Evaluating Conceptual Metaphor Theory

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A major revolution in the study of metaphor occurred 30 years ago with the introduction of "conceptual metaphor theory" (CMT). Unlike previous theories of metaphor and metaphorical meaning, CMT proposed that metaphor is not just an aspect of language, but a fundamental part of human thought. Indeed, most metaphorical language arises from preexisting patterns of metaphorical thought or conceptual metaphors. This article provides an evaluation of the linguistic and psychological evidence supporting CMT, and responds to some of the criticisms of CMT offered by scholars within cognitive science. Some new ways of thinking of conceptual metaphors from the perspective of embodied simulations and dynamical systems theory are also presented.

A good part of the Fall 2006 Congressional election campaign debated the wisdom of President George Bush's metaphorical statement that the United States intended to "stay the course" in the ongoing war in Iraq. Bush said on two occasions, "We will stay the course. We will help this young Iraqi democracy succeed," and "We will win in Iraq as long as we stay the course." However, as various political pundits soon noted, "The White House is cutting and running from 'stay the course'"—a phrase meant to connote steely resolve instead has become a symbol for being out of touch and rigid in the face of a war that seems to grow worse by the week; Republican strategists said, "Democrats have now turned 'stay the course' into an attack line in campaign commercials, and the Bush team is busy explaining that 'stay the course' does not actually mean stay the course" (Baker, 2006, p. A01).

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The debate over what Bush really meant by his use of "stay the course" is especially relevant to scholars of language and communication because it highlights enduring issues over whether the use of clichéd language, such as Bush's— or Bush's speechwriters—reflects anything fundamental about how people think metaphorically. Was Bush's use of the phrase "stay the course" motivated by a more general underlying metaphorical concept, such as "Progress toward a goal is a journey," or did he simply use this clichéd expression because it conventionally means "not changing plans" without any underlying metaphorical conception about the U.S. strategy for the Iraq war? Most important, what sort of empirical/experimental evidence can be relied on to answer this question?

The proposal that metaphor is as much a part of ordinary thought as it is of language has been voiced by rhetoricians, philosophers, and others for hundreds of years, but it has gained its greatest attention in the last 30 years with the rise of "conceptual metaphor theory" (CMT) within the field of cognitive linguistics, most notably starting with the publication in 1980 of the widely read book, *Metaphors We Live By*, co-authored by George Lakoff and Mark Johnson. Unlike earlier scholars who speculated on the metaphorical basis of thought, Lakoff and Johnson (1980) aimed to provide systematic linguistic evidence to support the claim that there are indeed metaphors of thought or "conceptual metaphors." Since 1980, there has been an avalanche of studies from numerous academic disciplines that have been motivated by CMT, enough so that this perspective currently represents the dominant theoretical framework in the academic study of metaphor.

At the same time, there have been numerous criticisms of CMT from scholars both within and outside of cognitive linguistics. Most generally, as one psychologist recently concluded, "Its atmospheric influence notwithstanding, the [conceptual metaphor] view has not fared well theoretically or empirically" (McGlone, 2007, p. 122); and, as a consequence, raised strong doubts about "the explanatory value of the 'conceptual metaphor' construct" (McGlone, 2007, p. 109).

My purpose in this article is to describe some of the evidence supporting the basic tenets of CMT, noting areas of study that are typically not discussed by critics of CMT, to better assess the role that enduring metaphors of thought play in language, thought, and culture. Part of the goal here is to highlight the significant linguistic, nonlinguistic, and experimental research that directly responds to criticisms of CMT. However, I also discuss, toward the end, some new developments that may alter how cognitive scientists think about conceptual metaphors and their purported role in communication.

At the outset, it is important to note that CMT is not a general theory of "figurative" language understanding, as it is not relevant to forms of figurative language such as irony, metonymy, and oxymora. CMT primarily relates to

certain kinds of metaphor (i.e., those with implicit target domains, such as in "I don't see the main point of that paper," which is motivated by "Knowing is seeing"), but not necessarily others (i.e., so-called resemblance metaphors where the source and target domains are explicitly stated, as in "My job is a jail"; however, for a proposal on how CMT may account for certain resemblance metaphors, as in "Social restrictions are physical restrictions" for "My job is a jail," see Lakoff, 1993).

SOME EVIDENCE SUPPORTING CMT

The original evidence for conceptual metaphors comes from the systematic analysis of conventional expressions in different languages (Croft & Cruse, 2004; Kovecses, 2002, 2006; Lakoff & Johnson, 1980, 1999). Consider the following ways that English speakers sometimes talk about their romantic relationships:

1. "We're headed in opposite directions."
2. "We're spinning our wheels."
3. "Our relationship is at a crossroads."
4. "Our marriage was on the rocks."

Cognitive linguistic analyses argue that these individual expressions are not clichéd idioms expressing literal meaning, but reflect, and are said to be partially motivated by, different aspects of the enduring conceptual metaphor, "Love is a journey." There is a tight mapping according to which entities in the domain of love (e.g., the lovers, their common goals, and the love relationship) systematically correspond to entities in the domain of journeys (e.g., the traveler, the vehicle, destinations, etc). Each previously mentioned linguistic expression refers to a different correspondence that arises from the mapping of familiar, often embodied, understanding of journeys onto the more abstract idea of a love relationship (e.g., difficulties in the relationship are conceived of as obstacles on the physical journey).

An important part of CMT is that many abstract concepts can be structured by multiple conceptual metaphors. Thus, a love relationship can also be understood as a natural force ("Love is a natural force"), as exhibited by the following conventional expressions:

1. "She swept me off my feet."
2. "Waves of passion overcame him."
3. "We were engulfed by love."
4. "She was deeply immersed in love."

The hypothesis that some concepts may be metaphorically structured makes it possible to explain what traditionally has been seen as unrelated, conventional expressions. Under the CMT view, so-called clichéd expressions, such as "stay the course" and "We're spinning our wheels," are not dead metaphors, but reflect active schemes of metaphorical thought. Certain kinds of idiomatic expressions have meanings that arise from sources other than conceptual metaphor, such as metonymically related idioms (e.g., "kick the bucket"). CMT does not assume that all conventional or idiomatic expressions are motivated by conceptual metaphor, and indeed many cognitive linguists study conceptual metonymy and its role in structuring many aspects of conventional language use and reasoning (Gibbs, 1994; Radden & Panther, 1999). Yet, the systematicity of many conventional expressions, as noted earlier, provides evidence for their meanings being motivated by enduring metaphorical mappings.

A second main discovery within CMT, beyond the exploration of systematicity among conventional expressions, is that many novel metaphorical expressions do not completely express new source-to-target domain mappings, but are creative instantiations of conventional metaphors. For instance, the English expression, "My marriage was a roller-coaster ride from hell," is a slightly unusual way of noting how one's romantic relationship can be understood as a kind of physical journey (e.g., "Love relationships are journeys"). Analyses of literary metaphors (Freeman, 1995; Goatly, 1997; Lakoff & Turner, 1989; Turner, 1996) and novel metaphorical arguments in expository writing (Eubanks, 2000; Koller, 2004) demonstrate how many so-called "novel" metaphors are grounded in conventional mappings. Experimental studies indicate that readers can readily infer the relevant conceptual metaphors in literary poems when asked to talk aloud about their interpretations (Gibbs & Nascimento, 1996). CMT has taken great pains to note the significant differences between several types of novel metaphors, such as novel metaphors that reflect conventional conceptual metaphors (e.g., "My marriage was a roller-coaster ride from hell"); novel metaphors that reflect one-shot mappings (e.g., "My job is a jail"); and novel metaphors that map static images, and not rich conceptual domains, called "image metaphors" (e.g., "my wife ... whose waist is an hour glass"; Gibbs & Bogdonovich, 1999; Lakoff & Turner, 1989).

Finally, cognitive linguistic analyses maintain that some of the meanings of polysemous words are motivated by conventional metaphors such that the meaning of "see" referring to knowing or understanding is motivated by an enduring conceptual metaphor "Understanding is seeing." A major trend in cognitive linguistic analyses of polysemy is showing the large extent to which these words' meanings are historically derived from conceptual metaphors that are still active parts of human conceptual systems (Cuykens & Zawada, 2001; Lakoff, 1987; Sweetser, 1990). Under this view, the lexical organization of polysemous words is not a repository of random, idiosyncratic information, but

is structured by general cognitive principles, like conceptual metaphor, which are systematic and recurrent throughout the lexicon.

Cognitive linguistic analyses of conventional expressions, novel extensions, and polysemy suggest that there are probably several hundred basic conceptual metaphors (Kovecses, 2002; Lakoff & Johnson, 1999; Yu, 1999). Conceptual metaphors have been found in virtually every language examined thus far, both in contemporary spoken (Kovecses, 2002, 2006; Ozcaliskan, 2003; Yu, 1999) and signed languages (Taub, 2002; Wilcox, 2000), as well as throughout history going back to the hieroglyphics in Egypt (Goldwasser, 2005), ancient Chinese (Singerland, 2003), and early Greek and Roman writings (Wiseman, 2007). As Yu (2003) concluded, "The fact that distinct languages show metaphors in a systematic way supports the cognitive status of these metaphors as primarily conceptual, rooted in common human experiences" (p. 162).

The range of abstract conceptual domains that appear to be structured in some manner by conceptual metaphor is immense and includes emotions (Kovecses, 2000), the self (Lakoff & Johnson, 1999), morality (Johnson, 1993), politics (Lakoff, 1996; Musolff, 2004), science concepts (Brown, 2003; Larson, Nerlich, & Wallis, 2006), illness (Gibbs & Franks, 2002), psychoanalytic concepts (Borbely, 2004), legal concepts (Winter, 2002), mathematics (Lakoff & Núñez, 2002), and certain cultural ideologies (Goatly, 2007), to name just a few of the many abstract concept domains and to cite just a few of the dozens of studies conducted on each domain (see Gibbs, 2008).

SOME POSSIBLE PROBLEMS WITH CMT

It is remarkable that scholars of completely different backgrounds have independently reached the same or very similar results about conceptual metaphor (Jakel, 1999), which speaks positively for the essential claims of CMT. However, it is not clear that different scholars have used the same criteria in making their judgments about systematicity and conceptual metaphors, and their intuitive analyses of linguistic expressions may not accurately reflect what ordinary speakers unconsciously do when using metaphoric language (Gibbs, 2006b). Linguistic research favoring CMT, described earlier, suffers from a lack of details about the ways these analyses are conducted.

For instance, cognitive linguistic analyses on conceptual metaphor typically do not provide explicit criteria (a) for identifying what constitutes a metaphor in language, as either the word or phrase level; (b) for defining *systematicity* among a given set of language expressions referring to a specific abstract target domain (e.g., love); (c) for inferring the existence of a specific conceptual metaphor, as opposed to some other conceptual metaphor, when finding systematicity among some metaphoric expressions in language; and (d) for determining how represen-

tative of real discourse are the analyses of isolated, self-constructed examples or individual examples taken from corpora. Debates about CMT often raise these and other questions (Steen, 2007), with some scholars suggesting that these issues make CMT difficult, if not impossible, to potentially falsify (Murphy, 1996; Vervaeke & Kennedy, 1996), particularly in regard to the circularity of the theory (Haser, 2005; and for an analysis of what is required to decide if CMT is circular or not, see Kertesz & Rakosi, 2009).

Another enduring concern in cognitive science with the linguistic evidence on CMT is that many conventional expressions viewed as metaphorical by cognitive linguists are not metaphorical at all. Conventional expressions, such as "stay the course," may have once originated with metaphorical meaning, but may be seen by contemporary speakers as "dead" metaphors, literal speech, or mere instances of polysemy (Glucksberg, 2001; Jackendoff, 1983; Keysar, Shen, Glucksberg, & Horton, 2000; McGlone, 2007; Pinker, 2007). However, simply calling something literal or polysemy, as critics of CMT refer to most conventional and idiomatic speech, does not explain why there is systematicity in conventional expressions and why individual linguistic expressions appear to reflect the detailed correspondences that arise from the metaphorical mapping of source onto target domains in talking about abstract concepts. Of course, there may be other reasons for why there is such apparent systematicity in both conventional and novel metaphoric expressions. At the very least, however, linguistic analyses offer detailed reasons for why certain words and expressions come into being and have specific correspondences arising from the mapping of source onto target domains. Critics of CMT must provide alternative hypotheses that explain the cognitive linguistic data, and not simply dismiss this evidence by simply labeling conventional expressions as "dead" metaphors. Conventional phrases motivated by conceptual metaphors are different from so-called dead metaphors, such as "kick the bucket," which typically come into being as one-shot metonymies that are now mostly opaque to contemporary speakers (Gibbs, 1994). Determining whether a person's use of a conventional or novel expressions is motivated by conceptual metaphor requires that empirical work be done of the sort offered by both cognitive linguists and psycholinguists (much more of which is presented later). One's intuition that some phrase is "dead" fails to consider the possibility that people have tacit knowledge of conceptual metaphors, which may structure their unconscious understandings of many abstract concepts and play a role in the immediate production and interpretation of metaphoric language (see the later section on psycholinguistic results related to these possibilities). Part of the reason why cognitive psychological work on conceptual metaphor is so important is because it provides various indirect methods for assessing what people unconsciously know, including metaphorical, and embodied, understandings of different abstract concepts.

There have, at the very least, been attempts to create schemes by which metaphorically used language may be reliably identified (Pragglejaz Group, 2007), and various computational programs have been developed that offer explicit procedures, and not just intuitive judgments, for discerning conceptual metaphors motivating different semantic fields/domains of metaphorical discourse (Martin, 1990; Mason, 2004). Corpus linguistic research has also begun to create procedures for identifying metaphor in language and thought, such as specifying what counts as a metaphorically used word and what counts as a relevant source domain in a metaphorical mapping (Deignan, 2006; Stefanowitsch & Gries, 2006). Most generally, corpora analyses are mostly supportive of the wide range of conceptual metaphors identified by introspection in cognitive linguistic research, but are also better able to quantify metaphorical patterns to provide important insights on the relative salience of conceptual metaphors in different domains (e.g., "Anger is heat" is more prominent than "Anger is a fierce animal").

This corpus work also indicates certain complexities in the kinds of metaphorical mappings seen in real discourse, which requires modifications to standard CMT. For instance, different inflections of the same word (or phrase) appear in different evaluative patterns when used metaphorically. Thus, the plural word "flames" conveys negative meanings (e.g., "His future crashed in flames"), whereas the singular "flame" mostly refers to positive evaluations (e.g., "George still carried a flame for Kelly"; Deignan, 2006). Many other corpus linguistic studies demonstrate similar lexical and grammatical constraints on metaphorical mappings (Stefanowitsch & Gries, 2006)—constraints that CMT have not always sufficiently acknowledged.

The corpus linguistic research is relevant to one misunderstanding of CMT, which claims that conceptual metaphors must necessarily map *all* aspects of a source domain onto a target—a process that leads to incoherent mappings. McGlone (2007, p. 114) argued the following in regard to the strong version of metaphoric representation (i.e., metaphor completely structures certain abstract concepts—see Murphy, 1996):

> If we understand theories entirely in terms of buildings, then we should occasionally make erroneous inferences about the applicability of building properties to the abstract concept—e.g., theories not only can have foundations (assumptions), architects (formulators), and blueprints (origins), but also stairwells (?), hallways (?) sprinkler systems (?) etc. People rarely, if ever, make inferences of this sort. (p. 114)

However, CMT does not maintain that *all* aspects of the source domain are mapped onto the target domain in metaphorical expressions or conceptual metaphors. One proposal within CMT, named the "invariance hypothesis," states,

"metaphorical mappings preserve the cognitive topology (that is, the image-schematic structure) of the source domain" (Lakoff, 1990, p. 54). Thus, most source domains have an image-schematic structure in being motivated by "recurring, dynamic patterns of our perceptual interactions and motor programs that give coherence to our experience" (Johnson, 1987, p. xix). Image schemas are not propositional in nature, but are highly abstract or schematic (Hampe, 2005; Kovecses, 2006). Some image schemas include *container, balance, source–path–goal, blockage, link*, and *center–periphery*.

For instance, the source–path–goal schema develops as we move from one place to another in the world and as we track the movement of objects. From such experiences, a recurring pattern becomes manifest, which can be projected onto more abstract domains of understanding, including those having to do with any intentional action. Thus, the source–path–goal image schemas gives rise to conceptual metaphors, such as "Purposes are destinations" (e.g., "I got sidetracked on my way to getting a PhD"). The invariance principle suggests, specifically in this case, that only the schematic aspects of taking journeys are applied to the domain of purposeful action such that the student is a traveler, destinations along the path are sub-goals, the final destination is the ultimate goal, and so forth (for some amendments to the invariance hypothesis, see Ruiz de Mendoza & Mairal, 2007).

The invariant mapping of source domain knowledge onto abstract target domains is related to proposals, and extensive empirical evidence from cognitive psychology, suggesting that metaphorical mappings are relational and not based on specific attributes or features (Gentner & Kurtz, 2006). Research in experimental psycholinguistics also specifically demonstrates how ordinary people's intuitions, as measured by various indirect methods, about the image-schematic structure of some source domains (e.g., "heated fluid in a bodily container") can be used to predict the specific meanings of metaphorically used words (Gibbs, Beitel, Harrington, & Sanders, 1994) and idioms (e.g., "blow your stack") motivated by different conceptual metaphors (e.g., "Anger is heated fluid in a bodily container"; Gibbs, 1992).

Nevertheless, as mentioned earlier, traditional CMT once had difficulty explaining why certain source-to-target domain mappings in conceptual metaphors are not likely to occur and why some lexical items, but not others, associated with a source domain are evident in analyses of metaphorical discourse. Yet, one important advance in CMT argues that conceptual metaphors are not the most basic level at which metaphorical mappings exist in human thought and experience. Grady (1997, 1999) proposed that strong correlations between domains in everyday embodied experience leads to the creation of "primary" metaphors, such as "Intimacy is closeness" (e.g., "We have a close relationship"), "Important is big" (e.g., "Tomorrow is a big day"), "More is up" (e.g., "Prices are high"), "Causes are physical forces" (e.g., "They push the bill through

Congress"), and "Understanding is grasping" (e.g., "I've never been able to grasp transfinite numbers"). A primary metaphor exhibits a metaphorical mapping for which there is an independent and direct experiential basis and independent linguistic evidence. A "complex" metaphor, on the other hand, is a self-consistent metaphorical complex composed of more than one primary metaphor.

For instance, combining the primary metaphors "Persisting is remaining erect" and "Structure is physical structure" provides for a complex metaphor "Theories are buildings," which nicely motivates the metaphorical inferences that theories need support and can collapse, and so forth, without any mappings—such as that theories need windows. In a similar way, the combination of "Structure is physical structure" and "Interrelated is interwoven" gives rise to a different complex metaphor for theories—namely, "Theories are fabrics." This complex metaphor gives rise to the reasonable inferences that theories can unravel or may be woven together without generating less likely entailments, such as that theories are colorful in the way that some fabrics have colors.

In general, the theory of primary metaphor provides critical constraints on the mapping of metaphorical relations. Various experimental studies in psycholinguistics suggest that recruitment of primary metaphors are part of understanding certain abstract concepts, people's interpretations of many conventional metaphoric expressions, and young children's early comprehension of some verbal metaphors (Gibbs, Lima, & Francuzo, 2004; Pelosi, 2007; Siquerra & Gibbs, 2007). Although the work on primary metaphor does not explain all aspects of why certain words, and not others, get metaphorically mapped from source-to-target domains, the theory does provide a crucial limit on why some metaphorical constructions are likely to occur, and others not (for how metonymy also limits metaphorical mappings within CMT, see Kovecses, 2002; see also Ruiz de Mendoza Ibáñez and Santibáñez Sáenz, 2003).

A THREE-STEP CHALLENGE FOR CMT

One of the largest complaints from critics of CMT is that evidence from nonlinguistic domains is needed to truly show the presence of conceptual metaphors in human thought apart from its manifestations in language (Murphy, 1996; Pinker, 2007). In this regard, McGlone (2007) suggested a particular challenge for CMT involving three steps:

> First, one would identify an abstract concept for which the idiomatic expressions used to describe it in a particular culture suggest a conceptual metaphor, such as the THEORIES ARE BUILDINGS metaphor in our culture. Next, one would explore the idiomatic expressions used in another culture to describe the concept and determine whether this culture employs a different metaphor. Third, having

established that members of the different cultures talk about theories in different ways, one would then demonstrate that they think about theories in different ways, as evidenced by their performance in non-verbal reasoning about theories. This third step is crucial, for without it there is no empirical basis for the claim that conceptual metaphors transcend their linguistic manifestations (Lakoff, 1993). To date, conceptual metaphor researchers have not ventured beyond the first step of this investigation. (p. 114)

However, there is a huge body of research that in different ways carries out McGlone's (2007) proposed Steps 2 and 3. First, there is significant cross-linguistic work showing that many cultures share similar conceptual metaphors (Kovecses, 2005). To take one example, there is an extensive subsystem of metaphors in English for *mind*, centered on the idea that "The mind is a body" (Lakoff & Johnson, 1999; Sweetser, 1990). Among the specific metaphors are "Thinking is moving" (e.g., "My mind was racing"), "Thinking is perceiving" (e.g., "I am trying to see what you are saying"), and "Thinking is object manipulation" (e.g., "Let's toss around some ideas"), to name just a few examples. Most important, these metaphors are not special to English speakers because the same metaphors are also found in Chinese (Yu, 2003), such as "Thinking is moving" (e.g., *si-lu*—thinking route/path—'train of thought'), "Thinking is perceiving/seeing" (e.g., *kan-fa*—see-method—'a way of looking at things'), and "Thinking is object manipulation" (e.g., *sixiang jiaoliu*—exchange of thoughts/ideas—'exchange of ideas'). It is not surprising that thinking is metaphorically conceptualized in similar embodied ways across cultures because of the prominence that moving, perceiving, manipulating objects, and eating have in people's everyday lives (Gibbs, 2006a).

The cognitive linguistic research on cross-cultural conceptual metaphor also shows that two languages may share a conceptual metaphor, but that specific linguistic manifestations of these metaphors can reveal subtle differences in the cultural-ideological background in which conceptual metaphors function (Kovecses, 2005; Yu, 2003). Consider the classic "Love is a journey" metaphor, as illustrated by different English and Hungarian examples (Kovecses, 2003):

(1) "Look how far we've come."

?Nezd milyen messzire jutotunk.

[Look how far reach—1st PERS PL-PAST]

?Latod milyen messzire jutottunk?

[See how far reach—1st PERS PL-PAST

(2) "We'll have to go our separate ways."

*Kulon utakra kell lepnunk.

[Separate ways-on (LOC) must step—1st PERS PL]

Elvalnak utjaink.

[Separate—3rd PERS PL way-POSSPL]. (pp. 315–316)

The American English examples easily translate into Hungarian. In most cases, where English has a metaphorical word or expression with a particular physical meaning, Hungarian also has a word of expression with the same or similar physical meaning. This suggests that the conceptual metaphor "Love is a journey" is linguistically expressed in much the same way in the two languages.

Nonetheless, there are subtle differences in the ways that English and Hungarian conceive of "Love is a journey," which may reflect larger cultural themes shaping metaphorical concepts and talk. For instance, the English example in (1) used the word *come*, whereas Hungarian used *jut* 'get to a place after experiencing difficulties.' In Example (2), the English expression used *we* in the subject position, whereas Hungarian used "our road that separates." Decisions about relationships appear to be made via internal considerations of active agents in English, whereas relationships are more influenced by external considerations in Hungarian (e.g., the fork in the road is forcing the agents to go on their separate ways). Kovecses (2003) argued that these subtle differences reflect cultural-ideological traditions, with American English adopting a more active stance in regard to relationships, and life more generally, whereas Hungarian embraces a more fatalistic attitude toward relationships and life events. In this case, different instantiations of a single conceptual metaphor in two languages reflects and constrains the ways individuals in different cultures reasons about an abstract target domain.

Finally, two cultures may sometimes have different conceptual metaphors for a particular target domain, leading to radically different concepts for that domain in two languages. For instance, Chinese language and culture typically conceive of the heart as the locus of mind (i.e., "The heart is the locus of mind"), which yields metaphorical concepts such as, "The heart is the ruler of the body." More broadly, within the Chinese cosmological view, the heart is the "center" of the body, with the human body being the "heart" of the universe, implying that the heart is the focal point of the entire universe (Yu, 2008). This view of the "mind is the heart" informs many aspects of Chinese reasoning, including that seen in art, music, literature, politics, and medicine (Yu, 2008). In English, however, as well as in many Western cultures, the brain is the locus of mind, leading to the "mind is the brain" metaphor, with the heart being seen as a center of feelings and emotions. This metaphorical model of the mind leads to alternative reasoning about the causes of human thought and action, which is also evident in a wide range of cultural artifacts and beliefs. Most generally, variation in Chinese and English metaphorical models of mind "symbolize an

important difference between two major civilizations of the world caught in our label as heart-centering holism versus heart-head dualism" (Yu, 2008, p. 375).

Overall, the analysis of metaphorical expressions across different languages supports the claim that many conceptual metaphors are largely universal, particularly in cases where the metaphors are based on recurring bodily experiences. Differences in the ways cultures metaphorically talk of certain abstract topics reflect important variation in the ways cultures think about those domains of experience. This assorted linguistic work constitutes evidence for McGlone's (2007) second step toward supporting CMT. One further possibility to consider along these lines is whether people's use of certain metaphorical language, which is presumably motivated by conceptual metaphors, partly enables speakers to think about certain abstract topics in specific metaphorical ways. For example, people learning Hungarian as a second language may come to infer the culturally specific instantiation of the "Love is a journey" metaphor from hearing and using particular Hungarian expressions. If this were to happen, then it would be evidence for some version of the Whorfian hypothesis on the influence of language on thought. Indeed, there are some experimental results consistent with a more dramatic version of this possibility (Boroditsky, 2000, 2001), although some of these findings have not been replicated (Chen, 2007). Clearly, more linguistic and psycholinguistic work is needed to explore the extent to which speaking metaphorically alters the nature of metaphoric thinking.

The third step in McGlone's (2007) challenge for CMT is to find evidence that people really use conceptual metaphors in how they think, and not just speak of, different abstract concepts. First, cognitive linguistic studies already show the deeply systematic ways that people not just speak, but reason, with conceptual metaphor in a large number of academic domains, including work related to mathematics (Lakoff & Núñez, 2002), the history of philosophy (Lakoff & Johnson, 1999), natural science concepts (Brown, 2003), and theories of mind in psychology (Gentner & Grudin, 1985). Various experimental studies also reveal how ordinary people's understanding of metaphor can be critical in certain forms of problem solving and decision making, including how people resolve everyday dilemmas that could be framed in two different metaphorical ways ("Trade is war" vs. "Trade is a two-way street"; Robins & Mayer, 2000), how conceptual metaphors affect people's attitudes toward controversial debates (Read, Cesa, Jones, & Collins, 1990), how people reason about economics (Boers & Littlemore, 2000), and people's reasoning about advertising and marketing communication (Coulter, Zaltman, & Coulter, 2001; Phillips & McQuarrie, 2007).

In addition to these studies, there is also a growing body of research from many academic disciplines that suggests the presence of conceptual metaphors in many nonlinguistic domains, including psychophysical judgments about time and space (Casasanto & Boroditsky, 2008), gestural systems (Cienki & Mueller,

2008; Núñez & Sweetser, 2006), mathematics (Lakoff & Núñez, 2002), music (Johnson & Larsen, 2003; Zbikowski, 2002), dance (Gibbs, 2003), pictorial advertising and comics (Forceville, 2002, 2005), architecture (Ferrari, 2006), and material culture (Orton, 2004; Tilley, 1999).

For example, conceptual metaphors play a significant role in people's use and understanding of gestures. Calbris (1990) identified metaphoric gestures as "passing from something concrete to the physical representation of something abstract" (p. 194), as when one person moves apart two palms facing each other to refer to the wide range of work that needs to be accomplished. Thus, mathematicians exhibit gestural images for the concept of limits, both direct and inverse (e.g., hand moving a straight line in front of the body for direct limits, and hand looping downward and back up for inverse limits; McNeill, 1992). In a different domain, Cienki (1998) showed in an analysis of students' discussions about honesty how one person said, "Like dishonest suggests, like, um, not truthful, the truth is what like," and when saying "truth" made a flat-hand gesture with her left hand in the vertical plane, fingers pointing away from her body. This gesture appears to express the conceptual metaphor of "truth," or "Honesty is straight" (e.g., "straight talk"), although nothing in the speech denotes this metaphoric understanding. Metaphoric gestures are not simple duplications of metaphoric lexemes, but reflect independent modes of expressions that are motivated by underlying conceptual metaphors (Cienki & Mueller, 2008).

All of the previously cited nonlinguistic evidence on conceptual metaphor demonstrates that similar patterns of conceptual metaphor are seen in the analysis of linguistic and nonlinguistic domains, such that conceptual metaphors are not merely linguistic, but reflections of entrenched thought. There is also a growing literature from experimental social psychology revealing how conceptual metaphors influence different nonlinguistic, social perception and cognition (Crawford, 2009). For example, there is the widespread set of metaphors suggesting that "Good is up" and "Bad is down." Experimental studies show that people evaluate positive words faster if these are presented in a higher vertical position on a computer screen, and recognize negative words faster if they appear in the lower part of the screen (Meier & Robinson, 2004). People also judge a group's social power to be greater when these judgments are made at the top of a computer screen than when presented in the lower part of the screen (Schubert, 2005). These findings are consistent with the idea that people conceive of good and bad as being spatially located along some vertical dimension—a concept that arises from good experiences being upward (e.g., being alive and healthy) and bad ones being downward (e.g., sickness and death).

Furthermore, increasing the vertical distance on a computer screen between a boss and an employee increases people's impressions of the boss being more powerful—a finding that is not replicated along the horizontal dimension

(Giessner & Schubert, 2007). Both power and social status are formed by bodily based conceptions of vertical space. Quite interestingly, even spiritual concepts are conceived along vertical spatial dimensions. Thus, people judged words related to God faster when these were presented in the top half of the computer screen, with the opposite occurring for Devil-related words (Meier, Robinson, Crawford, & Ahlvers, 2007). When asked to guess which people, based on their pictures, were more likely to believe in God, participants chose people more often when their pictures were placed along the higher vertical axis on the computer screen. Once again, people's nonlinguistic judgments appear to be shaped by conceptual metaphors depicting "Good is up" and "Bad is down."

All this experimental research illustrates the general point that evaluative judgments automatically activate embodied, spatial knowledge, including relevant metaphorical understandings of social concepts in spatial terms. Not surprisingly, people also judge their interpersonal relationships partly in light of their spatial experiences. Williams and Bargh (2008b) showed that when people engaged in a task emphasizing distance between two objects (e.g., placing 2 dots far apart on a Cartesian plane), they subsequently judged themselves to be interpersonally, or socially, further apart than when engaged in a distance-closeness task (e.g., placing 2 dots close together on a Cartesian plane). This finding makes sense given the conceptual metaphor that "Intimacy is closeness." A different study revealed that having people briefly hold warm, as opposed to cold, cups of coffee led them to judge a fictitious person's interpersonal traits as being warmer (Williams & Bargh, 2008a)—a finding consistent with the metaphor of "Affection is warmth."

Within a different experiential domain, having people make judgments about people's behavior in a dirty work area caused them to rate the behavior as more immoral than when the same judgments were made in a clean work area (Schnall, Benton, & Harvey, 2008). Asking people to recall an immoral deed, as opposed to an ethical one, made them more likely to choose an antiseptic wipe as a free gift after the experiment (Zhong & Lilgenquist, 2006). Both these findings are consistent with the conceptual metaphors "Good is clean" and "Bad is dirty." Similarly, people see "Good is white" and "Bad is black," which explains why people are faster in evaluating words when presented in font colors consistent with the embodied metaphors of good–white and bad–black (Meier, Robinson, & Clore, 2004). People who exhibit a greater desire for cleanliness even have a stronger association between morality/immorality and the colors white/black than do people with less interest in cleanliness (Storbeck & Clore, 2008).

These findings from social psychology directly respond to the challenge that CMT must demonstrate the power of conceptual metaphors in nonlinguistic domains of experience. Any proper evaluation of CMT must acknowledge, and discuss, this nonlinguistic evidence. My claim is that the work described earlier

provides sufficient evidence to meet McGlone's (2007) three-step challenge for CMT.

A final point of contention in some criticisms of CMT is the mistaken assumption that global conceptual metaphors alone must create the meanings of verbal metaphors. However, CMT scholars have always acknowledged that conceptual metaphors typically bring with them a whole range of source-to-target domain mappings or correspondences that more subtly shape the meaning of a linguistic metaphor. For instance, the expressions, "The argument flared up between them" and "His stupid comment just added fuel to the fire," mean something different, although they are both motivated by the conceptual metaphor "Argument is fire," which is a subset of the more general conceptual metaphor "Intensity is heat" (Kovecses, 2008). However, the meaning difference between these two expressions is due to the specific mappings that arise as part of the conceptual metaphor "Intensity is heat," such as the following:

Source	Target
the degree of heat	the degree of intensity
the cause of heat	the cause of intensity
increase in the degree of heat	increase in the degree of intensity
decrease in the degree of heat	decrease in the degree of intensity
heat drops to zero	intensity ceases

Thus, "The argument flared up between them" is motivated by the specific mapping of "increase in the degree of heat" onto "increase in the degree of intensity," whereas "His stupid comment just added fuel to the fire" is motivated by the specific mapping of "the cause of heat" onto "the cause of intensity." In this manner, the specific mappings arising from conceptual metaphors provide substantial information that shapes the subtle meanings of verbal metaphors. However, conceptual metaphors alone do not create the full interpretations of all verbal metaphors as, once more, various lexical, grammatical, and socio-cultural constraints shape the use and understanding of metaphorical discourse.

PSYCHOLINGUISTIC STUDIES ON CMT

A fundamental concern for a broad range of cognitive scientists is whether people actually recruit conceptual metaphors during their ordinary use and understanding of language. The experimental studies related to this issue have explored two specific questions: (a) do conceptual metaphors play a role in people's tacit understandings of why many metaphoric words and phrases convey

the specific meanings they do?, and (b) Do conceptual metaphors play a role in people's immediate production and understanding of metaphoric language? It is important to distinguish between these two questions because people may, given the appropriate experimental circumstances, reveal something about the conceptual metaphorical motivation for why certain words and phrases mean what they do without necessarily accessing this information during online metaphor production and interpretation. Different experimental methods are required to investigate each of these possibilities, and my claim is that the results of many studies provide affirmative answers to both questions.

Experimental studies showing that conceptual metaphors shape people's tacit understandings of why conventional and novel metaphoric expressions have the meanings they do includes research on mental imagery for idioms and proverbs (Gibbs & O'Brien, 1990; Gibbs, Strom, & Spivey-Knowlton, 1997; Sanford, 2008), people's context-sensitive judgments about the meanings of idioms (Nayak & Gibbs, 1990), people's judgments about the mappings from source-to-target domains for idiomatic phrases (Gibbs, 1992), people's judgments about the permissible mappings underlying primary metaphors (Gibbs et al., 2004), people's answers to questions about temporal events (Boroditsky & Ramscar, 2002), people's answers to questions about metaphorically motivated fictive motion (Matlock, Ramscar, & Boroditsky, 2005), readers' drawing of coherent connections during text processing (Albritton, McKoon, & Gerrig, 1995), and people's semantic and episodic memories for conceptual metaphors, such as "Life is a journey" (Katz & Taylor, 2008).

These assorted experimental findings, collected using a variety of experimental methods, indicate that the metaphorical mappings between embodied source domains and abstract target domains partly motivate the specific figurative meanings of many conventional and novel metaphors; and preserve the structural, or image-schematic, characteristics of the source domains. More important, these data also showed that people have specific metaphorical conceptions of abstract ideas (e.g., emotions) that are shaped by recurring bodily experiences (e.g., their own bodies as containers; Gibbs, 2006a).

However, do conceptual metaphors influence people's immediate use and understanding of verbal metaphors? There are many factors that affect people's in-the-moment comprehension of metaphoric language. One possibility is that people should find it relatively easy to read verbal metaphors whose meanings are motivated by conceptual metaphors identical to those structuring the previous text. Under this hypothesis, people are automatically accessing conceptual metaphors as they read and make sense of discourse. The activation of a specific conceptual metaphor should facilitate people's comprehension of a verbal metaphor if that expression is motivated by the same conceptual metaphor, compared to reading a verbal metaphor motivated by a different conceptual mapping.

The data from several psycholinguistic studies show that conceptual metaphors do affect online processing of verbal metaphor. For example, Pfaff, Gibbs, and Johnson (1997) found in a full-phrase reading task that euphemistic expressions (e.g., "She's turning my crank" motivated by "Sexual desire is an activated machine") were understood more quickly in contexts that depicted similar conceptual metaphors than in contexts that conveyed different conceptual metaphors. The data from this set of studies also ruled out the alternative possibility that reading time advantage for some verbal metaphors in context is due solely to lexical priming between words in contexts and words in the metaphors. More recently, a series of reading time studies, where contexts were presented in a full paragraph style and not line by line, also showed that conceptual metaphors are accessed during the online processing of verbal metaphors (Gong & Ahrens, 2007). Furthermore, studies employing an online lexical priming task also demonstrated that conceptual metaphors (e.g., "Anger is heated fluid in a container") are accessed during immediate idiom (e.g., "John blew his stack") processing (Gibbs, Bogdonovich, Sykes, & Barr, 1997). In line with this other work, studies indicate that people read metaphors that were consistent to a single conceptual metaphor faster than they did metaphors that were motivated by different conceptual metaphors (Gentner, Imai, & Boroditsky, 2002; Langston, 2002).

This body of experimental findings is clearly complementary to the various linguistic analyses of conceptual metaphor in ordinary language use. Yet, other studies have presented data that may contradict aspects of CMT as a psychological theory of verbal metaphor comprehension. For instance, one possibility is that ordinary people's intuitions about the meanings of idioms depend on their knowledge of the stipulated (i.e., historically given) figurative meanings of the phrases, and not on recognizing the possible conceptual metaphors that give rise to idioms and conventional expressions in the first place, as suggested by the cognitive linguistic and psycholinguistic literatures. Keysar and Bly (1995) tested this idea by first having people learn either the original or opposite meanings of unfamiliar idioms (e.g., for the idiom "The goose hangs high," meaning either "things look good," its original meaning, or "things look bad"). Later on, when participants were asked to rate whether an idiom's meaning made sense, the learned meanings were generally perceived as being more transparent than the non-learned meanings. More important, this result was obtained regardless of whether the original meaning of the idiom was stipulated. In other words, if people were told that the meaning of "The goose hangs high" is "things look bad," when in fact its original meaning was "things look good," they believed that the meaning presented to them originally made more sense as best capturing what the phrase "The goose hangs high" could mean. Keysar and Bly interpreted these findings to suggest that intuitions alone about why idioms mean what they do should not be trusted as evidence for CMT.

However, the major problem with Keysar and Bly's (1995) findings is that the vast majority of the idioms they studied are based on metonymy, and not metaphor. Thus, the phrase "The goose hangs high" means "things look good" because the act of hanging a dead goose up for all to see metonymyically stands for an entire sequence of events leading up to the successful slaughter of the goose for food. Contemporary speakers often have great difficulty explaining why metonymically based idioms mean what they do, even for widely used expressions (e.g., "kick the bucket"). Furthermore, Keysar and Bly's results may be due to the fact that all of their idioms had low transparent meanings (i.e., had opaque relations between their surface forms and figurative meanings). Studies that examined second language learners' understandings of more transparent meanings found that participants could give highly consistent and correct definitions for these phrases, even when these were encountered for the first time (Skoufaki, 2009). Thus, Keysar and Bly's "use of low-transparency idioms in highly biasing contexts and forced definitions choices may have presumpted the partial reliance of participants on idiom-inherent features to form their interpretations" (Skoufaki, 2009, p. 32). This possibility casts further doubt on the Keysar and Bly studies as evidence against CMT. Just as important, however, various experiments have demonstrated that first language learners acquire the meanings of idioms motivated by conceptual metaphors before they do other idioms (Gibbs, 1991), and that second language learners learn idiomatic phrases more readily when they explicitly attend to these expressions' conceptual metaphorical motivations (Boers, 2004; Boers & Littlemore, 2000).

Another set of studies critical of CMT asked people to paraphrase verbal metaphors, such as "The lecture was a three-course meal," to see if these may reveal the presence of conceptual metaphors in people's processing of these linguistic expressions (McGlone, 1996). Analysis of these paraphrases revealed that only 24% contained any references consistent with underlying conceptual metaphors, such as "Ideas are food." Even when participants were more specifically asked to give "figurative paraphrases" of the verbal metaphors in a second study, they still only did so 41% of the time (i.e., mentioning source domain terms, like *food*, related to the conceptual metaphor "Ideas are food"). A follow-up study found that people do not perceive expressions motivated by conceptual metaphor to be any more similar in meaning than they did expressions motivated by different conceptual metaphors (however, see Nayak & Gibbs, 1990). These data were interpreted as showing that people's interpretations of verbal metaphors might not be related to their putative, underlying conceptual metaphors.

Yet, asking people to verbally paraphrase a novel metaphor may not be the best indicator of the possible underlying presence of conceptual metaphors in interpreting these novel expressions. Given the long-noted difficulties people have in paraphrasing metaphors (Gibbs, 1994), the fact that 41% could provide

interpretations that seem to meet some criteria for conceptual metaphor may be a positive finding in favor of CMT. Moreover, the specific metaphors McGlone (1996) examined in his studies may not be related to conceptual metaphors, as most were classic "A is B" resemblance metaphors. Some of McGlone's (1996, p. 450) examples, such as "Dr. Moreland's lecture was a three-course meal for the mind" are examples of XYZ metaphors (e.g., "Religion is an opiate of the masses"), which are not typically motivated by single conceptual metaphors, and are likely produced and understood through complex conceptual blending processes (Fauconnier & Turner, 2002).

Keysar et al. (2000) also reported psycholinguistic results that appear to contradict the idea, in this case, that conventional metaphoric expressions are understood through recruitment of conceptual metaphors. Specifically, Keysar et al. found that when novel metaphors, such as "Tina was currently weaning her latest child," was read in the context of related conventional metaphors (e.g., talk of Tina as prolific and conceiving new findings, all related to the conceptual metaphor "Ideas are people"), they were comprehended no more quickly than when read in the context of non-metaphoric language. However, people were faster to read the same novel metaphors when seen in contexts containing related novel metaphors (e.g., Tina thinks of her theories as children; she is fertile and giving birth to new ideas). This pattern of results suggested that understanding novel metaphors activates a deeper conceptual metaphorical base, whereas conventional expressions do not, contrary to the claims of CMT.

However, a more recent corpus analysis of some of the experimental stimuli employed in Keysar et al. (2000) revealed that many of the so-called novel metaphors examined were really conventional, and that other metaphors were novel more because they reflected atypical language patterns as opposed to the context in which they appeared (Deignan, 2006). This corpus study raises questions about whether the empirical findings really reflected much about conventional and novel metaphor understanding. Indeed, a different examination of the Keysar et al. complete set of experimental materials also raised several problems with their stimuli (Thibodeau & Durgin, 2008). Many conventional metaphors used by Keysar et al. did not appear to be related to similar underlying conceptual metaphors, as well as the novel metaphorical expressions; and other conventional expressions seemed dissimilar from those described as being motivated by pervasive conceptual metaphors, as identified by much work in cognitive linguistics.

Thibodeau and Durgin (2008) replicated the same findings obtained by Keysar et al. (2000) using their original stimuli. However, a second study employed new stimulus materials that had consistent relations between conventional and novel metaphors in terms of their being motivated by identical conceptual metaphors. The results of a second reading time study with these revised stimuli demonstrated that reading conventional metaphors facilitated understanding of

novel metaphoric language, contrary to the conclusions of Keysar et al. A third study in this series compared pairs of conventional metaphoric scenarios that depicted different "metaphor families" for a target domain (e.g., "Anger is heat": "I was fuming"; and "Anger is a dangerous animal": "I was bristling"), with non-metaphoric expressions (e.g., "I was furious"). Once again, novel metaphors were comprehended more quickly when they were read after a story containing conventional expressions motivated by the same conceptual metaphor than when they followed conventional expressions motivated by a different conceptual metaphor. Thibodeau and Durgin concluded from these results that "conventional metaphors remain productive," and that "families of conventional metaphors . . . can facilitate the mappings of relevant conceptual structures when interpreting novel metaphoric language" (p. 537). One should note here that Thibodeau and Durgin only talked of "families of conventional metaphors," and did not explicitly endorse the idea that these verbal metaphors are necessarily reflective of underlying conceptual metaphors. Still, the Thibodeau and Durgin work provides a refutation of Keysar et al.'s results and negative conclusions about CMT.

Another psycholinguistic study whose findings, I claim, are consistent with the idea that conceptual metaphors influence verbal metaphor understanding is McGlone and Harding (1998). This set of experiments showed that people take less time to comprehend temporal metaphors (e.g., "The meeting originally scheduled for next Wednesday has been moved forward two days") when these are seen in contexts with consistent temporal perspectives (e.g., time is moving while an observer is still, or an observer is moving while time is still—both different versions of the "Time is motion" metaphor), compared to when these same verbal metaphors were seen in contexts with inconsistent metaphors (e.g., moving-observer and moving-event metaphors juxtaposed). However, McGlone and Harding interpreted these data as being most parsimonious with the idea that there is some abstract similarity, and not metaphorical mapping, between time and space (or motion through space; Jackendoff, 1983). Under this view, the idea that time can move, as in moving a date forward, is grounded in those abstract features that are common to both time and space, or movement through space.

The difficulty with this explanation, however, is that time and space have a directional relation such that time is understood in terms of space, but space is not understood in terms of time. Thus, the directional relation between time and space suggests that time is metaphorically understood (e.g., "Time is motion"), which is exactly the claim of CMT (Gibbs, 1994). One can argue, then, that the abstract similarity position is untenable as an account of verbal metaphor understanding, with the McGlone and Harding (1998) data being consistent with the tenets of CMT. A more recent set of online visual priming studies specifically demonstrated that people's responses to the ambiguous time question ("Wednesday's meeting has been moved forward by two days. What day will the

meeting now be held?") is structured in terms of a specific conceptual metaphor in which events that are in front are earlier, and those that are behind being seen as later (i.e., a *time–reference–point* metaphor), rather than in terms of an *ego-* or *time-moving* metaphor (i.e., a *time–ego* metaphor; Núñez, Motz, & Teuscher, 2006).

Several other studies have also explored people's various metaphorical understandings of time. For instance, the spatial metaphor "Time is movement along a path" raises the possibility of time moving from left to right, although there is no linguistic evidence of the left–right axis being used in talk about time (e.g., the rightward month). Nonetheless, understanding of a left–right flow of time does appear in cultures whose language has a left–right writing direction. One psychological study explored the automatic activation of the left–right axis in processing of temporal concepts (Santiago, Lupiáñez, Pérez, & Funes, 2007). Participants made speeded categorizations of individual words and phrases as to whether they referred to the past or future (e.g., "after," "next," "I will then," "before," "recently," "I thought"). These words and phrases, however, were visually displayed on either the right or left side of the computer screen, and participants made their speeded responses by pushing a button with either the left or right hand.

In general, participants were faster when past and future time was seen on the left and right sides of the screen, respectively, and when the left and right hands made the responses, respectively. This pattern of data suggests that irrelevant parts of the judgment task (e.g., speeded processing of words on the screen and hand response) played a role in people's immediate judgments of temporal concepts—a view that is consistent with the predictions of a specific conceptual "mapping between past time and left space and future time and right space" (Santiago et al., 2007, p. 515). Once again, experience in the left-to-right writing direction, and reading, provides some of the experiential motivation for the existence of this spatial understanding of past and future along the left-to-right axis. These findings are especially interesting because they suggest how "time can be spatialized in ways that have no corresponding reflection in language" (p. 515). Although it is not clear when and how people immediately adapt different spatial time metaphors, and resolve possible conflicts between them, studies have suggested that attention plays an important part in highlighting the relevant space–time metaphor for particular individuals in different cultural contexts.

NEW VISIONS OF CMT

This review of some of the contemporary psycholinguistic research findings on CMT describes only part of the work consistent with the idea that conceptual

metaphors appear to play some, but not necessarily exclusive, role in people's interpretation and online processing of many types of verbal metaphors. To take just one example, given space limitations, I have also not touched on some of the emerging ideas on a neural theory of conceptual metaphor (Gallese & Lakoff, 2005; Lakoff, 2008).

However, several key questions can still be raised about conceptual metaphors' exact role in metaphoric language understanding. First, does one initially access the complete conceptual metaphor (e.g., "Love relationships are journeys") from memory and then apply it to infer the metaphoric meaning of an expression (e.g., "Our marriage is a roller-coaster ride from hell")? Second, if the conceptual metaphor is accessed prior to interpretation of expression, does it come with a package of detailed meaning entailments or correspondences that are also inferred as part of one's understanding of what the expression means?; or, must people compute source-to-target domain mappings online to determine which entailments of the conceptual metaphor are applied to the meaning of utterance? Finally, do conceptual metaphors arise as products of understanding and are, therefore, not necessary to create an initial understanding of a metaphorical expression?

There are, as of yet, no empirical studies that provide exact answers to these questions. Nonetheless, two related trends in cognitive science offer partial responses to these questions, which may lead to a new vision of conceptual metaphor in thought and communication. One development is the idea that embodied simulations play some role in people's immediate processing of verbal metaphors, and language more generally (Bergen, 2005; Bergen, Lindsay, Matlock, & Narayanan, 2007; Gibbs, 2006a). People may, for instance, be creating partial, but not necessarily complete, embodied simulations of speakers' metaphorical messages that involve moment-by-moment "what must it be like" processes that make use of ongoing tactile-kinesthetic experiences (Gibbs, 2006c). More dramatically, these simulation processes operate even when people encounter language that is abstract, or refers to actions that are physically impossible to perform. Understanding abstract events, such as "grasping the concept," is constrained by aspects of people's embodied experience as if they are immersed in the discourse situation, even when these events can only be metaphorically, and not physically, realized.

Various experimental studies employing both offline and online methods provide evidence in support of these ideas about simulation and metaphor (Gibbs, 2006c; Gibbs, Gould, & Andric, 2006; Wilson & Gibbs, 2007). Gibbs et al. (2006) demonstrated how people's mental imagery for metaphorical phrases, such as "tear apart the argument," exhibit significant embodied qualities of the actions referred to by these phrases (e.g., people conceive of the "argument" as a physical object that, when torn apart, no longer persists). Wilson and

Gibbs showed that people's speeded comprehension of metaphorical phrases, like "grasp the concept," are facilitated when they first make, or imagine making, in this case, a grasping movement. Furthermore, hearing fictive motion expressions, implying metaphorical motion, such as "The road goes through the desert," affects people's subsequent eye-movement patterns while looking at a scene of the sentence depicted (Richardson & Matlock, 2007). This suggests that the simulations used to understand the sentence, in this case involving a particular motion movement of what the road does, interacts with people's eye movements.

One implication of these different empirical studies is that people do not just access passively encoded conceptual metaphors from long-term memory during online metaphor understanding. Instead, conceptual metaphors emerge through simulation of what these actions may be like in the moment of understanding to create detailed interpretations of speakers' metaphorical messages. This simulation perspective on conceptual metaphor is generally consistent with claims that thought and language are continually situated within the interaction of brains, bodies, and world (Gibbs, 2006c).

An even broader approach on conceptual metaphor aims to situate this aspect of mind within the framework of dynamic systems theory (Gibbs & Cameron, 2008). A dynamical systems perspective sees conceptual metaphor as an emergent phenomenon that arises from the interaction of numerous constraints operating at different time scales. Under this view, simple and complex behaviors are higher-order products of individual's self-organizational processes. The phrase "phase space change" refers to the set of possible states of the system. As the system changes states over time, it traces a trajectory in its phase space landscape—a path of the successive states it occupies. When a system's behavior is observed over an extended period, it sometimes happens that certain regions of the phase space are occupied often, others occasionally, and others never. An area of phase space the system occupies or approaches more frequently than others is called an *attractor*. An attractor exerts a kind of pull on the system, bringing the system's behavior close to it. Every system has multiple attractors shaping behavior at any one time.

My suggestion is that conceptual metaphors may be best thought of as basins of attraction (e.g., areas of stability in experience, such as correlations like "Knowing is seeing") in the phase space of the talking and thinking of a discourse community, which emerge from many different forces, operating along different time scales. For instance, some dynamic processes occur over short time spans (e.g., neural firings or momentary thoughts). Others processes unfold over the course of individuals' lives, and so guide development and change in personality, and interpersonal interactions throughout the lifespan. Dynamic processes also operate on populations over a much longer, evolutionary timeframe.

Consider some of the different levels at which conceptual metaphor has been claimed by scholars in various disciplines to have some influence:

1. Cultural models of many abstract concepts.
2. The evolution of language.
3. Contemporary language (e.g., conventional expressions, novel extensions, and polysemy).
4. Aspects of contemporary speakers' nonlinguistic thinking and communication.
5. Contemporary speakers' entrenched knowledge structuring many abstract concepts that motivate people's tacit understandings of why various words, phrases, and texts convey the figurative meanings they do.
6. Contemporary speakers' entrenched knowledge that is immediately recruited (i.e., accessed or activated) during online metaphorical language use.
7. Neural and computational processing underlying certain abstract thought and language use.

The extensive debates on CMT focus, to a large extent, over which of the previously mentioned levels is most critical to understanding the workings of conceptual metaphors in language, thought, and culture. Psycholinguists opposed to CMT may, for example, accept that conceptual metaphors may influence Levels 1 through 3, but not Levels 4 through 6. However, a dynamical perspective argues that these levels may represents different time scales in experience that are not independent, but are hierarchically organized (from slowest to fasting moving) and nested within one another such that constraints operating at one level (e.g., Levels 1 or 2) may be coupled in complex, nonlinear ways with those at other levels (e.g., Levels 5 or 6). For this reason, the occurrence of metaphorical words or phrases in some discourse may not only reflect the influence of certain conceptual metaphors, as basins of attraction (operating at Levels 5 and 6), but the interactions of metaphorical experience working simultaneously, in a continuously reciprocal fashion, at all levels.

For example, understanding of a conventional metaphorical expression, like "I don't see the point of this article," may not just arise from the simple activation of a primary metaphor, such as "Knowing is seeing," which has been stored within some conceptual network. Instead, people may spontaneously create a particular construal of this expression given the interaction of constraints from all of the previously mentioned, and other, levels, and what emerges from these interactions, in the very moment of speaking and understanding. Conceptual metaphors may, therefore, be "soft-assembled" during thinking, speaking, and understanding, rather than "accessed" or "retrieved" from long-term memory.

Furthermore, the dynamical perspective nicely explains the indeterminacy associated with metaphor understanding precisely because a central part of a dynamical, self-organized system is that the majority of a trajectory's time is spent in intermediate regions of state space that gravitate toward multiple, semi-stable attractor basins. A given conceptual metaphor is not just activated, and employed as a single entity, to help interpret a metaphorical utterance. Instead, multiple conceptual metaphors, which may have arisen to prominence at a specific moment in time, given the particular dynamics of the system at that moment, may collectively shape the trajectory of linguistic processing so that no one conceptual metaphor has complete control over how an utterance is interpreted. This possibility offers a very different view of the traditional question regarding whether a particular conceptual metaphor is activated, as many conceptual metaphors, along with many other constraining forces, may have partial, probabilistic influence on one's understanding of verbal metaphor.

A key principle behind a dynamical perspective on metaphor processing is that there is no overarching mechanism that decides the process of constructing a parse, or formulating an interpretation of a speaker's metaphorical meaning. Instead, the system as a whole will settle, or relax, into certain areas of stability, or even instability, which will constitute the momentary understanding of what a speaker is, for instance, communicating. This approach, which has been applied to solving many empirical dilemmas in psycholinguistics, such as in debates on lexical ambiguity resolution and the interaction of syntax and semantics during sentence processing (Spivey, 2007), can capture the various interactions of independently motivated contextual and linguistic constraints shaping verbal metaphor processing (Gibbs & Cameron, 2008), including all those seen in the psychological literature. How fast one processes a verbal metaphor in discourse, and whether one or more conceptual metaphors shape processing, will depend on the interaction of components, along multiple time scales, at a given moment in time (for discussion on a continuum of metaphor processing, see Bortfeld & McGlone, 2001). This makes it impossible, in principle, to state that metaphor, as a general category of language, will always take more or less time to interpret than any other kind of language. Similarly, it may very well be the case that, in some circumstances, conceptual metaphors may have a strong influence on the way a verbal metaphor is understood; and, in other instances, verbal metaphor understanding will be less constrained by various conceptual metaphors.

How any verbal metaphor is understood, and what conceptual metaphors arise to shape its processing, as well as emerge as a product of processing, will always depend on the very specific state of the system given its past history and present circumstances. Part of the difficulty here is that standard experimental studies of modularity employ methods that seek only changes in average performances on different trials or tasks (a very simple dynamic), and typically randomize stimuli, eliminating sequential effects that are revealing of more complex dynamics.

We can study these context-dependent contingencies, and make experimental predictions about the nature of processing, by looking at the variety of constraints that may influence whether certain conceptual metaphors come into play during verbal metaphor understanding.

For instance, other work on self-organization in language processing has examined cognitive performance in laboratory environments, as a whole context-sensitive measurement system. These studies track temporal patterns that emerge across a participant's sequence of response times or judgments, spanning all the trials of the experiment (Spivey, 2007). Close examination of changes, trial by trial, across the repeated measurements, reveals characteristic dynamical signatures that actually gauge the coupling between a person, the language stimuli encountered, and the specific experimental task at hand. Within metaphor studies, a whole host of factors may be experimentally studied—including one's familiarity with a metaphor, where it is presented in context, the trial pace at which an experimental participant must respond, the specific difficulty of the decision or judgment in a task trial, and the cognitive state at the moment of the trial—which can all be considered to assess their influence on metaphor use and understanding as a dynamic system.

There are several, particular empirical explanations that a dynamical account of metaphor may offer. First, dynamical systems theory offers various statistical tools to model how possible contingencies arise, and interact, according to the principles of self-organization to account for the continuous dynamics of metaphor performance. For example, verbal metaphors, and their possible conceptual metaphorical roots, occur unevenly in discourse. Dynamical systems theory is well-suited, more so than any other extant theoretical perspective, to explain different patterns of stability and instability in the emergence of metaphor in language, as well as gesture, precisely because it tracks nonlinear interactions among different constraints operating along varying time scales. Part of this modeling is likely to show patterns of metaphor coordination between speakers, a form of emergent coordinative structure in which the dynamics of each body and brain may come together to more closely mimic the other, as the two systems come to change and behave as one (Fowler, Richardson, Marsh, & Shockley, 2008).

Second, a dynamical view of metaphor offers an account of how different kinds of conceptual metaphors interact to produce specific metaphors at particular moments in time. Once more, a speaker's production of a specific verbal metaphor may arise from not just a single conceptual metaphorical base, but from a wide host of metaphorical contingencies that may exist in a given situation.

Third, a dynamical view of metaphor suggests how the creation of metaphorical language need not be deliberate or conscious, yet, again, arise from the interaction of a system's components. Speakers can just decide to communicate their recent thought processes, and the environmental constraints take care of

the fine-grained details of how these intentions are manifested in real-world behavior (i.e., saying something that may be seen as metaphorical, literal, or ironic; or also making a relevant gesture, head nod, body posture, etc.).

Fourth, dynamical systems theory also nicely explains how metaphorical meaning can express emergent properties, precisely because emergence is a fundamental property of self-organizing systems. Metaphorical meanings have long been seen as emergent properties of the interaction of source and target domains, or vehicles and topics in linguistic expressions. Within dynamic systems theory, emergent behavior, or an emergent property, arises from the interaction of different components, operating in some environment, over disparate size scales. Emergence involves circular causality in which there is often top-down feedback within the system. The metaphoric meaning of "My surgeon is a butcher," for example, is not simply a matter of bottom-up processes where semantic features associated with "surgeon" and "butcher" are matched and aligned, but depends on many other factors, working at a variety of time scales. Just as it is impossible to predict the shape and behavior of a flock of birds in flight by simply looking at the behaviors of individual birds, so, too, is it impossible to predict the emergent behavior of ensembles of metaphors, especially given their inherent context-dependent functioning. Emergent behaviors, such as metaphoric meanings, are fundamentally irreducible, and cannot be easily predicted or deduced from examination of the lower-level entities or components. Cameron (2007) provided several examples of how self-organizing processes may shape metaphor use, particularly in the way that emergent metaphors may constrain lower-level use of words with metaphorical meaning.

Fifth, a dynamical perspective on metaphor also can account for a wide variety of reading time results, showing ways in which verbal metaphors can either be quickly or more slowly processed given the specific dynamics operating within an experiment, for individual participants at different points in the experiment (for specific research and a discussion of this idea in terms of constraint satisfaction models of figurative language use, see Katz & Ferratti, 2001; see also Pexman, Ferratti, & Katz, 2000).

Finally, a dynamical view of metaphor is, again, best suited to explain how various constraints, from historical and cultural knowledge to the fast firing of neurons, simultaneously operate to shape any instance of metaphor use and understanding. Many of the debates over conceptual metaphor concern the most appropriate level at which to make generalizations about conventional patterns of metaphorical thought (e.g., culture, history, immediate social contexts, conceptual structures, linguistic expressions, and neural functioning). Scholars tend to privilege the methods and traditional topics of their own disciplines in making claims about "where" conceptual metaphor is best characterized. However, a dynamical perspective again sees how multiple, nested hierarchies of constraints, operating along different time scales, interact in nonlinear ways to

produce metaphorical behavior at any given moment. In this manner, a dynamical perspective, embracing principles of self-organization, provides a comprehensive theory to conceive of, and study, conceptual metaphors in action.

Overall, dynamical system approaches to metaphor see metaphor use and understanding as a whole system activity (i.e., interaction of brain, body, and world), giving rise to both stability and instability in a wide variety of laboratory and real-world behaviors. This approach is consistent with many other contemporary theories of human performance based on principles of self-organization, and holds much promise for studying the ways metaphor shape language, thought, and culture.

CONCLUSION

There will continue to be debates about the empirical and theoretical work done related to CMT, and this article only addresses some of the different evidence supporting, and criticisms of, CMT. At the same time, my evaluation of CMT is not intended to serve as a critique of any other theory of metaphor. My own belief is that other theories of metaphor may also have some relevant role in describing all we know about the complex topic of metaphor (see Tendahl & Gibbs, 2008). However, unlike virtually every other theory of metaphor, CMT provides important insights into the interaction of embodiment, language, thought, and culture that points to a fuller integration of metaphor studies within cognitive science (Gibbs, 2006a; Kovecses, 2005). However, at the very least, this article suggests that CMT has much empirical merit; and even if it does not necessarily account for all aspects of metaphoric thought and language use, this approach has great explanatory power, and must be considered to be foundational for any comprehensive theory of metaphor, as well as for broader theories of human cognition.

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