

The Continuum of Metaphor Processing

Heather Bortfeld

*Department of Cognitive and Linguistic Sciences
Brown University*

Matthew S. McGlone

*Department of Psychology
Lafayette College*

We describe the explanatory value of a relativistic account of metaphor processing in which different modes of metaphor interpretation are assumed to be operative in different discourse contexts. Employing the cognitive psychological notion of a processing set, we explain why people might favor attributional interpretations of figurative expressions in some circumstances and analogical interpretations in others. Applying this logic to findings in the psycholinguistic literature on metaphor suggests that some of the competing models may in fact describe different points on a continuum of metaphor processing.

In his classic essay “When Is Art?” Goodman (1978) argued that philosophical efforts to describe the attributes unique to art objects (i.e., what is art) might be misguided. Instead, he argued that the term *art* does not describe a class of objects that is intrinsically different from other object classes, but rather the product of interpreting an object in a particular way under particular circumstances. Our goal in this article is to point out the explanatory value of this benign form of philosophical relativism in developing a comprehensive cognitive theory of metaphor understanding. Just as the aesthetic status of an object can vary from context to context, so too can the meaning of a metaphor. A comprehensive theory of metaphor must be able to account for the fact that metaphors can be and often are interpreted in fundamentally different ways in different circumstances. Although some theorists have acknowledged that context plays a significant role in the time course of metaphor in-

terpretation (e.g., Gibbs, 1980; Ortony, Schallert, Reynolds, & Antos, 1978), there have been few, if any, attempts to explore the role of context in the manner with which metaphors are interpreted and ultimately are the products of the interpretation process. We argue that investigative efforts of this sort are not only warranted on empirical grounds, but also offer the added benefit of resolving long-standing disputes among various metaphor theorists.

THE PROCESS INVARIANCE ASSUMPTION

Research on metaphor in cognitive science has typically focused on the conceptual processes underlying metaphor comprehension. Two general classes of process models have emerged from this research. *Attributional models* (e.g., Glucksberg, McGlone, & Manfredi, 1997) characterize metaphor comprehension (e.g., “*Our love has been a rollercoaster ride*”) as a search for properties (e.g., exciting, scary, full of ups and downs, etc.) of the vehicle concept (“*rollercoaster ride*”) that can plausibly be attributed to the topic (“*our love*”). In contrast, *domain-mapping models* (e.g., Gentner & Clement, 1988) characterize metaphors as conveying a common relational structure between the topic and vehicle concepts (e.g., the lovers correspond to travelers, their relationship corresponds to the rollercoaster car, their excitement corresponds to the speed of the car, etc.). Noting that certain domain mappings underlie a variety of conventional figurative expressions (e.g., the mappings between “*love*” and “*journeys*”), some theorists have posited the existence of conventional conceptual metaphors that provide the conceptual basis for our understanding of the vast majority of metaphorical expressions (Gibbs, 1994; Lakoff, 1987).

Not surprisingly, there has been much debate among theorists about which model offers the most parsimonious or veridical account of how people comprehend metaphors in text and conversation (Bortfeld, 1998, 2000; Gibbs, 1992; Glucksberg, Keysar, & McGlone, 1992; McGlone, 1996; see also Murphy, 1997). The disputes over theoretical differences stem in part from a tacit assumption of process invariance common to both classes of models. This assumption holds that metaphor comprehension derives from a single conceptual process (whether it be attribution or domain mapping) that is consistently applied by all interpreters in all contexts in which metaphors are encountered. This pervasive assumption has not been challenged because the vast majority of empirical studies on metaphor comprehension have relied on indirect comprehension measures (e.g., the time it takes readers to comprehend metaphors), rather than examination of the products of comprehension (i.e., people’s written or oral interpretations of metaphor meaning).

The handful of empirical studies that have focused on the products of metaphor comprehension have found considerable interpretive variability as a function of interpreter characteristics (age, knowledge state, and interpretive goal), contextual

characteristics (whether the metaphor is presented in isolation or ongoing discourse), and statement characteristics (whether the metaphor is conventional or novel, relatively apt or inapt, etc.; Blasko & Connine, 1993; Bortfeld, 1998, 2000; Gentner & Clement, 1988; McGlone, 1996; Tourangeau & Rips, 1991). The fact that people's interpretations of a given metaphor may vary does not necessarily indicate that they are products of different interpretation processes. For example, the difference between interpreting "*Matt is a pig*" as meaning Matt is gluttonous or Matt is slovenly might reflect nothing more than the differential salience of pigs' stereotypical properties in different contexts. In this case, it is plausible that the different interpretations are derived by choosing differentially salient pig properties via the same property selection process.

However, other cases of interpretive variability suggest that people can use qualitatively different kinds of vehicle information to characterize the topic. For example, consider the different ways one might interpret "*A lifetime is a day*" (McGlone, 1996). A day is a relatively short span of time, and consequently one might interpret the statement as an assertion that life is short. Alternatively, one might recognize a day as comprised of stages that thematically correspond to periods in life, and thereby interpret the statement as an assertion that dawn corresponds to birth, morning to childhood, noon to middle age, and so on. Like the interpretations of "*Matt is a pig*" discussed earlier, the former interpretation involves using a stereotypical property of the vehicle concept "*day*" to characterize the topic "*lifetime*." Such an interpretation is predicted by attributional models; that is, the vehicle is understood as being emblematic of a category of short time spans that can plausibly contain the topic (Glucksberg et al., 1997). In contrast, the latter interpretation involves using a system of relations in the vehicle to characterize the topic. This rich, analogical interpretation is predicted by domain-mapping models; that is, people search for epistemic correspondences between entities in the topic and vehicle conceptual domains (e.g., Lakoff, 1987). Both interpretations are plausible, and one cannot be deemed more apt than the other without the benefit of contextual support. After all, context ultimately determines what meaning people will derive (Gerrig & Bortfeld, 1999). However, the assumption that metaphor interpretation derives from a single conceptual process prevents both the attributive categorization and domain-mapping models from accounting for alternative interpretations.

ATTRIBUTIONAL VERSUS RELATIONAL METAPHORS

Metaphors such as "*A lifetime is a day*" occupy an intermediate position in a similarity space between what Gentner and Clement (1988) referred to as attributional metaphors and relational metaphors (see Figure 1). Attributional metaphors such as "*Matt is a pig*" highlight the common attributes (e.g., gluttonous, slovenly, untidy,

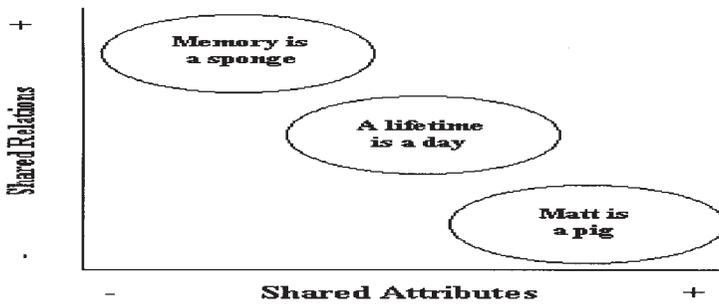


FIGURE 1 Metaphors depicted in a Shared Relation \times Shared Attribute similarity space.

etc.) of topic and vehicle concepts that do not have obvious analogical similarities. In contrast, relational metaphors such as “*Memory is a sponge*” convey common analogical structures (e.g., information is to memory as water is to a sponge) in topic and vehicle concepts that do not have obvious attributional similarities. For the remainder of this discussion, we use the term *analogical* rather than Gentner and Clement’s *relational* because it best characterizes the differences between the two types of metaphor.¹ In between attributional and analogical metaphors are those like “*A lifetime is a day*,” which can be interpreted in terms of the topic and vehicle common attributes (e.g., short time span) or analogical conceptual structures (e.g., birth = dawn, childhood = morning, etc.). Proponents of attributional and domain-mapping models of metaphor have differentially sampled metaphors from the semantic similarity space on which to focus their theoretic efforts.

Glucksberg and his colleagues formulated their attributional model primarily to describe how people interpret metaphors in conversation (Glucksberg & Keysar, 1990; Glucksberg & McGlone, 1999; McGlone, 1996). Because of the time constraints imposed by the obligation to participate in an ongoing conversational exchange, conversational metaphors tend to be fairly simple in nature, highlighting a few attributes that are relevant to the point being made (e.g., “*My job is a jail*,” “*My ex-wife’s lawyer is a shark*,” etc.). In contrast, Gentner and her colleagues (e.g., Gentner & Clement, 1988) account for metaphors in a domain-mapping framework that was originally formulated to explain meaning-rich, scientific analogies. Such analogies (e.g., “*An atom is like the solar system*”) are almost purely analogical in nature, and most of the example

¹Holyoak and Nisbett (1987) criticized Gentner’s (1983) analytic distinction between attribute and relational similarities on the grounds that the latter were representationally reducible to the former. Nonetheless, Holyoak and Nisbett also suggested that an analytic distinction can be drawn between literal comparisons (based on property matches) and analogies (based on schematic structural matches). Our use of the term *analogical metaphors* to describe what Gentner referred to as relational metaphors reflects our appreciation of the dispute over attributes and relations, still suggesting that there are similarities between concepts that transcend mere attributes.

metaphors (e.g., “*A cigarette is a time bomb*”) used to illustrate the domain-mapping model are from the relational portion of Gentner and Clement’s (1988) similarity space. In a similar vein, Lakoff and his colleagues (e.g., Lakoff, 1987; Lakoff & Turner, 1989) focused primarily on clusters of idiomatic expressions that imply epistemic relations between domains (e.g., “*blow your stack*,” “*get hot under the collar*,” and “*do a slow burn*” all imply analogical relations between the domains of anger and heated fluid under pressure).

This selective sampling of examples from the diverse corpus of metaphorical expressions explains in part why metaphor theorists have tacitly embraced the process invariance assumption. Within the limited set of metaphorical expressions that attributional and domain-mapping theorists have chosen to focus on, such an assumption is unnecessary: It is theoretically plausible that attributional metaphors are understood via a single conceptual process and analogical metaphors are understood via a single, albeit different conceptual process. There is no pressing theoretical need to question process invariance unless one tries to account for the interpretation of attributional and analogical metaphors within the same model. In this respect, the variability with which people interpret hybrid metaphors such as “*A lifetime is a day*” suggests that the labels attributional and analogical are not exclusively descriptive of metaphor classes, but also of different modes of metaphor processing. In some circumstances, people may interpret the metaphor in attributional mode (life is short), and in others they interpret it in an analogical mode (dawn = birth, morning = childhood, etc.).

METAPHOR PROCESSING SETS?

The notion of a processing mode or set has a long history in cognitive psychology. In the domain of problem solving, the observed bias of participants to apply rules to new problems that facilitated solving previous problems—even when these rules offer a suboptimal strategy for addressing the new problem—is characterized as a processing set (Lovett, 1998; cf. Luchins, 1942). The processing set notion has also proved useful in describing persistent language interpretation strategies as well (Bobrow & Bell, 1973; Carey, Mehler, & Bever, 1969; Garrett, 1969; Mackay, 1969; Marshall, 1965). For example, Carey et al. (1969) demonstrated that establishing a set to interpret particular syntactic structures can bias the way people interpret literally ambiguous sentences. They presented a literally ambiguous sentence following several unambiguous sentences that had the same grammatical structure as one of the meanings of the ambiguous sentence. Participants modally perceived the meaning of the ambiguous sentence in terms of the set structure. For example, when sentences such as “*They are unearthing diamonds*” and “*They are installing benches*” preceded the ambiguous sentence “*They are visiting sailors*,” participants modally interpreted *visiting* in the last sentence as a progressive transitive verb. However, when this sentence was preceded by “*They are incoming signals*”

and “*They are emerging nations,*” *visiting* was modally interpreted as a gerundive adjective (see also Mackay, 1969).

Similarly, it has been shown that presenting people with supplemental semantic information can induce a processing set that can bias people’s interpretations of polysemous words. In a dichotic listening paradigm, Garrett (1969) presented ambiguous sentences such as “*The fans were noisy that night*” to the attended ear while simultaneously presenting unambiguous sentences such as “*Baseball spectators were yelling*” to the unattended ear. She found that people tended to understand the ambiguous sentence in a manner consistent with the unambiguous prime. In this case, people were more likely to interpret *fans* as referring to people rather than mechanical devices.

Bobrow and Bell (1973) invoked the notion of a processing set to describe the way people interpret idiomatic expressions. They reasoned that our comprehension of idioms such as “*let the cat out of the bag*” proceeds as if the idiomatic phrase were effectively a long word. Processing the phrase as a long word differs from that for literal phrases, wherein each word is perceived, meanings are retrieved from semantic memory, and then each meaning is mapped into a representation of the phrase’s overall meaning (Quillian, 1968). To empirically investigate the dichotomy of literal and idiomatic modes of processing phrases, Bobrow and Bell presented people with sets of five sentences, the fifth of which included a phrase that could be interpreted literally or idiomatically (e.g., “*John gave Mary the slip*”). In the literal set condition, the preceding four sentences were sentences that could be interpreted only literally, (e.g., “*Alan fed biscuits to his dog*”). In the idiomatic set condition, the preceding sentences all contained idioms (e.g., “*Henry was in hot water*”). Consistent with previous demonstrations of processing set effects, people were more likely to recognize the literal meaning of “*John gave Mary the slip*” (i.e., John gave an undergarment to Mary) first when it was preceded by literal sentences, but were more likely to recognize its idiomatic meaning first (John evaded Mary’s pursuit) when it was preceded by idiomatic sentences. Bobrow and Bell interpreted this finding as evidence that people are inclined to interpret idioms as long words when this processing mode is induced by prior context. Although there are intrinsic problems with conceiving idioms as merely long words (see McGlone, Glucksberg, & Cacciari, 1994), the notion of distinct literal and idiomatic processing modes has nonetheless been supported by many contemporary studies of idiom comprehension (Cacciari & Tabossi, 1988; Gibbs, 1980; Swinney & Cutler, 1979).

For our purposes, the notion of different processing sets may be used to account for a significant portion of the observed variability in metaphor interpretation: Qualitatively different interpretations may be the product of different metaphor processing sets. By this logic, the attributional and domain-mapping models can be viewed not as competing comprehensive models of metaphor interpretation, but rather as descriptions of distinct processing sets that are activated in different inter-

pretational contexts. The models' status as distinct processing accounts has not heretofore been acknowledged because researchers have chosen to focus on metaphors from the extreme ends of the attributional–analogical similarity continuum. Thus, attributional and analogical interpretations are likely to be preferred for metaphors that are predominantly (if not exclusively) attributional (e.g., “*Clouds are marshmallows*”) or analogical (e.g., “*Sarcasm is a veil*”) in nature. The processing set account is most clearly evident when one examines people's interpretations of metaphors that afford both attributional and analogical interpretations and manipulates the contexts in which these hybrid metaphors appear.

As a preliminary test of the processing set account of metaphor interpretation, we developed a variation of the set paradigm used by Bobrow and Bell (1973). Twenty-four Lafayette College undergraduates generated written interpretations of target hybrid metaphors after interpreting a block of context metaphors constructed to induce an attributional or analogical processing set. To induce an attributional set, participants interpreted a series of four predominantly attributional metaphors prior to interpreting the target. In the same manner, an analogical processing set was induced when participants interpreted a series of predominantly analogical metaphors prior to the target. An example set of context and target metaphor materials is presented in Table 1. For any given target metaphor, participants saw only one set of the context sentences (attributional or analogical). The metaphors used to construct these materials were drawn from sets used by Gentner and Clement (1988), McGlone and Manfredi (in press), and Ortony, Vondruska, Foss, and Jones (1985). Classification of each metaphor as attributional, analogical, or a hybrid was made on the basis of a pretest using procedures described by Gentner and Clement (1988).

To measure the efficacy of the processing set manipulation, two independent judges (2 additional Lafayette College undergraduates) evaluated the number of references that were made to attributional and analogical topic–vehicle commonalities in the experimental participants' written target metaphor interpretations. Judges were trained to classify as an attributional commonality any description of a physical property shared by the topic and vehicle concepts; descriptions of a common system of attribute correspondences (independent of the attributes them-

TABLE 1
Examples of the Context and Target Sentences Used to Investigate
Metaphor Processing Sets

<i>Attributional Context Metaphors</i>	<i>Analogical Context Metaphors</i>
“ <i>Jellybeans are balloons.</i> ”	“ <i>Smiles are magnets.</i> ”
“ <i>The sun is an orange.</i> ”	“ <i>Sarcasm is a veil.</i> ”
“ <i>Soap suds are whipped cream.</i> ”	“ <i>Crime is a cancer.</i> ”
“ <i>Some roads are snakes.</i> ”	“ <i>Salesmen are bulldozers.</i> ”

selves) were classified as analogical commonalities. For example, an interpretation of “*Tree trunks are drinking straws*” as meaning that tree trunks are long and tube-shaped was classified as attributional; in contrast, the meaning that tree trunks pull water up like a drinking straw does was classified as analogical. The trained judges were blind to the processing set condition in which a given interpretation of a target metaphor was generated.

Inspection of participants’ written interpretations revealed a pattern similar to that observed in previous processing set studies. When hybrid targets were preceded by attributional metaphors, attributional topic–vehicle commonalities were mentioned first in 66.6% of participants’ interpretations. When the target was preceded by analogical metaphors, analogical commonalities were mentioned first in 83.3% of the interpretations. These results suggest that participants were initially sensitive to topic–vehicle commonalities in the target that were of the same kind as those in the preceding context metaphors. However, it was not the case that processing set blinded participants to plausible interpretations that were not of the sort favored by the induced set. Overall, participants generated both attributional and analogical interpretations for hybrid metaphors 70.8% of the time. Thus, the processing set manipulation exerted its influence primarily on the order with which attributional and analogical commonalities were mentioned, but did not block one sort of interpretation in favor of another. Both sorts of interpretation are available, by definition, in a hybrid attributional–analogical metaphor; the processing set manipulation merely influenced the degree to which the different types of commonalities were accessible.

AVAILABILITY VERSUS ACCESS

The distinction between the accessibility and availability of conceptual information in metaphor interpretation figures prominently in disputes over the potential role that conceptual metaphors might play in figurative language comprehension. This debate is also relevant to the proposal we present here, that different modes of metaphor interpretation are operative in different discourse contexts. Depending on the context in which a hybrid metaphor is used, either its attributional or its analogical characteristics may be more appropriate. A question stemming from this is whether one or the other characteristic will already have been recognized and be accessed or whether only the appropriate context induces such recognition. A more detailed discussion of the difference between availability and access will illustrate our point.

Lakoff and his colleagues (Lakoff, 1987; Lakoff & Turner, 1989) argued that conceptual metaphors underlie our use and understanding of conventional figurative expressions in a variety of domains. For example, consider the different metaphors that are reflected by idioms we use to describe anger. One conceptual metaphor for anger is that of heated fluid under pressure. Idioms that seem to re-

flect this conceptual metaphor include “*flip your lid*,” “*let off steam*,” and “*blow your top*.” An alternative conceptual metaphor for anger is that of animal-like behavior, reflected in idioms such as “*bite someone’s head off*” or “*hopping mad*.” Although broad conceptual metaphors seem to motivate many idiomatic expressions (Gibbs, 1994), their analogical role in idiom use and comprehension is questionable. When people encounter an idiom such as “*blow your top*” in text or conversation, is the “*ANGER IS HEATED FLUID UNDER PRESSURE*” metaphor merely available, or, as Lakoff (1990) argued, automatically accessed? A conceptual structure is available if it is simply represented in a given language user’s semantic memory (Miller & Johnson-Laird, 1976). Although many theorists have raised serious doubts about whether conceptual metaphors are so represented (Jackendoff & Aaron, 1991; McGlone, 1996; Murphy, 1997), we stipulate that they are for the discussion here. The availability of a conceptual structure is, by definition, context independent: It is either stored in semantic memory or it is not. In contrast, access to a conceptual structure that participates in language comprehension is typically context dependent: It may be retrieved in certain contexts but not others (e.g., Anderson & Ortony, 1975).

What determines whether a conceptual metaphor will be accessed to guide idiom comprehension, as opposed to being merely available (albeit dormant) in semantic memory? One important factor is the operative time constraints in the circumstances under which an idiom is encountered. The normal pace of conversation would seem too fast for interlocutors to retrieve the entire conceptual metaphorical underpinnings of a phrase like “*blow your top*” (Glucksberg, Brown, & McGlone, 1993). From a functional standpoint, it is not clear that there is any utility to retrieving a complex metaphorical structure when merely retrieving the phrase’s relevant import (i.e., someone got really angry) would suffice (Glucksberg et al., 1993). As with most words, the comprehension of idioms may functionally proceed in many contexts without recourse to or awareness of their etymological origins.

However, there are clearly some contexts in which retrieval of a figurative expression’s metaphorical underpinnings is functional. For example, when one is reflecting on why he or she thinks an idiom means what it means (e.g., a language teacher describing how to use an idiom appropriately or, conversely, a student explaining to a language teacher why he or she thinks an idiom means what it means), it would be quite functional to retrieve as much of its underlying metaphorical structure as possible. Bortfeld (1998) demonstrated that, in such circumstances, there is a surprising degree of consistency in people’s accounts of their understanding of an idiom’s metaphorical derivations, even among non-native speakers who have just learned an idiom from a new language. For example, when asked about their understanding of the idiom “*blow your top*,” both native and non-native speakers report mental images of containers about the size of one’s head bursting open and spouting their contents upward, as opposed to envisaging someone expelling air at a spinning child’s toy. This evidence suggests that the conceptual correspondences comprising the metaphor

"*ANGER IS HEATED FLUID UNDER PRESSURE*" may very well be represented in semantic memory and thus are available for retrieval in interpretational circumstances that are conducive to reflection.

A very different sort of reflective context in which conceptual metaphorical information is likely to be accessed is that of someone reading prose for pleasure or an analytic purpose. In these cases, both the lack of time constraints and the motivation to make intertextual connections are conducive to the reader retrieving and using conceptual metaphorical information. Interpreting metaphorical language in this context as opposed to how one does this in a typical conversation parallels the distinction Gerrig and Healy (1983) drew between metaphor appreciation and comprehension. They argued that although both types of metaphor processing may potentially draw from the same knowledge base, the representation of metaphor meaning in comprehension is a truncated version of that created during appreciation. A truncated representation is perfectly functional when the goal is merely to comprehend a metaphor; in contrast, an appreciative assessment of the metaphor (e.g., judging whether it is relatively apt or inapt) requires a richer representation. Gerrig and Healy's demonstration that differences in metaphor aptness (e.g., "*Drops of molten silver filled the night sky*" is highly apt, whereas "*Drops of molten resin filled the night sky*" is less so) do not translate into differences in comprehension time is consistent with the claim that appreciation and comprehension constitute distinct modes of metaphor processing.

CONCLUSION

Our survey of psychological research on metaphor interpretation leads us to two conclusions. First, the manner in which figurative expressions are interpreted is only partially determined by their linguistic structure. Although in some extreme cases metaphors may be classified as purely attributional or analogical in nature, there are many that constitute hybrids of these species. How these hybrid metaphors are interpreted depends not only on conceptual representations available in semantic memory, but also the processing set that is active when the expression is interpreted. Analogously, the availability of an underlying conceptual metaphor for understanding a conventional figurative expression does not necessitate retrieval of this conceptual information in all contexts in which the expression is encountered. Whether the interpreter will employ a conceptual metaphor processing set depends critically on the operative time constraints in the interpretational context, as well as on the goals of the interpreter.

Second, the dispute over which process model constitutes the definitive processing account of metaphor interpretation may simply be a red herring. Just as our interpretations of a given literal phrase structure or polysemous word can be dramatically influenced by processing sets, so might our interpretations of metaphorical language

from context to context and goal to goal. In this regard, metaphor theorists should distinguish between cases in which there is a legitimate conflict between models and other cases in which the models describe different points on a continuum.

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