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Cognitive Linguistics in the Year 2015

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Abstract

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

cognitive linguistics – radial category – prototype – metaphor – metonymy – blending – construction grammar – quantitative analysis

1 Introduction

The central organizing theme of cognitive linguistics is the idea that language is an integral part of cognition. Therefore, linguistic facts should be explained with reference to general cognitive mechanisms otherwise established by neurobiologists and psychologists. Facts of language are interpreted from the perspective of a usage-based model, according to which language is built from actual usage events. Thus for a cognitive linguist, data reflects authentic language use, being composed of "performance" or "parole" (in Saussurian terms).

This perspective on language motivates a series of core concepts for cognitive linguistics, presented in brief in this article. These concepts (and many more) are elaborated in greater detail in handbooks of cognitive linguistics (Geeraerts and Cuyckens 2007, Dąbrowska and Divjak 2015) and textbooks

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(Langacker 1987 and 1991a–b, Taylor 1995 and 2002, Ungerer and Schmid 1996, Croft and Cruse 2004, Dąbrowska 2004) devoted to cognitive linguistics. Among these works, Langacker 2008 and 2013 deserve special mention. These two books (the one from 2013 is a foreshortened version of the 2008 book) are a definitive concise introduction to central theoretical concepts that have defined much of the framework of cognitive linguistics and continue to steer the research of many scholars.

2 Cognition and Language

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.

Linguistics has a strong 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. However, 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. 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.

Languages are in a sense constantly engaging in "experiments" (the spontaneous production of speech and writing) that involve complex sets of variables. Our corpora are collections of this kind of data, and the quantitative turn (see section 7) in cognitive linguistics brings all the power of sophisticated statistical modeling to probe the structure of such data. In this sense, we are fulfilling the dream of linguistics to become an exact science.

Cognitive linguistics does not subscribe to a strictly dualistic understanding of the concepts predictable vs. arbitrary or objective science vs. subjective interpretation. We should not lose sight of the fact that even in the exact sciences traditions of how to interpret data are often just as valid and venerable as the data themselves. 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.

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, a goal that is probably 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 statistical trends rather than 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.

3 The Status and Source 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, but it is also the case that our expressive resources have some influence on how we perceive our experiences. 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.

Meaning has to come from somewhere. It can't just exist by fiat as a set of symbols. 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) went to great pains to show that "brains in a vat" (i.e., a disembodied 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. Cognitive

linguistics is an exploration of the fabric of meaning, woven thread by thread from bodily experience and embroidered by metaphor and metonymy.

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 complicated, but it also makes our endeavor more accurate.

4 The Structure and Extension of Meaning

If linguistic categories are cognitive categories, then we should expect them to have the same structure as cognitive categories. 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 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 borrowed from Lakoff 1987 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 concieves, 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* and *chair*. 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).

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 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.

Some key linguistic concepts deserve re-examination from the perspective of the radial category. For example, allomorphy is traditionally defined in terms of absolute criteria: semantic identity and complementary distribution. However, even textbook examples such as the plural morpheme of English (*cats* [s], *dogs* [z], *foxes* [əz]) fail to comply with the definition when we look at sufficient quantities of authentic data (cf. lack of complementary distribution in *leaves* [z] vs. *the Toronto Maple Leafs* [s]). Endresen 2014 shows through a series of detailed corpus and experimental studies that allomorphy is better

understood as a radial category, with prototypical examples and less prototypical examples where statistical significance is great enough to argue in favor of an allomorphic relationship despite some overlap in distribution.

The prototype of any category is an item with special salience. This special salience is often 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 (Coleman and Kay 1981). 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.

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 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. 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 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.

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.

5 Mental Spaces and Mapping: Metaphor, Metonymy, and Blends

Cognition and the use of language involve the access and manipulation of mental spaces (Fauconnier 1985). 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), a process that looks very much like metaphor (Churchland 1986). 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.

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. 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 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 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 is the aspectual 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: 380–415; *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 to another, often within or across paradigms.

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. Turner 1987, Lakoff and Turner 1989, Sweetser 1990, Palmer 1996, Janda 2008). 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, 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 tail. 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 Tinkertoys.

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 would 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).

Metonymy

Metonymy is present whenever one item, the "source" stands in for another item, the "target". Metonymies can thus be modeled as SOURCE 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 (1993) definition of metonymy as a mapping within a single "domain matrix".

A 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 protypicality. 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 languages, 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 denote 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 in Slavic languages which otherwise look rather like a random list.

A vast 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 2011). 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 Bob Dylan sang *Many days you have lingered all around my cabin door, Oh hard times, come again no more*, he was 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.

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 a 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).

6 Construction Grammar

Construction grammar can be understood as an offspring of a movement at Berkeley inspired by Head-Driven Phrase Structure Grammar, inspired by 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. Construction grammar has also been adapted for unification-based language processing in two versions, namely embodied construction grammar (Feldman 2006) and fluid construction grammar (Steels 2011).

A construction often 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" (Turner 1996: 140–168).

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 do 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), an 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 section 7.

7 The Quantitative Turn in Cognitive Linguistics

A quantitative turn in linguistics has been facilitated by the advent of digital corpora and sophisticated open source statistical software (primarily R). Cognitive linguists are increasingly taking the usage-based model of cognitive linguistics seriously by applying quantitative analyses to corpus and experimental data. In 2005 Mouton de Gruyter launched the journal Corpus Linguistics and Linguistic Theory as a venue for quantitative research. In a survey of all the articles published in the journal *Cognitive Linguistics* from its founding in 1990 through 2012, I found that while every volume of the journal had featured some percentage of articles using quantitative methods, in the year 2008 our field definitively crossed the 50% mark (Janda 2013). In other words, since 2008 the majority of articles we publish in the journal are quantitative. While there will probably always be a place for articles that are primarily theoretical and/or introspective, such contributions are likely to be in the minority in the future.

Computational linguistics of course has a long association with statistical methods, and it is not only cognitive linguistics that is experiencing the current quantitative turn. But I believe that cognitive linguistics brings something new to the table. Cognitive linguists have always had a commitment to a usage-based model of language and are doing pioneering work in implementing data analysis in the context of a strong theoretical framework. In my opinion, we have an historic opportunity to exercise leadership for the entire field of linguistics because we can establish best practices in using statistical models to address theoretically interesting questions. A conference series with the title Quantitative Investigations in Theoretical Linguistics (cf. http://wwwling.arts.kuleuven.be/QITL5/) has arisen to address precisely this challenge.

Although my sample size in Janda 2013 was small (141 articles using quantitative methods out of a total of 331 articles), some trends appear. The most popular statistical measure in that sample is the chi-square test, followed (in order of popularity) by ANOVA, the t-test, correlation, regression, clustering, the

Fisher test, and the binomial test. This gives us some indication of the types of statistical models that linguists find useful.

Here are just a few examples of where cognitive linguistics is headed in terms of quantitative analysis. Stefanowitsch and Gries (2003, 2005) 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 (2006a and b) 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). Baayen (2011) and Arppe (2014) have developed an R package for naive discriminative learning that simulates the type of usage-based learning that is a theoretical cornerstone of cognitive linguistics.

The quantitative turn creates a need to safeguard the corresponding data and statistical code and make it available to colleagues and to the linguistic community at large. If linguist X reports a finding, other researchers should be able to verify X's finding both by inspecting X's data and by comparing their findings with X's finding. Funding agencies and journals are increasingly requiring linguists to share their data, consistent with practices in other disciplines such as medicine and psychology.

Publicly archived linguistic data and statistical code have great pedagogical value for the community of linguists. As anyone who has dabbled with statistical methods knows, the most difficult part of quantitative analysis is often identifying an appropriate model. This is a key issue both for corpus data and for designing an experiment so that the data will be amenable to a given model. Access to examples of datasets and corresponding models will help us all over the hurdle of choosing the right models for our data. At the same time, we need an ethical standard for sharing data and code in a manner explicit enough so that other researchers can access the data and re-run the models. We can help each other and bring our whole field forward much more efficiently if we pool our experience. A shared pool of data and code will also have a normative effect on the use of statistics in linguistics and protect our integrity as scientists.

In 2014 the Tromsø Respository of Language and Linguistics (TROLLing at opendata.uit.no) was launched to provide free open access to linguistic data and statistical code. For the researcher, both public archiving and submission of data can be accomplished via the same task, preparing annotations for

datasets and code that facilitate data sharing with colleagues and peer reviewers. TROLLing is a professionally maintained, designated website created for this purpose. TROLLing is open to all linguists interested in quantitative study of language. My hope is that it will be a valuable tool as we proceed beyond the quantitative turn, both for cognitive linguists and for our fellow-travelers.

8 Conclusion

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 that 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 shutters one's eyes 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. It is my sincere hope that more bridges to frameworks beyond cognitive linguistics will be built as we progress.

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