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Discussion

Why many concepts are metaphorical

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The study of concepts in psychology has historically had little to say about the possible influence of metaphor on mental representation. This silence is not terribly surprising given the long-standing view that metaphor is an ornamental, even deviant, form of language bearing no relation to how people actually conceptualize of objects, individuals, events, and abstract ideas. But in the last 20 years there has been an explosion of research in cognitive science on metaphor and related topics. A significant part of this research, most notably studies from cognitive linguistics and psycholinguistics, suggests that metaphor is not merely a figure of speech, but is a specific mental mapping that influences a good deal of how people think, reason, and imagine in everyday life (Gibbs, 1994; Johnson, 1987, 1993; Lakoff and Johnson, 1980; Lakoff, 1987; Lakoff and Turner, 1989; Sweetser, 1990; Turner, 1991). One of the most provocative claims of this work is that many concepts, especially abstract ones, are structured and mentally represented in terms of metaphor.

In his paper "On metaphoric representation," Gregory Murphy argues that metaphor might only have a limited role in the acquisition and representation of many concepts. He suggests that a theory of structural similarity provides a more satisfactory account of the linguistic and psychological data, thus greatly reducing, or eliminating, the need for metaphorical concepts. Murphy deserves credit for raising important questions about the possible role of metaphor in a psychological theory of conceptual structure. However, Murphy misunderstands aspects of the evidence for metaphorical concepts, accepts unquestionably certain assumptions about what a psychological theory of concepts must be like, and ignores the role of human embodiment in theories of metaphor, all leading him to underestimate the significance of cognitive linguistic and psycholinguistic work on metaphorical thought. Space limitations prevent me from commenting in this reply on all of Murphy's arguments, but I will address some of his main points against metaphoric representations.

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1. Why do people speak metaphorically?

Perhaps the most fundamental problem Murphy has with the cognitive linguistic evidence in favor of metaphoric representations is that it is based on the analysis of linguistic expressions. He repeatedly argues that nonlinguistic evidence must be obtained before one can accept any aspect of the possibility that people conceptualize of many experiences in terms of metaphor.[1]

I agree that cognitive scientists must be cautious in inferring direct links between language and thought. At the same time, it is interesting and important to ask why is it that people talk about the world and their experiences in the ways that they do. Until the emergence of cognitive linguistics, scholars never recognized the systematic ways people talked about love, to take just one example, in a wide variety of languages, nor did scholars consider the idea that such talk might reflect important generalizations about people's metaphorical conceptualizations of love. Individual linguistic expressions, such as *We can't turn back now* and *We're spinning our wheels*, were perceived to reflect entirely different, and mostly dead, metaphors. We speak about love in the ways we do simply because of arbitrary conventions that people agree to follow for communicative purposes. Murphy embraces this view when he claims, for example, that the reason people talk about love in terms of journeys, but not the other way around, is merely a matter of pragmatics – we just find love a more interesting topic to discuss and consequently search for other domains with similar structure to facilitate how we speak about love. Under this view, there is no reason why people shouldn't in principle be able to understand someone talking about journeys in terms of love experiences – we simply just don't find it necessary to talk that way.

The problem with Murphy's position is that people generally can't understand talk about journeys in terms of love for the important reason that we don't generally think about journeys in that way.[2] On the other hand, we do conceptualize of love via our more concrete understanding of journeys. This

[1] There is some irony in this criticism given that the vast majority of studies in cognitive psychology on concepts, categorization, problem-solving, decision-making, learning, and memory use linguistic stimuli. Many theories of conceptual structures are based on people's use and understanding of the relations between terms such as *animal*, *bird*, and *sparrow* or of their interpretation of novel combinations such as *finger toy* (Murphy, 1988). Language has always been seen as a window to the mind, one reason why language studies are so important to cognitive psychology, especially if we wish to understand something about abstract concepts and not just people's categorization behavior when given dot patterns and colored triangles and squares. It seems odd, then, to criticize the cognitive linguistic and psycholinguistic evidence on metaphoric representations because, among other things, these studies focus on linguistic structure and behavior.

[2] Speakers certainly can create metaphoric expressions that express bizarre mappings between highly dissimilar domains of experience or even reverse typical source to target domain mappings (e.g., Shakespeare's *To trip the light fantastic* means "to dance"). But these "one-shot" phrases often require special contexts in which to be understood or further elaboration by the speaker as to what such expressions might actually mean. Ordinary listeners rarely understand, tacitly or otherwise, why such "one-shot" expressions mean what they do in the way people can understand the metaphorical motivation for most conventional expressions.

asymmetrical relationship between our concepts of love and journey can't be accounted for by the structural similarity view Murphy advocates because it obscures the directionality of the mapping between source (e.g., journeys) and target (e.g., love) domains. Although metaphor is not the only domain in which asymmetry is found, the experimental evidence is overwhelming that uni-directionality is a primary feature of metaphor (Glucksberg and Keysar, 1990; Ortony, 1979; Ortony et al., 1985; Shen, 1992).[3] The reason for this directionality in metaphorical mappings is that target domains tend to be more vague and incomplete than are source domains. Metaphors in thought (e.g., LOVE IS A JOURNEY) and language (e.g., *Our marriage has taken a wrong turn*) arise when people struggle to make greater sense of these less well-understood aspects of their experience. Even theories that focus on structural similarity, which Murphy embraces, such as structure-mapping theory (Gentner and Clement, 1988; Markman and Gentner, 1993), acknowledge that in comparison statements the source representation possesses a more coherent structure (e.g., a richer system of causal or explanatory connections) than does the target representation.

Murphy argues that the directionality in similarity statements can be explained in terms of factors such as typicality rather than having to appeal to uni-directional, metaphoric mapping. But what makes journeys more typical than love? The problem with this alternative idea is that typicality is difficult to assess in judging instances from different categories (see Glucksberg and Keysar, 1990). Murphy's structural similarity position is also inconsistent with different experimental evidence demonstrating that the topic and vehicle terms in verbal metaphors do not have to share abstract relations prior to being interpreted as components of a metaphor (Camac and Glucksberg, 1984; Tourangeau and Rips, 1991). Moreover, Murphy dismisses the strong view of metaphoric representations in part because it remains a bit unclear as to which aspects of the source domain are mapped onto the target domain. There are many theories and dozens of experimental studies that have explore what gets mapped in metaphor comprehension (see Gibbs, 1994). The fact that there remains disagreement over this, and the fact that Murphy seems to not have his own response, should not be taken as a reason to reject the idea of metaphoric representations.

A related part of Murphy's argument against metaphoric representations is seen in his discussion of the cognitive linguistic work on polysemy. Once again, Murphy questions whether demonstrations of the metaphoric nature of the way people speak necessarily informs us about people's mental representation for words and concepts. Murphy argues that polysemy can be best described in terms of the abstract similarity between physical and nonphysical senses of a word without any need for postulating the existence of metaphor. Thus, the use of *rise* to refer to both physical (e.g., *The water level rose*) and nonphysical (e.g., *Inflation is rising*) meanings can be explained by the literal similarity of these meanings –

[3] None of this implies that target domains never influence our understanding and mental representation of source domains (Turner and Fauconnier, 1995).

there is no reason to assume that speakers metaphorically infer the nonphysical meaning from the physical one.

Despite several linguistic proposals in favor of this idea (Jackendoff, 1990; Ruhl, 1989), many cognitive linguistic studies demonstrate the near impossibility of specifying the abstract features or relations of similarity that underlie all the different senses of a polysemous word (Brugman and Lakoff, 1988; Fillmore, 1982; Herskovits, 1986; Lindner, 1983; Rice, 1992; Sweetser, 1990). In fact, some advocates of the abstract similarity, or monosemy, view even admit that the similarity that supposedly exists between all the physical and nonphysical senses of many words is so abstract as to be semantically unspecifiable (Ruhl, 1989). We are asked, then, if Murphy is right, to accept as a matter of faith the idea that abstract relations exist and, for the purposes of theories of mental representation, are actually encoded as part of a speaker's knowledge of the meanings of polysemous words. Unfortunately, this view is inherently unfalsifiable in that there is practically no way of testing this theory against alternative possibilities.

The cognitive linguistic research has demonstrated that metaphor, in addition to metonymy and several other relations, provides an important process by which the different senses of words are linked together to form linguistic representations (Brugman and Lakoff, 1988; Lindner, 1983; Rice, 1992; Sweetser, 1990). Sweetser's (1990) work is especially relevant because she has shown in detail how many polysemous words in Indo-European languages acquired their nonphysical meanings via metaphorical extensions from earlier acquired, concrete, physical meanings. To take just one example, metaphorical mappings between the idea of visually seeing things to intellectually understanding things defines a pathway for semantic change. The presence of conceptual metaphors like UNDERSTANDING IS SEEING explains not only how words change their meanings historically (i.e., why the physical sense of *see* gets regularly extended via metaphor at a later point to have a nonphysical meaning), but also motivates for contemporary speakers just why it is that polysemous words have the specific meanings they do (e.g., why it just makes sense to us to talk about understanding ideas using expressions like *I clearly see the point you're making in this essay*). The structural similarity view provides no explanation of why the same kinds of meaning changes recur in the history of many Indo-European languages where nonphysical or abstract meanings are acquired by metaphoric extension *after* physical, concrete senses are acquired.

It seems clear that some version of metaphoric representations is needed to account for the asymmetrical relationships between source and target domains in people's use of both polysemous word meanings and the meanings of many conventional, as well as novel, linguistic expressions. At the very least, psychologists must explain something about why people talk about concepts in the metaphorical ways they do. The challenge here is to account for the precise inference patterns of meaning that people employ in talk about concepts without employing metaphorical cognition. My argument, in part, is that there is no reason to abandon the idea of metaphoric representations until psychologists embracing nonmetaphorical theories, such as the structural similarity view, have demonstrated in detail that they can explain the linguistic evidence.

2. Are metaphorical concepts independent?

In his discussion of the strong and weak views of metaphorical representations, Murphy focuses on the difficult problem of determining to what extent concepts like argument and love are metaphorically structured and represented independently from their prospective source domains. Consider Murphy's discussion of what he calls the problem of multiple metaphors. According to cognitive linguistics analyses, the concept of love, for example, can be understood through several different metaphors (e.g., LOVE IS A JOURNEY, LOVE IS INSANITY, LOVE IS AN OPPONENT, LOVE IS A VALUABLE COMMODITY). The entailments of these different metaphors vary in certain respects. Thus, LOVE IS A JOURNEY refers to the structure of a love relationship over time, whereas LOVE IS AN OPPONENT personifies love as an opponent against whom we often struggle. These different metaphors appear, at times, to be inconsistent with one another and it is unclear, in Murphy's view, how one resolves such inconsistencies in the mental representation for our concept of love. Murphy warns that the multiple metaphors structuring our concept of love leave no room for all of them to co-exist.

This argument appears to preserve a view of mental representations in which the attributes of each concepts must fit together like pieces of a jigsaw puzzle. Murphy seems to believe that concepts must be fixed, static structures. He assumes without justification that concepts are monolithic entities which must be internally consistent. But there is no special reason why human conceptual systems must be like jigsaw puzzles. Why can't people possess alternative ways of construing the same experience? Various linguistic, psychological, and anthropological evidence shows that each of us may make sense of certain experiences in different metaphorical ways at different times. This seems to be especially true for experiences and/or ideas that do not come with a clearly delineated structure of their own, such as logical arguments (Lakoff and Johnson, 1980), different emotion concepts (Kovecses, 1986; Lakoff, 1987), and concepts of words (Kay, 1979). The fact that people possess alternative, metaphorical models of many experiences and abstract ideas is not at all a problem because two different conceptualizations are often needed to solve different types of real-world, science problems (Gentner and Gentner, 1983; Kuhn, 1970).

The so-called problem of multiple metaphors for concepts can be easily handled if we view concepts not as fixed, static structures but as temporary representations that are dynamic and context-dependent. Under this view, concepts are temporary, independent constructions in working memory created on the spot from generic and episodic information in long-term memory. Because temporary conceptualizations are doing the traditional work of concepts in controlling categorization behavior, it is important in this view to refer to these as *concepts*, and to use *knowledge* for referring to the body of information in long-term memory from which concepts are constructed (Barsalou, 1993).

If we view concepts as dynamic, temporary representations, then we can easily understand how different metaphorical mappings might operate to help people

make sense of their experiences and solve different problems in their everyday lives. The LOVE IS A JOURNEY metaphor might be used to create a particular conceptualization of love in certain situations, while LOVE IS AN OPPONENT might be more appropriate to use in forming a concept in other situations. These alternative ways of thinking about human concepts allow, even encourage, the use of multiple metaphors to access different aspect of our rich knowledge about love to differentially conceptualize of these experience at various moments of our experience (see Quinn, 1991 for a discussion of how different marriage metaphors help structure different aspects of people's concepts for marriage). Each metaphoric construal of a concept in some context results in a concept that is independent as a temporary representation apart from source domain information in long-term memory.

3. The need for nonlinguistic evidence

Murphy argues that nonlinguistic evidence is needed to support the claims about metaphoric representations, especially if there is to be a solution to the circularity problem in which linguistic analyses are used to infer conceptual structures whose existence is then verified by appeal to linguistic expressions. But there has been a significant amount of psychological research showing the influence of metaphors in gesture, categorization, problem-solving, decision-making, learning, and memory (again, see Gibbs, 1994). Cognitive psychologists should take a close look at these studies to assess the extent to which they may, or may not, suggest some version of metaphoric representations. These empirical studies illustrate, at the very least, that providing someone with a particular way of metaphorically construing an idea or situation clearly affects many aspects of how people learn, remember, solve problems, and make decisions.

Murphy dismisses many of the psycholinguistic studies on the metaphorical motivation for why certain expressions mean what they do because these studies only address how specific linguistic expressions, such as idioms, are understood and represented. Yet a closer look at some of this research shows that important connections exist between people's nonlinguistic understanding of many concepts and their use and understanding of various metaphorically motivated linguistic expressions.

Consider, as one example, the psycholinguistic studies on why idioms mean what they do (Gibbs, 1992). In these studies, I specifically examined whether complex idiomatic meanings for expressions can be partly predicted based on the independent assessment of people's nonlinguistic, and in part, embodied, understanding of particular source domains. For instance, cognitive linguistic work suggest that people make sense of idioms such as *blow your stack*, *flip your lid*, and *hit the ceiling* because they metaphorically conceptualize of anger in terms of heated fluid in a container (Kovecses, 1986; Lakoff, 1987). Even though the existence of this conceptual metaphor does not predict that certain idioms or conventional expressions *must* appear in the language, the presence of this

independent conceptual metaphor provides a partial motivation for why specific phrases (e.g., *blow your stack, get pissed off*) are used to refer to particular events (e.g., getting very angry).

By looking at the inferences that arise from the mapping of people's nonlinguistic knowledge of heated fluid in a container onto the idea of anger, one can make specific predictions about what various idioms motivated by ANGER IS HEATED FLUID IN A CONTAINER actually mean. To do this, participants in the first of series of experiments were questioned about their understanding of events corresponding to particular source domains in various conceptual metaphors (e.g., the source domain of heated fluid in a container for ANGER IS HEATED FLUID IN A CONTAINER).[4] Overall, the participants were remarkably consistent in their responses to the various questions. To give one example, people responded that the cause of a sealed container exploding its contents out is the internal pressure caused by the increase in the heat of the fluid inside the container, that this explosion is unintentional because containers and fluid have no intentional agency, and that the explosion occurs in a violent manner. This provides a rough, nonlinguistic profile of people's understanding of a particular, independent source domain concept.

Other studies indicated that people's intuitions about various source domains map onto their conceptualizations of different target domains in very predictable ways. For instance, when people understand anger idioms, such as *blow your stack, flip your lid,* or *hit the ceiling,* they inferred that the cause of anger is internal pressure, that the expression of anger is unintentional, and is done is an abrupt, violent manner.[5] People do not draw the same inferences about causation, intentionality, and manner when comprehending literal paraphrases of idioms, such as *get very angry.* Additional experiments showed that people find idioms to be more appropriate and easier to understand when they are seen in discourse contexts that are consistent with the various entailments of these phrases, which, again, were predicted in advance from the nonlinguistic analysis of the source domain concepts.

These findings are hard to reconcile with the view that the figurative meanings of idioms are determined only on the basis of their individual lexical items or have the meanings they do for historically opaque reasons (cf. Keysar and Bly, 1995; Stock et al., 1993). More generally, though, these psycholinguistic studies are important because they provide independent, nonlinguistic ways of predicting something about the specific metaphorical meanings some linguistic expressions are likely to possess (also see Gibbs et al., 1994). Of course, none of this directly implies that people ordinarily access metaphorical knowledge when they immediately process each and every idiom (see Gibbs et al., 1996; and Glucksberg et al., 1993 for different perspectives on this question). Another of the important

[4] The participants were not told anything about the relations of these questions to issues of language use, much less the meanings of idioms.

[5] Control studies showed that the meanings of the individual words in idioms are not *by themselves* sufficient to account for the complex inferences people have about the meanings of idioms.

challenges for psychologists and cognitive linguistics is to be quite specific about the conditions in which different metaphorical, nonlinguistic knowledge is employed in how people make sense of and process linguistic expressions (Gibbs, 1994).

4. The embodied motivation for metaphorical concepts

Murphy raises one important question on the motivation for metaphorical representations. Why is it that certain conceptual metaphors, but not others, are used by people in speaking about abstract concepts? In discussing this question, Murphy never considers the large literature suggesting that much metaphorical thinking arises from our embodied experiences in the world (Johnson, 1987; Lakoff, 1987, 1990). For example, central to our understanding of the conceptual metaphor ANGER IS HEATED FLUID IN A CONTAINER is the embodied experience of containment. We have strong kinesthetic experiences of bodily containment ranging from situations in which our bodies are in and out of containers (e.g., bathtubs, beds, rooms, houses) to experiences of our bodies as containers in which substances enter and exit. An important part of bodily containment is the experience of our bodies being filled with liquids including stomach fluids, blood, and sweat. Under stress, we experience the feeling of our bodily fluids becoming heated. These various, recurring bodily experiences give rise to the development of an experiential gestalt, called an *image schema*, for CONTAINMENT (Johnson, 1987).

Image schemas emerge throughout sensorimotor activity as we manipulate objects, orient ourselves spatially and temporally, and direct our perceptual focus for various purposes. Image schemas cover a wide range of experiential structures that are pervasive in experience, have internal structure, and can be metaphorically elaborated to provide for our understanding of more abstract domains (Gibbs and Colston, 1995; Johnson, 1987; Lakoff, 1987). Our CONTAINMENT schema, to continue with this example, is metaphorically elaborated in a large number of abstract domains of experiences (e.g., concepts about emotions, the mind, linguistic meaning, moral obligations, social institutions). Moreover, this schema helps motivate some of the complex ways that we structure single abstract concepts. For instance, the conceptual metaphor ANGER IS HEATED FLUID IN A CONTAINER takes the image schema for CONTAINMENT as part of its source domain and maps this image-schematic structure onto anger, which gives rise to a number of interesting entailments. Thus, we know that when the intensity of anger increases, the fluid in the container rises (e.g., *His pent-up anger welled up inside of him*), we know that intense heat produces steam and creates pressure on the container (e.g., *Bill is getting hot under the collar, Jim's just blowing off steam*, and *He was bursting with anger*), and we know that when the pressure of the container becomes too high, the container explodes (e.g., *She blew up at me*). It is difficult to explain the richness of these metaphorical inferences without appealing to people's embodied experiences for heated fluid in containers that are

then metaphorically projected to help individuals make sense of their anger experiences. Children's kinesthetic, embodied experiences as containers provides exactly the kind of foundation they need to understand many conventional metaphors about anger – we need not assume that children must have sophisticated theories about physics for them to have a metaphorical concept for anger.[6]

The embodied motivation for metaphor provides a natural, non-arbitrary reason for why people regularly construct the asymmetrical metaphorical mappings they do to better understand many abstract concepts. I'm not arguing that people learn to form metaphorical representations only from their embodied experiences, because their experience with the language itself will help them to tacitly infer via generalization many metaphorical concepts. But it is clear that there are important links between people's recurring bodily experiences, their metaphorical projections of these image schemas to better structure many abstract concepts, and the language used to talk about these concepts.[7]

5. Conclusion

The evidence on the embodied, metaphoric nature of many abstract concepts presents cognitive psychologists, and others, with a distinct set of challenges. First, we no longer need to argue over whether all of thought is metaphoric or not. Nobody claims that all human cognition is shaped by metaphor. Nor does any one claim that all metaphors are motivated by or understood in exactly the same way (see Lakoff and Turner, 1989). There is enough evidence now from linguistics and psychology on the possibility that people construe many concept in terms of metaphor to suggest that psychologists actually conduct additional experimental studies to see if, when, and how much, certain concepts are metaphorically represented. These studies must focus on the extent to which any individual concept is constituted by both metaphorical and nonmetaphorical schemes of thought, as well as different linguistic and social information. Particular care is needed to make sure that the appropriate experimental methodologies are used to assess different aspects of metaphorical representations (i.e., learning, categorization, problem-solving, making sense of language vs. on-line language comprehension). We have come to the point that simply arguing against metaphoric

[6] See Gibbs and Colston (1995) and Mandler (1992) for discussion on how image schemas form the building blocks for many of children's concepts.

[7] Murphy asks why the concept of happiness is understood in terms of being spatially up and not in terms of down. A closer look at the important cognitive linguistic work on embodiment in metaphor provide a good answer to this question. The conceptual metaphors HAPPY IS UP and SAD IS DOWN are illustrated by the following linguistic expressions: *I'm feeling up. That boosted my spirits. My spirits rose. You're in high spirits. Thinking about her always gives me a lift. I'm feeling down. I'm depressed. He's really low these days. I fell into a depression. My spirits sank.* These expressions reflect the recurring bodily experiences that drooping posture typically goes along with sadness, depression, and ill-health, while erect postures are associated with positive emotional states, good health, and higher states of consciousness.

representations without actually testing for the presence of metaphor in many concepts is no longer sufficient. Most cognitive psychologists interested in theories of mental representation have not yet begun to do this kind of empirical work. Gregory Murphy has outlined some possible ways of thinking about and studying the possibility of metaphorical representations. But it's fair to say that a closer look at the linguistic and experimental evidence on metaphoric language and thought paints a very different, much more positive, picture of metaphor's significant role in human cognition.

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References

Barsalou, L. (1993). Flexibility, structure, and linguistic vagary in concepts: Manifestations of a compositional system of perceptual symbols. In A. Collins, S. Gathercole, M. Conway, & P. Morris (Eds.), *Theories of memory* (pp. 22–101). Hillsdale, NJ: Erlbaum.

Brugman, C., & Lakoff, G. (1988). Cognitive topology and lexical networks. In S. Small, G. Cotrell, & M. Tannenhaus (Eds.), *Lexical ambiguity resolution* (pp. 477–508). Palo Alto: Morgan Kaufman.

Camac, M., & Glucksberg, S. (1984). Metaphors do not use associations between concepts, they create them. *Journal of Psycholinguistic Research, 13*, 443–445.

Fillmore, C. (1982). Frame semantics. In *Linguistics in the morning calm* (pp. 111–138). Linguistic Society of Korea.

Gentner, D., & Clement, C. (1988). Evidence for relational selectivity in interpreting analogy and metaphor. In G. Bower (Ed.), *The psychology of learning and motivation* (Vol. 22, pp. 307–358). Orlando, FL: Academic Press.

Gentner, D., & Gentner, D.R. (1983). Flowing waters or teeming crowds: Mental models of electricity. In D. Gentner & A. Stevens (Eds.), *Mental models* (pp. 99–129). Hillsdale, NJ: Erlbaum.

Gibbs, R. (1992). Why idioms mean what they do *Journal of Memory and Language, 31*, 485–506.

Gibbs, R. (1994). *The poetics of mind: Figurative thought, language, and understanding*. New York: Cambridge University Press.

Gibbs, R., Beitel, D., Harrington, M., & Sanders, D. (1994). Taking a stand on the meanings of *stand*: Bodily experience as motivation for polysemy. *Journal of Semantics, 11*, 231–251.

Gibbs, R., Bogdonovich, J., Sykes, J., & Barr, D. (1996). *Metaphor in idiom comprehension*. Manuscript submitted for publication.

Gibbs, R., & Colston, H. (1995). The cognitive psychological reality of image schemas and their transformations. *Cognitive Linguistics, 6*, 347–378.

Glucksberg, S., Brown, M., & McGlone, M. (1993). Conceptual metaphors are not automatically accessed during idiom comprehension. *Memory and Cognition, 21*, 711–719.

Glucksberg, S., & Keysar, B. (1990). Understanding metaphorical comparisons: Beyond similarity. *Psychological Review, 97*, 3–18.

Herskovits, A. (1986). *Language and spatial cognition*. Cambridge, UK: Cambridge University Press.

Jackendoff, R. (1990). *Semantic structures*. Cambridge, MA: MIT Press.

Johnson, M. (1987). *The body in the mind*. Chicago: University of Chicago Press.

Johnson, M. (1993). *Moral imagination*. Chicago: University of Chicago Press.

Kay, P. (1979). *The role of cognitive schemata in word meaning: Hedges revisited*. Department of Linguistics, University of California, Berkeley.

Keysar, B., & Bly, B. (1995). Intuitions of the transparency of idioms: Can you keep a secret by spilling the beans? *Journal of Memory and Language, 34*, 89–109.

Kovecses, Z. (1986). *Metaphors of anger, pride, and love*. Amsterdam: John Benjamins.

Kuhn, T. (1970). *The structure of scientific revolutions*. Chicago: University of Chicago Press.

Lakoff, G. (1987). *Women, fire, and dangerous things*. Chicago: Chicago University Press.

Lakoff, G. (1990). The invariance hypothesis: Is abstract reason based on image-schemas? *Cognitive Linguistics, 1*, 39–74.

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. Chicago: Chicago University Press.

Lakoff, G., & Turner, M. (1989). *More than cool reason: A field guide to poetic metaphor*. Chicago: University of Chicago Press.

Lindner, S. (1983). *A lexico-semantic analysis of verb-particle construction with "up" and "out."* Bloomington: Indiana University Press.

Mandler, J. (1992). How to build a baby – 2. *Psychological Review, 99*, 587–604.

Markman, A., & Gentner, D. (1993). Structural alignment during similarity comparisons. *Cognitive Psychology, 25*, 431–467.

Murphy, G. (1988). Comprehending complex concepts. *Cognitive Science, 12*, 529–562.

Ortony, A. (1979). Beyond literal similarity. *Psychological Review, 86*, 161–180.

Ortony, A., Vondruska, R., Foss, M., & Jones, L. (1985). Salience, similes, and the asymmetry of similarity. *Journal of Memory and Language, 24*, 569–594.

Quinn, N. (1991). The cultural basis of metaphor. In J. Fernandez (Ed.), *Beyond metaphor: The theory of tropes in anthropology* (pp. 56–93). Stanford, CA: Stanford University Press.

Rice, S. (1992). Polysemy and lexical representation: The case of three English prepositions. *Proceedings of the Fourteenth Annual Conference of the Cognitive Science Society* (pp. 206–217). Hillsdale, NJ: Erlbaum.

Ruhl, C. (1989). *Monosemy: A study in linguistic semantics*. Albany: State University of New York Press.

Shen, Y. (1992). Metaphors and categories. *Poetics Today, 13*, 771–794.

Stock, O., Slack, J., & Ortony, A. (1993). Building castles in the air: Some computational and theoretical issues in idiom comprehension. In C. Cacciari & P. Tabossi (Eds.), *Idioms: Processing, structure, and interpretation* (pp. 229–247). Hillsdale, NJ: L. Erlbaum.

Sweetser, E. (1990). *From etymology to pragmatics: The mind–body metaphor in semantic structure and semantic change*. Cambridge, UK: Cambridge University Press.

Tourangeau, R., & Rips, L. (1991). Interpreting and evaluating metaphors. *Journal of Memory and Language, 30*, 452–472.

Turner, M. (1991). *Reading minds: The study of English in the age of cognitive science*. Princeton: Princeton University Press.

Turner, M., & Fauconnier, G. (1995). Conceptual integration and formal expression. *Metaphor and Symbolic Activity, 10*, 183–204.