

Lexical Causatives and Prototype Theory:

A Reply to Gergely and Bever

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Abstract

This is a reply to a recent paper in this journal by Gergely and Bever (henceforth, GB) on lexical causatives and prototype theory. GB present evidence correctly arguing against a nonexistent theory of prototype causation, which they incorrectly attribute to me. Their arguments actually *support* the theory of prototype causation as it has developed in my own work and in contemporary cognitive semantics.

In a recent paper in this journal on lexical causatives and prototype theory, Gergely and Bever (henceforth, GB) present correct arguments against a nonexistent theory of lexical causatives that they incorrectly attribute to me. The actual theory that I hold, and that is implied (though not explicitly discussed) in current cognitive semantics research is *supported* by the empirical research that GB present.

GB give an extremely confused picture of prototype theory and its role in contemporary cognitive semantics, mixing elements of disparate theories in a way that no semantic theorist ever has. They come up with a previously unheard of gerrymandered theory that they then successfully refute. GB seem unaware of the developments in cognitive semantics that they claim to be arguing against. They cite only three works in the tradition, and in each case their citations are taken out of context, both historically and within the work cited.

To correct these confusions, it will be necessary to review briefly a small part of the history of the cognitive semantic tradition to show just what the GB mistake in interpretation is, and where research in this tradition has disproven the approach taken by GB. The historical view will necessarily be much oversimplified and will be tailored only to addressing the confusions of the GB article. The survey will discuss three relevant stages in the development of generative semantics, three relevant stages in the work of Eleanor Rosch on prototype theory, and the synthesis that has emerged over the past decade in cognitive semantics.

Some History

Let us begin with generative semantics. That theory developed in stages and had several major impulses:

- To demonstrate empirically the wide variety of ways in which syntactic principles depend upon semantics.
- To use this research to provide a means of more adequately understanding the nature of natural language semantics and syntax.
- To situate these results within the best linguistic theories of the day.

Generative semantics succeeded in its first two goals, but it failed miserably in the last goal, and for a very good reason. The best semantic theories of the sixties and early seventies were all based on truth-conditional semantics, while the best syntactic theories were transformational. Both truth-conditional semantics and transformational grammar were inadequate for representing the empirical results achieved within generative semantics. The past decade has seen a burgeoning of theoretical developments in both cognitive semantics (which is based on understanding rather than truth conditions) and in nontransformational syntactic theories. Cognitive semanticists are now close to being able to achieve the third goal of generative semantics, though within a cognitively-based theory that has developed greatly beyond the theories used two decades ago.

Generative Semantics, Stage I

Much of the early generative semantics research (1963-69) was dedicated to bringing the concept of logical form into linguistics. The Katz-Fodor semantic theory (1964) had no notion of logical form, and there was a great deal of resistance in the generative community in the mid-sixties to ideas like predicate-argument structure, the use of logical variables to indicate coreference, the binding of variables, operator scope, and propositional functions within the theory of grammar. Generative semantics was entirely successful in getting the linguistics community to accept the relevance of these ideas.

Part of stage I generative semantics research included results indicating that sublexical aspects of logical form entered into the general principles governing the distribution of grammatical morphemes. For example, a verb like *dissuade* has an implicit negative. From the point of view of logical form, that negative is embedded. Thus, it was argued that *dissuade* has the rough logical form of PERSUADE(X,Y,INTEND(Y,NOT S)), since *John dissuaded Harry from leaving* entails that *John persuaded Harry to intend not to leave*. It was then observed (Lakoff, 1969) that the distribution of negative polarity items followed sublexical logical form, rather than the occurrence of the negative morpheme in syntactic structure. This accounted for the following paradigm.

- A. John dissuaded Sue from dating anybody.
- B. John persuaded Sue not to date anybody.
- C *John dissuaded anybody from dating Sue.
- D *John persuaded anybody not to date Sue.
- E John didn't persuade anybody to date Sue.

The distribution of *anybody* in these sentences is governed by the location of the negative in logical form, not in syntactic structure. It is the logical scope of negation plus various pragmatic factors that determines the distribution of polarity items. The polarity item *anybody*, in such cases can only occur in the logical scope of negation. The crucial cases here are C,D, and E. *Dissuade* in C works like *persuade not* in D, which has the same logical scope of negation. It does not work like *not persuade*, which has the same syntactic position of the negation (in front of the verbal root), but the reversed logical scope.

It is generally accepted these days that the distribution of polarity items is governed by such semantic factors. What is disputed is whether the distribution of grammatical morphemes like *any* should be part of the syntax. If you it assume it

is, as early generative grammarians and generative semanticists did, then considerations of sublexical logical form must be part of syntax. However, Chomskyan linguistics is flexible enough to decide that the regularities governing the distribution of grammatical morphemes should not be part of syntax, and to discount such cases on those grounds.

The relevance of all this for the GB argument is the following: Within the modes of transformational grammar available in 1963-1969, the only way to state such regularities was by making use of lexical decomposition. To state such regularities at all within the limitations of that framework, we were forced to what GB call the "definitional decomposition (DD)" position. Moreover, we were forced to assume that the most basic kinds of rules were those that directly related logical form and surface structure. These had to be formulated as "global rules" that looked simultaneously at logical form and surface structure. These had to be formulated globally since we assumed that transformational grammar was correct, and transformations stood in the way of direct correspondences between logical form and surface structure. The development of nontransformational grammars in recent years (cf. Lakoff, 1977 and Lakoff, 1986, case study 3) has eliminated that globality in favor of direct correspondences between semantics and syntax.

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Within stage I of generative semantics, we held the DD position in general, and one of the most common applications was our application of it to the analysis of lexical causatives. We were very much aware of the difference in direct and indirect causation and of the problems brought up by GB, and we assumed at stage I that such difference would be handled in pragmatics since they were subject to contextual constraints. In this respect, the GB two-stage proposal has some of the features of the generative semantics stage I proposal.

In 1968, it became clear to myself and McCawley that logical form alone could not represent all the aspects of meaning that entered into the distribution of grammatical morphemes. I argued (Lakoff, 1968) that model theory and possible world semantics had to be introduced into linguistics. The following year, Barbara Partee and Ed Keenan came to the same conclusion. Much of the research of stage II of generative semantics (1969-1972) was directed toward making possible-world semantics respectable within linguistics, and the natural logic movement of the time (see Lakoff, 1970, 1972a) was directed toward this end. It was around this time that it became clear that entailment in context played a role in the distribution of morphemes and syntactic constructions (see Lakoff, 1969b, 1972a).

The natural way to characterize lexical meaning within the stage II theory was via meaning postulates (see Lakoff, 1970, 1972a), which are viewed as providing structural constraints on model structures. In the stage II theory, the most natural kind of rule governing the distribution of morphemes is one that can make reference to an entailment in context. Since these are, strictly speaking, outside of a transformational derivation, they were referred to as *transderivational rules* (see Lakoff, 1973 for examples). These are rules that can directly link entailments in a model with surface structure. Rules of this form thus permit one to make use of entailments based on meaning postulates.

The significance of this for the discussion of the GB paper is that by 1970 generative semantics had given up the DD position and had adopted a version of the meaning postulate position that, with transderivational rules, allowed us to look at inferential structure derived as a result of meaning postulates. This allowed us to do the kinds of things that the DD position was good at, while also doing what meaning postulates were good at.

Rosch went through three phases in her thinking about categorization.

-Phase I (late 1960's to early 1970's): Because she was studying color, shape, and emotions, she assumed prototypes were primarily a matter of (a) perceptual salience -- which things are most readily noticeable to the human perceptual system, (b) memorability -- which things are easiest for people to remember, and (c) stimulus generalization -- the human ability to generalize from one thing to something else that is physically similar to it. As she says (Rosch, *in press*): "Suppose that there are perceptually salient colors which more readily attract attention and are more easily remembered than other colors. When category names are learned, they tend to become attached first to the salient stimuli; then, by means of the principle of stimulus generalization, they generalize to other, physically similar instances."

-Phase II (early to mid 1970's): Under the influence of information-processing psychology, Rosch considered the possibility that prototype effects, as operationalized by the experiments cited above, might provide a characterization of the internal structure of the category. Thus, for example, the goodness-of-example ratings might directly reflect the internal structure of the category in mental representation. Two natural questions arose:

- (1) Did the EFFECTS, defined operationally, characterize the STRUCTURE of the category as it represented in the mind?
- (2) Did the PROTOTYPES constitute mental REPRESENTATIONS?

Given the assumptions of information processing psychology, these were the most straightforward interpretations of the experimental data. Rosch, 1975, gives just such interpretations.

-Phase III (late 1970's): Rosch eventually gave up on these interpretations of her experimental results. Such interpretations were artifacts of an overly narrow view of information processing psychology. She came to the conclusion that prototype effects, defined operationally by experiment, underdetermined mental representations. The effects constrained the possibilities for what representations might be, but there was no 1-1 correspondence between the effects and mental representations. The effects had 'sources', but one could not determine the sources from the effects. As she says of the research in Phase II (Rosch, *in press*), "The type of conclusions generated by this approach were, however, very general; e.g., that the representation evoked by the category name was more like good examples than poor examples of the category; that it was in a form more general than either word or pictures, etc. On the whole other information processing researchers have considered the concepts of prototypes and typicality functions underspecified and have provided a variety of precise models, mini-models, and distinctions to be tested..."

It is often the case that positions taken early in one's career tend to be associated with a researcher long after he or she has given up on those positions. Many of those who read Rosch's early works have continued to view prototype theory as the view she held in either Phase I or Phase II of her research. Because of this, Rosch has had to provide explicit admonitions against overly simplistic interpretations of prototype effects -- interpretations of the sort that she herself made in Phase II of her research. For example, in Rosch, 1978 she states:

The pervasiveness of prototypes in real-world categories and of prototypicality as a variable indicates that prototypes must have some place in psychological theories of representation, processing, and learning.

However, prototypes themselves do not constitute any particular model of processes, representations, or learning. This point is so often misunderstood that it requires discussion:

1. To speak of a *prototype* at all is simply a convenient grammatical fiction; what is really referred to are judgments of degree of prototypicality... For natural-language categories, to speak of a single entity that is the prototype is either a gross misunderstanding of the empirical data or a covert theory of mental representation.
2. Prototypes do not constitute any particular processing model for categories... What facts about prototypicality do contribute to processing notions is a constraint -- processing models should not be inconsistent with the known facts about prototypes. For example, a model should not be such as to predict equal verification times for good and bad examples of categories nor predict completely random search through a category.
3. Prototypes do not constitute a theory of representation for categories...Prototypes can be represented either by propositional or image systems...As with processing models, the facts about prototypes can only constrain, but do not determine, models of representation. A representation of categories in terms of conjoined necessary and sufficient attributes alone would probably be incapable of handling all of the presently known facts, but there are many representations other than necessary and sufficient attributes that are possible.

4. Although prototypes must be learned, they do not constitute any particular theory of category learning. (pp. 40-41)

Despite Rosch's admonitions to the contrary, and despite her minimal theorizing concerning the sources of prototype effects, her results on prototype effects are still sometimes interpreted as constituting a *prima facie* theory of representation of category structure, as she thought was possible during Phase II of her research.

For example, take her results showing prototype effects within the category *bird*. Her experimental ranking shows that subjects view robins and sparrows as the best examples of birds, with owls and eagles lower down in the rankings and ostriches, emus, and penguins among the worst examples. In the early-to-mid 1970's, during phase II of Rosch's research, such empirical goodness-of-example ratings were commonly taken as constituting a claim to the effect that membership in the category *bird* is graded and that owls and penguins are less members of the *bird* category than robins. It later became clear that that was a mistaken interpretation of the data. Rosch's ratings make no such claim; they are just ratings and do not make any claims at all. They are consistent with the interpretation that the category *bird* has strict boundaries and that robins, owls and penguins are all 100 percent members of that category. However, that category must have additional internal structure of some sort that produces these goodness-of-example ratings. Moreover, that internal structure must be part of our concept of what a bird is, since it results in asymmetric inferences of the sort discussed above, described by Rips (1975).

This point is extremely important. Category structure plays a role in reasoning. In many cases, prototypes act as *cognitive reference points* of various sorts,

and form the basis for inferences (Rosch, 1975a, 1981). The study of human inference is part of the study of human reasoning and conceptual structure; hence, those prototypes used in making inferences must be part of conceptual structure.

It is important to bear in mind that prototype effects are superficial. They may result from many factors. In the case of a graded category like *tall man*, which is fuzzy and does not have rigid boundaries, prototype effects may result from degree of category membership, while in the case of *bird*, which does have rigid boundaries, the prototype effects must result from some other aspect of internal category structure.

Prototype Theory within Cognitive Semantics

In *Women, Fire, and Dangerous Things*, I propose a theory that elaborates Rosch's Phase III views. This theory is set within a general theory of idealized cognitive models, or ICMs. According to this theory, prototype effects arise from the nature of ICMs and the way they function in our conceptual system. I have found, to date, four general types of sources of prototype effects within the theory of cognitive models:

-ICMs containing gradations. Some concepts, like TALL and RICH are graded, and their ICMs have graded scales with norms.

-Classical ICMs. Some concepts are characterized by necessary and sufficient conditions *relative to an idealized background model*. Prototype effects can arise due to discrepancies between the idealized background and our knowledge of a situation in which we apply the ICM.

-Metonymic ICMs. Metonymy is a common feature in ICMs; it is a case where one aspect of an ICM stands for another for some purpose. Metonymic prototype effects arise in ICMs where a member or subcategory stands for the whole category for some cognitive purpose (say reasoning, making judgments, doing calculations, etc.). There are many types of metonymic ICMs. They include social stereotypes, typical cases, ideals, generators, submodels, etc. (See Lakoff, 1980, chapter 5.)

-Radial Structures. These are category structures with a central member and conventional extinctions. The extensions have to be learned and are not predictable by rule, but are motivated by some general cognitive principle -- similarity, conceptual metaphor, image-schema transformation, etc.

A common type of radial structure when a concept is characterized by a cluster of properties and then gets extended to non-central cases. A common example is the concept *mother*, which in the central case included the person who supplies the female share of the genetic material, gives birth, raises the child, is married to the father, etc. As times have changed and these characteristics do not necessarily cluster together, the concept has extended to people who have some of those characteristics. The extensions are still in the category, but they are not the "best examples."

Causation, as it is characterized in Lakoff, 1977, Lakoff and Johnson, 1980, and Lakoff, 1980, is a radial category. Its central subcategory is defined by the following conditions:

Prototypical Causation:

There is a patient that undergoes some change and an agent that brings it about.

The change of state is physical.

The agent has the change of state as a goal.

Carrying out that goal requires motor activity.

The agent is in control of that motor activity.

The agent is primarily responsible for the change in the patient.

The agent is energy source and the patient is energy goal.

The agent touches the patient with his body or an instrument (that is, there is spatiotemporal overlap).

The agent monitors the change in the patient via sensory perception.

Noncentral causation includes causation at a distance, causation over time, causation involving an intermediary, causation involving a metaphorical force (such as the force of reason, which is used in persuasion), etc. All of these are forms of causation in general, which can be viewed as a generalization from prototypical causation (direct manipulation) by the process of radial category extension.

The Point of the History

By the time I had become acquainted with Rosch's Phase I theory of prototypes in 1972, I was working within Stage II of generative semantics, which assumed the meaning postulate rather than the DD approach. Thus, there was never a stage in my work at which I held both the DD hypothesis and any form of prototype theory. Indeed, by 1977, when I first presented my theory of causative prototypes (which is the version cited by GB), I had found the meaning postulate view, as well as the DD view, to be empirically untenable and had gone on to an early version of cognitive semantics, Fillmore's frame semantics. Thus, the theory

of causative prototypes came two semantic theories and almost a decade later than the DD view. GB act as if they were part of a single semantic theory held at one time. They were not, and to my knowledge, no semantic theorist has ever held those two views simultaneously. The entire GB paper is directed against a nonexistent theory.

Application to the Gergely-Bever Examples

The view of prototype causation just outlined is embedded within a the general cognitively-based approach to semantics and syntax that has devloped within the cognitive linguistics community over the past decade (see annotated bibliography). Semantics is based on understanding, not on truth-conditions (see Fillmore, 1985, Lakoff, 1986, and Johnson, ¹⁹⁸⁷ ~~in press~~). Grammar makes use of general cognitive principles (see Lakoff, 1986, case study 3). Words are defined relative to ICMs, in accordance with Fillmore's frame semantics. Up to now there has been no explicit discussion within this framework of the examples that GB cite. Let us consider them.

To get a feel for how frame semantics works, let us take the verb *paint*. *Paint* has two related senses, which we will refer to as the covering-sense (as in *paint the house*) and the art-sense (as in *paint a picture*). Within frame semantics, each lexical item is defined relative to a conceptual frame. The two senses of *paint* are each defined relative to different frames -- what we will call for convenience a covering-frame and an art-frame. With cognitive semantics, polysemy is represented in the lexicon via lexical networks, each link of which characterizes the regular relationship between the senses. There are three relevant cases of polysemy for the word *paint*: the noun *paint*, the verb in the covering sense and the verb in the art sense. The noun *paint* is linked to the verb *paint* by the generalized

metonymy which states that *a substance may stand for the act of applying that substance to a surface*. This applies in a variety of cases such as *butter the bread*, *oil the knife*, etc. The existence of such metonymic links does not mean that *paint the house* means no more than "apply paint to the surface of the house". The covering sense of *paint* is still defined relative to a frame that characterizes our knowledge about painting surfaces for protection and beautification. The metonymy serves to explain why the same word is used for the substance and the act. Similarly, there is a polysemic link between the covering sense and the art sense of *paint*. That link is a similarity link, which accounts for the fact that the same word is used on the basis of the fact that both senses involve the application of paint to a surface. The art sense is, of course, defined with respect to an art frame, which characterizes our knowledge of painting in art. Thus, we have three systematically related senses of the word *paint* -- none of which means "cause to cover surface with paint" and no more. Cognitive semantics thus allows us to represent our detailed knowledge of the meanings of the verbs as well as representing our knowledge of how the noun and the two verbs are systematically related. Note that cognitive semantics is neither a meaning postulate theory nor a DD theory.

In addition, cognitive semantics allows for categorization. Thus, within both the covering frame and the art frame, there is an activity which is categorized as causation, that is, it is an instance of a generalized causation frame, which is characterized by the causation prototype that I suggested in (Lakoff, 1977). Thus, there are three relevant frames -- (1) the causation frame, (2) the maintainance-painting frame, and (3) the artistic-painting frame. Each of these frame characterizes a prototype. The two senses of the verb *paint* are defined by frames (2) and (3), neither of which means simply to cover with paint.

The GB Mistake

We can now see the fundamental error of the GB analysis. As GB point out, when Michaelangelo dipped his brush into Cerulian blue, he did not thereby paint his brush, even though he did thereby cause the surface of his brush to be covered with paint. This is just what a cognitive semantic analysis would predict. The reason is that dipping one's brush into paint is not an instance of the activity of painting in either frame (2) or frame (3). However, such an act of dipping *is* a prototypical act of causation, in that it is a direct manipulation of the brush. Prototypical dipping-a-paintbrush is a form of prototypical causation, but not of prototypical painting, or of painting at all.

GB take this example as being an argument against prototypical causation, but it is not. It is completely consistent with a causation prototype, as well as with painting-for-maintainance prototypes and painting-for-art prototypes. Their argument is only an argument against a silly analysis that has never been proposed.

Incidentally, such a cognitive semantic analysis is entirely consistent with the acquisition data that GB cite from Bowerman. As GB observe, Bowerman has found cases of overextension in the second stage of the acquisition of causatives. These observations can be summarized as follows:

Stage 1: Children have acquired transitives like "hit", "open", and "break", which have corresponding intransitives. The transitives apply only to what I have called cases of prototypical causation. Children have not acquired a general rule relating intransitives and corresponding transitives.

Stage 2: Children acquire a general rule relating intransitives to corresponding

causative transitives. The children "overgeneralize" relative to the adult rule. The adult rule is constrained to prototypical causatives. The children's overgeneralizations extend to nonprototypical causatives. That is, children use their new causative forms synonymously with periphrastic causatives, which are emerging simultaneously.

Stage 3: Children learn the adult rules, according to which the causative forms are limited to prototypical causation and the periphrastic forms are limited to nonprototypical causation.

Here is how these data might be looked at from the point of view of cognitive semantics:

During stage 1, the child must be able to distinguish prototypical from nonprototypical cases of causation, since causative verbs like *break*, *hit*, *open*, etc. are not used for nonprototypical cases.

By the beginning of stage 2, the child must have acquired a prototype-based category of causation. This means that both prototypical and nonprototypical cases are both members of the category, but prototypical cases are better examples.

During Stage 2, the child learns a lexical rule that makes reference to the category of causation. Though the category is established on the basis of generalizations over the prototypical cases, it automatically extends to nonprototypical cases, as prototype-based categories usually do.¹

¹Note that "lexical rule" here means a generalized metonymy of the form: A change may stand for the cause of that change. This sanctions polysemic links between inchoatives and causatives within lexical networks.

At stage 3, the child learns that the category used in the lexical rule must be restricted to prototypical cases, unlike most prototype-based categories. Moreover, the child must learn that the periphrastic cases must be restricted to *nonprototypical* cases of causation.

Thus, within a theory of cognitive semantics, prototype causation makes sense of the Bowerman data.

What about the GB proposal? It claims not to use a prototype for causation, but in fact it sneaks in just such a prototype in the guise of a "conceptual stereotype". In short, there is no question that there is prototype causation. And there is no doubt that the adult system makes the distinction between lexical and periphrastic causatives on the basis of a conceptual distinction between prototypical causation and nonprototypical causation.

It should be mentioned in closing that GB oversimplify the adult data. The syntax of causatives in English shows at least a three-way distinction: lexicalized causatives (e.g., *kill*, *break*), nonfinite periphrastics (e.g., *cause to die*), and finite periphrastics (e.g., *bring it about that he dies*). As Lakoff and Johnson (1980, pp. 128-132) observe, there is an iconic principle at work in English in which directness of causation is reflected in the closeness between the morphemes expressing causation and change. When they are in the same word (ultimate closeness), causation is most direct (prototypical causation). In infinitival periphrastics (intermediate closeness), we get a deviation from prototypical causation, and in finite periphrastics (least closeness), we get the greatest deviation from the prototype. What is important about this is that there are *degrees* of deviation from prototypical causation represented in English grammar. This suggests a prototype

structure rather than the mere occurrence or nonoccurrence of a "conceptual stereotype". If there is a "conventionalized stereotype", it must work just like a prototype, that is, it must have degrees of deviance that are conventionally represented in the grammar.

My views on causative prototypes were designed to fit in with the developing theory of cognitive semantics. For those readers not familiar with the basic literature in that field, I am including a selected annotated bibliography:

Selected Annotated Bibliography

Brugman, Claudia. 1981. *Story of Over*. University of California, Berkeley, M.A. Thesis. Available from the Indiana University Linguistics Club, Bloomington, Indiana.

This is one of the most detailed studies ever done of the relationships among the senses of a single lexical item. Brugman considers nearly 100 senses of *over*. She argues that the senses are characterizable by image-schemas and independently necessary metaphors applying to them. The senses form a radial structure, with a central sense and other senses linked to it by image-schema transformations and metaphors.

Brugman, Claudia. 1983. Extensions of Body-part Terms to Locating Expressions in Chalcatongo Mixtec. In University of California, Berkeley, Report No. 4 of the Survey in California and Other Indian Languages. 

Casad, Eugene. 1982. *Cora Locutionals and Structured Imagery*. University of California, San Diego Ph.D. Dissertation.

The studies by Brugman on Mixtec and Casad on Cora demonstrate that space is conceptualized in those languages in a way that is radically different from the conceptualization of space in Indo-European languages. In Mixtec, relative spatial location is conceptualized in terms of the metaphorical projection of body-part concepts onto objects. In Cora, there is an extensive system of locational morphemes. Each phoneme in such a morpheme designates an image-schema, and the meaning of the morpheme is given by the superimposition of all the schemas.

Fauconnier, Gilles. 1985. *Mental Spaces*. Cambridge, Mass.: MIT Press.

Within cognitive semantics, mental spaces play many of the roles that possible worlds and Barwise-Perry situations play in objectivist semantics. They are partial models. They contain (mental) entities. They permit the explicit statement of conditions of satisfaction. Entailment can be characterized relative to them. They bear relations to one another. But they are cognitive in nature; they are not interpretable as fitting objectivist metaphysics. Mental spaces provide the apparatus needed for a precise cognitive model theory, without the limitations of objectivist philosophy. Fauconnier's book presents a unified account of metonymy, presupposition and referential opacity making use of mental spaces, connectors, and cognitive strategies. The strategies are formalized versions of the following:

- Avoid contradictions within a space.
- Distinguish between foregrounded and backgrounded elements.
- Maximize common background assumptions across adjacent spaces.
- Currently foregrounded elements are subsequently backgrounded.

Fauconnier demonstrates that these simple intuitive strategies provide a simultaneous solution for both referential opacity and the projection problem for presuppositions.

Fillmore, Charles. 1975. An Alternative to Checklist Theories of Meaning. In *Proceedings of the First Annual Meeting of the Berkeley Linguistics Society*.

Fillmore, Charles. 1976. Topics in Lexical Semantics. In P. Cole, ed., *Current Issues in Linguistic Theory*. Bloomington: Indiana University Press.

Fillmore, Charles. 1978. The Organization of Semantic Information in the Lexicon. In *Chicago Linguistic Society Parasession on the Lexicon*.

Fillmore, Charles. 1982a. Towards a Descriptive Framework for Spatial Deixis. In Jarvella and Klein, eds., *Speech, Place, and Action*. London: John Wiley.

Fillmore, Charles. 1982b. Frame Semantics. In Linguistic Society of Korea, eds., *Linguistics in the Morning Calm*. Seoul: Hanshin.

Fillmore, Charles. 1985. Frames and the Semantics of Understanding. *Quaderni di Semantica*.

Within frame semantics, lexical items are defined relative to frames (which are akin to cognitive models, schemas, scripts, etc.). Frames characterize a unified and idealized understanding of an area of experience and Fillmore argues that meaning must be defined in terms of such understandings, not in terms of truth conditions. The principle data that Fillmore draws on is the semantic relationships holding among

words within semantic fields.

Gentner, Dedre and Donald R. Gentner. 1982.³ Flowing Waters or Teeming Crowds: Mental Models of Electricity. In D. Gentner and A.L. Stevens, eds., *Mental Models*. Hillsdale, N.J.: Erlbaum.

The authors show that reasoning about electricity by students learning about it is done using metaphorical models. The students get different answers to problems based on the metaphorical models used. The study is significant for cognitive semantics since it demonstrates that metaphorical models are used in reasoning, which contradicts objectivist cognition and supports cognitive semantics.

Holland, Dorothy, and Naomi Quinn, eds. 1987. *Cultural Models in Language and Thought*. Cambridge University Press.

This volume includes a number of papers that show the utility of cognitive semantics for characterizing culture-specific concepts. Quinn's paper is of special interest in its discussion of the use of image-schemas and metaphor in the characterization of the concept of marriage in America.

Janda, Laura. 1984. *A Semantic Analysis of the Russian Verbal Prefixes ZA-, PERE-, DO-, and OT-*. University of California, Los Angeles Ph.D. Dissertation.

The semantics of the Russian verbal prefixes has been a perennial problem in Slavic linguistics. Using techniques of image-schematic analysis developed by Lindner, 1981 and Brugman, 1981, Janda is able to display for the first time the regularities among the many senses of four

extremely complex verbal prefixes.

Johnson, Mark. 1987. *The Body In The Mind: The Bodily Basis of Reason and Imagination*. Chicago: University of Chicago Press.

Johnson argues that our everyday bodily experiences are *preconceptually* structured by image-schemas, and that such structuring in our bodily experience provides the basis for our understanding of image-schematic concepts. It is by this means that the body plays a central role in characterizing rational processes. Johnson's book plays a central role in the characterization of experientialist cognition.

Kay, Paul. 1979. The Role of Cognitive Schemata in Word Meaning: Hedges Revisited. Unpublished ms., Berkeley Cognitive Science Program.

Kay, Paul. 1983. Linguistic Competence and Folk Theories of Language: Two English Hedges. In *Proceedings of the Ninth Annual Meeting of the Berkeley Linguistics Society*. pp. 128-137. Reprinted in Holland and Quinn.

The theory of objective reference is a key part of objectivist cognition. Within contemporary philosophy there are two contending theories -- Frege's view that sense determines reference and the Putnam-Kripke theory of direct reference. Kay observes that English contains expressions such as *strictly speaking*, *loosely speaking*, and *technically* whose meaning concerns the way reference is fixed. *Strictly speaking* and *loosely speaking* are defined relative to a folk version of the Fregean view, while *technically* is defined relative to a folk version of the Kripke-Putnam theory. Kay argues that this makes sense under

Fillmore's theory that words are defined relative to cognitive schemata. In this case, the two cognitive schemata are about reference and are mutually inconsistent. But the meanings of these expressions cannot be given by association with anything in the external mind-free world. The reason is that the expressions are defined in terms of two mutually inconsistent accounts of reference, while at most one of these accounts of reference could be true objectively.

Lakoff, George and Mark Johnson. 1980. *Metaphors We Live By*. Chicago: University of Chicago Press.

The book presents evidence that the phenomenon of metaphor can best be explained in terms of conceptual mappings from one conceptual domain to another. Under such a characterization, the meanings of a large proportion of ordinary everyday language can be seen to involve such mappings. The book argues that such a view of meaning is inconsistent with objectivist cognition.

Lakoff, George. 1986. *Women, Fire, and Dangerous Things: What Categories Reveal About the Mind*. Chicago: University of Chicago Press.

Since most reasoning concerns categories, empirical studies of categorization bear crucially on theories of the nature of meaningful thought. This book surveys research on categorization, especially research on basic-level categories and prototype theory. It argues that this research disconfirms objectivist cognition and confirms a version of cognitive semantics. The book also outlines a general theory of cognitive semantics and cognitive grammar and presents three detailed case studies that support the theory.

Langacker, Ronald W. 198^f. *Foundations of Cognitive Grammar*, Vol. 1. Stanford: Stanford University Press.

This is the first of two monumental volumes laying out foundations for a general theory of cognitive semantics and a theory of grammar based on it. Langacker gives a meticulously detailed and carefully thought out account of his theory of "images" (what I have called "image-schemas") and of the cognitive operations needed to operate on them. The volume contains a great many insightful analyses of semantic phenomena.

Langacker, Ronald, and Eugene Casad. 1985. "Inside" and "Outside" in *Cora Grammar*. *International Journal of American Linguistics*.

An oversimplified version of one chapter of Casad's dissertation. It is an accessible and short discussion of one aspect of the conceptualization of space in *Cora*.

Lindner, Susan. 1981. *A Lexico-Semantic Analysis of Verb-Particle Constructions with Up and Out*. University of California, San Diego. Ph.D. Dissertation. Available from the Indiana University Linguistics Club.

Lindner, Susan. 1982. What Goes Up Doesn't Necessarily Come Down: The Ins and Outs of Opposites. In *Proceedings of the Eighteenth Regional Meeting of the Chicago Linguistic Society*.

Lindner's dissertation represented a major advance in the description of polysemy using image-schemas and metaphors. Lindner took up a question that was previously thought to be intractable: How are the senses of particles, such as the *out of figure out*, *space out*, and *fill out*, related

to one another. Lindner took as data more than 600 examples of *out* and more than 1200 example of *up* in verb-particle constructions. She showed that systematic semantic regularities appear once image-schemas and metaphors are taken into account in the semantics. In the process, she discovered the existence of reflexive variants of image-schemas.

Putnam, Hilary. 1981. *Reason, Truth, and History*. Cambridge: Cambridge University Press.

Prior to this book, Putnam was one of the principal figures in objectivist philosophy. His functionalism thesis laid the contemporary philosophical foundation for the idea that thought is the manipulation of symbols that get their meaning by being related to things in the world. In his classic paper "The meaning of *meaning*", he had both argued for the theory of direct reference and proposed a way of reconciling the objectivist account of meaning with a schema-based account of cognitive meaning (which he discussed under the rubric of "stereotypes"). In this book, Putnam rejects his former views about meaning and reference. He argues on the basis of a theorem proved in an appendix that all "metaphysical realist" accounts of meaning and reference are internally incoherent, and that his own functionalist thesis, on which objectivist cognition depends, is equally mistaken. In short, he proves that meaning cannot be based on truth and that the very idea that there can be a theory of reference is based on a mistaken philosophy. Putnam's ideas are discussed in great detail in Lakoff, 1986, chapter 15.

Reddy, Michael. 1979. The Conduit Metaphor. In A. Ortony, ed., *Metaphor and Thought*. Cambridge University Press.

This is a classic paper showing the role of metaphor in cognition. Reddy shows that most of our language about communication is based on a single metaphor -- the conduit metaphor. Reddy discusses in detail how the metaphor is used in reasoning about communication and what aspects of communication the metaphor hides.

Sweetser, Eve E. 1984. *Semantic Structure and Semantic Change*. University of California, Berkeley Ph.D. Dissertation. ~~Revised version~~ To be published by Cambridge University Press, under the title, From Etymology to Pragmatics: The Mind-as-Body Metaphor.

Sweetser argues that the historical change of word meaning can only be accounted for by a cognitive semantics that makes use of image-schemas and metaphors. She also argues that the meanings of modal verbs in English (e.g., *must*, *may*, *can*, etc.) are metaphorical in nature and are based on Talmy's "force images".

Talmy, Leonard. 1972. *Semantic Structures in English and Atsugewi*. University of California, Berkeley Ph.D. Dissertation.

Talmy, Leonard. 1975. Semantics and Syntax of Motion. In J. Kimball, ed., *Syntax and Semantics*, Vol. 4. New York: Academic Press.

Talmy, Leonard. 1978. Relation of Grammar to Cognition. In D. Waltz, ed., *Proceedings of TINLAP-2 (Theoretical Issues in Natural Language Processing)*. Champaign, Ill.: Coordinated Science Laboratory, University of Illinois.

Talmy, Leonard. 1985. Force dynamics in language and thought. *Papers from the Parasession on Causatives and Agentivity*. Chicago: Chicago Linguistic

Society.

Talmy's work, over many years, has contributed to the development of cognitive semantics in many areas, especially to the role of image-schemas in cognition. His was the earliest detailed research in this area.

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