an abstract level, these motivations yield a consistent pattern: all linguistic phenomena are meaningful; linguistic categories are radial categories with prototype effects; meaning is grounded in embodied experience and elaborated via metaphor, metonymy, and blends; construal determines how perceived reality is sorted into foregrounded and backgrounded information; etc.

1 The case can be made that no metaphor is entirely dead; some are in a frozen state, but can be thawed out when desired, often in the context of humor. A regular feature in my courses on metaphor and cognitive linguistics is a homework assignment asking students to implement parts of a conventional metaphor that are usually not active to produce jokes such as “His ideas are so far out that even the Hubble telescope can’t detect them”, or “I’m at the end of my rope! Could you hand me something longer, like maybe a bungee cord?” This task shows that even the metaphors underlying idiomatic expressions are not really “dead” – they can be reactivated and pressed into creative service.

2 A historical linguist once pointed out to me that it is just as common to see a change in which A goes to B, as to see one in which A “just goes all to hell”. I can cite many examples from the history of the Slavic languages that corroborate this statement (e.g., tŭrt/trŭt reflexes and jer loss/vocalization), and surely linguists who work with other languages know of similar stories.

3 Even the “hard” sciences are not immune to liberal application of “soft” interpretation. As often happens with folk theories such as LINGUISTICS IS AN EXACT SCIENCE, we apply a stripped-down version of the model, ignoring the subtler intricacies. We forget that the traditions of how to interpret data are often just as valid and venerable as the data themselves.
Exploration of this pattern of motivations takes the place of a quest for “universals” in cognitive linguistics. Because cognitive linguistics is not in the business of prediction, it is also not looking for a set of concrete universals that would facilitate prediction (on the assumption that this is neither desirable nor realistically achievable). In the big picture, cognitive linguistics’ ultimate goal is to understand how human cognition motivates the phenomena of language, to be described in terms of abstract trends rather than air-tight, absolute rules. One could say cognitive linguistics recognizes that human beings are not rule-guided algorithms, but individuals with a free will which they exercise in ways not entirely consistent and predictable, but on the whole well-motivated and according to certain patterns.

4.4. The Embodiment of Meaning

Given the central role of meaning in language, it is essential that we understand what it is and where it comes from. One could easily spend an entire lifetime studying philosophical debates on the nature of meaning. I’ve taken a wade in this pool myself and quickly discovered that if I stayed in, I would soon be in so deep that I wouldn’t be able to do anything else, so instead of trying to swim alone, I have relied on a variety of philosophers and texts. Some of the details and the philosophical implications of cognitive linguistics are hotly contested within the movement itself. However, the vast majority of research that can be conducted in the cognitive linguistic framework requires only the principles I will describe in this subsection; the debatable details are of almost no consequence for the kind of work most of us do. I will therefore restrict my remarks to the assumptions that most cognitive linguists agree on.

Meaning has to come from somewhere. It can’t just exist by fiat as a set of symbols. It isn’t just there in the words (or morphemes or whatever). And for the most part, meaning in natural languages cannot be manipulated by pushing symbols through the rigors of a set of logical rules. Very little of language can be fruitfully explained in this way. One cannot magically breathe the life of meaning into theoretical algorithms. The philosopher Hilary Putnam (1981) has gone to great pains to show that “brains in a vat” (i.e., a disembodied

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4 For example, the concepts presented in Inns 1994, who is working entirely from the perspective of the philosophy of meaning, are remarkably familiar to cognitive linguists, and indicate a strong potential affinity between the two lines of inquiry (cf. Janda 1999b.)

5 There are some ideas associated with cognitive linguistics that one does not have to swallow in order to work within this framework. For example, Lakoff (1987) asserts that because all human experience is mediated through perception, humans have no unmediated transcendent experience of absolute reality, and therefore there is no absolute reality. In other words, cognitive linguistics can be taken as a proof that God does not exist. I would argue that our lack of access to absolute reality does not disprove the existence of this reality. Lakoff and Johnson (1999) take this argument even further, and come close to asserting that there is no real world out there. Again, I (and many other cognitive linguists) think that just because there are filters of perception and conception between us and the real world does not mean that the latter is absent, but I lack the philosophical sophistication (as well as the time and inclination) to attempt a refutation. Both Lakoff (1996) and Johnson (1992) have likewise used the premises of cognitive linguistics to support a certain moral perspective, but when Lakoff first presented his case at the 1995 ICLA meeting, there was strong opposition voiced by the audience, and Johnson’s article sparked considerable debate, chronicled in rebuttals published by McLure (1993), Gorayska (1993) and Sinha (1993). The point is that none of these theological or moral assertions necessarily follow from the premises of cognitive linguistics, and it is not necessary to agree with them in order to be a productive contributor to this field.

6 Cf. Reddy’s (1979) article about how this common fallacy has been conventionalized in the metaphorical system of English and why it is indeed a fallacy.
thinking system), though they might be able to pass symbols around, would not have access to meaning, and also that the assumption that meaning could exist in such a system leads to an essential logical error (cf. Lakoff 1987: 229-259).

Cognitive linguistics works from the premise that meaning is embodied. This means that meaning is grounded in the shared human experience of bodily existence. Human bodies give us an experiential basis for understanding a wealth of concepts (often called "image schemas" in cognitive linguistics), such as IN vs. OUT, UP vs. DOWN, NEAR vs. FAR, COUNT vs. MASS, FIGURE vs. GROUND, BALANCE, and SOURCE-PATH-GOAL. One of the first experiences babies rehearse is that of the body as a container (IN/OUT), by putting things in their mouths. UP/DOWN is dictated by gravity and the erect adult posture, itself an achievement of BALANCE. NEAR/FAR, COUNT/MASS, and FIGURE/GROUND all derive from the way our senses work (primarily sight and hearing, though to a lesser extent touch, taste, and smell all participate in these distinctions), and SOURCE-PATH-GOAL results from our experience of ourselves and other objects moving through space. This is only a small sampling of the meanings directly attributable to bodily existence. Cognitive linguistics is an exploration of the fabric of meaning, woven thread by thread from bodily experience and embroidered by metaphor and metonymy. This is an ambitious and intricate project that still has a long future ahead of it.

It is necessary to remember that all experience is filtered by perception, and that as a consequence language is not a description of the real world (nor any possible world), but rather a description of human perception of reality. Therefore, when we examine meaning, our goal is not to find a correspondence between utterances and a world (real or otherwise), but rather to explore the ways in which meaning is motivated by human perceptual and conceptual capacities. A salient characteristic of these capacities is that they aren't constantly processing everything that comes their way; human beings are usually ignoring the vast majority of perceptual information available at any given instant. This ability to attend to certain inputs while ignoring the rest is essential to successful cognitive functioning, and can be manipulated at various levels of consciousness. The tension between what is perceptually and cognitively foregrounded and what is backgrounded can be resolved in a variety of ways, and can even be resolved differently by the same person at different moments. In cognitive linguistics we call this phenomenon construal, and it has significant linguistic consequences. For example, the same event of objective reality may be differently construed by different speakers or even by the same speaker in different utterances, thus resulting in differences in linguistic expression such as aspect, syntax, case, etc. Recognition of this fact is another reason why cognitive linguists do not aspire to prediction, yet construal enables us to examine a much broader spectrum of language use than would be possible if we assumed a direct correspondence between the input of exterior reality and linguistic output. Accepting the fact that there are both a body and a mind between those two endpoints makes the formula more

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7 Johnson (1987) presents these and several other basic image schemas, and also discusses ways in which they are metaphorically extended to other domains in cognition, language, and art. Johnson’s list of image schemas is very abbreviated; a complete catalogue would be enormous.

8 The interplay of perception and conception has inspired Talmy (1996) to coin “ception” as an umbrella term.

9 Churchland (1996) provides numerous examples of how human attention is focused and manipulated. At the neuronal level, it appears that vision, for example, tends to focus on moving objects. At the level of conscious manipulation, there are ambiguous drawings (the beauty/hag and rabbit/duck are the most familiar examples) that people can construe in different ways. This type of construal is probably more common and more significant in the manipulation of linguistic categories than it is in perception.
complicated, but it also makes our endeavor more accurate (and note that formalism and prediction do not necessarily correlate with this type of accuracy).

Here’s an anecdote to illustrate why the embodiment of meaning is important to linguists. A psycholinguist once called to tell me about some strange patterns he was finding in data on the grammatical status of numerals in various languages (I think he called me because Slavic languages provide rich evidence of this phenomenon). The numerals ‘one’ and ‘two’ tended to be treated differently, ‘two’ was sometimes treated differently from ‘three’, but sometimes they were treated the same, and often ‘four’ followed a similar pattern. However, ‘five’ tended to behave very differently from both ‘four’ and ‘six’, and ‘six’, ‘seven’, ‘eight’, ‘nine’, etc. tended to behave similarly again, usually aligned with ‘five’. My colleague was puzzled by the fact that this distribution is so consistent among unrelated languages. My answer went something like this: you’ve found that ‘five’, ‘one’, and a lesser extent ‘two’ tend to have a special status in languages. To understand ‘five’, hold your hand up in front of your face. To understand ‘two’, notice your other hand, and the similar pairing of legs, eyes, ears, etc. ‘One’ is your experience as a unique human being, and your experience of single as opposed to plural things. The motives are all there in the body, though different languages may conventionalize and grammaticalize these facts in various ways.

The premise that meaning results from human bodily experience as processed by perception and cognition has many ramifications that cannot be explored in detail in this article. For example, there is a huge gulf between human and artificial intelligence. Why is that gulf there and is it bridgeable? The Turing ([1950]1996) Test was conceived as an operational definition of the goal of artificial intelligence – the creation of a computer that could think. The Turing Test involves a computer and a person engaged in conversation overheard by a human judge to whom the identities of the interlocutors are not revealed. According to Turing, if the human judge is unable to tell which interlocutor was the computer and which the live person, then the computer has passed the Turing Test, and the computer is indeed thinking, not just performing calculations. Searle ([1990]1996) protested that simulations such as the Turing Test are not adequate proof of conscious cognition, and presented an analogy to the Turing Test, the Chinese Room, in an attempt to defeat Turing’s proposal. The Chinese Room contains a person who does not know anything about Chinese and a rule book that the person uses to match incomprehensible Chinese inputs with equally incomprehensible Chinese outputs. A Chinese speaker who provides the inputs and reads the outputs is satisfied that s/he is having a conversation with a Chinese speaker, but does this mean that the Chinese Room understands Chinese? Searle insisted that the Chinese Room does not understand Chinese, but rather than laying the Turing Test to rest, Searle’s analogy sparked further debate over what it means to understand language, and some scholars insisted that his Chinese Room does indeed understand Chinese. Cognitive linguistics sided with Searle: his Chinese Room does not understand Chinese, and passing the Turing Test does not prove that a computer can think. It was thus assumed that the gulf between human and artificial intelligence is unbridgeable.

How might computers access meaning? Computers don’t have bodies. Worse yet, they don’t share our perceptual organs or our cognitive abilities (especially the drive to manipulate construal and to organize information in radial categories based on experience). Consequently, computers don’t have access to meaning, the engine that drives both thought and language. Unless we can find a way to give them this access, computers will never be able to think or truly use language (rather than just aping cognitive and linguistic tricks via
massive calculations). Barring such a breakthrough, machine translation of human utterances is similarly doomed to failure. But what if the problem is approached not by means of brute-force computation, but by means of providing computers with an embodied experience and a human-like way to process it? Churchland and Churchland ([1990]1996) presented a counterpoint to Searle, suggesting that advancements in artificial intelligence and neurobiology make it possible to envision a thinking computer. More recently, Steels (2010) and his collaborators have set up systems of robotic “agents” that have bodies and perceptual “organs”, and play “language games” in which they negotiate linguistic categories for concepts such as color and location. Unlike the computers of Turing’s and Searle’s era, these robots do not function according to pre-set rule-based programs, but rather build categories of meaning based on their embodied experiences and communications among themselves. Their categories are dynamic and compatible with radial categories of human cognition. These robotic communities are beginning to use metaphor to understand time in terms of space, and their syntax is inspired by construction grammar. In other words, once the problem of artificial intelligence was re-stated in a way that took seriously the role of embodiment in meaning and the structure of meaning in human consciousness, progress became possible again.

4.5. The Structure of Cognitive Categories

If linguistic categories are cognitive categories, then we should expect them to have the same structure. Empirical research in psychology, neurobiology, and linguistics indicates that human knowledge is stored, accessed, and manipulated in categories with a specific structure. Set theory and Venn diagrams have trained us to expect that a category is defined by a boundary, that category membership is all-or-nothing (usually based on the criteria of necessary and sufficient features), and that all members of a category share equal status within the category. None of these parameters are valid for the vast majority of human categories. Rather than having a defining boundary and no internal structure, human categories tend to have a defining internal structure and no boundary. A given category is motivated by and organized around a prototypical member, to which all other members ultimately bear some relationship. Bearing a relationship to the prototype does not necessarily entail sharing a feature with the prototype, since a relationship to the prototype may be mediated by a chain of linked members, in which each contiguous pair shares features, but there may be no feature shared by category members at the extreme ends of this chain. Indeed, it is often impossible to arrive at the set of members of a cognitive category by using features to define it. Complex categories can have numerous chains radiating from the

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10 The notion of “fuzzy sets” attenuates the absolute values of these characteristics, but does not change the nature of the set structure. One should note that set theory is itself a metaphorical projection of the IN/OUT image schema. This fact makes the theory accessible and compelling, and very useful for many mathematical applications, but it is inadequate to the task of describing human categorization.

11 I have been searching for a counterexample to this for years, by asking students (and offering them credit toward their grades) to find a definition via features that will accurately capture all and only the members of a category represented by a monomorphemic lexeme of their choice, yet no one has ever succeeded in this challenge. Every featural description either excludes members that need to be included, or includes members that should be excluded, and most descriptions do both. Thus “four legs, a seat, and a back” as a definition of “chair” excludes wheelchairs and beanbag chairs, but includes many stools, couches, and benches, whereas
prototype, and are therefore referred to as “radial categories”. The prototype has privileged status in a category, the densest structure of relationships to other members, and peripheral members are less representative of a category than the prototype (cf. Lewandowska-Tomaszczyk 2007). The relationship of the center/prototype to the periphery cannot be described in terms of a core + rules model, because the entire category, complete with its structure, is something that exists rather than being continuously generated from the center. The contents and structure of radial categories vary from language to language, and to some extent even from speaker to speaker. Radial categories are conventional and often language-specific, not a predictable result of the application of rules, and categories can both grow and shrink. The prototype is often also of higher frequency than other members of a category, however frequency is not a cause, but rather a symptom of prototypicality, and not an entirely reliable one at that.

An illustration will demonstrate some of these points. The English word mother has as its prototype a woman who is married to the father of a child whom she conceives, gives birth to, and nurtures. However, of course there are lots of mothers: stepmothers, adoptive mothers, birth mothers, surrogate mothers, foster mothers, genetic mothers (egg donors), etc. None of the features of the prototype is necessary or sufficient to define all these people as mothers, since there is no one feature that they all share (a birth mother usually does only the conceiving, gestating and birth, but none of the nurturing, whereas the opposite is true of an adoptive mother; a stepmother is not required to perform biological or nurturing functions -- she need only be married to the father). And the category of mother is a dynamic one, showing growth at the periphery in response to fertility technologies and new legal and ethical precedents. The category represented by English chair demonstrates that such categories are often language-specific. Both Czech and Russian use an entirely different lexeme for what we call armchair (Cz křeslo, R kreslo) than for what we call chair (Cz židle, R stul); for Czechs and Russians, an armchair is not in the chair category, it’s a different object altogether. Furthermore, Czechs are capable of viewing a wheelchair as either a type of armchair or as an entirely different type of object. In the literary language, a wheelchair is křeslo na kolečkách, literally an ‘armchair on wheels’; but in the spoken language a wheelchair is usually called vozejk, a ‘small cart’. Thus even in different registers of a single language the conventional categorization of an object can vary.

The value of the radial category to linguistics is by no means limited to the semantics of lexemes such as mother. Successful analyses demonstrating the validity of this model have been applied to many phenomena, among them the allo-/eme relationship (phonemes and morphemes are central to categories with allophones and allomorphs being relatively more or less central or peripheral), the semantics of grammatical morphemes (such as conjunctions, prepositions, prefixes, suffixes, and desinences), and the syntax of grammatical constructions (where some constructions are prototypical, and others are variants of these prototypes). Indeed, the radial category provides powerful explanations for all kinds of linguistic relationships involving polysemy, for it allows the linguist to explore both the variety and the coherence of related items (rather than attending exclusively to either the variety by making

“made to be sat upon” excludes toy chairs and logs that might be referred to as chairs when they come in handy at a campsite, but again includes other pieces of furniture for sitting. Even if a counterexample is found, it is clear that the vast majority of human categories (linguistically represented as morphemes) do not yield to a featural analysis.

12 This example of mother is borrowed and adapted from Lakoff 1987.
atomistic lists, or to the coherence by assigning abstract features that fail to capture the variety). The linguist can see both the trees and the forest, since even the messiest array of related items can usually be viewed as a unified (though internally complex) category. As I have argued elsewhere (Janda 1996b), the radial category also establishes the asymmetric relationships (between center and periphery) that motivate the phenomena that linguists of all stripes attribute to markedness. Markedness thus emerges as a by-product of the way in which human knowledge is organized. I have likewise argued at length (Janda 1993a, 1993c, 1996a, 1998) that linguistic change flows according to the structure of radial categories (with pruning and growth expected at the periphery; analogical leveling is therefore the pruning of a peripheral category member in favor of the prototype).

The prototype of any category is an item with special salience. This special salience is not something that can be mathematically defined (e.g., as the one feature shared by most members of the category). Instead this special salience is attributable to how human beings interact with members of the category, which is exactly what we should expect given that meaning is grounded in human bodily experience. The source of meaning for the word *chair* is a kinesthetic image schema of how a human being typically interacts with a chair. In other words, the act of sitting in a prototypical chair is the experience that defines what a chair is, and variations on that experience result in variations among the peripheral members of the category. Human interaction generally proves to be much more significant than features that might be available in an “objective” description of a category. For example, even though dictionaries and English speakers consistently identify falsity of information as the defining feature of *lie*, when presented with potential examples of lies (some containing true and some containing false information), speakers of English consistently rate incidents involving intention to deceive (even when all the information is true) as better examples of lies than incidents merely containing false information. 13 In other words, it is the human interaction with lies, the experience of being deceived, that is most salient in the prototype for this category.

One might easily claim that the objective defining feature of the *bird* category is the presence of feathers. However, feathers are only a minor factor in human interaction with birds, which also includes experiences such as that birds move fast (preferably by flying), are voracious eaters, sing, build nests and lay eggs in them, and both birds and their eggs are often a source of food. The current popularity among non-scientists as well as many paleontologists of the theory that birds and dinosaurs are the same kind of creature has been facilitated by discoveries that some dinosaurs did move fast, eat a lot, and lay eggs in nests. Knowing that some dinosaurs exhibited behavior like the salient prototypical behavior of birds makes it easy to imagine these dinosaurs as “featherless birds”, a concept that would be oxymoronic under a featural analysis requiring feathers in order to belong to the bird category. It is the way we interact with birds that makes it possible for us to imagine the existence of dinosaurs that were really birds rather than reptiles (which do lay eggs, but nobody seems to want to call them birds, probably because they don’t usually move very fast or eat very much, nor do they build impressive nests, etc.).

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13 This result was published in Coleman & Kay 1981, and I have reduplicated it with students in class demonstrations over the course of nearly two decades. Though all of the samples involved are small, the consistency of results is compelling.
The urge to categorize is very strong, and it seems that in order to process, store, manipulate, and access information, human beings need to organize it in categories. Even damaged, partial, and irrelevant information is run through this process, enabling people to make sense out of fuzzy or faded photographs, or to “see” various items in the shapes of clouds and inkbots. As neurobiologists have indicated, there is no “grandmother cell” in the brain that uniquely contains everything you know about your grandmother, nor is any other information stored as discrete bits. Instead all information is distributed and interconnected.

Not only is information arranged in categories, but these categories are related to one another, and further participate in a hierarchy of categorization involving subordinate and superordinate levels. All of the categories we have looked at in this section have been basic-level categories, which generally correspond with monomorphemic linguistic units (like bird, chair, mother, or a grammatical morpheme). The subordinate level provides finer detail clustered around members of a given basic-level category (thus the category of armchairs, with ones that recline or swivel and ones that do not, etc., would be a subordinate category). The superordinate category of furniture includes the chair as one of its more prototypical members (with items such as chaise-longues, ping-pong tables, standing lamps, and cabinet-style television sets as relatively more peripheral examples of furniture). Subordinate, basic, and superordinate levels are not simply concentric sets; these relationships are complex and follow the center/periphery structure. Radial categories of all types (organizing lexical meaning, grammatical meaning, and hybrid types) are constitutive of mental spaces that structure both thought and language use. Furthermore, Lamb (1999) has shown parallels between the structure of the brain and the structure of radial categories, suggesting that radial categories are indeed neurologically plausible.

A radial category is not necessarily composed of unique, discrete members, each occupying a single slot in a structure defined by a single set of relations to the prototype. Cognitive categories are not in the business of pigeon-holing information anymore than the brain is in the business of growing “grandmother cells”. Often there are category members that fit into a given category in more than one place (or in a transitional zone between parts of a category) and/or are related to the prototype in more than one way. Cognitive linguists refer to such category members as “multiply motivated”, and do not eschew such redundancy, since it is a natural part of human cognition. The recognition of multiply motivated category members allows us to analyze and account for phenomena of ambiguity and overlap, which are rampant in natural languages, but frequently ignored by linguistic theories. Langacker (2006) reminds us that overall linguists tend to be more attracted by models that emphasize discreteness instead of models that emphasize continuousness of phenomena. The radial category, for example, lends itself to an overly discrete interpretation that suppresses the real continuousness of category structure. Langacker suggests instead a model that looks like a mountain range, where the peaks (that are equivalent to the subcategories or members of a radial category) are joined by continuous zones that connect them in multiple ways.

In addition to the prototype, many cognitive linguists (especially Langacker and his students) posit an overall abstract schema that sums up an entire category and relates to all the members. This concept is probably more important and more understudied than most of us realize. Cognitive linguistics still has quite a bit of work to do in order to research, develop and ultimately define the role of the overall abstract schema (perhaps best described as “firstness” for those familiar with Peircean semiotics).
While the examples presented in this section have focused on lexical items such as mother and chair in English, radial semantic structures are also found among linguistic categories and thus form the backbone of grammar. I have for example examined Russian cases as radial categories (Janda 1993c, 1999b, 2000). The Russian genitive case is a basic level radial category with a prototypical member (SOURCE) and three extensions (GOAL, WHOLE, REFERENCE) motivated by metaphor and metonymy. Subordinate structures organize smaller details of meaning (such as the metaphorical implementation of the SOURCE meaning in the various domains of space, time, etc.), and the basic level category of the genitive participates in a superordinate category of case relationships in general. There is evidence that this kind of organization motivates most (perhaps all) linguistic phenomena.

4.6. Mental Spaces and Mapping

Cognition and the use of language involve the access and manipulation of mental spaces. Mental spaces are constructed from human perceptual experience and are extended through imaginative mapping processes. The three most significant processes are metaphor, metonymy, and blends. All three processes are vital to linguistic analysis. Although much of the scholarly work that has been done on metaphor, metonymy, and blends focuses on the meanings of lexical items, these cognitive processes are likewise vital to the structure of grammatical meaning. Of course this is exactly what we should expect, given that grammar and lexicon form a single continuum, governed by the same general cognitive strategies.

Metaphor, metonymy, and blends appear to have neurological analogs. It is believed that eye-hand coordination is achieved by mapping vectors of eye angles onto vectors of muscle contractions, in other words, taking information from one domain (eye positions) and transferring this information to find “equivalents” in another domain (muscle positions) (Churchland 1986), a process that looks very much like metaphor. Feldman (2006) asserts that metaphor is consistent with the architecture of the brain.

A computer simulation of human retinal cells (Churchland 1995: 236-242) reveals that our visual perception focuses on certain information (particularly movement and edges), largely ignoring other possible inputs. Thus we tend to see moving parts and edges rather than wholes, and this seems to parallel metonymy.

These analogs do not mean that we know how metaphor and metonymy work on the biological level, but they do mean that metaphor and metonymy at least appear to be biologically plausible (whereas serial processing of ordered rules seems much less promising, given what we know about brain structure and neural processing time).

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14 The most prototypical member of the superordinate category is the nominative case (which is why we think of it as the “default” case in dictionaries, on signs, etc.). Accusative is somewhat more peripheral (opposing the nominative as an agent to the accusative as a patient in a prototypical SVO clause). The genitive is even more peripheral, since it does not involve the verb (central to the structure of a clause). And the instrumental, dative, and locative are relatively peripheral in relation to the nominative, accusative, and genitive, respectively. In other words, Jakobson ([1936]1971) was right, and indeed much of his work on case (and other phenomena) looks to a cognitive linguist like it was ahead of its time.
4.6.1. Metaphor

For a cognitive linguist, the definition of metaphor is very broad. A metaphor is a mapping from a source domain to a target domain. In other words, whenever a person takes a concept that has been formed in one domain and tries to implement it in another, a metaphor has occurred.\(^{15}\) The domain in which most human knowledge is formed is that of a human body in physical space, which usually serves as the source domain for metaphor. Common target domains are time, emotions, and states of being. As mentioned above, babies become acquainted with their bodies as containers by practicing putting things in their mouths. After this routine has been established, they move on to placing objects in other containers, and many baby toys are designed just for this task. On a crude level, even this is a metaphor, for the concept IN/OUT has thus been mapped from the body to external objects. Later, babies will learn to extend IN/OUT to many other domains; in English these include time (getting things done in time and running out of time), emotions (falling in and out of love), and states of being (getting into and out of trouble). The ways in which metaphorical extensions are realized and conventionalized are highly language-specific, but the metaphorical process itself is a pervasive universal. Metaphor is a very robust phenomenon for all languages. It is quite impossible to speak any language without mastering the metaphorical conventions embedded in it.

Lakoff and Johnson (1980) identify three basic types of metaphor: orientational metaphor, ontological metaphor, and structural metaphor. Orientational metaphor is the extension of orientations such as IN/OUT, UP/DOWN, FRONT/BACK to non-spatial domains. Ontological metaphor is the conceptualization of non-things (emotions, abstract ideas, ambient phenomena) as if they were things (usually entities, substances, or places), as in We are working toward peace (where peace is conceived of as an object or place), or His emotional health has deteriorated recently (where emotional health is an object subject to deterioration). Structural metaphors take an item with rich structure in bodily experience as the source domain for understanding something else. For example, the structural metaphor PEOPLE ARE PLANTS underlies many metaphorical expressions, enabling us to refer to the growth of children as sprouting up, youth as a blossom, old age as a time of withering and fading, and the slaughter of soldiers as being mowed down. The three types of metaphor are not entirely discrete and often collaborate in a given expression. Falling in love, for example, uses all three types: an orientational metaphor extending the use of in, an ontological metaphor identifying love as a place, and a structural metaphor that maps our understanding of physical falling onto our understanding of an initial encounter with love. Languages make use of all three types of metaphor in their grammars. Orientational metaphors are quite routine (often involving cases, prepositions, and prefixes), and they typically collaborate with ontological metaphors (as in getting things done in time, running out of time, where time is a

\(^{15}\) Notice that under this definition there is no substantive difference between metaphor and simile, or, to be more accurate, all similes are actually metaphors. US public education never fails to indoctrinate all children with the belief that there is an important difference between the two, and disabusing them of this notion at the college level can be quite a challenge. The difference they have learned to cherish is one of superficial syntactic variations on metaphorical expression that has little bearing on the substance of the comparison. It also hides the fact that there are more ways to produce metaphor than by saying that “x is y” or even that “x is like y”. Metaphor is present in all kinds of syntactic situations, and can be expressed by all kinds of morphemes. Here are two examples with an adjective (firey) and a verb (beefing): firey anger; authorities are beefing up security at area schools (see also the metaphors using IN and OUT and those that motivate Russian aspect described in this section)
container or a substance). Grammatical case uses a structural metaphor mapping our experience of physical relationships to understand the abstract relationships among referents in a sentence.

Though it appears that all languages of the world make use of TIME IS SPACE metaphors (Haspelmath 1997b), it seems that every language does this in its own way. One example that I am very familiar with is the aspeccual system of Russian. All Russian verbs identify the situations they describe as either perfective or imperfective. This grammatical distinction is motivated by a pair of metaphors: PERFECTIVE IS A DISCRETE SOLID OBJECT and IMPERFECTIVE IS A FLUID SUBSTANCE (Janda 2004). The rich source domain of physical matter yields over a dozen parameters according to which verbal situations can be differentiated, such that perfective situations are characterized by clear boundaries, uniqueness and countability, whereas imperfective situations are characterized by lack of clear boundaries, spreadability, and mixability. The metaphorical understanding of verbal situations as isomorphic to types of matter makes it possible for Russian grammar to organize a large complex of distinctions in a coherent way.

The mapping that metaphor performs is usually highly selective. It is by no means a one-to-one mapping of all the information from a source domain to a target domain. For example, the fact that in English we use fire as a source domain for understanding anger (cf. Lakoff 1987: 3 80-415; His temper is like a powder-keg, She’s white-hot with rage, I’m fuming, doing a slow burn, etc.) does not mean we expect anger to be something we can light with a match, use for cooking, or that we will have to clean up ashes afterward. Like the prototype, metaphor is motivated by relevant information that is salient in human experience; it highlights some facts about the target domain, but hides others. The behavior of metaphor is likewise well-motivated but not entirely predictable.

For the purposes of grammatical analysis, metaphor is equally essential. Metaphors involving IN/OUT, as mentioned above, and similar metaphors based on kinesthetic image schemas are valuable for exploring the meaning and grammatical functions of cases, prepositions, and all sorts of linguistic categories and functor words. Iconicity is properly understood as a metaphorical phenomenon, for it is the mapping of a parameter from one domain to another. Analogy in both the broad ordinary sense and in the specific linguistic sense of analogical change is likewise the product of a metaphorical transfer of information from one place (usually a paradigm) to another.

When linguists recognize and focus on the central role that metaphor plays in language, it becomes possible for us not only to better understand grammatical phenomena, but also to participate in cultural studies and poetic analysis (cf. Janda 2008, Lakoff and Turner 1989, Palmer 1996, Turner 1987). The difference between the types of metaphors prevalent in linguistic categories and those encountered in creative expression is not a matter of quality, but rather a matter of the degree to which certain metaphors have become conventionalized in a given language and culture. Conventionalized metaphors form the backbone of linguistic categories, idioms, clichés, expository prose, and ritual. Creative use of writing contains metaphors that are either less conventional (being extensions of conventional metaphors, cf. the jokes mentioned in footnote 1), or altogether unconventional.

It is instructive to note that most scientific theories are based on metaphors, and that the inferences we draw from theories are influenced by our understanding of these metaphors. Set theory is the IN/OUT image schema writ large. The modern understanding of the chemical structure of benzene arose from an iconic metaphor inspired by a dream of a snake biting its
Understanding of atomic structure underwent many metaphorical realizations in the 20th century, going from a grapes in gelatin model, to a model of a miniature solar system, to a mathematical probability model. Light continues to be understood partly according to a metaphor based on waves and partly according to a metaphor based on particles. Closer to home, the vowel triangle is a metaphor that helps us predict which vowels are likely to turn into which other vowels because they are “closest” to each other. Radial categories are likewise a metaphor of our experience of points and links (rather like the old tinker toys).

The presence of metaphors in scientific theories is not a problem unless we forget that they are metaphors and assume that we are just dealing with raw “truth”. Metaphors facilitate understanding and lend power to our theories, and they often inspire us to draw inferences that we might otherwise overlook. However, they can also inspire us to draw incorrect inferences or can shade our eyes from inferences that we should consider (were we not so enamored of the current metaphor). We need to be able to not only recognize and respect metaphors, but also to look beyond them (Langacker 2006).

4.6.2. Metonymy

Metonymy is present whenever one item, the “vehicle” stands in for another item, the “target”. Metonymies can thus be modeled as VEHICLE FOR TARGET formulas. If I say Dostoevsky takes up a whole shelf in my library I am using an AGENT FOR PRODUCT metonymy, where the agent, Dostoevsky, stands in for his products, i.e. books he has authored. Similarly, an utterance like The ham sandwich wants his check is an example of POSSESSED FOR POSSESSOR metonymy, since the possessed ham sandwich stands in for the person who has (or had) it. Most work on metonymy has thus far focused on lexical metonymy (such as the examples above), and there are roughly three main strategies for classifying metonymy, involving contiguity, frames, and domains. Jakobson ([1956]1980) pioneered the understanding of metonymy as a kind of contiguity relationship, and this is echoed in Croft’s definition of metonymy as a mapping within a single “domain matrix”.

The most recent version of the contiguity model is found in Peirsman and Geeraerts 2006, where four levels of contiguity are distinguished (part/whole, containment, contact, and adjacency) along a scale of prototypicality. The use of frames to model metonymy has been particularly popular in cognitive linguistics (Kövecses and Radden 1998, Radden and Kövecses 1999, Panther and Thornburg 1999, Barcelona 2002). Under this model, it is the fact that items such as customers, meals ordered, waiters, and checks all belong to a single “restaurant frame” that motivates metonymies such as the one in the ham sandwich example above. The frame approach is very similar to that invoking domains (or “dominions” Croft 1993, 2006; Langacker 1993, 2009; Ruiz de Mendoza 2000).

All phenomena of ellipsis, truncation, and phonological reduction/neutralization are linguistic examples of metonymy. Very common uses of metonymy in the world’s languages are the reduction of movement along a path to either a stationary path or just the endpoint of a path. English over provides examples of both types of reduction. We can invoke movement along a path by saying Bill walked over the hill. This can be reduced to a stationary path in The road goes over the hill. A statement like Bill lives over the hill accesses only the endpoint of the path described by over. Similar use of endpoint metonymy is common in the semantics of grammatical case.

In my work on the dative case in Slavic, I have argued that metonymy has been used to extend the indirect object to constructions lacking a direct object (Janda 1993a). There are
many verbs (especially verbs that denote the giving of money/gifts, giving of messages, and
giving of good/evil, such as the Slavic equivalents of ‘pay’, ‘advise’, and ‘please’/‘hamper’) that
deno te the giving of something that is so predictable from the meaning of the verb itself that
there is no need to express the something given as an accusative direct object. We know,
via metonymy, that when we pay someone, we are giving them money; when we
communicate with someone, we are giving them a message; and when we please or hinder
someone, we are giving them a good or hard time. This metonymy motivates the use of the
indirect object, and therefore the dative case, with a host of verbs which otherwise look rather
like a random list.

A huge system of semantic associations is present in the word-formation systems of most
languages of the world, and these associations are primarily motivated by metonymy (Janda
forthcoming). Thus, for example, in English we can form cellist from cello via an
INSTRUMENT FOR AGENT metonymy, and baker from bake via an ACTION FOR
AGENT metonymy. Word-formation is thus another example of how metonymy pervades the
grammar of languages, and indeed as Langacker (2009) asserts, grammar is metonymic by its
very nature.

It is certainly the case that metaphor and metonymy can interact in a single linguistic
expression (Goosens 1990, Geeraerts 2002). When Johnny Cash sings Many days you have
lingered all around my cabin door, Oh hard times, come again no more, he is invoking both
metaphor and metonymy simultaneously. Metaphorically, hard times are represented as a
person who can be located by the door and directly addressed. Metonymically the location of
the door refers to the setting in which a person is living, so having the hard times at your door
means that one is living in a period of hard times.

4.6.3. Blends

Like metaphor, a blend involves two domains and a mapping relationship (Fauconnier
and Turner 2002). However, in a blend both domains are source domains, and together they
contribute to the creation of a third, entirely new domain. For example, if I were to talk about
discourse between Roman Jakobson and cognitive linguistics, I might say that Jakobson
made certain contributions (such as the “relative invariant”), which cognitive linguistics
reacted to (suggesting prototypes instead), and that Jakobson did not accept all the premises
of cognitive linguistics, etc.

This discourse is of course hypothetical and anachronistic, since Jakobson died in 1982,
several years before anyone ever used the term “cognitive linguistics”. The discourse is a
blend constructed from Jakobson’s work and work on cognitive linguistics. On the
morphological level blends are fairly common and are traditionally called just that: blends.
Morphological blends include the coinage of words like motel (from motor + hotel) or
workaholic (from work + alcoholic).

Blends also occur at the level of the linguistic category. The historical development of
virile endings from what was originally dual morphology in some Slavic languages appears to
be the result of a blend in which special distinctions that could be made in the plural number
and special distinctions that could be made in the masculine gender contributed to the creation
of a special plural masculine distinction, namely virility (Janda 1999a).
4.7. Construction Grammar

Construction grammar can be understood as an outgrowth of Langacker’s (1987: 58) definition of grammar as “symbolic units” which pair form (phonological pole) with meaning (semantic pole). A construction is any conventionalized pairing of form and meaning in language, at any level, from the level of the morpheme, through words and phrases, and up to the level of discourse. Although construction grammar comes in several “flavors” -- cf. the slightly different versions offered by Langacker (1987, 1991a-b, 2003), Croft (2001), Goldberg (1995 and 2006), and Fillmore (Fillmore 1985, Kay and Fillmore 1999) -- they all share a similar view on the relationship between the parts and the whole in a construction.

A construction cannot be adequately described by means of recourse to compositionality because the meaning of the whole is only partially determined by the meanings of the components. And conversely, the meaning of the parts is clearly influenced by the meaning of the whole. The failure of compositionality is clearest in the case of idioms like *he kicked the bucket*, where the whole has a meaning that cannot be arrived at from the parts. Construction grammarians will quickly point out that idioms are only the extreme end of the scale, and that all constructions are idiomatic to some extent. Even the conventionalization of SVO as a typical transitive construction can be considered schematically “idiomatic”. The converse effect of the whole influencing the meaning of the parts is most visible in examples of “coercion” such as *Alice sneezed the napkin off the table* and *There is dog all over the road*. In the first example, the caused-motion construction (verb + object + direction) coerces a strongly intransitive verb, *sneeze*, to behave like a transitive verb. In the second example, the use of a singular verb form in a context describing a substance coerces a count noun, *dog*, to behave like a mass noun. Again, scholars who work in construction grammar assert that this is only the tip of the iceberg, and that all constructions show this effect to various extents. In some collaborative work (Janda and Solovyev 2009), I have explored how case constructions used with Russian emotion terms reflect the conceptualization of emotions as containers, gestures, diseases, and sources. In other words, the use of emotion terms in the same constructions where we find containers (e.g., with prepositions meaning ‘in’, ‘into’), as in *v pečali* ‘in sadness’ reveals that sadness can behave like a container in Russian. The meaning of each construction is emergent (Langacker 1991b: 5-6, 534), motivated by the patterns of uses over the various items that appear in the construction, and also by the larger (clause- or discourse-level) constructions that a given construction appears in.

Goldberg (2006: 62, 46) claims that it is unlikely that speakers store all uses of given words and constructions, but there is evidence that people use generalizations about the frequency of word use (cf. also Dąbrowska 2004 for evidence of both storage and generalization in acquisition of constructions). These generalizations can serve as the basis for creating abstract schemas for constructions, establishing correlations between form and meaning. Goldberg (2006: 104-119) argues that constructions have strong associations with meaning by virtue of their advantages in terms of both cue validity and category validity. Cue validity refers to the likelihood that a given meaning will be present given the presence of a certain item. In a study comparing the cue validity of words (verbs) with constructions, Goldberg found that words and constructions have roughly equal cue validity, which means that knowing that a linguistic unit contains a given word gives you about the same predictive information as knowing that a linguistic unit occurs in a given construction. However, because there are far fewer constructions than lexical items in a language, constructions are
far more available in terms of determining meaning. Category validity is the likelihood that a certain item will be present when the meaning is already given. In Goldberg’s studies the category validity of constructions is found to be far higher than that of words (verbs). In other words, if you know that a unit expresses a certain meaning, it is much easier to predict what construction might be present than to predict what word the unit might contain. Goldberg has thus empirically established the connections between constructions, frequency and meaning.

Construction grammar has become an important sub-field of cognitive linguistics, with significant publications (Östman and Fried 2005), and international organization, and a conference series. The presence of frequency effects in relation to constructions has fueled much of the application of quantitative methods in cognitive linguistics, described in more detail in 5.1.

5. ADVANTAGES OF COGNITIVE LINGUISTICS

Cognitive linguistics offers a number of advantages over some other linguistic frameworks, particularly in relation to the range of language phenomena it can address and in relation to researchers’ need to communicate their results. I would contend that cognitive linguistics facilitates the analysis of far more language data, and that the results of analysis are far more accessible to others both within and particularly beyond the field of linguistics.

5.1. Cognitive Linguistics is Data-friendly

From the very beginning, cognitive linguistics has been a refuge for linguists who are intimately acquainted with real language data and have a profound respect for empirical methods. The most outstanding contributions made by cognitive linguists continue to be insightful analyses of intricate sets of naturally-occurring data performed by linguists with a subtle and detailed understanding of the languages they work on. Although theory is a crucial concern, it is treated as something that emerges gradually from and must be constantly verified against data. It is impossible for a proper cognitive linguist to imagine “marshalling data to support theory” (an exact quote in which I heard one non-cognitive linguist praise another for his unswerving devotion to theory). Whenever I hear an expression of this sort, I shudder to think what this means: Was the data forced into conform to pre-determined regiments? What happened to the “naughty” data that didn’t support the theory? Was it banished from consideration? Where did the data come from? Was it real data (spontaneously produced by native speakers under natural conditions)? Or not (concocted, elicited, etc.)? I rejoice in finding the “naughty” data that challenges us to stretch or change our theory. This “naughty” data need not be the least bit exotic or ungrammatical – it’s usually hidden in plain sight, until you gather a database of real usage or peer into a corpus. I always start every project by gathering as much data as I can before worrying too much about how it might be organized, and I likewise insist that all my students “get their hands dirty” with some data before settling on an analysis. There is much that can be learned about linguistics by simply gathering and sifting through data, and no amount of theory or classroom lecturing is a substitute for this experience.
The framework of cognitive linguistics (especially the radial category and metaphorical extensions of it) is particularly adept at handling analyses of very messy arrays of data. There is never any motive for hiding or ignoring “problematic” data, primarily because cognitive linguistics is interested in finding internal structures, however fine-grained, rather than air-tight immutable boundaries for categories. The “ugly ducklings” that are often shunned by other theories are properly appreciated for their beauty in this framework. For example, the Russian verb *zavidovat’* ‘envy’ bears no close affinity to any other “dative-governing” verbs, but it serves as an important transitional type linking two parts of the semantic category of the dative case (Janda 1993c). Case usage is itself an example of a relatively messy phenomenon for which cognitive linguistics provides an ideal solution, making it possible to respect all the variation while producing a coherent analysis. This not only facilitates the description of a given case in a given language, but it also makes cross-linguistic comparisons relatively easy and transparent (a feat not previously achievable). Case semantics is only one of the enduring, intractable problems of Slavic linguistics for which the cognitive framework is likely to provide elegant solutions.

Cognitive linguistics is an excellent framework for probing both the complete range of language use (all natural production, including errors, anomalies, creative use, poetry, idioms, even “dead metaphors”) and the complete range of language phenomena (phonology, morphology, syntax, and semantics).

In the past decade, more and more cognitive linguists have taken the usage-based model of cognitive linguistics seriously by applying quantitative analyses to corpus and experimental data. This empirical movement has been facilitated by the advent of digital corporal and statistical software. Stefanowitsch and Gries (2003, 2005) have pioneered “collostructional analysis”, which takes a grammatical construction as the point of departure and investigates to what extent lexical items are attracted or repelled by constructions. Stefanowitsch (2006 aandb) has proposed statistical means for analyzing metaphorical expressions. Newman and Rice (2006) have examined the relationship between paradigm-form frequency and semantics of verbs. Divjak (2006; cf. also Divjak and Gries 2006) explores the “behavioral profiles” of Russian verbs, namely the way that grammatical, semantic, and constructional factors interact statistically. Schmid has probed the relationship between frequency and entrenchment, first asserting a direct relationship (2000), and then finding that model inadequate (2007a-b). These are just a few examples of where cognitive linguistics is headed in terms of quantitative analysis. In 2005 Mouton de Gruyter launched the journal Corpus Linguistics and Linguistic Theory as a venue for this promising line of research.

5.2. Cognitive Linguistics is User-friendly

The absence of an entrenched formalism has its advantages. A cognitive linguist never has to build a mountaneous formal machine to strain at a gnat (or any bigger prey, for that matter), and no one has to master a formal system in order to appreciate research in cognitive linguistics. This means that cognitive linguistics research is readily accessible to all linguists, and also that cognitive linguists can focus more of their effort on collecting and analyzing data than on toying with the formal artifacts of a theory. With minor adaptations, research done in cognitive linguistics can be made accessible to other audiences. This is particularly
valuable for those of us who wish to communicate with colleagues in other fields, or for researchers who submit grant proposals that will be evaluated both by linguists and by other scholars. More important is the fact that cognitive linguistics facilitates the transfer of research to teaching; it allows us to make our research breakthroughs available to students. Rather than encouraging the production of arcane scholarship, too often consisting of minutiae hopelessly embedded in complex and counterintuitive frameworks, cognitive linguistics facilitates the production of scholarship that is actually useful, both to scholars and to students.

Case and aspect are universally acknowledged as the greatest stumbling-blocks for learners acquiring a Slavic language as a second language. I have coauthored two textbooks on the case systems of Slavic languages (Janda and Clancy 2002, 2006), plus a media module on the Russian aspect system (http://hum.uit.no/lajanda/aspect/ainr/). These materials take the full complexity of my research on case and aspect and make them accessible to language learners with no linguistic expertise. These learner-oriented materials contain virtually no terminology; the most difficult terms encountered are “verb”, “preposition”, and the like. Formalism is also nearly non-existent; the use of diagrams is the closest we come to formalism, yet is itself mainly decorative, since the contents of the diagrams are also rendered in everyday prose and the materials can be comprehended without recourse to the diagrams. In studying the meanings Russian cases, learners are asked to build upon their everyday experiences (of orientation, forces, and movement along a path, for example), and to use metaphor to extend spatial concepts to other domains such as time and states of being (guided by familiar and parallel metaphorical extensions in English). The strategy for learning Russian aspect is similar, asking learners to rely upon their “sandbox” knowledge of how various kinds of physical matter behave and interact. In the latter materials, interactive units lead the learner through virtual “experiments” with matter (asking which kinds of matter can be sliced or spread, for example), and provide comparisons with authentic examples of Russian aspect. Perhaps it is immodest of me to say so, but the reaction to these materials has been enthusiastic, proving that cognitive linguistics can be made utterly transparent and valuable for many people other than cognitive linguists. The 2002 book on Russian case won a nationwide award (for pedagogy, from the American Association of Teachers of Slavic and East European Languages). The 2006 book has found an audience that we never imagined: it is being used to teach deaf citizens in the Czech Republic to read Czech (since case is non-existent in Czech Sign Language, and thus just as exotic a phenomenon for those learners as for learners with a non-Slavic spoken language as their first language).

CONCLUSION

This article reflects my personal perspective on cognitive linguistics, which has now grown to the point where it is almost impossible for any one individual to have full oversight over the entire field. In closing, I would like to remind both myself and everyone else that all theoretical frameworks, cognitive linguistics included, are built upon metaphorical models, and all metaphorical models reveal some truths and suggest some questions while suppressing other truths and other questions that might be asked. In other words, neither cognitive linguistics nor any other framework is entirely comprehensive; no one framework is THE
answer to all our problems. Some frameworks are more apt than others, particularly at addressing given issues. Cognitive linguistics happens to be a great way to deal with the kinds of puzzles that light my fire: grammatical meaning, polysemy, and historical change. But ultimately the use of any one framework shuts one’s eyes one from other opportunities for inquiry. If we cannot communicate across theories, we risk a fate like the proverbial three blind men encountering an elephant: one finds the ear and declares that an elephant is like a sheet of leather, one finds the side and declares an elephant to be like a wall, and the third finds the tail and declares an elephant to be like a rope. The results of their research are entirely incompatible and they are unable to find any common ground on which to base a discussion. Cognitive linguistics offers one view of linguistic inquiry. Thus far I’ve enjoyed that view and never run out of things to see from this vantage point, and I’ve also tried to make my contributions as accessible as possible to others who might want to join me. I’ve attempted to peer at language phenomena from other points of view now and again (more as a spectator than as a participant), but too often found unnecessary theoretical artifacts in my way. It is my sincere hope that more bridges to frameworks beyond cognitive linguistics will be built as we progress.

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CONCEPTUALIZATION, SYMBOLIZATION, AND GRAMMAR

Ronald W. Langacker
University of California, San Diego, USA

ABSTRACT

Cognitive grammar belongs to the broader traditions of cognitive linguistics and functional linguistics. It emphasizes the symbolic function of language and the crucial role of conceptualization in social interaction. It is based on a conceptualist semantics recognizing the central importance of construal, i.e. our ability to conceive and portray the same situation in alternate ways. A properly formulated conceptualist semantics makes possible a symbolic account of grammar. It is claimed that lexicon and grammar form a continuum fully describable as assemblies of symbolic structures (form-meaning pairings). Grammar is therefore meaningful, and valid grammatical notions have conceptual import. By way of example, a variety of evidence is cited to support semantic characterizations of subject and object.

Keywords: cognitive grammar; cognitive semantics; conceptualization; construction; grammatical category; object; profile; prominence; psychological evidence; subject; symbolization.

1. INTRODUCTION

Language has two basic and closely related functions: a semiological function, allowing thoughts to be symbolized by means of sounds, gestures, or writing; as well as an interactive function, embracing communication, expressiveness, manipulation, and social communion. A pivotal issue in linguistic theory is whether the functions language serves should be taken as foundational or merely subsidiary to the problem of describing its form. The recognition of their foundational status is the primary feature distinguishing functionalist approaches to language from the formalist tradition (notably generative grammar).

The movement called cognitive linguistics belongs to the functionalist tradition. Although its concern with cognition hardly makes it unique, the label cognitive is not entirely arbitrary.

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Within functionalism, cognitive linguistics stands out by emphasizing the semiological function of language and the crucial role of conceptualization in social interaction. It contrasts with formalist approaches by viewing language as an integral facet of cognition (not as a separate “module” or “mental faculty”). Insofar as possible, linguistic structure is analyzed in terms of more basic systems and abilities (e.g. perception, attention, categorization) from which it cannot be dissociated.

The theory called cognitive grammar (Langacker 1987a, 1990, 1991) represents one approach to cognitive linguistics. Its central claim is that grammar is per se a symbolic phenomenon, consisting of patterns for imposing and symbolizing particular schemes of conceptual structuring. It is held that lexicon, morphology, and syntax form a continuum fully describable as assemblies of symbolic structures (form-meaning pairings), and consequently, that all valid grammatical constructs have conceptual import. While quite radical from the standpoint of orthodox linguistic theory, these positions are actually both natural and desirable.

Reducing grammar to symbolic assemblies affords a major theoretical unification as well as great austerity in the kinds of entities analysts are allowed to posit. It is realistic from the psychological standpoint, for unlike semantics and phonology—grounded in the broader realms of conceptualization and sound—grammar is not connected to any independently accessible domain of experience. It is more naturally taken as residing in schematized representations of sound-meaning pairings, abstracted from (and immanent in) the specific symbolic configurations observable in complex expressions. Described in this manner, grammar (like lexicon) can be seen as directly reflecting the semiological function of language.

Although the analyses and theoretical claims of cognitive grammar are proposed and justified on the basis of linguistic evidence, some care is taken to stay within the bounds of psychological plausibility. A guiding principle is that language structure should be characterized relying only on mental abilities and phenomena that are either well known or easily demonstrated. This leads to a primary working strategy (described in Langacker 1993a) based on the convergence of three kinds of considerations.

The objective is to find descriptions of linguistic elements that simultaneously meet the conditions of being (i) reasonable from the psychological standpoint, (ii) well motivated in purely semantic terms, and (iii) optimal as a basis for analyzing grammar. In my view this methodology has proved quite successful. It is argued in various works (e.g. Langacker 1995b; van Hoek 1995) that conceptually grounded descriptions satisfying conditions (i) and (ii) support revealing accounts of classic grammatical problems. The advantages of reducing grammar to symbolic assemblies are not purchased at the expense of descriptive adequacy, but quite the contrary.

The presentation will begin by sketching a conceptualist approach to semantics. We will next consider symbolic assemblies and the gradation between lexicon and grammar. Following this will be a discussion of how cognitive grammar handles some basic problems of grammatical description.

Finally, as a case study, an attempt is made to justify (or at least render plausible) a conceptual characterization of the grammatical notions subject and object. The supposed impossibility of such a characterization is of course a central argument for the autonomy of syntax.
2. SEMANTICS

Views of grammar are critically dependent on assumptions made about semantics. In particular, the autonomy of grammar appears self-evident given the prevalent assumption that meanings consist of truth conditions. The meaningfulness of grammatical elements becomes apparent only by adopting a conceptualist semantics that properly accommodates our ability to conceive and portray the same objective situation in alternate ways. The term conceptualization is interpreted broadly as embracing any kind of mental experience. It subsumes: (i) both established and novel conceptions; (ii) not only abstract or intellectual “concepts” but also sensory, motor, and emotive experience; (iii) conceptions that are not instantaneous but change or unfold through processing time; and (iv) full apprehension of the physical, social, cultural, and linguistic context. Thus, far from being either static or solipsistic, conceptualization is viewed as the dynamic activity of embodied minds interacting with their environment.

Linguistic semantics has traditionally posited a definite boundary between “semantics” and “pragmatics”. It is further assumed that lexical items have fixed, well-delimited meanings (far less inclusive than speakers’ general knowledge of the entities they denote), and that sentence meanings are fully derivable from lexical meanings by rules of semantic composition. Attractive though it is, a semantics of this sort is actually quite problematic. It reflects the dubious metaphorical supposition that linguistic elements are containers from which discrete components of meaning need only be extracted and assembled in building-block fashion (cf. Reddy 1979). In practice, motivated boundaries between “linguistic” and “extralinguistic” facets of meaning have proved notoriously hard to establish.

The basic vision of cognitive semantics is radically different. Rather than imposing artificial boundaries, it posits a gradation between semantics and pragmatics, and also between linguistic and general knowledge. It views expressions as evoking (rather than containing) meanings, which emerge via an elaborate process of meaning construction drawing on all available resources—linguistic, psychological, and contextual. Even at the lexical level, meanings are variable and malleable. The encyclopedic approach (Haiman 1980; Langacker 1987a: §4.2; cf. Wierzbicka 1995) treats lexical items as points of entry into vast conceptual networks. While the access they afford to these networks is to some degree conventionally established, it is nonetheless flexible, open-ended, and highly subject to priming. To the extent that distinct paths of access become entrenched and conventionalized, the result is the common situation of polysemy, where a lexical item has a number of related senses, any one of which might be activated on a given occasion. These senses form a complex category describable as a network, usually centered on a prototype (Lakoff 1987; Langacker 1987a: ch. 10; Taylor 2004).

At higher levels of organization, the essential role of meaning construction is even more evident. Multifaceted research in cognitive semantics has demonstrated that the meanings of complex expressions are not in general algorithmically derivable from their parts—at least given a representative range of data (not selected just to avoid the problem) and a realistic definition of “meaning” (not so impoverished as to be trivial in relation to natural language understanding). Patterns of semantic composition do of course exist (they are considered an inherent aspect of grammar) and their importance is undeniable. Still, since language is neither autonomous nor encapsulated, semantically it exhibits only partial compositionality.
The meanings contributed by lexical and grammatical elements evoke and constrain—but do not fully constitute—the overall conceptualization evoked by a complex expression, its composite semantic structure. This is an entity in its own right with many possible sources of extracompositionality. It may, for instance, be crucially dependent for its coherence on discourse or contextual clues to supplement the fragmentary information explicitly encoded. It may invoke domains of knowledge not accessed by any component element taken individually. It is likely to require the construction and manipulation of an elaborate set of connected mental spaces (Fauconnier 1985; Fauconnier and Sweetser 1996). Almost certain to be involved are basic and ubiquitous phenomena such as metaphor (Lakoff and Johnson 1980; Lakoff and Turner 1989), metonymy (Langacker 1995b; Nunberg 1995), and conceptual blending (Fauconnier and Turner 1994, 1996, 2002). It might then seem attractive to distinguish between evoked and encoded meaning, equating semantic structure with just the latter (Harder 1996). The feasibility of such a move is anything but obvious, however. There is no clear boundary between evoked and encoded meaning, nor is the latter necessarily either independently coherent or separately apprehended.

Fundamental to cognitive semantics is construal, our manifest capacity for conceptualizing the same situation in alternate ways. At least for mortals, construal is inescapable—there is no completely neutral way of apprehending a situation (though there are of course defaults). Meaning is thus a function of both conceptual “content” and how that content is construed. As an inherent aspect of their conventional semantic value, linguistic elements impose a particular construal on the content they evoke, and speakers adopt it for purposes of linguistic expression. Differences in conventional patterns of construal are largely responsible for the impression that languages embody contrasting “world views”. A strong claim of linguistic relativity, that language drastically and unavoidably shapes thought, is not however warranted. The effect of linguistically imposed construal may be fairly superficial (Slobin 1987). The content evoked by expressions can be largely the same (affording the basis for understanding and rough translation) even when they construe it very differently. Moreover, the symbolic resources of a single language provide an enormous range of options for construing any given situation, and speakers show great dexterity in shifting from one to another.

One dimension of construal is “granularity”, i.e. the degree of precision and detail with which a situation is characterized. The lexicon of a language allows an entity to be described at varying levels of specificity (conversely, schematicity), the choice depending on circumstances and communicative objectives. For instance, the same feline might be described specifically as a Siamese, more abstractly (in coarser-grained detail) as a cat, and still more schematically with terms like animal, creature, or even thing. Complex expressions obviously allow indefinite variation along this parameter, as illustrated by the progressively more schematic descriptions in (1):

(1) Your wretched Siamese just gobbled up my crème brûlée. > Your cat just ate my dessert. > An animal did something. > Something happened.

The meanings of grammatical elements are usually quite schematic (cf. Talmy 1988). This does not distinguish them sharply from lexical items, since the latter range widely along the dimension of specificity. There is rather a gradation, such that the more schematic an element
is semantically, the more likely it is to be regarded by linguists as grammatical rather than lexical.

Numerous aspects of construal reflect a very general ability to conceive of one structure against the *background* provided by another. One kind of background consists of assumptions, expectations, and presuppositions, which expressions evoke with varying degrees of explicitness and specificity. Consider the sentences in (2), which might be used to describe the same objective situation.

(2)(a) *He has published few articles in refereed journals.*
(b) *He has published a few articles in refereed journals.*

In (2)(a), *few* indicates that the quantity of articles is less than anticipated. By contrast, *a few* in (2)(b) assumes a baseline of zero and specifies a small departure from it in a positive direction. The difference between a negative vs. a positive displacement from a presupposed value is not without grammatical consequences. Observe that *any* co-occurs with *few*, but not with *a few*:

(3)(a) *He has published few articles which make any sense.*
(b) *He has published a few articles which make any sense.*

It is well known that *any* requires a negative context (e.g. *He doesn’t have any money*, but *He has any money*). Its distribution in cases like (3) is thus sensitive to how the objective situation is construed in terms of background expectations.

The previous discourse constitutes an essential background for the current expression. Most obviously, previous specification in the discourse allows entities to be referred to more schematically than when they are first introduced:

(4) *My psychiatrist would prefer to interview patients in her own study. However, she never actually does it there.*

Less often noted is the fact that expressions judged ungrammatical and semantically anomalous when considered in isolation often appear coherent, natural, and grammatically well formed when situated in the appropriate discourse context. For instance, while linguists would normally append an asterisk (for ungrammaticality) to a sentence like (5)(a), it seems perfectly appropriate when uttered in response to (5)(b).

(5)(a) (*)I think diced slightly tipsy.
(b) *Is there any way of preparing them so that Cedric might be willing to eat carrots while in any conceivable mental state?*

It is a basic principle of cognitive linguistics that well-formedness judgments always presuppose some context, if only an implicit one based on default assumptions.

Another background phenomenon is metaphor, in which a *target domain* is construed in relation to a *source domain*. A theory, for example, can be viewed metaphorically as a building, an airplane, or even as a bucket (Lakoff and Johnson 1980):
(6)(a) His theory rested on such poor foundations that, despite all his attempts to buttress it, it finally just collapsed.
(b) Your theory just won’t fly; in any case, it could be shot down by any half-way competent linguist.
(c) That theory is full of holes; it won’t hold water.

Categorization can also be considered a background phenomenon, in that the target is interpreted as instantiating a particular pre-existing conceptual frame. Even if the objective behavior is just the same, it makes a difference whether contributions to a political candidate are construed as gaining access or buying influence.

Numerous dimensions of construal can be grouped under the rubric of perspective. The most obvious is the vantage point from which a situation is conceptualized. Thus (7)(a), with come, implies that the speaker is in the attic, while go in (7)(b) implicates the opposite.

(7)(a) Why don’t you come up into the attic?
(b) Why don’t you go up into the attic?

Of course, speakers display great agility in recognizing other vantage points and mentally adopting them for expressive purposes. In (8)(a), for instance, the use of come conveys empathy and solidarity by indicating that the speaker is adopting the vantage point of the addressee.

(8)(a) I’ll come to your place Tuesday morning.
(b) Ellen was writing furiously. Tomorrow was the deadline for the manuscript.

In (8)(b), the second sentence is readily interpreted as reflecting Ellen’s vantage point rather than the speaker’s. The incongruity of using tomorrow with a past-tense verb signals this transfer to the mental space representing Ellen’s consciousness at the time of writing.

Another aspect of perspective is the overall viewing arrangement an expression presupposes. This is best illustrated by a classic example due to Len Talmy:

(9) There’s a cottage every now and then through the valley.

A cottage is not the sort of thing that goes in and out of existence, as suggested by the adverbial phrase every now and then. Nor is anything explicitly described as moving, as suggested by the path phrase through the valley. On the face of it, then, the sentence ought to be semantically and grammatically incoherent. Yet we immediately and easily understand it as making perfect sense. In contrast to the default of a static viewer reporting on a series of events, it presupposes the special arrangement in which a moving viewer describes what appears in the “viewing frame” (e.g. the window of a vehicle) during a journey. Every now and then pertains to the frequency of a cottage being observed in that frame. Likewise, through the valley describes the path followed by the moving observer. Note, however, that the sentence makes no explicit reference to the mover, the journey, or the viewing activity. These notions have to be supplied by the conceptualizers (i.e. the speaker and the addressee), who create the basis for semantic and grammatical coherence by engaging in an active process of meaning construction.
A distinct but related phenomenon involves the conceptualizer traversing a static situation by means of “fictive” or “subjective” motion (Langacker 1986; Matsumoto 1996a, 1996b; Talmy 1996). The contrast in (10), for example, depends solely on the direction of mental scanning, as indicated by the prepositional phrases.

(10)(a) An ugly scar runs all the way from his knee to his ankle.
(b) An ugly scar runs all the way from his ankle to his knee.

Mental scanning of this sort is by no means limited to spatial configurations but can be manifested in any conceptual domain:

(11)(a) The prices on this model run from about $18,000 all the way to $27,000 depending on optional equipment.
(b) As average body size increases, the typical gestation period gets longer.

The sentences in (10) and (11) all describe situations that are locally stable with respect to the actual passage of time. The sense of movement and directionality reflects the order in which a range of options (spatial or otherwise) are mentally accessed by the conceptualizer in the process of building up to the full apprehension of a complex structure.

Lastly, our capacity for construal comprises various ways of rendering certain entities more prominent than others. Numerous types of prominence need to be distinguished for linguistic purposes. One kind of prominence attaches to elements that are new in relation to what has already been established in the discourse. Collectively called the focus, these elements stand out against the background of information said to be old or given. In English, focus is generally marked by unreduced stress (indicated here by small caps):

(12) He said she was wearing a white blouse with black polka dots, but actually she was wearing a white SWEATER with black STRIPES.

Rather different is the inherent cognitive salience of certain kinds of entities and experiential domains. Examples include the salience of a whole relative to its parts, the special status of animate entities (especially humans) in relation to inanimate objects, that of physical entities as opposed to abstractions, and the psychological primacy of visual and spatial experience. Among the linguistic manifestations of these salience asymmetries are the usual directions of metaphor and metonymy. It is well known, for instance, that abstract notions tend to be structured metaphorically in terms of source domains pertaining to physical experience, as in (6). Some cases of metonymy are given in (13). In (13)(a), a whole turkey refers metonymically to the turkey’s edible flesh; presumably the bones, feathers, and other sundry parts were not consumed.

(13)(a) For Thanksgiving we ate a whole turkey.
(b) I’m in the phone book.

The metonymic use of the pronoun I in (13)(b) illustrates the inherent salience of humans as well as physical entities. Under normal circumstances it would actually only be a graphic
Especially important for grammar are two kinds of prominence intuitively describable as involving the focusing of attention. The first, called *profiling*, characterizes expressions of any size or type. Within the full conceptualization it evokes, an expression directs attention to some particular substructure—its *profile*—as being the entity that it designates or refers to. An expression’s profile is thus its “referent”, in a psychological (as opposed to a logical or philosophical) sense of that term. The noun *lid*, for example, evokes the conception of a container together with a cover serving to close an opening in its top, as sketched in Figure 1(a). This entire conception is necessary, since a lid can be identified as such only in relation to a container and its covering/closing function. Yet the full conception is not per se the meaning of *lid*, since a lid is not equivalent to a container-cover assembly. A crucial semantic property of *lid* is that, within this assembly, it specifies the cover in particular as being its referent. The cover is thus its profile, as shown in Figure 1(b). In the diagrammatic representations of cognitive grammar (which are heuristic rather than formal), profiling is indicated by heavy lines.

![Figure 1. The effect of profiling.](image)

An expression can profile either a *thing* or a *relationship* (assuming abstract and broadly inclusive definitions of those terms—see Langacker 1987b). Consider the words *advise*, *advisor*, and *advisee*. As shown in Figure 2, they evoke the conception of two individuals engaging in a particular kind of verbally mediated social and psychological interaction. A dashed arrow represents this experiential relationship, its alignment indicating the primary direction of influence. Note that this entire conception figures in the meaning of all three expressions: a person does not qualify as an advisor or advisee except by virtue of participating in an interaction of this sort, nor can one conceive of the advising process without conceptualizing its participants. Since *advise*, *advisor*, and *advisee* have the same conceptual content, the semantic contrast among them resides in profiling, an aspect of construal. The verb *advise* profiles the relationship, including the participants essential to its conception. On the other hand, the nouns *advisor* and *advisee* profile only the respective participants, identified and distinguished by their role in the process.

Such examples clearly demonstrate that an expression’s meaning depends on both content and profiling. Yet these alone are not sufficient. We can see this from semantic oppositions like *above* vs. *below*, diagrammed in Figure 3. Both expressions designate a spatial relationship between two things (shown as circles) occupying different positions along the vertical axis. They thus evoke the same conceptual content. Moreover, they have the same
profile (represented by the heavy dashed lines)—referentially, an above relationship is also a below relationship. Some other factor must therefore be responsible for the contrast in meaning. This factor, a final dimension of construal, is the relative prominence accorded the participants in a profiled relationship.

![Figure 2. The profiling of a relationship vs. the profiling of its participants.](image1)

In a relational expression, there is usually a participant that stands out as the one being located or characterized, or whose activity is being followed. Called the trajector (tr), this entity can be described as the primary figure in the scene. Often a second participant, called the landmark (lm), stands out as a secondary figure. The semantic contrast between above and below resides in whether the upper participant is focused as trajector and the lower one as landmark, or conversely. If I say, for example, that The knob is above the keyhole, I am using the keyhole as a spatial landmark to specify the location of the knob. I do the opposite in saying that The keyhole is below the knob. Observe, however, that the notions trajector and landmark are not defined spatially, but as a matter of focal prominence, hence they are applicable to any kind of relationship. In Figure 2(a), for instance, the source and the target of advice are respectively identified as the trajector and landmark of advise.

![Figure 3. Expressions that differ in trajector/landmark alignment.](image2)

3. LEXICON AND GRAMMAR

Both lexicon and grammar are claimed to be fully and properly describable as assemblies of symbolic structures. The term “symbolic” does not imply operations on strings of empty markers (as when “symbolic processing” is contrasted with connectionist approaches). On the contrary, it refers to the semiological function of language and the symbolization of meanings by phonological sequences. In cognitive grammar, a symbolic structure is defined as
consisting in the association between a semantic structure and a phonological structure—its semantic and phonological poles. Every lexical and grammatical element is thus attributed some kind of semantic and phonological value, whether specific or schematic.

Lexicon is defined in cognitive grammar as the set of fixed expressions in a language, regardless of their size or type. Each lexical item is an assembly of symbolic structures. A morpheme can be regarded as a minimal symbolic assembly, degenerate by virtue of having no symbolic substructures. The morpheme *door*, for example, can be given as [DOOR/door], where upper- and lower-case orthographic sequences respectively stand for semantic and phonological structures. The lexical unit *garage door* is more typical in being symbolically complex. As shown in Figure 4 (where dashed-line boxes delimit complex assemblies), it comprises two component symbolic structures, [GARAGE/garage] and [DOOR/door], together with the symbolic structure defined by the composite form and meaning of the overall expression: [GARAGE DOOR/garage door]. At a higher level of organization, this entire assembly combines with *opener*, itself complex, to form the lexical unit *garage door opener*. There is clearly no inherent upper limit on the symbolic complexity expressions can exhibit.

A lexical item is “fixed” in the sense of being learned by individual speakers and conventional within a certain speech community. Since both are matters of degree, there is no strict boundary between lexical items and “novel” expressions. The latter, of course, are usually novel only in limited respects. How much is actually novel in the sentence *The garage door opener is broken*, for example? *Garage door opener* comes prepackaged as a lexical unit, and for those who have such a device, the full noun phrase *the garage door opener* is probably a familiar expression. Moreover, although the phrase *is broken* is not traditionally considered a lexical item, a typical speaker has used it on many occasions and may very well store it as a prefabricated unit. The truly novel aspect of the sentence may in fact be limited to combining *the garage door opener* and *is broken* as subject and predicate. More generally, the fluency of real-time speech may only be possible owing to the substantial proportion of boilerplate language and standard expressive schemes it employs.
Both fixed and novel expressions consist of symbolic assemblies, of any potential size, at least partially constructed in accordance with regular grammatical patterns. Either are capable of diverging from such patterns, especially at the semantic pole, where an elaborate process of meaning construction may intervene between the meanings of component elements and the composite semantic value. In the case of a lexical item, deviations from regularity and strict compositionality are accepted as part of its linguistic characterization, since the entire assembly is familiar and conventional (by definition). With novel expressions, where this is not so (at least not yet), comparable deviations are normally regarded by linguists as involving ungrammaticality or facets of meaning that are extralinguistic (hence beyond the scope of semantics). But the difference is more apparent than real, hinging only on degree of entrenchment and conventionality. The standard doctrine that lexical items are idiosyncratic and semantically unpredictable, whereas novel expressions are regular and semantically compositional, does not stem from any empirical finding but rather from a tacit decision to consider only those facets of the latter that are already sanctioned by established convention.

Be it fixed or novel, a linguistic expression is a symbolic assembly whose composite structure is specified in enough detail—particularly at the phonological pole—that it can actually be uttered and understood. Linguists, however, are less interested in expressions per se than in the patterns and regularities they instantiate. In cognitive grammar, linguistic generalizations (the functional equivalent of “rules”) are simply schemas abstracted from occurring expressions. A schema is a template representing the coarse-grained commonality exhibited by a set of expressions with respect to some facet of their structure. It is reasonably supposed that schemas are immanent in their instantiating expressions, and emerge as cognitive entities by reinforcement of the structural properties they share at a certain level of abstraction. We have already noted degrees of schematization for semantic structures (e.g. in (1)). Moreover, since linguists are concerned with phonological structures as mental representations (not just as actual sounds), these too are susceptible to schematization. Schematized symbolic structures constitute grammar.

Cognitive grammar is highly restrictive and very down-to-earth in regard to the kinds of structures it allows in linguistic descriptions. On the one hand, it specifies that only semantic, phonological, and symbolic structures are permitted. Thus every linguistic element contributes directly to the semiotic function of language by virtue of having some kind of semantic and/or phonological value. On the other hand, cognitive grammar imposes strong restrictions on the relation between linguistic structures and the primary data of occurring expressions. It specifies that the only structures validly posited are those which figure directly in the data (i.e. actual expressions and their parts), or which emerge from the data via the basic cognitive processes of abstraction (schematization) and categorization. To take a phonological example, particular segments such as [m], [n], and [ŋ] can be posited because they occur as parts of actual expressions. Permitted as an abstraction from these elements is the schematic segment [N], i.e. a nasal consonant unspecified as to place of articulation. It represents the generalization that nasal consonants occur in the language, and embodies the commonality that makes them a natural phonological class. Also permitted are the categorizing relationships identifying each nasal segment as an instance of that class: [[N] → [m]], [[N] → [n]], and [[N] → [ŋ]]. Similarly, we can posit the semantic structures [LID], [DOOR], and [CAP], permitted because they occur as the respective meanings of lid, door, and cap. Also allowed is the schematized conception they all instantiate, [COVER FOR OPENING], as well as categorizations such as [[COVER FOR OPENING] → [LID]].
The most striking and controversial claim of cognitive grammar is that these same few possibilities—applied to symbolic structures—are sufficient for a full and optimal account of lexicon, morphology, and syntax. Note first that lexical items are permitted in a linguistic description by virtue of being actual, recurring expressions. As shown in Figure 4, these include symbolic assemblies of any size, some of which function as components of others. Also permitted are schematizations of occurring expressions (not limited to lexical items). These schematic symbolic assemblies, potentially having any degree of complexity, embody the coarse-grained commonality inherent in sets of expressions. Such assemblies constitute grammatical structure, and their categorization of specific expressions (both fixed and novel) constitutes the structural characterization of those expressions.

Consider expressions like jar lid, pot lid, box lid, and coffin lid. Each is an assembly comprising two component symbolic structures (e.g. [JAR/jar] and [LID/lid]) together with the composite symbolic structure giving the meaning and form of the expression as a whole (e.g. [JAR LID/jar lid]). Although they vary in their frequency of occurrence and lexical status, they exhibit a structural parallelism that provides a basis for schematization. The resulting schema, which we can abbreviate as CONTAINER lid, represents a particular low-level pattern of forming nominal compounds. Higher-level abstractions are of course possible, such as the general schema for noun-noun compounds like door knob, desk clerk, tomato juice, broom handle, luggage strap, movie star, tooth filling, cab driver, fire alarm, dust rag, computer virus, etc. This highly schematic assembly—call it THING THING—is instantiated by CONTAINER lid and numerous other subschemas describing special cases of the general pattern. We can therefore posit schematic hierarchies, e.g. THING THING \(\rightarrow\) CONTAINER lid \(\rightarrow\) jar lid.

We must further recognize extensions from a basic pattern. Thus eyelid is an instance of THING THING but an extension vis-à-vis CONTAINER lid, for an eye is not a container: CONTAINER lid \(\rightarrow\) eyelid. It is quite typical for the full description of a grammatical construction to involve a substantial number of constructional variants. These are characterized at different levels of specificity and linked by categorizing relationships to form a network, often centered on a prototype (Goldberg 1995; Janda 1990; Lakoff 1987: case study 3). The same can be said for the alternate senses of a polysemous lexical item, and indeed, for linguistic categories in general (Langacker 1987a: ch. 10, 1988).

4. Grammatical Structure

Why should there be such a thing as grammar? It would not exist were lexical units available to symbolize every conception one would want to express. However, lexical items form a limited set, whereas the conceptions we wish to encode linguistically are open-ended and indefinitely varied. We overcome this by resorting to complex expressions comprising multiple lexical elements. Each component element evokes some facet of the overall conception, a facet singled out precisely because it is susceptible to individual lexical encoding. Collectively, these individually symbolized conceptual “chunks” provide enough clues about the composite conception intended by the speaker that the addressee (especially in context) is able to reconstruct some approximation to it. But this reconstruction cannot
proceed effectively without some kind of systematic indication of how the conceptual chunks are supposed to fit together. The role of grammar is to provide this information.

We can start by examining a specific symbolic assembly, namely jar lid, sketched in Figure 5. The composite structure is shown at the top, the two component structures below. At the semantic pole, lid profiles the cover to a schematic container, jar profiles a specific container, and jar lid profiles the cover to a container of that type. (The pictorial representations are only mnemonic; they have to be understood as abbreviating multifaceted conceptualizations.) Phonologically, the components jar and lid are single words (W), the composite expression being a two-word sequence with accent on the first. The component and composite structures form an assembly by virtue of correspondences, represented diagrammatically by dotted lines. In particular, a semantic correspondence equates the profile of jar with the schematic container evoked by lid, while at the phonological pole jar is identified with the word directly preceding lid. When elements of the component structures correspond, they project to the same composite structure element. Correspondences can thus be regarded as instructions for “integrating” components to form the composite structure.

The specific symbolic assembly in Figure 5 instantiates schematized assemblies such as CONTAINER lid and THING THING, describing conventional compounding patterns at different levels of abstraction. The schema describing the general pattern is depicted in Figure 6. Phonologically, it indicates word order and the characteristic stress pattern of compounds without specifying any particular segmental content. At the semantic pole, the component and composite structures are characterized abstractly as profiling things (represented by circles). The profile of the first component corresponds to a thing associated in some unspecified fashion with the profile of the second, which also prevails as the composite structure profile. The correspondences inherited from the sanctioning schema indicate how the conceptual “chunks” provided by the component structures are supposed to be combined in forming the composite semantic structure. Typically, however, the composite structure incorporates extracompositional properties and therefore has to be recognized as an entity in its own right.

Figure 5. Details of a specific symbolic assembly.
Figure 6. Details of a schematic symbolic assembly.

For instance, compounds like lipstick and apple polisher evoke conceptual “frames” not associated with either of their component elements taken individually (cf. Downing 1977; Ryder 1994). Neither lip nor stick by itself reliably evokes the cultural practice of females coloring their lips with a paint-like substance packaged in a stick-like shape. Although this cultural frame is necessary for the conceptual coherence of lipstick, it is neither mechanically determined nor fully constituted by the individual meanings of lip and stick, which explicitly encode only selected aspects of it. Semantics is only partially compositional: conventional patterns of composition (the semantic poles of schematic symbolic assemblies) are only one of the factors in the process of meaning construction that intervenes between component and composite conceptions in complex expressions. Compositional rules do not function in isolation, nor does their fully compositional “output” necessarily exist or have any independent cognitive status.

If the basic idea of symbolic assemblies is clear, it must next be asked whether they are able in principle to provide a full account of grammatical structure. Can they actually accommodate the various phenomena generally interpreted as demanding that grammar be treated autonomously? By way of partial demonstration that they can, let us briefly consider some fundamental problems: grammatical classes, grammatical markers, constituency, and distributional restrictions. An additional problem, how to characterize the grammatical relations subject and object, is the topic of section 5.

To this very day, standard linguistic doctrine holds that basic grammatical classes (noun, verb, adjective, etc.) are not semantically definable. The arguments are anything but conclusive, however, for they consider only the most simplistic semantic characterizations and completely ignore our ability to impose alternate construals on the same conceptual content (see, for instance, Jackendoff 1994: 68-69). It is argued, for example, that since not every noun names a physical object, and not every verb names an action, these classes cannot be defined on the basis of any meaning their members all share. The impossibility of a semantic definition is also argued on the grounds that expressions with the same meaning sometimes belong to different grammatical classes, e.g. explode (a verb) and explosion (a noun). But it should be evident that if all nouns have something in common semantically, or
all verbs, it must be more abstract than notions like ‘physical object’ and ‘action’ (which do however describe the category prototypes), and must be independent of any specific conceptual content. A viable conceptual characterization should instead be sought at the level of general cognitive abilities, in particular our capacity to conceive of the same situation in alternate ways. Category membership does not reflect conceptual content so much as the construal imposed on it.

What sort of cognitive abilities might be invoked in a conceptual characterization of the noun class? One is profiling. As we saw in Figure 2, the words advise, advisor, and advisee have basically the same conceptual content, the semantic contrast residing in their choice of profile. It is in fact the nature of an expression’s profile—not its overall content—that determines its grammatical class. Advise is thus a verb because it profiles a certain kind of relationship, whereas advisor and advisee are nouns because they profile “things” (identified by their role as participants in that relationship). The claim, then, is that a noun profiles a thing, in an abstract and broadly inclusive sense of that term. This is the conceptual property that all nouns have in common, and they are nouns precisely because they have this property.

But what is a “thing”? My working hypothesis is that a thing is the product of two fundamental and ubiquitous cognitive phenomena. The first is grouping, whereby entities are singled out and conceived in relation to one another, to the exclusion of others. Most familiar are the gestaltist principles of grouping by contiguity and similarity. In viewing (14)(a) we can hardly avoid forming groups of two and three x’s on the basis of contiguity, while in (14)(b) similarity affords a basis for singling out certain entities (the x’s) which can then be grouped by proximity.

(14)(a) x x x x x
(b) - - x x x x - - - - - - - x x x - - - - - - - x x x - x - x

We can also recognize more abstract bases for grouping. For instance, the members of an orchestra are mentally grouped because they are conceived as interacting to collectively fulfill a certain function. A number of stars are grouped to form a constellation because they are conceived as points in the outline of a schematic image. The second relevant phenomenon, call it reification, is the manipulation of a group as a unitary entity for higher-level cognitive purposes. In (14)(b), for example, I reify the groups of x’s when I count them, observe that all three are the same, note that they form a straight line, etc. I reify an orchestra when I compare it to another in size or quality, or when I think of it as joining with others to form an orchestra association (a higher-level group).

A “thing” is thus defined as any product of grouping and reification, and a noun is characterized as an expression that profiles a thing. Large numbers of nouns are straightforwardly describable in this manner: group, team, club, stack, pile, alphabet, archipelago, swarm, herd, jigsaw puzzle, chess set, lexicon, bouquet, collection, orchard, chord, squad, galaxy, and so on indefinitely. Each such noun designates a set of constitutive entities that obviously are grouped and conceptually wielded as a single unit for linguistic and other purposes. I suggest that the same description applies to physical objects, even those whose constitutive entities are nothing more than arbitrarily delimited “splotches” of material substance continuously distributed throughout a certain expanse of space. The splotches constituting a rock, for example, are neither individuated nor consciously recognized, yet the very apprehension of their continuous extensionality effects their grouping to yield the
conception of a unitary object. The reason physical objects are prototypical for nouns is that the grouping and reification of their constitutive entities is so basic and automatic that any awareness of them requires subsequent, higher-level analysis. I have argued elsewhere (Langacker 1987b, 1991: ch. 1) that mass nouns, abstract nouns, and others also conform to this general description.

I have no definite proof for this conceptual characterization of nouns. If basically correct, it will nonetheless have to be refined, properly formulated, and empirically tested from the psychological standpoint by those with proper expertise. It is merely offered as a coherent proposal with some claim to linguistic adequacy and cognitive plausibility. Even so, by indicating what a viable conceptual description of nouns might look like, it underscores the simplistic nature of standard arguments for the impossibility of a semantic definition. I personally find it hard to imagine that fundamental and universal categories like noun and verb would not have a conceptual basis (cf. Gentner 1981, 1982; Kellogg 1994, 1996). As a general matter, I believe that such categories reflect inborn cognitive abilities that are initially manifested in the category prototype and become more apparent when extended to other kinds of circumstances. (This is not in principle incompatible with an account based on metaphor, e.g. the notion that nominal referents are metaphorically construed as physical objects.)

The prototype for verbs is an action, i.e. an event producing observable change carried out by a volitional agent. The more schematic conception which verbs all share, I suggest, is that of a relationship mentally scanned sequentially—instant by instant—in its evolution through time. I refer to this as a process. Every verb is thus said to profile a process, just as every noun profiles a thing. Other basic classes, such as prepositions and adjectives, are characterized as profiling different sorts of relationships viewed “holistically”, in the sense that their evolution through time is not in focus. A preposition like above, for instance, profiles a non-processual relationship with a thing as its landmark (Figure 3); while this relationship is likely to endure through time, its temporal evolution is not essential to its description or identification (it can be identified in a configuration viewed only instantaneously). An adjective profiles a relationship with a thing as trajector but no salient landmark. The adjective square, for example, profiles a complex relationship—involving length of sides, parallelism, perpendicularity, etc.—holding among various facets of its trajector. (As a noun, square profiles a thing consisting of connected line segments whose configuration instantiates the relationship profiled by the adjective.) Participles and infinitives derive from verbs, hence they evoke the conception of a process, but in one way or another they construe it holistically to form a higher-level conception that is non-processual. For instance, one kind of past participle restricts the profile of a change-of-state verb to the final state resulting from the change. Thus, whereas the verb melt profiles the process of a solid (its trajector) gradually becoming liquid, the participle melted profiles just the latter situation. By virtue of profiling a single-participant, non-processual relationship, such participles actually qualify as adjectives and behave that way grammatically (e.g. melted ice cube; The ice cube is finally melted).

Standard linguistic doctrine notwithstanding, I see nothing problematic or inherently implausible about the notion that the members of a basic grammatical class all share an abstract commonality. It is thus proposed that every noun instantiates the symbolic schema [THING/...] (i.e. it profiles a thing, but need not have any particular phonological properties). Likewise, every verb instantiates the schema [PROCESS/...]. While class membership is
usually taken as demonstrating the need for irreducible grammatical primitives, it is coherently and more naturally seen as residing in categorizing relationships between specific and schematic symbolic structures: $[[\text{THING/...}] \rightarrow [\text{EXPLOSION/explosion}]];\]
$[[\text{PROCESS/...}] \rightarrow [\text{EXPLODE/explode}]]$. It needs to be emphasized that these characterizations do not invoke any specific conceptual content. The schematic conception immanent in all nouns, or in all verbs, is primarily a matter of construal: a noun profiles a product of grouping and reification, while a verb profiles a relationship whose temporal evolution is scanned sequentially. These alternate modes of construal can perfectly well be applied to the same conceptual content, resulting in a difference in grammatical class. If explode and explosion evoke the same basic conception, they nonetheless impose distinct construals on it. As a verb, explode construes the event as a dynamic process and simply tracks its occurrence through time. On the other hand, the noun explosion profiles an abstract “thing” created by the reification of such a process. Its constitutive entities are the successive phases of the process (i.e. the situations obtaining at each successive point in time), and the very act of scanning through them sequentially provides the basis for their grouping. Hence explosion designates a reified event consisting of one instance of the process explode.

As this example indicates, the semantic import of grammar is largely a matter of the construal it imposes on the content supplied by lexical elements (cf. Talmy 1988). The reason why the meaningfulness of grammar is not generally recognized is that semantics has not generally acknowledged the critical role of construal. Especially in the formalist tradition, linguists have consequently analyzed many elements as “purely grammatical” markers whose meaning is ignored and often explicitly denied. I have argued, to the contrary, that all grammatical markers have at least schematic conceptual import, and have proposed and justified particular meanings for a substantial number of representative instances (e.g. Langacker 1990, 1991, 1992). Semantically, such markers are comparable to the schemas describing grammatical classes. As overtly realized grammatical markers, however, they differ from class schemas by virtue of being phonologically specific.

Consider the auxiliary verb do, which occurs with negation (I do not see them), in questions (Did you wash it?), and for emphasis in statements (I DO love you!). It is often viewed as meaningless, being inserted just for grammatical purposes (e.g. in Chomsky 1957). However, the fact that do serves a grammatical function does not entail that it has no meaning (cf. Reid 1991). It is cogently analyzed as a maximally schematic verb, i.e. one whose semantic pole is equivalent to the verb-class schema despite its phonological specificity: [PROCESS/do]. This accounts for its taking verbal inflection, and also for its use as a kind of verbal anaphor: Can you fix it? I already did. One reason do appears to have no meaning is that it refers schematically to the same process that the lexical verb it combines with describes in more specific terms, hence it contributes no additional content. Yet semantic overlap is characteristic of all grammatical constructions (see Figure 6), and full inclusion is just an expected limiting case.

Most derivational and inflectional morphemes are reasonably described as being schematic for the class they derive, their semantic contribution residing in the construal they impose on the stems they combine with, especially in regard to profiling. For example, the derivational morphemes -er and -ee profile things characterized only by their agent- or patient-like role in a schematically specified process; they impose this nominal profile on the specific process designated by the verb stem they attach to. I would thus describe -er and -ee as schematic agentive and patientive nouns, which forms like advisor and advisee
respectively instantiate. By the same token, the nominalizing morpheme -ion (as in explosion) profiles a thing characterized as the reification of a schematic process, and the past participial morpheme -ed (as in melted) profiles the state resulting from a schematic change-of-state process. Of course, these same elements have alternate semantic values—just like other lexical items, grammatical markers are often polysemous. (For the polysemy of -er, see Ryder 1991.)

We have so far discussed how certain basic grammatical phenomena—namely rules, classes, and markers—are in principle describable in terms of symbolic assemblies. Other phenomena commonly taken as supporting the autonomy of grammar include constituency as well as the problem of “distribution” or “structure dependency”, i.e. arbitrary restrictions on the structural contexts in which elements are allowed to occur. In fact, however, the symbolic view of grammar readily handles them both.

To represent constituency, generative grammar posits syntactic phrase trees in which lexical items are “inserted” and function as terminal nodes. These tree structures are thought of as purely grammatical entities essential to syntactic description. While they may play a role in semantic and phonological interpretation, the trees themselves draw on syntactic primitives and have no intrinsic semantic or phonological value. Three kinds of information are represented in these phrase trees: constituency, grammatical category (given by node labels), and linear order. All of these are clearly important for grammar. Only the status of phrase trees as autonomous syntactic objects is being called into question.

Constituency per se is hardly unique to grammar. It is just a matter of component elements being incorporated as facets of more complex structures at successively higher levels of organization. As such, it is evident in virtually every domain of experience: in motor experience, where component routines are coordinated into higher-level routines (as in learning to type); in perception, as in (14)(b), where x’s cluster into groups of four, which can then be perceived as forming a cluster of three such groups; and so on. Constituency emerges in symbolic assemblies when a composite symbolic structure at a given level of organization functions in turn as a component structure at a higher level. For example, we see in Figure 4 that [GARAGE DOOR/garage door] and [OPENER/opener], each a composite structure with respect to its morphemic components, are themselves component structures with respect to the overall composite structure [GARAGE DOOR OPENER/garage door opener]. To the extent that they have this kind of hierarchical arrangement, symbolic assemblies are reasonably depicted as trees in the manner of Figure 4. These trees are quite different from the phrase trees of generative grammar, however. Most importantly, every “node” is symbolic, having both a semantic and a phonological value, whereas the nodes of a generative phrase tree have neither.

Another difference is that the components of a symbolic assembly are not linearly ordered with respect to one another (hence assemblies like Figure 4 are more like mobiles than trees). Linear ordering is actually the temporal ordering of speech. While temporal ordering is exploited for the symbolization of grammatical relationships, it is properly regarded as a dimension of phonological structure. Temporal sequencing is therefore specified internally to every component and composite symbolic structure, as an inherent aspect of its phonological characterization (e.g. the phonological pole of [GARAGE DOOR/garage door] specifies that garage directly precedes door in the temporal sequence). In similar fashion, grammatical category—which phrase trees indicate by means of node labels—is properly regarded as an inherent aspect of a symbolic structure’s semantic
characterization. In Figure 5, for instance, the component and composite structures of *jar lid* are all classed as nouns because each profiles a thing (the noun-class schema is immanent in each of them).

We see, then, that the kinds of information represented in phrase trees are all available in symbolic assemblies as different aspects of their intrinsic organization. Interpreted as distinct and autonomous syntactic objects, phrase trees are therefore held to be unnecessary theoretical artifacts, a product of linguistic gerrymandering. Moreover, cognitive grammar views constituency as being less essential than does generative theory, and also more fluid and variable (Langacker 1995a, 1997a). Phenomena for which syntactic phrase trees per se have been considered indispensable (e.g. the definition of subject and object, discussed in section 5) are claimed to be better analyzed in other ways.

Turning now to distributional problems, I must first offer a point of clarification concerning grammatical classes. The claim that such classes are susceptible to schematic semantic descriptions valid for all members is specifically intended for basic and universal classes like noun and verb, for their major subclasses (e.g. count vs. mass noun), and for certain other “part-of-speech”-type classes (such as adjectives, adpositions, and particular kinds of participles). It is definitely not asserted that every class a linguist might validly posit is definable in this manner. Such a claim would obviously be untenable for many distributional classes, consisting of the lexical items conventionally allowed to participate in a given syntactic, morphological, or even phonological pattern. Even when a construction has a semantic basis, and the lexical items entering into it exhibit some degree of semantic coherence (as in the English passive), the exact inventory is often conventionally determined and less than fully predictable. The membership of some classes (e.g. the class of verbs taking a particular irregular past-tense form) may be totally arbitrary.

Because the membership of certain classes cannot be predicted, it has to be specifically learned by speakers and explicitly described by linguists. This does not by itself establish the autonomy of grammar, except in the weakest sense (acknowledged by every linguist) that functional considerations fail to fully and uniquely determine every detail of language structure—the specific patterns and distributions of a language are shaped by convention and acquired through social interaction. Whether distributional restrictions support any stronger form of autonomy depends on what kind of apparatus is needed to describe them. There is in fact every reason to believe that only symbolic assemblies are necessary.

Complex expressions consist of symbolic assemblies, and the conventional patterns they instantiate consist of schematizations of such assemblies (recall Figures 5 and 6). Depending on the supporting data, the process of schematization can be carried to any degree, and to different degrees for different facets of a construction. This produces hierarchies of schematized assemblies, illustrated by our previous example \( \text{THING THING} \rightarrow \text{CONTAINER lid} \rightarrow \text{jar lid} \) (where \( \text{THING THING} \) represents a very general pattern for nominal compounds, and \( \text{CONTAINER lid} \) is the low-level pattern abstracted from forms like *jar lid*, *pot lid*, *box lid*, and *coffin lid*). In view of the many possible levels and dimensions of schematization, as well as the many kinds of similarity exhibited by overlapping sets of complex expressions, we can reasonably envisage the emergence of vast, intersecting networks of schemas representing patterns with varying degrees of generality and salience. The full characterization of what linguists might consider to be a unified construction—e.g. nominal compounding, passive voice, or past tense formation—requires a substantial network in which certain schemas are categorized as instantiations or as extensions vis-à-vis others.
that are more abstract or more prototypical. Despite its complexity (which I believe to be both linguistically necessary and cognitively realistic), such a characterization does not imply a loss of generality: any valid generalization is captured by a schema at the appropriate level of abstraction.

These networks are the locus of distributional knowledge. Even in cases where a high-level schema presumably emerges (e.g. \textit{THING THING}), a network of instantiating structures specifies which regions within the large space of possibilities it defines are in fact conventionally exploited. Among these structures, capturing local generalizations, are low-level schemas pertaining to narrowly defined classes of elements. The lowest-level structures in such a network are schemas incorporating specific lexical items as components (e.g. \textit{CONTAINER lid}) and even actual expressions learned as units (\textit{jar lid}). Symbolic assemblies that incorporate specific lexical items embody a speaker’s knowledge of their distributional idiosyncrasies. Consider the English ditransitive construction, where a verb takes two post-verbal nominal complements:

(15) She \{gave/lent/bequeathed/*transferred\} him a substantial amount of money.

Not every verb potentially occurring in this construction actually does so, and while various partial regularities are captured by a network of low-level schemas (Goldberg 1992, 1995), a certain amount of lexical specification is also necessary. It is provided by subschemas that mention particular verb stems. For example, the information that \textit{bequeath} occurs in this construction resides in a subschema which incorporates this specific verb but is schematic in regard to the nominal complements (there is no such schema for \textit{transfer}). Similarly, the information that \textit{break} follows a certain minor pattern in forming its past tense resides in knowledge of the specific form \textit{broke}, which instantiates that pattern.

Since language is learned through usage, it ought not be surprising that the preponderance of linguistic knowledge consists of specific expressions and low-level patterns, many of which incorporate particular lexical items. This is not to deny the existence and importance of general, productive patterns represented by high-level schemas. I would however suggest that fully general patterns constitute a distinct minority, that lower-level structures provide critical information and do much if not most of the work in speaking and understanding. Attempts to impose a strict boundary between structural regularity and idiosyncrasy—attributing them to distinct modules or processing systems (Chomsky 1965; Pinker and Prince 1991)—are, I believe, both linguistically untenable and psychologically dubious. Instead I envisage a dynamic, interactive process whereby structures at all levels of abstraction compete for activation and the privilege of being invoked in producing and understanding utterances (cf. Elman and McClelland 1984; Langacker 1988, 2000). Particular high-level schemas may be so entrenched and accessible (relative to alternative patterns or to subschemas) that they normally win the competition and prevail as general or default-case patterns. But even in such circumstances, specific instantiating expressions can be learned and accessed as units if they occur with sufficient frequency (Stemberger and MacWhinney 1988). And in general, lower-level structures have a built-in competitive advantage, since their greater specificity enables them to match a potential target in many more respects, each contributing to their activation.
5. SUBJECT AND OBJECT

Though radical in relation to current dogma, cognitive grammar is not at all fanciful. It is highly conservative in what it assumes about cognition and what it allows the analyst to posit in describing a language. It has been successfully applied to myriad problems in diverse languages (see, for example, Achard 1993; Casad 1982; Cook 1988; Janda 1993; Maldonado 1992; Manney 2000; Rice 1987; Rubba 1993; Smith 1993; Tuggy 1988). Moreover, detailed accounts have been given of representative phenomena that have figured prominently in the theoretical literature and have often been cited in support of autonomous syntax. In particular, I would argue that the cognitive linguistic descriptions of English passives, “raising” constructions, and pronoun-antecedent relationships are more adequate and more revelatory than generative analyses (Langacker 1982, 1995b; van Hoek 1995, 1997).

One basic problem for a symbolic account of grammar is to characterize the notions subject and object. There are few topics on which linguistic theorists exhibit such a striking lack of consensus. About the only thing virtually all of them agree on is that a conceptual definition valid for all subjects or all objects is just not feasible. I believe that such a characterization is indeed possible. It must however be suitably abstract, as well as psychologically plausible. As in the case of grammatical classes, we must seek a broadly applicable description at the level of general cognitive abilities initially manifested in the prototype. I propose that subject and object status ultimately reduces to a kind of focal prominence conferred on participants in a profiled relationship.

In particular, subject and object nominals are identified as respectively specifying the trajector and the landmark of a profiled relationship. These latter notions have in turn been described in various ways (Langacker 1990: ch. 9, 1991: 7.3, 1997b). I have characterized a trajector as (i) the primary figure in a profiled relationship, (ii) the element one is primarily concerned with describing or locating (a clause-internal “topic”), and (iii) the initial focus of attention (“starting point”) in a chain representing the order in which elements are accessed in building up to a full conception of the profiled relation. The characterization of a landmark is obtained by replacing the words primary, primarily, and initial with secondary, secondarily, and second (i.e. changing “1” to “2”). I conceive of points (i)-(ii) as being complementary and mutually compatible. In referring to trajector and landmark as primary and secondary focal participants, I intend to subsume all three.

Stated more precisely, the proposal is as follows: a subject (or object), at a given level of organization, is a nominal element which elaborates the trajector (or landmark) of the relationship profiled at that level. A nominal element is one that profiles a thing, and it elaborates a trajector or landmark by virtue of its profile corresponding to it. Consider the sentence Alice admires Bill, whose semantic pole (ignoring tense) is sketched in Figure 7. Admire(s) profiles a relationship of mental experience (indicated by a dashed arrow). Its trajector is the experiencer, and its landmark is the target of experience. Alice and Bill are nominal expressions, for they profile “things”, whose semantic specifications are abbreviated as “A” and “B”. Following usual assumptions regarding constituency, admires and Bill combine, at one level of organization, to form the composite structure admires Bill. At a higher level of organization, admires Bill combines with Alice to give the overall composite structure Alice admires Bill. Observe that the same experiential process is profiled at three levels: by the verb admire(s), by the “verb phrase” admires Bill, and by the full clause Alice

Alice admires Bill,
admires Bill. Tracing along correspondence lines (both vertical and horizontal) reveals that Alice elaborates the trajector of this process at all three levels, and Bill the landmark. Thus Alice is identified as the subject, and Bill the object, with respect to the verb, the verb phrase, and the clause.

Figure 7. A symbolic assembly illustrating the definition of subject and object.

This proposal exemplifies the working strategy noted at the outset, namely to seek characterizations that are simultaneously (i) reasonable from the psychological standpoint, (ii) well motivated in purely semantic terms, and (iii) optimal as a basis for analyzing grammar. Let us first consider semantic motivation. I have already indicated that the trajector/landmark distinction is necessary just to describe the meanings of relational expressions. An adequate description has to capture the semantic contrast between pairs like above and below (also before vs. after, in front of vs. in back of, precede vs. follow, etc.), which have the same conceptual content and profile the same relationship (Figure 3). Constructs like trajector and landmark, pertaining to the salience and accessibility of the relational participants, would seem to offer the only possible basis for distinguishing them. The claim, then, is that a sentence like (16)(a) is primarily concerned with locating the alarm button, and evokes the light switch as a landmark for doing so, whereas (16)(b) shows the opposite alignment.

(16)(a) The alarm button is just above the light switch.
(b) The light switch is just below the alarm button.

Discourse considerations provide supporting evidence. Observe that only (16)(a) is natural in response to the question Where is the alarm button?, while (16)(b) responds to Where is the light switch?. This illustrates Chafe’s discourse-based characterization of a subject as “a starting point to which other information is added” (1994: 92). The question Where is X? establishes X in the discourse as the obvious point of departure for the answer.

What about cognitive plausibility? We can start by noting that figure/ground organization is a well-established perceptual phenomenon and that the figure in a scene is the first element
to catch our attention. Moreover, I presume there is nothing inherently implausible about supposing that figure/ground organization (or something directly analogous to it) is also prevalent at higher levels of conceptualization. The trajector/landmark asymmetry in relational expressions does in fact exhibit certain tendencies suggesting a strong affinity to figure/ground organization. Talmy (1978) has pointed out that factors contributing to the choice of perceptual figure—notably compactness and mobility—also tend to be associated with the elements I would identify as relational trajectors. For instance, (17)(a) is far more natural than (17)(b), given usual assumptions about the relative size and mobility of the participants.

(17)(a) The bicycle is next to the church.
(b) *The church is next to the bicycle.

There are of course many cases where opposite trajector/landmark alignments are both permitted, e.g. the active/passive alternation, as in (18), or lexical alternations like above/below, in front of/in back of, before/after, etc.

(18)(a) Iraq invaded Kuwait.
(b) Kuwait was invaded by Iraq.

Intuitively I regard these alternations as being quite comparable to the phenomenon of figure/ground reversal. Partial support for this comparison derives from the fact that in both cases there is usually a preference for one of the alternate alignments. In (14)(b), for example, it is easier to perceive groups of x’s standing out as figure against a background of dashes than to do the opposite. Likewise, an active is unmarked relative to its corresponding passive, and forms like above, in front of, and before are the default members of their respective pairs. Furthermore, the neutral member of these oppositions is usually the one that confers trajector status on the entity which is most easily chosen as perceptual figure. As the terms themselves indicate, an “active”-clause subject tends to be more mobile and energetic than its “passive”-clause counterpart. Also, if X is above or in front of Y it is X that we are more likely to see, and if X comes before Y it is X that we will first encounter.

A variety of experimental findings are interpretable as lending plausibility to the proposed characterization of grammatical subjects. I hasten to add that the interpretation is in each case my own, and that the investigators were not specifically concerned with subjects per se. To show the relevance of this work, I need to say just a word about the broader theoretical context in which my proposal is situated (Langacker 1993b, 1997b, 2003). Myriad linguistic phenomena call out for description in terms of conceptualizations that are dynamic in the sense that the temporal axis—how they unfold through processing time—is critical to their value. They involve successive foci of attention, each occurring in a context evoked by its predecessor. In a focus chain of this sort, directing attention to a given element results in the conceptualizer orienting to a new context within which the next focus can be detected. Equivalently, I will speak of a reference point providing mental access to a set of potential targets, which collectively constitute its dominion. The initial focus (or reference point) in such a chain can be called a starting point. We find clear examples of reference point chains in certain possessive and locative constructions:
In (19)(a), a focus chain leads from Tom, the starting point, to a particular psychiatrist, the ultimate target. Each possessor serves in turn as a reference point, in which capacity it evokes a dominion containing the possessed, which can then be put in focus as the next reference point. Similarly, the successive locatives in (19)(b) direct attention to smaller and smaller spatial areas, each of which contains the next and thus affords mental access to it.

It needs to be emphasized that the conceptualizations associated with most expressions are complex and multifaceted, so that no single ordering accounts for all their properties. There are numerous kinds of focus chains, which can co-exist without necessarily being co-aligned, each pertaining to a different level or dimension of linguistic organization. Besides possession and location, exemplified in (19), natural orderings are given by such factors as the temporal sequence of events, the transmission of force from participant to participant along a causal chain, and successive access to a series of minds, each conceiving of the next (e.g. Fred believes Sally suspects Bob knows Martha likes him). Along the axis of speech time, the words in a sentence constitute a focus chain which can correlate with any of the others and thereby heighten its salience. With respect to the tracking of referents in a discourse, salient nominals emerge as reference points, establishing structural dominions within which compatible pronouns are freely interpretable as being coreferential to them. A “topic” (at a given level of organization) is a reference point anchoring a realm of knowledge or experience (its dominion) into which one or a series of propositions is to be integrated.

In the context of this general scheme, it is reasonable to view the trajector/landmark asymmetry as a special kind of focus chain. Trajector and landmark would then be characterized as initial and second focus in a natural ordering pertaining to relational participants. Specifically, since the conception of a relationship presupposes the conception of its participants, we can describe a trajector (and landmark) as the first (and optionally the second) participant saliently evoked in building up to the full conceptualization of a profiled relation. If I conceive of a person, for example, I can use this as a starting point to anchor the more elaborate conception of a person engaging in some activity—such as motion, perception, or the exertion of force—which may well involve its interaction with a second focused participant. Verbs impose this kind of asymmetry as an inherent aspect of their lexical semantic value. At the lexical level (where events are categorized into conventionally recognized types), the more active participant is usually chosen as starting point. At higher levels of grammatical organization, where discourse considerations come into play, other options are available. For instance, the passive construction allows us to evoke a non-active participant as starting point, using it to anchor the more elaborate conception of an event in which it has a patient-like role.

Turning now to the experimental findings, MacWhinney (1977) presents a variety of evidence (from experimental tasks involving rating, elicited production, problem solving, verification, production, and recall) that “the speaker uses the first element in the English sentence as a starting point for the organization of the sentence as a whole”, where a starting point serves as basis for “the ACTIVE CONSTRUCTION OF AN ACTIVE PERSPECTIVE” (152). Similarly, Gernsbacher and Hargreaves (1992) explain numerous experimental results, notably pertaining to the “privilege” of initial elements, in terms of the “structure building framework”. They suggest that building coherent mental representations first involves “laying
a foundation”, and that subsequent information which “coheres or relates to previous information is mapped onto the developing structure” (87). Moreover, recent experimental work points to agents being accessed more rapidly than patients: “...When a prototypical causal relation can be perceived directly and when the participants in the event maintain their role for an extended time interval, agent information is accessed more rapidly than patient information. The prominence of the agent over the patient in grammatical phenomena is paralleled by a privileged status of the agent at the level of perceptual processing. It is tempting to speculate that the observation that the agent is a prototypical subject and that the subject in canonical sentences surfaces before the object, can be traced back to the fact that, during visual event perception, agent information is available earlier for further processing than patient information” (Verfaillie and Daems 1996: 144).

While these formulations do not refer specifically to grammatical subjects, they help render plausible the general type of characterization proposed. In most of the cases cited by MacWhinney and by Gernsbacher and Hargreaves, the initial element was in fact the subject. We can further note the cross-linguistic tendency for agents to be chosen as subjects, and for subjects to precede objects in basic word order. These studies strongly suggest that order of access is important in language processing, and that the conception evoked by a clause is actively constructed on the foundation provided by a starting point. In the overall scheme outlined above, a complex expression comprises numerous natural orderings pertaining to different levels and dimensions of organization. Hence there ought to be some proclivity for their starting points to coincide, which we do in fact observe in canonical clauses like He broke it, where the initial word is also the subject, the agent, and the topic. By the same token, experimental findings indicating that agents are accessed quickly and that initial elements provide the starting point for structure building lend some credence to the characterization of subjects in such terms.

If the studies just described offer circumstantial evidence for the proposed characterization of subjects, some experimental results reported by Tomlin (1995) are perhaps the equivalent of a smoking gun (see also Forrest 1996). Tomlin’s basic hypothesis—fully compatible with my proposal—was that, at the time of utterance formulation, the speaker codes the referent currently in focal attention as the syntactic subject of the sentence. He tested it by controlling the attention of experimental subjects as they observed a two-participant event, which they then encoded verbally with either an active or a passive sentence. The event consisted of one fish swallowing another, and attention was directed to one of the fish (by means of an arrow flashed on the screen) just 150 ms. prior to the swallowing—too brief an interval for attention to wander in between. Tomlin thus predicted that attention focused on the swallowing fish would lead to the production of an active sentence (e.g. The red fish swallowed the blue fish), while attention focused on the swallowee would lead to production of a passive (The blue fish was swallowed by the red fish). This proved to be the case nearly 100% of the time.

Tomlin’s results are of course insufficient to conclusively establish the proposed characterization of subjects. They do not, for example, clearly distinguish between grammatical subject and initial clausal element. They do however enhance the plausibility of claiming that subjecthood is ultimately a matter of focal prominence, interpretable as order of access to relational participants. Pointing in the same direction are numerous grammatical considerations, some of which will now be briefly summarized.
An initial point is that the characterization is sufficiently abstract, hence flexible enough in application, to handle the full range of subjects and objects. Depending on what relationship is profiled, for example, the subject can occupy any position in a causal chain (cf. Fillmore 1968):

(20)(a) *She opened the door with this key.* [subject = agent]
(b) *This key opened the door.* [subject = instrument]
(c) *The door opened.* [subject = patient]

The characterization accommodates the subject in passives, and various other “special” constructions, without requiring derivation from hypothetical underlying structures. It also accounts directly for a striking asymmetry: a landmark implies a trajector, but not conversely. In (20)(c), for example, the single participant has an object-like semantic role but is nonetheless realized as the grammatical subject. This is a consequence of the trajector and landmark being the initial and second focal elements: something can be second only if something else comes first. Note that this asymmetry pertains specifically to trajector/landmark alignment—“argument structure”—irrespective of whether the focal elements are actually spelled out by overt nominal expressions. For instance, an imperative like *Shut the door!* has both a trajector (understood as the addressee) and a landmark, even though only the latter is overtly realized.

The proposed characterization of subject and object makes no reference to grammatical constituency, but rather to correspondences, profiling, and focal prominence: a nominal expression qualifies as a subject by virtue of its profile corresponding to the trajector of a profiled relationship, and as an object when its profile corresponds to the landmark. Although Figure 7 assumes the familiar S[VO] constituency for *Alice saw Bill*, the same grammatical relations are assigned with [SV]O constituency (where *Alice* first combines with *saw*, and *Bill* then elaborates the landmark of *Alice saw*), or even with a “flat” SVO structure. There are indeed constructions that manifest [SV] constituents:

(21)(a) *The lawyer [we hired] was incompetent.*
(b) *[Jack sort of liked] but [Jill really detested] that movie we plan to see.*

In cognitive grammar these can simply be assembled as [SV] constituents—there is no need to posit derivations from underlying structures with the canonical S[VO] arrangement. And of course, the well-known problem posed by languages with VSO word order does not even arise, since the characterization of objects does not depend on a [VO] constituent.

The characterization of subject and object in terms of primary and secondary focal prominence is fully consonant with, if not responsible for, their high levels of grammatical activity. Though every construction has its own rationale, and other factors (including other sorts of prominence) come into play, it stands to reason that focal participants would tend to be recruited for purposes of agreement, clause linkage, antecedence, etc. Keenan and Comrie (1977) posited a universal hierarchy for access to relative clause formation that we can abbreviate as Subject > Object > Other, and most frameworks adopt this hierarchy for various reasons. On my account, the high accessibility of subjects and objects directly reflects their intrinsic nature.
Particularly strong support comes from van Hoek’s analysis of pronoun-antecedent relationships (van Hoek 1995, 1997). She has achieved an impressively comprehensive and unified account in terms of reference-point organization, such that a nominal with sufficient salience establishes a dominion within which a suitable pronoun is freely interpretable as being coreferential to it. The hierarchy Subject > Object > Other proves quite important in this regard. As shown in (22), a subject can function as the antecedent of any other nominal element, but not conversely, and an object can serve as antecedent for any element other than the subject (elements in bold are to be construed as coreferential):

(22)(a) **Tom** likes his mother.
(b) *He* likes **Tom’s** mother.
(c) Jenny put the kitten in its box.
(d) *Jenny put it in the kitten’s box.*

The special, ranked ability of subject and object to serve as reference points in pronominal anaphora nicely corroborates their characterization as first and second foci on the reference-point chain defined in terms of access to relational participants.

It needs to be emphasized that the focal prominence of subject and object is not inherited from the entities chosen for this status, but rather is imposed on them by the very fact of their being singled out in this way. Trajector/landmark alignment is an aspect of construal, inhering in how a situation is conceptualized, as opposed to being objectively given. While trajeclor status will naturally tend to be conferred on an entity that is salient for other reasons, such as an agent or a discourse topic, it is not fully predictable from such factors, nor reducible to them. From this perspective examples with so-called “dummy” subjects, as in (23), are not necessarily problematic.

(23)(a) There are alligators in the moat.
(b) It was obvious that the house had not been cleaned.

I do regard items like *there* and *it* as meaningful. They can be thought of as abstract “settings” or “presentational frames”, subjective counterparts of the deictic *there* and referential *it*. Instead of referring to a specific place or thing, they announce the subsequent introduction of a local or global circumstance. Now certainly an abstract presentational frame has no objective basis or intrinsic salience—it is not there beforehand to attract focal prominence, and its abstract nature ensures that it will not seem terribly salient even when invoked to bear it. I suggest, then, that such elements are coherently subsumed in the proposed analysis as a limiting case. Recall that primary focal prominence is being explicad in terms of initial access in conceptualizing a relationship. This is quite compatible with the description of *there* and *it* as referring to presentational frames announcing the subsequent introduction of a situation.

Observe next the privileged status of subjects in equational sentences, which specify the identity of nominal referents. Now identity per se would seem to be a symmetrical relationship. Objectively, the sentences in (24) describe the same situation.

(24)(a) **My father is the mayor**
(b) *The mayor is my father.*
Yet they contrast linguistically in just the way predicted by the characterization of subject as starting point, as the element one is primarily concerned with describing or locating. Hence (24)(a) would be the more natural response if I asked you to tell me about your father, and (24)(b) if I asked you to tell me about the mayor. The linguistic asymmetry is especially striking with plural generics:

(25)(a) Wombats are marsupials.
(b) *Marsupials are wombats.

I would analyze these as equational sentences which establish identity between sets of indefinite size comprising “arbitrary instances” of the wombat and marsupial categories (Langacker 1991: 2.2). Since the extension of wombats is included in the extension of marsupials, a set of wombats (even the maximal set) can always be equated with a set of marsupials, but not conversely. Thus (25)(a) will always be valid, for it initially focuses on a set of wombats and describes it as coinciding with a set of marsupials. But if we start with a set of marsupials, as in (25)(b), its coincidence with a set of wombats cannot be assumed.

Finally, I will mention that numerous grammatical phenomena point to a special affinity between subjects (and secondarily, objects) on the one hand, and possessors on the other. To take just one example, it is very common across languages for possessive constructions to be used in specifying the trajector, and often the landmark, of a nominalized verb. English makes liberal use of both options, e.g. Booth’s assassination (of Lincoln), Lincoln’s assassination (by Booth). This affinity is quite expected given my description of possessors as reference points affording mental access to the entities possessed (Langacker 1993b). A possessive relationship holds between two things, one accessible via the other, while a verbal trajector and landmark are points of access to the conception of a process. When a verb is nominalized (e.g. assassinate ---► assassination), the process it designates undergoes a conceptual reification and is thereby construed as an abstract thing. As a consequence, the reference-point relationship between a processual participant and the reified process becomes a relation between two things, which makes it susceptible to possessive encoding.

**CONCLUSION**

Cognitive grammar identifies meaning with conceptualization and emphasizes our capacity for construing the same situation in alternate ways. Once construal is properly recognized and accommodated, the meaningfulness of grammatical structure becomes apparent. Grammar is symbolic in nature, wholly reducible to assemblies of symbolic structures (form-meaning pairings). It consists of patterns for imposing and symbolizing particular ways of construing the more specific conceptual content provided by lexical items. But specificity is a matter of degree, and lexical items also impose construals. Despite the traditional dichotomy, lexicon and grammar form a continuous spectrum of symbolic assemblies distinguished primarily by their level of abstraction, hence the generality of the patterns they embody. Cognitive grammar treats them all in a unified manner and acknowledges the critical role of low-level schemas (often incorporating particular lexical
items) representing generalizations of limited scope. By reducing lexicon, morphology, and syntax to a continuum of symbolic assemblies, the framework achieves a major conceptual unification. It is also highly restrictive, in that all structures ascribed to a linguistic system must either be directly encountered as parts of occurring expressions, or else capable of emerging from them through the basic processes of abstraction and categorization.

The descriptive and theoretical notions of cognitive grammar have been formulated primarily on the basis of linguistic considerations and justified by their efficacy in handling the subtle complexities of representative language data. While certain assumptions are indeed made about cognitive processing, and various psychological phenomena are invoked (e.g. figure/ground alignment, prototype categorization, grouping, focusing of attention), for the most part these are either well established or virtually self-evident. Less straightforward (and certainly controversial) is the issue of whether the specific use made of them for the description of language structure is optimal and appropriate. I believe the internal coherence and descriptive achievements of the framework suggest a positive answer. At some point, however, other kinds of evidence have to be sought more systematically and on a larger scale than they have to date. To be sure, particular claims and ideas of cognitive grammar have been employed or tested in a number of acquisitional, clinical, computational, and experimental studies (e.g. Barsalou, Yeh, Luka, Olseth, Mix, and Wu 1993; Holmqvist 1993; Jurafsky 1996; Kellogg 1993, 1994, 1996; Ryder 1994; Sandra and Rice 1995; Tomasello 1992; Verfaillie and Daems 1996). Such research is steadily gaining prevalence and influence in all facets of linguistics. It is especially welcome in cognitive linguistics and cognitive grammar.

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CONCEPTUAL COMBINATION:
MODELS, THEORIES AND CONTROVERSIES*

Bing Ran† and P. Robert Duimering‡
1Pennsylvania State University at Harrisburg, Middletown, USA
2University of Waterloo, Waterloo, Canada

ABSTRACT

This paper provides a comprehensive and critical review of the major theories and models of conceptual combination, by highlighting agreements and controversies in the literature, and identifying future directions for research.

The review summarizes the basic arguments of ten major models and then presents an analytical framework to compare and contrast these models along four dimensions: (1) the causal role of schemata in the model, (2) the role of cognitive harmony or consistency in the model, (3) the pragmatic orientation in the model, and (4) the explanatory scope of the model. The review identifies areas of agreement and disagreement among the various models and theories and calls for a synthesis theory to address various theoretical weaknesses and empirical gaps in the current explanations.

Keywords: conceptual combination; schema; cognitive harmony; consistency; pragmatics.

1. INTRODUCTION

Conceptual combination refers to the cognitive process by which people use two or more concepts to construct a new conceptual entity that a single concept is insufficient to describe. Researchers agree that the ability to combine concepts plays a fundamental role in diverse cognitive processes such as learning, communication, language comprehension, the composition of thoughts, and the expansion and structuring of knowledge.

In the last thirty years, there has been a very strong interest in the cognitive mechanisms involved in combining concepts in cognitive psychology and related fields such as linguistics, artificial intelligence, and philosophy. Many models and theories of conceptual combination

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† Contact Address: Bing Ran, School of Public Affairs, Penn State Harrisburg, 777 W. Harrisburg Pike, Middletown, PA, 17057. USA. Tel: +1 717 948 6057; Fax: +1 717 948 6320; Email: bingran@psu.edu
have been proposed, among which ten models are of particular significance: Fuzzy Set Theory (Zadeh 1965, 1976, 1982; Osherson and Smith 1981, 1982); Selective Modification Model (Smith and Osherson 1984; Smith, Osherson, Rips, and Keane 1988); Amalgam Theory (Thagard 1984); Concept Specialization Model (Cohen and Murphy 1984; Murphy 1988, 1990, 2002); Composite Prototype Model (Hampton 1987, 1988, 1989, 1990, 1991); Dual-Process Model (Wisniewski 1997a, 1997b, 1999; Wisniewski and Love 1998); Constraint Model (Costello and Keane 2000, 2001); Competition Among Relations in Nominals (CARIN) Model (Gagné 2000, 2001; Gagné and Shoben 1997); Coherence Theory (Thagard 1989, 1997); and Interactive Property Attribution Model (Estes and Glucksberg 2000; Choi, Oh, Yi, and Shin 2007). This paper will critically review these ten models by identifying areas of agreement and disagreement among them, and various theoretical weaknesses and empirical gaps in the current explanations that might be addressed by a future synthesis theory.

The paper is organized as follows. In the next section, each of the ten models will be briefly described and evaluated. Then an analytical framework will be proposed to summarize agreements and controversies among the models. Questionable assumptions and issues in the current theorizing will also be critically examined in the context of a discussion of future directions for conceptual combination research.

2. CURRENT MODELS OF CONCEPTUAL COMBINATION

In this section, we will briefly summarize ten significant models of conceptual combination. The ten models can be sorted into two groups. In the first group, each model was proposed as a logical extension or modification of previous models: Fuzzy Set Theory, Selective Modification Model, Concept Specialization Model, Dual-Process Model, and Interactive Property Attribution Model. Our review will trace the development of these models, focusing on how each addresses earlier theoretical weaknesses. In the second group, the remaining five models each focus on particular aspects of the conceptual combination process: Amalgam Theory, Coherence Theory, Composite Prototype Model, Constraint Model, and CARIN Model. Our review will examine the specific aspects that are emphasized by each model in this group.

2.1. Conceptual Combination as the Intersection of Fuzzy Sets

The earliest attempt to describe the phenomenon of conceptual combination was conducted by mathematicians known as fuzzy set theorists. This attempt generated a formalized explanation of how humans combine smaller conceptual units into more complex ones (Osherson and Smith 1981, 1982; Zadeh 1965, 1976, 1982). The model is based on the idea of referential semantics in which the meaning of a concept represented by a word equates to the extensional set of things denoted by the word. For example, the meaning of the concept *bird* refers to the set of all birds. When two concepts are combined, the resulting concept is then the intersection of the two extensional sets. Thus, if X and Y are the extensional sets of
concepts x and y respectively, the conceptual combination xy is understood as the intersection of the set X and the set Y, that is the set of things that are both X and Y. For example, the meaning of pet fish is the intersection of pet and fish, i.e., the set of things that are both pet and fish. More formally, in classic set theory, the conceptual combination XY is defined as follows: (Let X, Y be sets) the intersection of X and Y (denoted X∩Y) is the set {Z: z∈X, z∈Y}. In fuzzy set theory, the intersection of two fuzzy sets A and B with respective membership functions fA(x) and fB(x) is a fuzzy set C, whose membership function is related to those of A and B by fC(x) = Min [fA(x), fB(x)], xE X. (Zadeh 1965).

As a formal logic model of conceptual representation, fuzzy set theory provides a strong tool to describe and analyze conceptual combination. The description is clear, logical, and parsimonious. However, as a description of conceptual structure, fuzzy set theory was strongly criticized by psychologists. The major criticisms could be summarized as follows.

The first criticism relates to whether set theory is an appropriate theory of concept representation. For example, the applicability of set theory in concept representation is limited. Osherson and Smith pointed out that the extensional view of concepts “is best suited to “kind” notions (such as dog, tree and animal), artifact” notions (like tool and clothing), and to simple descriptive notions (like triangular and red) where the extensional sets are easier to define. More difficult to describe are intentional or intricate concepts such as belief, desire, and justice” (Osherson and Smith 1981: 38). The diversity of different kinds of concepts imposes difficulties on how set theory formally describes their structure, and whenever non-kind concepts are combined, the intersection of sets is difficult to describe or formalize. Based on this observation, Murphy argued that “(i)t is very difficult to interpret (set theory) as a psychological theory at all. Even if all pet fish fall into the intersection of pets and fish, this does not tell us what people do with their concepts pet and fish in order to create a new concept” (Murphy 1988: 531). To be considered a psychological model, set theory should provide an intensional explanation of how or why people combine concepts.

The second criticism relates to what are known as conjunction effects. Fuzzy set theory will lead to a contradiction in its calculation whenever an object is more prototypical of a conjunction set than of its constituent sets (Osherson and Smith 1981). For example, it can be shown empirically that a guppy is more prototypical of the conjunctive concept pet fish than it is of either pet or fish. That is, C_pet (guppy) > C_pet (guppy) or C_fish (guppy). However, the intersection of the fuzzy sets is defined as: (Vx E F) (C_pet fish (guppy)) = min (C_pet (guppy), C_fish (guppy)) which implies: C_pet fish (guppy) < C_pet (guppy) or C_fish (guppy). In other words, “it is possible, contrary to fuzzy-set theory, for the characteristicness of an instantiation of a conjunctive concept to be greater than either of the characteristicnesses of its constituent simple concepts” (Jones 1982: 284). This apparent contradiction suggests that set intersection is insufficient to describe the conceptual combination process.

The third criticism relates to concepts that are not intersective. For example, Murphy (1988) noted that set intersection does not account for the meaning of combinations like apartment dog, which does not correspond to the intersection of the sets apartments and dogs. Moreover, nonpredicating adjectives, when combined with nouns, do not produce meaningful intersections. “The interpretation of atomic engineer as someone who runs equipment to make atomic energy is not the intersection of atomic things (whatever they are) and engineers. .... the intersection of the two sets does not define the combined concept” (Murphy 2002: 445).

A final criticism is related to the symmetric property of set intersection which contradicts our intuitive understanding of the meaning of many conceptual combinations. Set theory
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presumes that noun-noun combinations are symmetric (i.e., true conjunctives), because \(X \cap Y\) is equal to \(Y \cap X\). However, our intuitive understanding of the combination \(XY\) usually has very different meaning than its \(YX\) counterpart. For example, “a desk lamp is a kind of lamp, but a lamp desk is a kind of desk” (Murphy 2002: 445).

2.2. Selective Modification Model

The weaknesses of using fuzzy set theory to explain conceptual combination led to an alternative explanation: the selective modification model proposed by Smith, Osherson and colleagues (Smith and Osherson 1984; Smith, Osherson, Rips, and Keane 1988). This model consists of two arguments describing how concepts are mentally represented and how these mental representations are combined. The model assumes that concepts are represented by Attribute-value pairs. For example, apple may be represented by Color-red, Shape-round, Taste-sweet etc. Each attribute is associated with a certain weight, or “diagnosticity,” which is an empirically-determined numerical value that indicates “how useful the attribute is in discriminating instances of the concept from instances of contrasting concepts” (Smith, Osherson, Rips, and Keane 1988: 487). Each value is also associated with a certain weight to indicate its relative salience. For instance, red might be more salient than round in the apple concept, as determined by “votes” for the value by experimental subjects. Despite different terminology, attribute-value pairs essentially correspond to slots (or dimensions) and features in a schematic concept representation (Rumelhart and Ortony 1977; Rumelhart 1980).

The model further proposes that the meaning of an adjective-noun combination results from a process of “adjective modification” in which, the adjective modifies the noun: “Each attribute in the adjective concept selects the corresponding attribute in the noun concept; then, for each selected attribute in the noun, there is an increase in the salience (or votes) of the value given in the adjective, as well as an increase in the diagnosticity of the attribute. Consider shrivelled apple as an example. Presumably shrivelled contains attributes pertaining to shape and texture; accordingly, it would select these attributes in the apple prototype, boost their diagnosticities, and shift their votes away from round and smooth and toward irregular and bumpy” (Smith, Osherson, Rips, and Keane 1988: 492).

Selective modification is regarded as the first psychological model of conceptual combination. The main contribution of this model is that it highlighted important aspects of conceptual combination, including typicality effects (i.e., that the typicality of a combination is not a simple function of the typicality of component concepts) and the conjunction effect (i.e., when an item is well described by a conceptual combination, it is usually more typical of that concept than of the two components). However, the model suffers from two major drawbacks. First, the scope of the model is limited to only one kind of conceptual combination, namely, predicating adjective-noun phrases such as red apple or long vegetable. The model does not explain other types of combinations such as nonpredicating adjective-noun combinations like atomic engineer (Murphy 2002) or noun-noun combinations like telephone television.

Second, the process of conceptual combination described by this model is problematic. As discussed by Murphy: “The main problem with this theory that later writers have criticized is its assumptions about modification. Consider the way modification works for the concept red apple. The adjective red finds its match in the schema: There is a feature with the same
name. That feature now gets all the votes, and its dimension gets a higher diagnosticity rating. However, there are more complex cases that aren’t so easily accommodated. It has been argued that sometimes, the exact feature would not be present in the concept already, and yet people can figure out how to modify it. Indeed, there may not be an obvious dimension for the modifier to affect. Furthermore, sometimes more than one dimension is altered. Thus, the modification process itself has been argued to be much more complex than Smith et al. let on” (Murphy 2002: 449-450).

2.3. Concept Specialization Model

Murphy and Cohen proposed the concept specialization model to address weaknesses of the selective modification model (Cohen and Murphy 1984; Murphy 1988, 1990, 2002). Similar to the previous model, the concept specialization model assumes a schematic representation of concepts where nouns are represented as schemata with slots (dimensions) and fillers (values for each dimension). Based on this representation, “conceptual combination is a process in which a head noun concept (is) specialized by one or more of its slots being filled by the modifying concept” (Murphy 2002: 453). In this process, “knowledge is involved in choosing the best-fitting slot” (Murphy 2002: 453). For example, to understand the combination apartment dog, the modifier apartment is used to fill some slot in the head concept dog. What dimension or slot of dog is picked by the modifier apartment? Our background knowledge will guide us to choose the slot of dog that makes the most sense with apartment as the filler. In this case, apartment is classified as a type of Habitat and so fills the Habitat slot in the head concept dog. This provides the interpretation of “a dog that lives in an apartment”. Beyond this slot-filling process, the model proposes that further interpretation and elaboration occurs in which we use our background knowledge to expand our initial interpretation. This process seeks to make an interpretation more coherent and complete by retrieving information from our background world knowledge that is relevant to the interpretation. For example, people might elaborate that an apartment dog is cleaner, smaller and quieter than other dogs. This elaboration generates a rich conceptual combination with emergent features that were not part of the original concepts.

As an extension of the selective modification model, concept specialization can account for more complex combinations. As Murphy explained: “one way to relate these two models is to think of the feature weighting model (selective modification model) as a simpler version or subset of the specialization model. That is, the specialization model is very similar in the way it deals with simple features, but it adds another layer of conceptual operations – the elaboration based on world knowledge” (Murphy 1988: 535). However, later researchers noted two major issues in this model’s explanation.

First, the concept specialization model can account for limited types of interpretations (Costello and Keane 2000; Wisniewski and Gentner 1991). The model can only account for conceptual combinations where the head and modifier concepts are linked by some kind of thematic relation, but ignores the possibility of property-based interpretation. Wisniewski and Markman (1993) used the example robin hawk to illustrate. Robin hawk could be interpreted as “a hawk that preys on robins”, by filling the Preys slot in the schema representation of hawk with the modifier name. The meaning generated this way explains the thematic relation between hawk and robin. However, it does not allow for properties of the modifier to be
transferred into the head representation. This means that an interpretation such as “a hawk with a red breast” cannot be explained by this model.

Second, the process of concept specialization is worth further scrutiny. The model suggests that people attempt to place the modifier into the best fitting slot in the head noun’s schema. However, beyond a metaphorical description, the mechanisms involved in cognitively “filling a slot” are not specified in the model. Intuitively, it is not the whole modifier concept that fills the slot in the head concept. For example, the meaning of apartment dog does not result from the whole concept of apartment filling the Habitat slot of dog, but only certain aspects of apartment. The concept of apartment has its own rich and complex schematic structure, potentially including dimensions related to rent, size, storey, apartment number, landlord, etc. None of these dimensions would be relevant to the Habitat slot of the concept dog, but what happens to them in the slot filling process is not clear.

2.4. Dual-Process Model

Wisniewski (1997a, 1997b, 1998, 1999) proposed the dual-process model as a successor to address some of the weaknesses in the concept specialization model and to account for a wider range of empirical data. The model assumes that concepts are represented by a schematic structure, and proposes three general types of conceptual combination: property-based, relation-based, and hybrid interpretations. “Relation-linking interpretations involve a relation between the referents of the modifier and head concepts. For example, people sometimes interpret robin snake as “a snake that eats robins”. In property interpretations, people assert that one or more properties of the modifier concept apply in some way to the head concept, as in “snake with a red underbelly”, for robin snake. A third, less frequent type of interpretation is hybridization. These interpretations refer to a combination of the constituents (e.g., a robin canary is „a bird that is a cross between the two – half robin and half canary”) or to a conjunction of the constituents (e.g., a musician painter could refer to someone who is both a musician and a painter)” (Wisniewski 1997b: 168-169). The dual process model proposes that these different interpretations arise from two different cognitive processes: relational combinations result from integration (also known as scenario creation), while property-based combinations result from comparison and construction (hybridization may be considered as both).

In a process similar to Fillmore’s (1968, 1976, 1982) case and frame grammar, scenario creation generates a relation-based interpretation, “...creating a plausible scenario involving the constituents of the combination. ... For example, a plausible interpretation of truck soap is “soap for cleaning a truck”, because truck can be bound to the recipient role of cleaning (i.e., the thing being cleaned), while soap to the instrument role (what is used to do the cleaning)” (Wisniewski 1 997b: 174).

Property-based interpretations start from comparing commonalities and differences between the head and modifier concepts along comparable dimensions, and selecting a property from the modifier to apply to the head. When multiple differences are found, several factors regulate the choice of the best property to be transferred to the head concept, including the communicative context, the salience of the property, cue and category validity, and plausibility. After comparison, the selected property is used to construct a new version of that property for the combined concept. “The new property must bear enough resemblance to its
source in the modifier so that people can determine how the modifier contributes to the meaning of the combination... at the same time, the construction of the new property must not alter the head noun concept in such a way that it destroys its integrity” (Wisniewski 1997b: 176). For example, “in interpreting fork spoon, people could begin by aligning the handle of fork with the handle of spoon, and the end of fork with the end of spoon and note an important difference: forks have prongs on their ends but spoons have “little bowls” on their ends... the comparison process identifies where in the representation of spoon the property “has prong” can be incorporated (on the end of spoon). However, there is a conflict between mentally connecting this property to the end of spoon and staying within the referential scope of spoon... People can resolve this conflict by mentally attaching the prongs to the end of the little bowl and shortening them or by mentally attaching the prongs to the top of the spoon” (Wisniewski 1997b: 176-177).

The dual-process model extends the concept specialization model by providing an explanation of different types of interpretations, especially by accounting for processes involved in property-based conceptual combinations, and by synthesizing schema based theories of conceptual combination into one model. However, critics of the dual-process model have argued that it lacks a detailed explanation of the underlying cognitive mechanisms involved. For example, Costello and Keane (2006) noted that “the elaboration or construction process ... is clearly a very complex process that is, as yet, unspecified” (Costello and Keane 2006: 334). Similarly, Murphy (2002) pointed out that “what is not yet known is the online process by which one of these interpretations is constructed / selected. .... The feature-mapping process involves comparing the two concepts, identifying a feature of the modifier that could be plausibly transferred over to the head noun, and carrying out that transfer. The slot-filling process involves seeing whether there is a relation available in the head noun that the entire modifier could fill, and then constructing that relation. Furthermore, both of these are complicated by the possibility of construal (e.g., interpreting skunk as referring to a bad smell), which allows many more ways of possibly relating the concepts. How all these alternatives are considered (or if they aren't, how they are ruled out) is at this point not clear” (Murphy 2002: 458-459).

2.5. Interactive Property Attribution Model

The interactive property attribution model was proposed by Estes and Glucksberg (2000) as an extension of Wisniewski’s dual process model. Specifically, this model provides an explanation of property-based interpretation by suggesting that it is not similarity between component concepts, but feature interactions between the head and modifier, that guide property-based interpretations. By assuming a schematic representation of component concepts, the model proposes that “the modifier and the head play different, but equally important, roles: The head provides relevant dimensions, whereas the modifier provides candidate properties for attribution. For example, in the combination shark lawyer, the head concept lawyer provides relevant dimensions for attribution (e.g., TEMPERAMENT, COMPETENCE, COST, etc.), and the modifier shark provides salient candidate properties (e.g., “predatory,” “aggressive,” and “vicious”) that can be attributed. ... (In the interactive property attribution model ..., instead of exhaustively aligning the dimensions and comparing
the features of the two concepts, people align the relevant dimensions of the head with salient properties of the modifier” (Estes and Glucksberg 2000: 29-30).

The interactive property attribution model made two important extensions beyond previous models. First, it proposes that the head and modifier do not need to exhaust their complete list of dimensions for comparison and alignment as suggested by dual-process model; instead, only certain dimensions of the head concept are activated which are relevant to salient properties of the modifier. The second extension is the observation that relevance and salience of dimensions and features are context-dependent, rather than context-independent as assumed by most previous models. That is to say, “a salient feature of a modifier may increase or even introduce the relevance of a dimension in the head concept, and vice versa. For instance, NUMBER OF LEGS is not a particularly relevant dimension of table, since almost all tables have four legs. However, that dimension becomes relevant in the combination octopus table, when interpreted as a table with eight legs” (Estes and Glucksberg 2000: 30).

The preceding five models of conceptual combination have been reviewed chronologically according to their first appearance in the literature, because each can be regarded as an extension or replacement of previous models, which addresses prior limitations and offers increasing explanatory power. The remaining five models to be reviewed were proposed over a similar time-frame, and emphasized particular aspects of the conceptual combination process, but were not proposed as explicit extensions of previous models.

2.6. Amalgam Theory

Thagard (1984) proposed a theory of conceptual combination within the context of philosophical investigations on the phenomenon of scientific concept development. It is “a theory of how new concepts can arise, not by abstraction from experience or by definition, but by conceptual combination. Such combination produces a new concept as a non-linear, non-definitional amalgam of existing concepts” (Thagard 1984: 3). The basic claim of amalgam theory is that “conceptual combination requires mechanisms for reconciling the conflicting expectations contained in the candidate concepts” (Thagard 1984: 4).

Using formalized language, this theory assumes a schematic representation of concepts (the paper adopted the term “frame” from Minsky 1975) with slots and values (i.e., each concept has slots Ci with values Ci,1 ... Ci,n), and proposes that a new concept C3 is formed from initial concepts C1 and C2 by selecting from C1,j and C2,k, a subset of slots C3,m for combined concept C3. Thagard proposed six procedural rules to regulate the process of slots and value selection. For example, “a concept concerning a kind of physical object which has a value for size is also likely to have a value for weight. Conceptual combination should preserve such linkages” (Thagard 1984: 7). Other rules propose that if a slot is chosen by conceptual combination, the value of the slot will depend on the adjectival concept, the variability of the concept, specific examples of the combination, or the representativeness of given instances of the combination. Specifically, the theory proposed that when we try to reconcile conflicting slots, we tend to favor those that contribute to desired problem solutions. For example, “suppose that in forming the combined concept of a Canadian violinist you notice that your friend the Canadian violinist prefers hamburgers to classical French cuisine.
In order to explain this preference, you may add the default expectation about Canadians to your frame for Canadian violinist, overruling the expectation derived from the frame for violinists” (Thagard 1984: 9). To reconcile the conflicting preference of food by Canadian violinist, we favor the connotation that “Canadians usually prefer hamburgers” to resolve the conflict that was brought in by Canadian and violinist (who supposedly prefer classical French cuisine).

Amalgam theory was the first model to suggest that conceptual combination is a kind of problem solving process of reconciling conflicting expectations contained in the candidate concepts. This general line of thinking is consistent with Thagard’s (1997) later theorizing of coherence on this problem (to be discussed below). The six procedural rules specify how features of the candidate concepts and empirically observed instances are reconciled into a non-conflicting set for the new, combined concept. However, how these rules might be implemented cognitively is not specified by the theory. Further, the theory emphasizes the importance of specific examples in resolving the conflicting expectations contained in our component concept schema. For example, four of the six rules are example-driven procedures, in which empirical observations influence the meaning of a combination. However, some conceptual combinations do not have ready-made examples, especially novel combinations such as triangular basketball or tasty computer. How conflicting expectations are reconciled for such novel combinations needs more theoretical exploration.

2.7. Composite Prototype Model

Hampton proposed the composite prototype model (Hampton 1987, 1988, 1989, 1990, 1991) at about the same time as Murphy proposed the concept specialization model. The model assumes that concepts are represented schematically as sets of attributes connected by theory-driven relations. For example, we might know that birds have wings and can fly (attributes) and that having wings is an enabling condition for flight. Attributes are assumed to have a quantitative “degree of definingness” called Importance, which parallels with definingness (Smith, Shoben, and Rips 1974), cue validity (Murphy 1982), diagnosticity (Smith and Osherson 1984), or centrality (Barsalou and Billman 1989). It reflects the relative likelihood of an item belonging to a category given that it does or does not have the particular attribute. “At the top end of the scale of attribute importance there may be some attributes which are so important as to be necessary for category membership. For example HAS GILLS may be treated as a necessary attribute of FISH” (Hampton 1991: 106).

Based on these assumptions, Hampton proposed that “a conjunctive concept is then represented semantically by a composite prototype... which is formed as the union of the sets of attributes from both „parent“ (constituent) concepts. Thus initially the concept PET FISH will have all the attributes of both PET and FISH prototypes” (Hampton 1991: 107). The combined set of attributes is then modified based on a necessity constraint, which specifies that a necessary attribute of one constituent concept will also be a necessary attribute for the conjunctive. For example, if “has gills” is necessary for fish, then it will also be necessary for pet fish. For non-necessary attributes, their importance is determined as a monotonic positive function of importance for each constituent concept and attributes with low average importance will be dropped from the conjunctive set.
After forming the set of attributes for a conceptual combination, a consistency checking procedure is applied, and “(w)here there are incompatible attributes, a choice has to be made to delete certain attributes” (Hampton 1991: 107). The consistency constraint incorporates several rules. When a non-necessary attribute of a constituent concept has a conflict with the necessary attribute of the other constituent concept, it will not be used by the conjunctive. “For example, if PETS typically breathe air, but this is inconsistent with living underwater, which itself is necessary for the concept FISH, then breathing air will not be possible for PET FISH” (Hampton 1991: 108). When the conflict is between two necessary attributes of two constituents, then the conjunction is an empty set - a “logical impossibility” (Hampton 1991: 108). “When the conflict involves two non-necessary attributes, then the choice of which to delete will depend on their relative importance, on the overall consistency that can be achieved with respect to the other inherited attributes, and on the context in which the phrase is being used” (Hampton 1991: 108).

The composite prototype model contributes by proposing the necessity and consistency constraints, which exhibit a strong pragmatic orientation. This model is applicable to both novel and mundane combinations. As Hampton explained, “the proposed model could be applied to the conjunction of well-defined concepts with a core of common element defining features, with the desired results. The necessity constraint would ensure that all defining features of each concept remain critical for the conjunctive concept, and the consistency constraint would ensure the correct identification of nonoverlapping sets. Well-defined concepts would therefore require no different treatment in the model” (Hampton 1991: 108).

It is notable that this model bears some similarity to fuzzy set theory, in that the union of the attribute sets of constituent concepts corresponds closely with the intersection of the extensional sets denoted by each constituent concept. Hampton’s model can, therefore, be viewed as a kind of extension of fuzzy set theory by suggesting cognitive processes involved in the intersection of extensional sets. It also bears similarity to later Wisniewski’s hybridization interpretation whereby the meaning of a conceptual combination is taken to be a hybrid of the constituent concepts.

### 2.8. Constraint Model

The constraint model was proposed by artificial intelligence scholars Costello and Keane (1997a, 1997b, 1998, 2000, 2001). This model focuses on the efficiency of the conceptual combination process based on pragmatic principles, which have been implemented as a computational model called C3. The following will focus on the theoretical model and ignore technical details associated with its computational implementation.

Similar to other models, the constraint model assumes that concepts are represented in a schematic structure. When people understand a novel combination, they construct a combined concept to represent that combination. In the process of combining, people assume that everyone involved in the communication follows the cooperative principle as theorized by Grice (1975). “Three constraints ... follow from this assumption. By following these constraints the listener can construct the correct concept as intended by the speaker” (Costello 2004). The first constraint is called plausibility. Because it is assumed that everyone in the communication is cooperating, the intended combined concept should be something the listener already somewhat knows. Thus the listener assumes that the new combined concept
must describe something plausible which is similar to things the listener has seen before. The second constraint is called diagnosticity. Because the speaker is assumed to be cooperating, the intended combined concept is one best identified by the two words in the phrase (otherwise the speaker would have selected other words). Thus the listener knows that the new combined concept must contain some properties which are best identified by (that is, are diagnostic of) each word in the phrase. The third constraint is called informativeness. Because the speaker is cooperating, the intended combination is one for which both words in the phrase are necessary (otherwise the speaker would have used fewer words). Thus the new combined concept must be more informative than either of the constituent words. Costello illustrated his idea with the example of shovel bird understood as “a bird that has a flat, wide beak like a shovel, for digging worms” (Costello 2004). In this case, the listener constructs an understanding with the diagnostic properties of shovel (flat, wide, and used for digging) that is something plausible (bird digging worms) and informative (flat, wide beak).

The constraint model contributes by emphasizing pragmatic principles and addressing the possibility of multiple interpretations for novel combinations and how different interpretations are selected. For this reason Costello (2004) describes the model as a pragmatics of conceptual combination. Theoretically, however, it is notable that Grice discussed cooperation in communication in relation to four cooperative principles (quality, quantity, relevance, and manner), to explain how listeners could arrive at a speaker’s meaning and why speakers could mean more than they said. Grice argued that it is a violation of the cooperative principles that produces extra meaning not contained in what is said. Although the constraint model borrows the general idea of cooperation, the proposed plausibility, diagnosticity, and informativeness constraints do not correspond directly to Grice’s four cooperative principles. Thus, whereas many communicative and pragmatic constraints may influence human cognition, why these particular three are emphasized by Costello and Keane is not clear.

2.9. Coherence Theory

Thagard (1997) proposed a coherence theory of conceptual combination following the basic line of thinking in his 1984 paper that conceptual combination involves solving a problem by reconciling conflicting expectations contained in the candidate concepts. The basic argument of coherence theory is that elements in a conceptual system (concepts, propositions, parts of images, goals, actions etc.) can cohere (i.e., fit together) or incohere (i.e., resist fitting together as described in Thagard 1989, 1997, 1998). If two elements cohere, there is a positive constraint between them. Otherwise, there is a negative constraint between them. “A positive constraint between two elements can be satisfied either by accepting both of the elements or by rejecting both of the elements. A negative constraint between two elements can be satisfied only by accepting one element and rejecting the other. The coherence problem consists of dividing a set of elements into accepted and rejected sets in a way that satisfies the most constraints” (Thagard and Verbeurgt 1998: 2-3). Conceptual combination is therefore viewed as an “instance of coherence conceived of as maximization of constraint satisfaction” which “requires us to apply some concepts to a situation and withhold other concepts in such a way as to maximize the overall satisfaction of the constraints determined by the positive and negative associations between the concepts.”
(Thagard 1997). In practice, Thagard models such problems by constructing a constraint network with elements of all possible inferences of the head and modifier concepts. He then uses certain connectionist algorithms to propagate association weights in a way that maximizes coherence by accepting some elements and rejecting others. The output is “an interpretation of the relation between the head and modifier, as well as a collection of inferences about the object denoted by the head as characterized by the modifier. If the most coherent interpretation is nevertheless not very coherent, then move to other mechanisms such as analogy and explanation that produce incoherence-driven conceptual combinations” (Thagard 1997). Thagard (1997) used racial stereotypes associated with the conceptual combination *well-dressed black* to illustrate. He suggested that people confronted with this combination might activate a network of associated concepts such as *aggressive* or *poor ghetto inhabitant* for *black*; *and businessman*, not poor and not aggressive for well-dressed. The positive constraints in this network include the associations that ghetto blacks are aggressive, while negative constraints include the negative association that ghetto blacks tend not to be businessmen. Apparently, this is not a coherent network. To understand the meaning of this combination, we need to come up with the most coherent interpretation, which best satisfies the constraints. A connectionist algorithm is used to maximize coherence by rejecting *aggressiveness*, resulting in the interpretation of *well-dressed black* as “a black businessman who is not an aggressive ghetto black”.

Different from his earlier amalgam theory, Thagard’s coherence theory does not depend on schematic concept representation and uses connectionist logic to achieve coherence rather than a system of logical rules. Perhaps the most important contribution of this theory to the field of conceptual combination is the explicit orientation toward coherence and consistency in a cognitive network. The basic assumption is that a conceptual network tends to evolve toward a more stable and harmonious state through “the maximal satisfaction of multiple positive and negative constraints that is achieved by some parallel constraint satisfaction algorithms” (Thagard and Verbeurgt 1998: 1).

As such, coherence theory exhibits a basic assumption of goodness-of-fit or harmony as emphasized by Gestalt psychology. However, as explained by Thagard (1997), the current coherence-driven constraint-satisfying model has difficulties explaining non-predicting combinations such as apartment dog and incoherence-driven novel combinations like web potato where meaning may be motivated not by coherence but by the failure to find coherence. Finally, the connectionist algorithms used in coherence theory are not a direct reflection of mental activity, but a simulated approximation of the mind.

### 2.10. CARIN Model

The Competition Among Relations In Nominals (CARIN) theory (Gagné 2000, 2001; Gagné and Shoben 1997, 2002) provides a model of conceptual combination that uses our prior experience of the kinds of thematic relations that words have in compounds to predict what interpretations people will produce, and what compounds people will find easiest to understand. In linguistics, thematic relations between two words in a compound have often been examined by developing taxonomies of relations required for interpreting combinations (Kay and Zimmer 1976; Gleitman and Gleitman 1970; Downing 1977; Levi 1978). For
example, Levi (1978) identified 15 thematic relations (such as Cause, Has, Make, For, Is, Use, About, etc.) to classify the meanings of many familiar compounds.

Unlike models which use a feature based schematic representation of concepts, the CARIN model assumes a kind of schematic representation of the relations between concepts. That is to say, it assumes a slot-type structure where slots are not features of the concept but are the kinds of thematic relations it can have with other concepts. The internal feature representation of concepts is largely irrelevant in this model, where the goal of conceptual combination is to fit compounds into existing relational templates. Specifically, the model argues that people possess distributional knowledge based on their experience of how often particular relations are used with particular concepts, corresponding with variable relation strengths for concepts. These relations “compete for the interpretation of the combined concept and ... the difficulty of interpretation is a function of the relative strength of the selected relation. ... Interpretations are easier if the required relation is of high strength than if the thematic relation is of low strength. Other things being equal, it is easier to arrive at the correct interpretation for mountain stream than it is for mountain magazine because the Locative relation has a greater strength relation than does the About relation” (Gagné and Shoben 1997: 81). Thus combinations involving typical thematic relations will be easier to understand than those involving atypical relations.

The CARIN model proposes a linguistic taxonomy of 16 thematic relations between component words, including Cause, Has, Make, For, Is, Use, Located, etc. By paying attention to the kinds of thematic relations that words assume and adding weights to these relations, the model predicts the priority between different thematic relations when constructing an interpretation for a compound. The model differentiates between the roles of the head and modifier concepts and, unlike other models which primarily emphasize the head concept, CARIN places most emphasis on the modifier by suggesting that it selects a thematic relation for the compound during the combination process. It is easy to conclude, however, that the 16 relations proposed in the model are too abstract to capture the variety of meaningful interpretations that can arise in conceptual combinations. For example, the combinations birthday cake and bravery medal share the For relation between their components. However, treating these as the same relation overlooks crucial differences between the interpretations of For in these two combinations: a birthday cake is a cake used for the purpose of celebrating birthday while a bravery medal is a medal rewarded because of bravery. The relations denoted by simple words such as Make or For imply very complex meanings corresponding to complex conceptual structures. Using this complex conceptual structure to link two concepts will inevitably result in a rather vague interpretation. In general, each of the 16 proposed relations is itself a category of diverse relational meanings, which lacks the precision to account for particular interpretations of conceptual combinations.

3. AGREEMENTS AND CONTROVERSIES AN ANALYTICAL FRAMEWORK

The preceding review demonstrates that conceptual combination research has produced a variety of theories with different emphases and terminology. As such it is impossible to compare and contrast every aspect of the literature in this paper. However, we will use a
relatively coherent analytical framework to summarize the major issues related to conceptual combination and to provide a basis on which to compare and contrast the models and theories in an integrative way. The framework consists of four dimensions reflecting major characteristics of the various models: (1) the causal role of schemata in the model, (2) the role of cognitive harmony or consistency in the model, (3) the pragmatic orientation of the model, and (4) the explanatory scope of the model. In addition to using the framework to summarize major characteristics of the models, we will also provide a critical analysis and challenge some of the fundamental assumptions related to these four dimensions. Table 1 summarizes major characteristics of the ten models in relation to our framework.

3.1. The Causal Role of Schemata

Perhaps the most prominent aspect of the conceptual combination literature is that most models rely on schema theory in two ways. First, most models assume a schematic representation of conceptual structure. Except fuzzy set theory and coherence theory, all of the current models assume a schematic representation of noun concepts as dimension-value pairs. Although the CARIN model emphasizes thematic relations between the two constituent concepts, if thematic relations are understood as a kind of dimension reflecting how concepts connect with one another, then there is not too much difference between feature-based schema models and CARIN model. Second, schemata play a causal role in the cognitive mechanisms proposed by many of the models, where conceptual combination is understood in terms of certain cognitive operations that take place along dimensions in the schema. For example, the selective modification, concept specialization, dual process, CARIN, and interactive property attribution models all propose cognitive processes related to the idea of slot-filling, where a modifier, or some aspect of a modifier, fills a slot in the head concept schema. Schemata play a different causal role in the composite prototype model, which proposed mechanisms of composing a schema to represent the conceptual combination from the union of the prototypical attributes of both component concepts, based on necessity, importance, and consistency constraints. Only the constraint model did not specify a causal role of schema in the operation of its three proposed constraint mechanisms (plausibility, diagnosticity, and informativeness), despite of assuming a schematic concept representation.

Several questions could be raised about the nature of schemata in current theories of conceptual combination and the workings of associated cognitive processes such as slot filling. The causal role of schemata in current theories of conceptual combination is based on several problematic assumptions: 1. Schema represents our fundamental conceptual structure, independent of communicative context, 2. Pre-existing schema dimensions and values are necessary, sufficient, and exhaustive for cognitive processing, 3. The weights associated with a schema’s dimensions and values are absolute and will carry over to any cognitive processing task. There are issues related to each of these assumptions.

The first assumption, that schema represents our fundamental conceptual structure, deals with the nature of schema as either intrinsic to our cognition or retrospectively imposed. Schema theory describes “how knowledge is represented and about how that representation facilitates the use of the knowledge in particular ways” (Rumelhart 1980: 34). Schema theory assumes a logical structure to organize knowledge in human mind, in which features are organized at a lower conceptual level relative to the super-ordinate dimensions. This structure
seems to match our intuitive experience: when we think about a concept, we may feel that it is logically related to other concepts in a manner similar to the dimensions or values proposed by schema theory. For example, we may know that apples are typically red and that red is a color, so the concepts apple, red, and color have a logical relationship that could be described by an apple schema consisting of a dimension/slot color with a value red. However, the fact that we understand these concepts as being logically related to one another does not necessarily imply that our minds represent them in such an organized manner in permanent memory. It is quite possible that our minds represent knowledge in less structured ways and that logical structure is imposed after the fact, as part of online processes of thinking about these concepts and the logical relations between them. Hierarchical concept taxonomies serve situation-specific purposes or goals, suggesting that they may be created or activated online in response to a communicative context, rather than permanently stored in memory. Red might be a subordinate concept within an apple schema if we are selecting fruit at the supermarket, but apples might be subordinate to red if we are classifying objects based on color, and red might be irrelevant to apple if we are thinking metaphorically about New York City (the big apple).

The second assumption that a schema’s pre-existing set of dimensions and values are necessary, sufficient, and exhaustive for cognitive processing is quite problematic. The fact that we can quite easily make sense of novel combinations counters such a view. For example, the novel combination smart apple has the same structure as the more mundane red apple, but it is hard to imagine that our schematic knowledge of apple would include an intrinsic dimension/slot for intelligence with different values in smartness. How many dimensions are needed to account for all of the possible knowledge that we have regarding a concept and for all potential conceptual combinations? How would we know whether a limited number of dimensions such as color, shape, texture, etc. would be capable of representing our complete knowledge of the concept apple? What about social concepts such as country and suicide, or abstract concepts like love and hate? How should we determine a necessary, sufficient, and exhaustive set of slots/dimensions for these kinds of concepts? Apparently, certain extra dimensions or associations must be activated and constructed online in the process of conceptual combination, rather than being stored in memory independent of context.

By the same token, many schema dimensions may be eliminated or filtered out efficiently in the process of conceptual combination. It was observed earlier that the specific cognitive mechanisms involved in filling a slot are not specified by any of the current models of conceptual combination. The example of apartment dog was used to illustrate that the modifier concept apartment is at least as complex in structure as the head concept dog, including potential dimensions related to rent, size, storey, apartment number, landlord, etc., yet most of these are irrelevant to the meaning of this combination. Thus, if apartment fills a habitat slot in dog, is it the entire complex modifier concept that fills the slot? Or is much of this conceptual structure filtered out during the combination process, and if so, how does this filtering process work? In general, most current models place primary emphasis on the structure of the head noun schema and overlook both the potential complexity of the modifier’s schema structure and theoretical difficulties associated with the slot filling process.

The third assumption, that the weights associated with dimensions and values in a schema are absolute and will carry over to any cognitive processing task, deals with the way that the importance, saliency and diagnosticity of an attribute are evaluated in various models of
conceptual combination. In some of the models, the importance or diagnosticity of an attribute are evaluated within the concept itself and treated as an absolute value to carry over to the combination. Thus, if certain attributes are most central for category membership, they will be assigned a higher weight which will be carried over to the combination. However, when combining concepts, the importance of an attribute is not just related to individual concepts alone. The weight of an attribute seems to vary in relation to the context in which the concept is used. In other words, diagnostic and important features of a concept depend on the set of other concepts that are salient at the time of use and should not be evaluated just within a single concept. For example, when the meaning of the novel combination chocolate computer is understood as “a chocolate shaped like a computer”, most of the attributes of computer are dropped regardless of how important they might be for the individual concept, and the importance of the dimension shape increases from a low weight to the much higher value for this combination.

Based on this analysis of assumptions underlying schema-based models, we would argue that a schematic representation of conceptual structure is insufficient to account for the complexity of conceptual combination. Pre-existing schema dimensions and values cannot provide a necessary, sufficient, and exhaustive set of knowledge resources appropriate to the required cognitive processing. A different model of how conceptual information is stored and processed in the mind is needed to address the preceding limitations. In this respect, Thagard’s coherence theory may suggest a potential alternative in that its proposed cognitive mechanisms do not depend on a priori schematic conceptual structure. Instead of an overly restrictive schematic representation, a connectionist framework requires only that networks of associated concepts are activated online during cognitive processing.

3.2. The Role of Cognitive Harmony or Consistency

The second dimension of our analytical framework considers the role of cognitive harmony or consistency in conceptual combination. When we combine two previously unrelated concepts, there are always conflicting or inconsistent connotations, expectations, and attributes contained in the component concepts that need to be reconciled before a coherent understanding can be generated. For example, in the combination television cellphone, the first concept television might bring in such attributes as large screen and a remote control, which would conflict with attributes of the second concept cellphone such as small screen and no remote control respectively. Thus the final meaning of the combination television cellphone needs to reconcile these conflicts. Three conceptual combination models (amalgam theory, coherence theory, and composite prototype model) propose explicit consistency checking mechanisms for combining concepts with conflicting expectations to generate a meaning that is coherent, consistent and harmonious. Amalgam theory proposes six procedural mechanisms by which features from candidate concepts and instances are reconciled into a non-conflicting set for the new, combined concept. The composite prototype model proposes mechanisms that focus on how necessary attributes of head and modifier influence the meaning of the combined concept. Coherence theory proposes parallel weight propagation among elements in a conceptual network to maximize coherence. Two other models (the concept specialization and dual-process models) discuss the issue of consistency
implicitly by suggesting that world knowledge is used to construe or clean up conflicts in the combined concepts.

Consistency is discussed intuitively without an explicit operationalization in most of these models with an exception of Hampton’s model where he proposed a way to empirically estimate attribute coherence scores as part of the composite prototype model. For example, “the PET and BIRD attributes were set up as rows and columns of a two-way matrix, and ... subjects ... were instructed to take each row attribute in turn and to rate it against each column attribute using a scale from +2 meaning “can occur together”, to -2 meaning “impossible to occur together” ... For each attribute, an average coherence score was calculated, based on the mean ratings given to the attribute, averaged across subjects and across the attributes of the other concept” (Hampton 1987: 66). This is a useful contribution in that it provides a way to measure the degree of consistency empirically, rather than relying on an intuitive notion of consistency.

Consistency and harmony issues are usually approached from the connectionism and consistency perspectives in cognitive psychology. Connectionism began in the field of artificial intelligence with the goal of understanding cognition by viewing the brain as a network of interconnected neurons (Rumelhart, Hinton, and Williams 1986). Connectionist models consist of interconnected and distributed processing units that perform simple computations concurrently transforming inputs into outputs to neighboring units. Thagard’s coherence theory follows this connectionist tradition in terms of the basic assumptions of goodness-of-fit or harmony. The idea of harmony in connectionist approaches is also very similar to what has been historically called cognitive balance or consistency in the psychology literature. Consistency theories began in 1940s and include a group of theories that were proposed in attempts to “uncover the structural-dynamic characteristics of human cognition” (Simon and Holyoak 2002: 283) towards consistency. “These conceptions, symmetry, consonance, balance, and simplicity, are, of course, implied in that idea with which Gestalt theory started and which always was central to it, namely, the idea of a “good” figure... this model implies a number of different entities with certain properties and standing in certain relations, which make up a constellation of factors tending toward a standard (consistent) state” (Heider 1960: 168).

These theories generally assume that inter-related cognitive elements tend to form a stable structure, whereas inconsistent elements are associated with psychological tension that will lead to a tendency towards reestablishing stability or harmony. Conceptual combination could be understood as forming a stable structure of attributes associated with two component concepts, such that conflicting attributes associated with each concept are reconciled. Particularly in the case of novel combinations, perceived inconsistency among attributes may be associated with tension and psychological forces to reorganize the cognitive elements into a more balanced or harmonious state. For example, we might interpret elephant fish as “a fish with a trunk”, but nonetheless will experience some residual psychological inconsistency or discomfort in relation to this constructed meaning. The remaining inconsistency comes from perceived conflict between this constructed interpretation and a larger cognitive field associated with our background knowledge of concepts associated with elephant and fish. In this circumstance, it is likely that further cognitive effort beyond the initial interpretation will be exerted to make the larger field harmonious. What cognitive mechanisms are involved in reducing discomfort and making the system of attributes coherent and harmonious? How do we empirically examine the state of harmony before and after a combination? How could the
tradition from consistency theories and connectionist models be carried over to the research of conceptual combinations so that we do not re-invent wheels when proposing explanations? Future models of conceptual combination should address these questions.

3.3. The Pragmatic Orientation

The third dimension in our framework considers the pragmatic orientation of conceptual combination models. Studying how people construct and understand a conceptual combination is largely the study of how meaning is constructed and communicated in the context of a two-word combination. There are two senses of meaning in this situation: the semantic meaning (the literal meaning or the informative intent of an expression) and the pragmatic meaning (the implied meaning or the communicative intent of the expression). All ten models made attempt to explain semantic meaning of conceptual combination, but only five (amalgam theory, concept specialization model, dual process model, constraints theory, and interactive property attribution model) consider pragmatic meaning in their explanation of conceptual combination, where communicators might cooperate to achieve intended meaning, use context and general knowledge to contruct the meaning of the combination, or make sense of the combination in terms of judging the plausibility, intention, goal, and appropriateness of the combined concepts. However, the degree of emphasis and the focus on pragmatic principles varies greatly between these five models.

For example, amalgam theory proposed that there are three kinds of conceptual combinations, pure, data-driven, and goal-directed, based on the degree that context is involved. A context could consist of prospective instances of the new combined concepts, or of a goal of solving a problem by reconciling the conflicting expectations contained in the candidate concepts. The interactive property attribution model discusses only the linguistic context of the combination, involving the collocation and pairing of words in the combination, rather than a broader communicative context that might contribute to the construction of a plausible and appropriate meaning. The concept specialization model does not consider how context or communicative intent contribute to meaning, but relies heavily on the concept of “background knowledge” to explain the plausibility and appropriateness of the meaning of combinations. As a direct descendent of the concept specialization model, the dual-process model has a stronger pragmatic orientation and discusses how context, plausibility, informativeness, and defininess contribute to comparison processes and the construction of combined meaning. Costello and Keane’s constraint model explicitly proposed three pragmatic constraints that influence conceptual combination – diagnosticity, plausibility and informativeness – and implemented them in a computational simulation. However, the underlying cognitive mechanisms that might correspond to these constraints are very vague. In computer simulations, for example, Costello and Keane operationalized the informativeness constraint as the appearance of a new predicate that was not contained in the prototype of the head concept but whether similar processes might operate in cognition is unknown.

Constructing the meaning of a conceptual combination involves numerous factors, among which the communicative context is undoubtedly one of the most important. Conceptual combination is largely a problem of communication, where someone intends to communicate a meaningful message to others within a certain context. Pragmatics provides useful tools to
help conceptualize this process. However, current models that include pragmatic considerations generally lack detailed explanations of how pragmatic factors function cognitively. For example, Murphy proposed that knowledge serves two functions in the concept specialization model. “First, outside knowledge must often be consulted in order to decide which slot is the appropriate one to specialize... the second reason for consulting outside knowledge is to elaborate or clean up the concept in order to make it more coherent and complete” (Murphy 1988: 533). However, the nature of “outside knowledge” is not clearly defined and is treated as a kind of black box in which the cognitive mechanisms that guide its function are unknown. Similar observations could be made about variables such as context, appropriateness, and relevance in various models. These pragmatic factors have face validity, but the cognitive mechanisms underlying them are in need of more detailed specification.

One reason such cognitive mechanisms may be difficult to specify is an apparent assumption that pragmatic constructs such as context or knowledge require a different representation and treatment than that used for conceptual meaning. Is it possible that we could treat meaning, context, and knowledge in more or less the same way, using a common representational structure, so that whenever we discuss the meaning of a conceptual combination, we naturally include aspects of context and knowledge in the discussion? Ideally, future models of conceptual combination need to consider how pragmatic factors could be integrated with conceptual meaning in a parsimonious fashion.

3.4. Explanatory Scope

The last dimension of our framework compares the theories of conceptual combination based on the explanatory scope of each model, referring specifically to the following four distinctions: novel vs. mundane combinations, true vs. spurious conjunctives, head vs. modifier roles, and noun-noun vs. adjective-noun combinations. With respect to the first of these distinctions, a mundane combination is the one that is commonly used in everyday language, such as red apple, while a novel combination is the one that rarely if ever appears in our daily language, such as elephant fish. It has been suggested that novel conceptual combinations are a key source of creative thought, thus several of the models focus on the cognitive processes of combining concepts in novel ways (Table 1).

For the second distinction, a true conjunctive refers to a symmetric conceptual combination of two component concepts (X and Y), such that the combined concept (XY or YX) represents something that is a member of both category X and Y, regardless of component sequence. On the other hand, if XY and YX have different meanings, they are considered to be spurious conjunctives. For example, if pet fish has the same meaning as fish pet it is a true conjunctive. Two models of conceptual combination explicitly focus on true conjunctives. In fuzzy set theory the meaning of a combination is defined symmetrically as set intersection (i.e., $X \cap Y = Y \cap X$). In the composite prototype model a particular syntactic structure of “X that is also Y” is used in experiments to ensure that combinations reflected true conjunctives (e.g., “machines that are also vehicles,” “furniture that is also a household appliance,” etc.). Most of the other theories, however, assume that XY and YX have different meanings and, therefore, focus their attention on spurious combinations.
**Table 1. The Summary of ten models evaluated against the analytica framework**

<table>
<thead>
<tr>
<th></th>
<th>Schema Consistency</th>
<th>Pragmatic orientation</th>
<th>Explanatory scope</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Schematic</td>
<td>Schema as causal factor</td>
<td>Reconciling conflicting expectation</td>
</tr>
<tr>
<td>Interactive property attribution</td>
<td>yes</td>
<td>no</td>
<td>somewhat</td>
</tr>
<tr>
<td>CARIN</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Coherence</td>
<td>no</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Constraint</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Dual process</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Composite prototype</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Concept specialization</td>
<td>yes</td>
<td>somewhat</td>
<td>somewhat</td>
</tr>
<tr>
<td>Amalgam</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Selective modification</td>
<td>yes</td>
<td>no</td>
<td>No</td>
</tr>
<tr>
<td>Fuzzy set</td>
<td>no</td>
<td>no</td>
<td>no</td>
</tr>
</tbody>
</table>
The third distinction relates to the different roles of head and modifier concepts in contributing to the meaning of a combination. In the current literature, the head noun or head concept (sometimes simply called head) refers to the central word or concept in the combination (usually corresponding to the second word in the combination in English). The modifier refers to the word or concept in the combination that changes some aspect of the head (usually corresponding to the first word in the combination in English). Five of the models explicitly discuss the role of head or modifier (Table 1), but they differ with respect to which concept is believed to contribute most to the combined meaning. The selective modification, concept specialization, and dual process models propose that the head concept dominates the meaning of the combination, while the CARIN model proposes that the modifier dominates by selecting thematic relations for the combination. The interactive property attribution model proposes that both head and modifier contribute equally to the meaning of the combination.

The fourth distinction is between noun-noun and adjective-noun combinations. It is interesting to note that grammatical terminology is often intermingled with cognitive terminology in the current literature. When we define conceptual combination as a combination of two (or more) concepts, we are discussing the cognitive structure of this combination. However, cognitive structure cannot be explicitly discussed without reference to the grammatical structure of words and their relations. Thus in all of the current models, a combination of two concepts equates to a combination of two words. For example, the two-word combination “elephant fish” refers to a combination of two concepts *elephant* and *fish*. Because of this, researchers frequently use grammatical terms to refer to cognitive combinations. Noun-noun combinations, such as “zebra bird,” refer to combinations of two concepts represented by nouns in the English language. Adjective-noun combinations, such as “red apple,” refer to combinations of one noun concept and one adjective concept that, arguably, expresses a feature of the object denoted by the noun. The latter are sometimes subcategorized into predicating adjective-noun combinations (e.g., “beautiful story”) in which the combination can be re-written into a semantically correct sentence (“story is beautiful”), and non-predicating adjective-noun combinations (e.g., “atomic engineer”) in which the combination cannot be rewritten into a semantically correct sentence (i.e., the sentence “engineer is atomic” is meaningless). Except the selective modification model, most of the current models are intended to explain noun-noun combinations and only a few are adequate to explain adjective-noun combinations (Table 1).

These four distinctions (novel vs. mundane combinations, true vs. spurious conjunctives, head vs. modifier, and noun-noun vs. adjective-noun) are based on current terminology used in the literature to characterize the explanatory scope of the ten models. However, it should be noted that these distinctions themselves raise certain questions or concerns in relation to theorizing the conceptual combination process.

First, the assumption of the existence of genuinely conjunctive concepts is questionable. Zadeh (1982) assumes that conjunctive concepts are distinguishable from spurious conjunctions and that fuzzy set intersection is applicable only to genuinely conjunctive concepts. Psychologically, if we artificially define concepts strictly in terms of categorical denotations, there may be genuine conjunctives representing something that is both in category X and Y. Hampton (1988) used such a strategy in experiments by directly asking subjects to think about conjunctives like “machines that are also vehicles.” However, whenever we move to the linguistic level and use two words to denote a conceptual
combination (e.g., “apartment dog”), it could be argued that the vast majority of empirically observed conceptual combinations, if not all, are really spurious conjunctives, because our intuitive understanding of the meaning of combination XY is usually very different from the meaning of YX. To repeat an earlier quote, “a desk lamp is a kind of lamp, but a lamp desk is a kind of desk” (Murphy 2002: 445). In the communicative context, syntactic constraints function by which one word subconsciously functions as a logical operator X (i.e., the modifier) while the other word functions as a denotation Y (i.e., the head) such that X transforms Y into the denotation XY. Thus, when conceptual combinations are interpreted within a natural linguistic context and not defined artificially, it seems that there really are no genuine conjunctives and all combinations XY become so-called spurious conjunctives.

Another questionable implicit assumption made by most of the current models is that nouns represent concepts deserving of a rich schematic representation, while other parts-of-speech do not represent concepts and thus do not need to be represented by a similar cognitive structure. The earlier example of apartment dog showed that modifiers (e.g. apartment) are also rich concepts but, compared to head concepts, modifiers are treated by most theories in much simpler ways as mere slot fillers. In general, it is clear that concepts exhibit a greater variety of linguistic manifestations than just nouns, including adjectives, verbs, prepositions, adverbs, etc., which deserve an equally rich representation of their conceptual structure. If the modifier or non-noun component of a conceptual combination does more than just providing a value for a slot of the head noun concept, what might be the appropriate schematic representation of the modifier concept? How do the two schemata of the head and modifier concepts interact and influence one another in the interpretation of a conceptual combination? Future models of conceptual combination need to address these two questions.

**CONCLUSION**

Conceptual combination is a fundamental process of human cognition, in which people use two or more concepts to articulate and comprehend complex meanings that a single concept cannot denote. Through conceptual combination we develop new ideas, communicate with one another, learn and expand our knowledge. This paper contributes to the study of conceptual combination by comprehensively and critically reviewing ten major models, which have been proposed over the last thirty years by researchers in cognitive psychology, linguistics, artificial intelligence, and philosophy. We have examined fuzzy set theory, the selective modification model, amalgam theory, the concept specialization model, the composite prototype model, the dual-process model, the constraint model, the CARIN model, coherence theory, and the interactive property attribution model. We summarized the basic arguments of each model and critically examined their major issues and theoretical limitations. In addition, we proposed an analytical framework to compare and contrast the ten models along four dimensions: (1) the causal role of schemata in the model; (2) the role of cognitive harmony or consistency in the model; (3) the pragmatic orientation in the model; and (4) the explanatory scope of the model. We identified areas of agreement and disagreement among the various models and theories. For example, all models assume a communicative purpose for the combination and a correspondence between linguistic words and psychological concepts. Most also agree that the component concepts (modifier or head)
play different roles in the conceptual combination process, and interact with one another to
generate a meaning in harmony with a person’s background knowledge. Different models
disagree substantially on the cognitive mechanisms involved, however, and emphasize
different aspects of the process.

Finally, we have offered suggestions for future research directed toward the development
of a synthesis model on the cognitive process of conceptual combination. A suitable theory
should address the limitations and problematic assumptions of representing conceptual
structure using schema theory in online cognitive processing. It should accommodate the
requirement of cognitive consistency by specifying both the cognitive mechanisms involved
in reducing inconsistency and providing empirical methods for measuring the degree of
consistency before and after combination. Pragmatic considerations should be integrated with
cognitive considerations, such that background knowledge and aspects of the communicative
and linguistic context of conceptual combination can be represented consistently with how
concepts are represented. Lastly, a complete theory of conceptual combination must account
for the diversity of combinations observed empirically (including both novel and mundane),
accommodate the different roles of head and modify concepts in the combination process,
reflect the conceptual complexity of the full range of linguistic parts-of-speech beyond just
head nouns, and account for the interaction of complex head and modify concepts and their
relative contribution to meaning during the combination process.

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