Metaphors Are (Sometimes) Processed as Generative Domain-Mappings

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Abstract

Metaphors are said to bring about conceptual change by providing a generative

mapping from one domain to another (Kittay & Lehrer, 1981; Lakoff & Johnson, 1980).

Extended metaphors, such as the water model for electricity, appear to provide a system of knowledge for reasoning in the target domain (Gentner & Gentner, 1983).

In this research, we studied how people comprehend new information when it is presented in terms of an extended coherent metaphoric system. Are such metaphors combined into one global mapping from one conceptual system to another, or is each individual metaphor simply comprehended independently and discarded once its meaning in the target has been extracted? Out technique was to present subjects with a series of consistently mappings from one domain to another, and then disrupt the mapping while preserving the meaning in the target. If subjects are slowed, this is evidence that they were performing a coherent domain mapping. *(?why?)*

Subjects were timed as they read passages containing extended metaphors. The passages varied in whether their last sentence (which was always the same across groups) was preceded by a set of metaphoric sentences drawn from the same base domain or by a set from a different base domain: e.g.
(1) "...After just three hours she had *lost her edge*...Her mind was too *dulled* with fatigue for her to think well.";
(2) "...After just three hours she had *run out of steam*...
Her mind was too *dulled* with fatigue for her to think well." The dependent measure was the time to read the last sentence.

Subjects were slowed by a shift in the underlying metaphor, even though the meaning of the passage remained the same. However, this effect was significant only for novel metaphors. When the passages were made up of highly conventional metaphors, subjects were not significantly slowed by a shift in the base of the metaphor. These results suggest that at least some extended metaphors are indeed comprehended as generative mappings between domains. However, they also suggest that this process may not apply to highly conventional metaphors, which may be locally processed and

may have their metaphoric interpretations stored in the lexicon rather than derived (Gibbs, Nayak & Cutting, 1981).

However, preliminary results from a second project with Mutsumi Imai concerning the way in which people process space-time metaphors such as "My exams are still before me." and "Christmas comes before New Year." show a pattern more like that of novel metaphors. Subjects' time to comprehend sentences increases when they are forced to shift between different spatio-temporal metaphors. In this case, a highly conventional metaphoric system seems to induce a global mapping.

These studies provide evidence that extended metaphors can indeed induce generative domain-mappings. However, they also suggest that such mappings are not inevitable; some conventional (though extended) metaphors appear to receive merely local processing. Further research is needed to differentiate the cases in which conceptual mappings are most likely to occur.

Metaphors Are (Sometimes) Processed as Generative

Domain-Mappings

Metaphors are said to bring about conceptual change by providing a generative mapping from one domain to another (Kittay & Lehrer, 1981; Lakoff & Johnson, 1980). People use metaphors from familiar concrete domains to discuss less familiar or abstract domains: e.g., flowing water for electricity (Gentner & Gentner, 1983) or a long journey for marriage (Quinn, 1986). Extended metaphors can seemingly evoke a whole system of knowledge, as when the computer metaphors, with its notions of encoding, retrieval, etc. is applied to cognition. They can evoke a complex set of feelings, as in Virginia Woolf's (1953, p. 17) comparison: "It rasped her, though, to have stirring about in her this brutal monster (hatred)! to hear twigs cracking and feel hooves planted down in the depths of that leaf-encumbered forest, the soul". Such metaphors appear to provide a generative system of knowledge for thinking about the target domain. Indeed, Lakoff and Johnson suggested that the generative mapping hypothesis applies not only to relatively novel metaphors such as those above but also to the vast numbers of conventionalized metaphors that run through our language: metaphors such as "the weight of evidence" and "the scales tipped towards guilty" that people utter without noticing their metaphorical basis. But as attractive as the domain mapping hypothesis may be, there is a more prosaic possibility that must be considered: namely, that metaphors (at least relatively standard metaphors) are simply processed and then discarded, with no commitment to further mappings from the same domain. In the extreme, such metaphors might simply be processed as instances of multiple word senses.

This research investigates the on-line processing of extended metaphors; metaphors which span a range of discourse greater than one sentence, as in example (1):

(1) Was Anna still boiling mad when you saw her? No, she was doing a slow simmer.

In both the Woolf example and (1), we find a consistent mapping between the base and the target of a metaphor[1]: Woolf compares hatred to a monster throughout, and both speakers in (1) draw on the same conceptual metaphor of ANGER IS HEAT to explain the character Anna's mood. In extended metaphors then, a plausible intuition is that the processing of a sentence is affected by the metaphorical interpretation given to the prior sentences. For example, compare (1) and (2):

(2) Was Anna still a raging beast when you saw her? No, she was doing a slow simmer.

The initial sentences of (1) and (2) communicate the same meaning, are structurally very similar, and have connotations of violence and agitation. Both (1) and (2) also share the same final sentence. However, the last sentence of (2) sounds odd while the (identical) last sentence of (1) scans easily. We suggest that (2) is jarring because it involves a switch from the base to target mapping set up in the first sentence (ANGER IS A BEAST), to the base to target mapping in the second sentence (ANGER IS HEAT). In contrast, (1) maintains the same base to target mapping of ANGER IS HEAT throughout. Example (1), which maintains the same base to target mapping throughout, we label a consistently extended metaphor, while example (2), which switches from one base domain to another, we label an inconsistently extended metaphor.
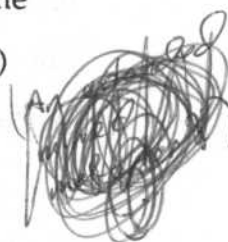
To explain phenomenon such as the difference between (1) and (2), we propose the domain-mapping hypothesis, which states that; people construct base to target

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1. In accord with usage in discussions of analogy but in contrast to conventions concerning the naming of the elements of a metaphor, the following terminology will be used in this paper: the vehicle of a metaphor, the domain from which a metaphor extrapolates, will be referred to as the base of a metaphor, and the topic or tenor of a metaphor, that to which the comparison is made, will be referred to as the base's target. For example, in the metaphor, "The sapling was a blade of grass in the forest", 'blade of grass' is the base of the metaphor, and 'sapling' is its target. The ground of a metaphor will be referred to as its interpretation.

mappings when they read extended metaphors, and that they attempt to make these mappings structurally consistent across connected systems within the base and target.

The domain-mapping hypothesis owes much to linguistic and conceptual analyses of extended metaphors. For example, Lakoff and his colleagues have analyzed many conceptual metaphors that are pervasive in contemporary American English, and have made the controversial claim that metaphors organize thought (Lakoff & Johnson, 1980; Lakoff & Köveces, 1987). Other researchers have also discussed conceptual metaphors: Reddy (1979) analyzed systems of metaphors for 'idea' and 'mind', in which communication is likened to physical transfer; Quinn (1987) analyzed metaphors for marriage; Roedigger (1980) and Gentner and Grudin (1985) discussed metaphors for the mind; and Hobbs (1979) and Nagy (1974) analyzed the use of spatial metaphors to explicate systems as disparate as the stock market and human emotional states. From these analyses the domain- mapping hypothesis takes the idea that extended metaphors can create powerful interpretive contexts by bringing knowledge about the base to bear on the target domain.

Kittay and Lehrer's (1981) metaphor comprehension theory has also influenced the domain-mapping hypothesis. Their theory is expressed in terms of the interaction hypothesis of metaphor and asserts that: 1) linking a base and a target alters one's view of the domains of one or both of them, and 2) this restructuring of domain(s) makes inferences about the target domain possible. The domain-mapping hypothesis adopts Kittay and Lehrer's suggestion that in extended metaphor comprehension the base domain can strongly determine interpretation of the target domain. In their analysis of Wordsworth's poem likening the history of Venice to the lifecourse of a woman, Kittay and Lehrer argue that the base domain structures one's understanding of the target domain and that this structuring is predictive: an important event in the base (e.g., childbirth) can predict an event in the target domain (e.g., the artistic flowering of Venice).

From these conceptual and linguistic accounts of metaphor comes the domain-mapping hypothesis' suggestion that extended metaphors set up interpretive contexts which guide understanding of targets. In reading the first sentence of example (1) then, one infers, perhaps implictly, the underlying conceptual metaphors ANGER IS HEAT and THE MIND IS A CONTAINER (Lakoff & Johnson, 1980; Lakoff & Köveces). These metaphors give rise to the metaphor ANGER IS THE HEAT OF A LIQUID IN A CONTAINER, which provides a mapping between Anna's anger and hot liquid, allowing one to understand "boiling mad". This specific metaphor is continued in the second sentence, which continues the mapping of anger to heat and which indicates that the 'amount' of heat (and thereby the 'amount' of anger) has diminished: Anna is no longer "boiling" mad, she is now "simmering".

We turn now to empirical and additional theoretical research for insight into the nature of metaphoric domains and the mechanisms which link them. We will discuss two major veins of work which can be roughly characterized as the 'what' and 'when' of metaphoric comprehension. The first of these (the 'what') is epistemological and concerns how a metaphor's meaning relates to the meanings of its terms. The 'when' line of research concerns the real-time processing of metaphors and the order in which metaphorical and literal meanings are considered.

Epistemological Research

A number of metaphor theories have been expressed in terms of the comparison view (Black, 1962), according to which metaphors involve comparisons between things which are not literally similar. Here, finding the meaning of a metaphor involves finding the set of features that the base and target share. This view evolved into subtheories taking three major stances on the relationship of bases to targets in metaphors: those emphasizing similarity (e.g., Malgady & Johnson, 1980; Marschark,

Katz, Paivio, 1983), those emphasizing difference (e.g., Campbell, 1975), and those incorporating both similarity and difference (e.g., Ortony, 1979).

Ortony's (1979) salience imbalance metaphor model, which is based on Tversky's (1977) contrast model of similarity, is an example of the third subcategorization. His theory asserts that salience imbalance regulates which features will be transferred from a base to a target in a metaphor: high-salient features in a base are matched against low-salient features of a target. This inclusion of salience imbalance as a variable allows Ortony's theory to account for the finding that metaphors are asymmetrical in that their targets and bases play different roles in a metaphor (e.g., Ortony, 1979; Camac & Glucksberg, 1984). For example, the metaphors "Surgeons are butchers" and "Butchers are surgeons" mean very different things, depending on which term (i.e., butcher or surgeon) is the base and which is the target. However, the salience imbalance theory is silent on the question of how to extend its analysis to extended metaphors, and so cannot help address the current question.

Glucksberg and Keysar's (1990) class-inclusion theory of metaphor, in explicit rejection of comparison theories, argues that metaphors are class-inclusion statements. Here, metaphors such as "my job is a jail" are understood as follows: the target of the metaphor ("my job") is considered a member of the category of things which confine, are stressful, are difficult to leave, etc. The metaphor's base ("a jail") refers to and is a prototypical member of this category.

In extrapolating from this theory, it seems that in the development of an extended metaphor, the target may be considered a member of several different categories rather than of a single one. However, this theory provides no mechanism for linking such categories. For example, the target in the first sentence of (1), (i.e., "Was Anna still boiling mad when you saw her?"), is "Anna"; she is the one to whom a comparison is made. In terms of Glucksberg and Keysar's theory, Anna is considered a member of the category of things which are very agitated and potentially dangerous. Boiling hot

water, the metaphor's base, refers to and is arguably a prototypical member of this category. While this explication seems reasonable, it is not clear how to link it to the metaphor's second sentence: "No, she was doing a slow simmer". While Anna is still the target, she is now a member of the category of actions characterized by mild agitation. The metaphor's base is no longer boiling hot water; it is now the action of simmering. With Glucksberg and Keysar account, this extended metaphor has two bases, one referring to an object and one to an action category, and no mechanism for recognizing that the two express the same conceptual metaphor of ANGER IS HEAT. Therefore, while this framework may explicate single-sentence metaphors, it does not seem able to explicate extended ones.

The two epistemological approaches discussed so far we label "localist" because they address single-sentence, rather than extended, metaphors. Because their focus is on understanding the mappings between a particular metaphor's base and target, such localist theories are not designed to explain the discourse level, inter-sentential relations we think are crucial to extended metaphor processing. Therefore, we now consider approaches which have explicitly addressed exten led metaphors or which seem relatively amenable to such analyses.

The domains-interaction hypothesis proposed by Tourangeau & Sternberg (1981; 1982), with its focus on domains, seems a potentially useful model. It adopts a mental distance model of similarity and dimensions according to which a good metaphor, such as "Brezhnev is a hawk", satisfies two criteria. First, a good metaphor involves two very different domains (i.e., political figures and birds) and thus has high between-domain dissimilarity. Second, it shows high within-domain similarity of the base and target: Brezhnev and hawks occupy the same relative position in their domain spaces. Therefore, a metaphor is better the greater the between-domain distance, and the smaller the within-domain distance, of its base and target.

This multi-dimensional representation was also adopted by Kelly and Keil (1987). They had subjects use semantic differential scales to perform two sets of ratings on concepts from the domains presented in the experiment. The scales were designed to measure similarities between pairs of concepts. Before starting the second set of ratings (which were identical to the first), subjects in the experimental condition paraphrased and rated the aptness of four metaphors linking two domains from the experiment, such as periodicals and food (e.g., "The Wall Street Journal is the spinach of newspapers and magazines"). Kelly and Keil found that subjects in the experimental group gave higher similarity ratings to pairs of concepts from the metaphors they saw than the control group, but only if these pairs made good metaphors. If these pairs made inappropriate metaphors, the former group gave them lower similarity ratings than did the latter. While they did not explicitly address extended metaphors, Kelly and Keil's central finding that metaphors seem to activate domains is applicable to such metaphors.

Despite these interesting findings, overall empirical support for the domains-interaction hypothesis is mixed. Both Kelly and Keil (1987) and Tourangeau and Sternberg (1982) found support for the theory's prediction that within-domain closeness is positively correlated with aptness, but not for its other central claim that between-domain distance is positively correlated with aptness ratings.

Furthermore, the multi-dimensional space representation of conceptual structures, while attractive for some purposes, is very seriously limited by the fact that it cannot represent causal relations nor other types of relations. For example, it cannot represent which predicate in a statement (if either) is acting on the other. Also, this representational format cannot represent state changes. For example, while such a mechanism could explicate each of the sentences in example (1) individually, it would not represent the transition of Anna from "boiling mad" to "simmering": it could represent each of these states individually on a dimension of "greater to lesser heat", but

would not link them in time. It also could not capture the causal metaphor that anger causing emotions to boil is equal to heat causing a liquid to boil.

The domain-mapping hypothesis draws significantly from Gentner's structure-mapping theory of analogy (Gentner, 1982, 1983, 1988, 1989; & Gentner, 1983) and metaphor (Gentner, 1982; Gentner & Clement, 1988). Structure-mapping theory represents the domains in an analogy as systems composed of objects and the predicates applying to those objects (e.g., Norman & Rumelhart, 1981; Rumelhart & Ortony, 1977). Understanding an analogy like "ideas are plants" involves comparing two domains and finding relational commonalities. Object matches are not crucial to analogy; the focus is on matching and transferring relations. In the above example, ideas are noncorporeal and plants are corporeal, the first are colorless, the second are green; but both respond to some type of nurturance, and both can yield a product of some sort. After matching relations between the two domains, one may transfer relations from the base to the target domain (if the relations are part of a common system and are present in the base but not the target) (e.g., Clement & Gentner, 1990; Falkenheiner, Forbus, & Gentner, 1989; Gentner, 1983; 1989). This mapping permits the carryover of candidate inferences from the base to the target. Although structure-mapping was designed to account for analogy, Gentner and Clement (1988) suggest that it can also be applied to relational metaphors (i.e., metaphors which, like analogies, rest primarily on common relational structures) (see also Gentner, 1982). They further suggest that the use of propositional structures allows for an appropriate degree of richness and explicitness in representations.[2] Neither the multi-dimensional representation of Tourangeau and Sternberg (1982) nor the feature-list representations of comparison theories such as Ortony's (1979) provide sufficient representational specificity to guide a processing model of metaphor because neither allows for the important distinction between higher-order relations and attributes. Structure-

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2. We use 'propositional' here to refer to underlying interrelated systems of concepts, not necessarily verbalizable. This usage is quite distinct from the sense used in the 'propositional-analog distinction' (e.g., Johnson-Laird, 1983).

mapping theory, in contrast, postulates that structurally different kinds of predicates participate differently in a mapping, and that these differences must be captured to model analogy and relational metaphor.

Structure-mapping theory further posits that people have a preference for structurally consistent rather than inconsistent mappings from a base to a target domain; for mappings that preserve the relational structure between a base and a target. Evidence for the assertion that people produce this type of extended consistent mapping has been found by Gentner and Gentner (1983) in a study in which subjects were taught about electricity using different base domains (i.e., a hydraulic system or a moving crowd). Results showed that subjects tended to answer questions by making inferences consistent with the particular analogies they had learned. Structure-mapping thus provides a mechanism for the domain-mapping hypothesis: just as with analogy, relational metaphors are understood by consistently mapping terms from a base to a target domain.

Applying structure-mapping theory to the domain-mapping hypothesis predicts that subjects will preserve structura' consistency and systematicity across the elements of an extended mapping.

Research on real-time processing of metaphor

The second major focus of metaphor research concerns order of processing. This research is largely centered on the dual-stage hypothesis, proposed by Clark and Lucy (1975) and Kintsch (1974), which asserts that people process linguistic material literally first, and that only if it cannot be understood literally do they try to process it nonliterally. In this view, metaphor is seen chiefly in contrast to literal language. Many studies have examined the dual-stage hypothesis, some finding support for it (e.g., Petrun & Belmore, 1981, cited in Hoffman & Kemper (1987)), others rejecting it (e.g., Glucksberg, Gildea, & Bookin, 1982; Gildea & Glucksberg, 1983; Keysar, 1989) and

others restricting its scope (e.g., Ortony, Schallert, Reynolds, & Antos, 1978). Hoffman and Kemper (1987) review the rather large body of work testing this hypothesis and conclude that the evidence for this theory is equivocal, and that it may even be in principle impossible to prove or disprove it. For our present purposes, a further limitation of this research is that the dual-stage hypothesis is primarily concerned with issues of modality — with potential differences or similarities between metaphoric and literal material — whereas the domain-mapping hypothesis is concerned with two kinds of metaphor — consistently and inconsistently mapped. The current question is not about the relative reading speed of metaphoric and literal material, but whether people are sensitive to systematic mappings of relations in metaphors. Therefore, we focus on studies that have looked at metaphors in context and at extended metaphors.

Ortony, Schallert, Reynolds, and Antos (1978) investigated the importance of context on metaphoric processing. Subjects read non-metaphoric context passages which were either long or short (mean length of 45 or 6 words, respectively). Reading times were collected for the last sentence in each passage (the target), which was either metaphoric or literal in relation to the passage. An example of the former type of passage concerned a group of children who were not heeding their angry babysitter, and ended in the sentence, "Regardless of the danger, the troops marched on". The context passage bearing a literal relation to this target sentence concerned a group of soldiers preparing to launch an attack. Ortony et al. (1978) found a significant interaction between context type and length of passage. In the short context condition, literal targets were read faster than metaphoric targets, as predicted by the dual-stage hypothesis. However, both were read equally fast in the long context condition. With enough context to permit interpretation of the last sentence, the advantage of literal over metaphoric material evaporated.

Ortony et al. interpreted their findings in terms of schema theory (e.g., Norman & Rumelhart, 1981; Rumelhart & Ortony, 1977). A schema is an information structure

composed of generic concepts. In reading metaphors and other materials, schema theory suggests, one constructs a schema which guides the interpretation of what one is reading. This notion of 'schema' concerns the story line of a passage. An even stronger claim, however, is made by the domain-mapping hypothesis, which predicts context effects not only from the story line in the target but also from the specific base to target mappings of an extended metaphor, which create an interpretive context.

Inhoff, Lima, and Carroll's (1984) study addressed Ortony et al.'s short context condition, suggesting that literal targets might have been read faster than metaphoric ones because the short contexts might not have provided sufficient conceptual support for understanding the metaphoric targets. In contrast to Ortony et al.'s experiment, Inhoff et al. systematically varied context and target sentence pairings, such that the one-sentence context was either literal or metaphoric (e.g., "The jumbo jet was a big machine waiting for the travellers" or "The jumbo jet was a big insect waiting for its prey") as was the target sentence (e.g., "The plane contained the passengers" or "The airplane swallowed the passengers"). Also unlike Ortony et al., Inhoff et al. used metaphoric sentences which did not literally make sense. The materials were designed to provide adequate conceptual contexts, primarily by creating referential overlap between context and target sentences.

Even with only one-sentence contexts, Inhoff et al., unlike Ortony et al., found no significant difference in reading times for metaphoric and literal targets. Inhoff et al. concluded that conceptual adequacy, not length, of context, enabled the use of schemas to facilitate metaphor comprehension. An interaction also appeared between the context and target variables: metaphoric targets were read faster following metaphoric rather than literal contexts, and literal targets were read faster following literal rather than metaphoric contexts. This last result might seem to provide evidence that same-modality material is facilitated. However, an analysis of Inhoff et al.'s stimulus items reveals that their metaphor-metaphor items were all consistently extended extended

metaphors. All of Inhoff et al.'s metaphoric contexts utilized consistent base to target mappings across their two sentences (e.g., "The jumbo jet was a big insect waiting for its prey. The airplane swallowed the passengers"). From the perspective of the domain-mapping hypothesis, this result might stem not from a modality advantage for metaphor-metaphor processing, but from a domain-mapping advantage for metaphors consistent with an ongoing mapping. To distinguish between a same- modality advantage and a same-mapping advantage, it is necessary to contrast consistently and inconsistently mapped metaphors.

Testing the domain-mapping hypothesis

As reviewed above, very little in the extant empirical metaphor research examines extended metaphors, despite the fact that such metaphors seem quite common. Our interest, therefore, was to test the importance of consistency of mappings as a variable in the comprehension of such metaphors. Given that experimental research on both analogy (e.g., Clement & Gentner, 1990) and metaphor (e.g, Gentner, 1988; Gentner & Clement, 1988) suggests that people prefer structurally consistent and systematic materials to materials which are not like this, it seemed important to test the importance of this variable in on-line processing. Therefore, the comparison of interest was between consistently (within-domain) and inconsistently (across- domain) mapped metaphors.

The reasoning behind our tests of the domain-mapping hypothesis was as follows: if someone reading a metaphor creates a mapping based on the correspondence expectations between the base and target in that metaphor, then reading time for a new metaphoric sentence should vary as a function of whether the new metaphor is consistent with the established base to target mapping. That is, the assertion of structure-mapping theory that people prefer consistently to inconsistently mapped

analogies (e.g., Gentner & Clement, 1988), leads us to predict that people will read within- domain metaphors faster than across-domain ones.

The major contrast in the first experiment, therefore, was between two types of passages: those which utilized the same base throughout (within-domain), and those in which the base was switched at a key point (across-domain). In all passages this potential switch occurred in the last sentence, for which reading times were collected. Passages were paired such that they shared a story line and a last sentence.

For example, a short story about a character named Dan who was a debater was written using two different metaphors (see Table 1). In the within-domain passage, the metaphor, "A debate is a journey", was present throughout the passage and in the final sentence: Dan "wanted to guide his audience" and he "did not stray" from his logic. The across-domain passage, in contrast, draws on the metaphor, "A debate is a war". Here, Dan "wanted to devastate his audience" and he "did not desert" his logic. The last sentence for both passages is, "He won the debate because he oriented the judges to his interpretation". For the within-domain passage, this repi esents a continuation of the metaphor. However, for the across-domain passage, the critical final sentence presents a switch from one base domain to another; from "A debate is a war" to "A debate is a journey". The domain-mapping hypothesis predicts that the last sentence will be read more quickly following a within-domain metaphor than following an across-domain metaphor, because the former continues an established base to target mapping, while the latter disrupts it.

Insert Table 1 about here

A literal control condition was included to check for the possibility that this predicted result, if observed, could be attributed to mere associative priming between the words in a passage and the words in the final sentence. Control passages contained

all of the metaphoric terms of their matched within-domain passages, but included no metaphors (except for those in the final sentence); the metaphoric terms were used literally.[3] We expected to replicate Shinjo and Myers' (1987) finding that semantically related primes embedded in a context do not speed up comprehension of a metaphoric target relative to non-semantically related primes. The finding that control passages were read as fast as within-domain passages would suggest that facilitation for the within-domain condition relative to the across-domain condition was caused by associative priming, not by consistency of mappings.

Localist metaphor theories (i.e., Glucksberg & Keysar, 1990; Ortony, 1979), theories which do not explicitly address extended metaphors, would either make no predictions or would predict equal reading times across the three experimental conditions since the key (metaphoric) sentence is the same across conditions. Similarly, an exclusively localist modality view (i.e., an approach emphasizing differences between metaphoric and literal language) would predict no difference here. However, context-sensitive versions of the modality-centered views would predict: 1) no difference between the within- and across-conditions because both are metaphor-metaphor passages; but 2) an advantage for both within- and across-domain passages over control passages, since metaphoric last sentences should be read faster after metaphoric than after literal material (Inhoff et al., 1984). Finally, context-sensitive approaches emphasizing the role of schema-based expectations in the target would predict no difference in reading times across these conditions because passages in a set share a story line (Ortony et al., 1978).

Experiment 1

Method

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3. Hereinafter the phrase "metaphoric terms" will be used to designate words or phrases which are used metaphorically.

Subjects. Twenty-nine undergraduate subjects from the University of Illinois at Urbana-Champaign participated in this experiment to fulfill a course requirement. Four subjects were removed from the final analysis because they missed five or more questions on a comprehension post-test and the data of one subject were lost, thus leaving twenty-four subjects.

Materials. The materials consisted of 12 sets of key passages and 16 filler passages included to disguise the purpose of the study and keep subjects in a natural processing mode. Each set of key passages consisted of three different passages: a within-domain passage, an across-domain passage and a literal control passage. The metaphors used were drawn from standard metaphoric domains and some were culled from the literature (e.g., Lakoff & Johnson, 1980; Reddy, 1979). Table 2 gives a list of all the metaphoric domains used, along with the passages' final sentences. An effort was made to keep the metaphors used fairly subtle and so to prevent subjects from noticing that the task concerned metaphors. To this end, the underlying conceptual metaphors were not explicitly stated.

The following general guidelines were also observed. All three passages within a set followed the same story line. The control passages in some cases had slightly more detailed story lines than the metaphoric passages in order to accommodate all the necessary metaphoric terms literally. All passages were four sentences long (final sentence included), and contained no idioms (idioms were identified by their inclusion in the NTC's American Idioms Dictionary, 1988). In order to present all stimulus items a line at a time on a CRT screen, no sentence was more than 80 characters long.

The metaphoric passages employed systematic mappings between base and target domains, except for the across-domain passages, in which the base domain shifted in the last sentence. Both metaphoric passages within a set used between three and five ($\underline{M}$ = 3.5) metaphoric terms (e.g., guide, stray, oriented), and the number of such terms in matched passages never differed by more than one. These passages ranged from 17

to 35 words in length and had approximately equal numbers of words: within-domain ($\underline{M}$ = 27.67); across-domain ($\underline{M}$ = 27).[4] Final sentences were from 5 to 13 words long ($\underline{M}$ = 8.67).

Each control passage contained all of the metaphoric terms used in the within-domain passage in its set, but used the words literally. These passages contained no metaphors except for those in the final sentence (see Table 1 for an example). Sentences in this condition ranged from 26 to 34 words in length ($\underline{M}$ = 29.92).

The filler passages contained no metaphors and included none of the metaphoric terms found in the within- and across-domain passages.

Insert Table 2 about here

Design. The design was a within-subject split plot factorial as follows: Condition (3) x Group (3) x Order (2). Condition was a within-subjects variable: all subjects read four passages in each of the three conditions (within-domain, across-domain, and control). Group was a between-subjects counterbalancing variable (group A, B, C) and determined which passages subjects read in each condition. Subjects read only one of the three passages in each set. Finally, order was a between-subjects variable; two orderings of the stimulus sets were used.

Procedure. Subjects read passages a sentence at a time on the CRT screen of an IBM XT. Passages were separated by a row of asterisks. Subjects were told to press the space bar on their keyboard to see the next line of a passage. They were told that after reading all the passages, they would answer a series of questions on the material. Subjects were tested in individual sound-attenuated booths, and at most two were tested at a time. To accustom them to the bar-pressing procedure, subjects read five filler passages on the CRT screen before reading any key passages. Key passages were

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4. These condition means and those in subsequent experiments refer to the material before the last line of each passage. Also, determiners were not included in the word counts for passages in this or subsequent experiments.

randomly interspersed among the filler passages, with no more than two of them in a row. Reading times were collected with a TurboPascal program counting in 1 msec increments. After reading all the passages, subjects were given a comprehension post-test composed of 12 4-answer multiple choice questions. They were not told the purpose of the experiment until they had completed all portions of it.

Data trimming. Following convention regarding the trimming of data points in metaphoric sentences (e.g., Ortony et al. (1978)), reading time points below 700 msec (a total of 6 out of 288 data points) were dropped. No subjects had reading times more than three standard deviations above their individual means, so no data points were dropped as outliers for this reason.

Results

The variable of interest was subjects' mean reading time for the final sentence of each passage.[5] The mean reading times for final sentences in each of the three conditions were: within, 3050; across, 2856; and control, 3047 msec. The standard deviations were: 1196, 1036, and 1169 msec, respectively. Contrary to predictions of the domain-mapping hypothesis, reading times appear faster for the across-domain condition than for the within-domain condition. A mixed-measures analysis of variance, however, found no difference between the three conditions, $F(2, 36) = .93$, $p < .40$. The significant Group x Order ($p < .02$) and Order x Group x Condition ($p < .01$) interactions seem to point to great variability in subjects' reading times.

Discussion

The results provide no support for the domain-mapping hypothesis. However, before abandoning the hypothesis, we considered two possible reasons for the null results. The first possibility is that the passages may have been varied in their reading difficulty. Ratings by a group of 39 independent subjects suggested a great deal of

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5. In this and subsequent experiments, a mean reading time per condition was calculated for each subject, and these means were used in conducting the analyses.

variance in passage readability, which could have led to high variance in reading time. Another possible explanation for these results is that the amount of context may have been insufficient. Possibly, the four-sentence passages were not long enough to draw subjects into the stories and lead them to construct a sufficiently structured base to target mapping with which to interpret the final sentence. Without an established mapping to disrupt, no difference in reading times across conditions would be expected. Also, while Inhoff et al. (1984) found that contextual support and not context length was important in equating reading times for literal and metaphorical material, it is not known if the same is true for comparisons of different types of metaphoric material. Therefore, passage length was increased in the second experiment to test the possibility that, given more context, the domain-mapping hypothesis might hold.

In order to lengthen the passages without introducing other differences, a literal four-sentence section was added to the beginning of the within-domain, across-domain, and control passages. A second experiment was conducted with these revised passages to test the domain-mapping hypothesis.

Experiment 2

Method

Subjects. Forty paid undergraduate subjects from the University of Illinois at Urbana-Champaign community participated in this experiment. The data of one subject were discarded for reasons noted below. No subjects had participated in the previous experiment.

Materials. Stimuli from Experiment 1 were rewritten using the stimulus construction guidelines of that experiment, with the following exceptions: All passages were eight sentences long, the first part of each being a literal four-sentence section (see Table 3). Metaphoric passages ranged from 21 to 33 words in length, had approximately 3.62 metaphoric terms, and had approximately equal numbers of words:

within-domain, 28.25; across-domain, 27.83.[6] Target sentences ranged from 6 to 13 words in length ($\underline{M}$ = 9.75). Control passages ranged from 26 to 37 words in length ($\underline{M}$ = 32.58). Finally, the number of filler passages were increased from 16 to 24 to further decrease the possibility that subjects would notice that they were reading metaphors.

Insert Table 3 about here

Design and procedures. The design and procedures in this experiment were the same as in the first experiment, except for the fact that instead of taking a post-test, subjects were told that after some passages they would see true/false questions on their computer screens about the passage they had just read. Seven such sets of questions appeared across the 36 passages. Each set of questions consisted of 3 true/false questions for a total of 21 questions. It was expected that the possibility of being tested after any given passage would encourage subjects to read the passages more carefully than they might otherwise.

As in Experiment 1, the domain-mapping hypothesis predicts that the final sentence will be read more quickly after the within-domain than after the across-domain passages. Such a finding would provide evidence that subjects were carrying out extended mappings between the base and target domains.

Data trimming. The dependent measure was reading time for the final sentence, and data trimming was done as in Experiment 1. One data point below 700 msec was deleted. One subject was removed from the study because his mean of 5845 msec was more than twice the overall mean of 2633 msec; this subject had reading times as high as 13234, 10857, and 8430 msec, but such high variance that these scores could not be deleted with the 'three standard deviations' rule, so he was removed altogether. No

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6. These figures do not include the word count for the literal 4-line section at the beginning of passages because this was the same across the conditions within a set.

subjects were deleted on the basis of comprehension test performance; the greatest number of questions missed was 3 out of 21.

Results

The mean reading times for the three conditions were: within, 2568; across, 2636; and control, 2679 msec. Standard deviations were 675, 766, and 687 msec, respectively. The differences between these conditions were in the direction predicted by the domain-mapping hypothesis; reading times were faster for last lines following within-rather than across-domain passages, and faster after within-domain than after control passages. However, these differences were not significant, $F(2, 66) = .48$, $p < .62$. No other effects were significant at the $p < .05$ level. An item analysis also showed no significant effects for condition, $F(2, 22) = .68$, $p < .52$.

Discussion

Although there appeared to be a trend in the predicted direction, the results of this experiment still failed to show statistically reliable support for the domain-mapping hypothesis. In retrospect, having the added passage length consist of literal sentences probably would not help advance the mapping process. Perhaps more importantly, however, was the fact that all the metaphoric passages in Experiments 1 and 2 utilized highly conventional metaphors. For example, the within-domain metaphor THE MIND IS A KNIFE presented in Table 3 maps dullness onto mental exhaustion. This use is, of course, so conventionalized as to be nearly a cliché. We chose these highly conventional metaphors because we thought they would be invisible to subjects; that is subjects would be likely to read them without noticing that they were metaphors. This effort was highly successful. In oral debriefings, only 4 out of the 40 subjects in Experiment 2 said that they had explicitly noticed any metaphors, and these had only noticed one or two. In fact, all had read eight passages containing metaphors. Most subjects were surprised to learn that they had read any metaphors at all.

In retrospect, however, this choice of materials may have been unfortunate. It is possible that these metaphors are so familiar as to be partially lexicalized, and thus not act as metaphors — they may not elicit any base to target mappings. It is perhaps definitional that the comprehension of a true metaphor requires one to consult the base domain to learn what a term means in the target. With conventionalized metaphors, however, it is possible that the metaphoric terms are simply polysemous, so that their metaphoric interpretation is stored in the linguistic lexicon. In this case, no mapping may be required: one would not need to consult the base domain in order to interpret the metaphor. For example, someone reading the metaphor, "Her mind was too dull with fatigue for her to think well", may be able to go straight from the word "dull" to the notion of "feeling mentally slow and stupid" without conducting a mapping from the base (knife) to the target (Janet the lawyer).

This possibility is indirectly supported by research which indicates that linguistic material can vary in its degree of conventionality (e.g., Gibbs, 1984, 1985), and that people do not always analyze the literal meanings of idioms which they read (Gibbs, Nayak, & Cutting, 1989). Other research has shown that idioms can be read more rapidly than even their literal translations (Ortony et al., 1978), although Gibbs, et al. (1989) restricts this effect to particular types of idioms. These findings support the hypothesis that highly conventionalized phrases, even if from a conceptual metaphor, may come to have meanings which can be accessed directly and which do not require a mapping process. To the extent that this occurred in our stimuli, any differences between within- and across-domain metaphors would have been attenuated, since subjects would not have mapped bases onto targets while reading.

These arguments led us to suspect that the metaphors used in Experiments 1 and 2 may have been so conventional as to not elicit true mappings, and prompted us to carry out a third experiment which would more thoroughly test the domain-mapping hypothesis. In Experiment 3, we presented subjects with passages containing novel,

extended metaphors. For example, the metaphor "A debate is a journey" from Experiments 1 and 2 used terms such as "guid(ing)", "stray(ing)", and "orient(ing)" to describe the actions of the character Dan. In Experiment 3, this metaphor was replaced by the more novel "A debate is a race" metaphor: Dan was described as; "steer(ing) his course in the competition", "cruis(ing) through initial points", and "revv(ing) up" near the end. The last sentence read, "Dan's debating skill left his opponent a mile behind the finish line". Not all metaphors from the first two experiments were completely replaced: some had terms substituted or added to make them less conventional. For example, the conceptual metaphor CLEANLINESS IS VIRTUE used the following metaphoric terms in Experiment 2: "clean-living, honorable person", "a dirty trick", and "(an action was) filthy". It ended in the sentence, "Not everyone has as spotless a reputation as Steve". This same final sentence was used in Experiment 3, but this version of the metaphor used more vivid language: e.g., "What a sordid character!", "One more blot on a stained history".

The prediction for the third experiment was the same as that for the two previous ones; that the last, metaphoric sentence would be read more quickly following a within-domain passage than following an across-domain passage. In contrast to the previous two experiments, however, this experiment did not contain a control condition.[7]

<center>Experiment 3</center>

Method

Subjects. Forty-nine undergraduate subjects from the University of Illinois at Urbana-Champaign participated in this experiment to fulfill a course requirement. The data of six subjects were not included in the analysis because they missed four or more

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7. Because of the difficulty of constructing materials, we decided to test the basic consistent-inconsistent contrast before constructing a literal control.

questions on a comprehension post-test. No subjects had participated in either of the previous experiments.

Materials. The materials consisted of 14 sets of key passages and 26 filler passages. Each set of key passages consisted of a within-domain passage and an across-domain passage. The guidelines used for creating these passages were the same as those for the passages in Experiment 1 with the following exceptions: While the first two experiments used very conventional metaphors, this experiment used relatively novel ones (see Table 4 for a listing of the metaphoric domains and final sentences of the passages). The passages were between seven and nine sentences long and matched (metaphoric) passages were always of the same length. These passages ranged from 61 to 100 words in length, with approximately equal number of words: within-domain ($\underline{M}$ = 80.14); across-domain ($\underline{M}$ = 79.36). They used between three and seven metaphoric terms ($\underline{M}$ = 5.05), which were found in the same sentence in both passages. Target sentences ranged from seven to thirteen words in length ($\underline{M}$ = 9.43). Filler passages were eight to nine sentences long.

Insert Table 4 about here

Design and procedures. The design was identical to that of Experiment 1, except that there were only two conditions (within- and across-domain) instead of three. The design was therefore Condition (2) x Group (2) x Order (2). The procedure was also essentially the same as that of Experiment 1. Subjects first read either two or four initial passages on the CRT screen to accustom them to the bar-pressing procedure.[8] The comprehension post-test they completed consisted of 10 4-answer multiple-choice questions. In contrast to the pattern in Experiment 2, most of the subjects reported noticing metaphors in their debriefings (34 of a total of 43 subjects).

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8. Due to experimenter error, subjects in Order 1 read two passages before seeing any test passages while subjects in Order 2 read four passages before seeing any test passages.

Data trimming. As in the previous experiments, all reading times below 700 msec were deleted (a total of 8 data points), and 8 data points more than three standard deviations from the individual means of subjects were dropped, leaving a total of 670 data points.

Results

As predicted by the domain-mapping hypothesis, last lines were read significantly faster following within-domain passages than across-domain passages (within, 2729; and across, 2933 msec), $F(1, 78) = 5.86$, $p < .02$. Standard deviations were 735 and 783 msec, respectively. An item analysis further confirmed these results, $F(1, 13) = 5.45$, $p < .04$.

In addition to the effect of condition, there was a significant Group x Condition interaction, $F(1, 39) = 22.544$, $p < .001$. Post-hoc Scheffé tests ($p < .05$) conducted on this interaction showed that group A was significantly slower than group B in the within-domain condition, but significantly faster than it in the across-domain condition. In general, therefore, we are inclined to consider this interaction as resulting from group variation in materials across conditions.

Discussion

The results supported the central prediction of the domain-mapping hypothesis: metaphors that continued an established base to target mapping were read more quickly than ones that disrupted this systematic mapping. These findings suggest that subjects were creating consistent mappings as they read.

However, in view of the null results of the first two experiments, it seemed advisable to replicate these results. We also wished to add the control condition which was omitted in Experiment 3. Finally, we wished to rule out another possible confounding variable. It could be that final sentences were read most quickly following within-domain passages simply because they made more sense after these passages

than after the across-domain or control ones. In Experiment 4a, therefore, we collected ratings on how well last sentences followed from the passages which preceeded them. Experiment 4b employed these tested materials.

Experiment 4a

Method

Subjects. Fifteen undergraduate subjects from the University of Illinois at Urbana-Champaign participated in this experiment for pay. One subject was removed from the final analysis for reasons noted below. The subjects had not participated in any of the previous experiments.

Materials. The materials consisted of 15 sets of key passages and 15 filler passages. As in Experiments 1 and 2, each set of key passages consisted of three types of passages: a within-domain, an across-domain and a control passage. See Table 4 for a listing of the metaphoric domains and final sentences of the stimulus items, and Appendix A for a complete set of the non-filler stimulus items from Experiments 4a,b). The materials were like those in Experiment 3 with the following exceptions. The first, last and next-to-last lines in each metaphoric passage contained metaphors. Also, the first line of each passage stated the metaphor directly (see Table 5).[9] Metaphoric passages ranged from 56 to 97 words in length and had approximately equal mean numbers of words: within-domain, 76.8; across-domain, 78.47. They had from three to seven metaphoric terms apiece; within-domain (M = 4.87); across-domain (M = 4.93). The number of words in the target sentences ranged from 7 to 13 (M = 10). Control passages ranged from 61 to 100 words in length (M = 83.33).

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9. Concern in the first two experiments with making metaphors as inobtrusive as possible precluded stating the metaphor directly, but we included these statements here since localist accounts would not predict intersentential facilitation even with such a statement.

Insert Table 5 about here

Design. The design was as follows: Condition (3) x Group (3). Condition was a within-subjects variable; group was a between-subjects variable. The materials set was enlarged relative to earlier experiments so that subjects read 5 rather than 4 passages per condition.

Procedure. Subjects read booklets containing 15 experimental and 15 filler passages. Each subject read 5 passages in each of the 3 experimental conditions: within-domain, across-domain, and control. Subjects were instructed to rate how well the last lines of passages followed what preceded them using a seven-point scale, with 1 = "easy", 7 = "hard". To ensure that subjects read the passages carefully, two of the filler passages were altered so as to make them poorly written (see Appendix B). These passages were third and ninth in the set of thirty passages. Subjects who did not give these passages a "4" ("medium") or higher in their ratings were removed from the analysis. The data of one subject were deleted for this reason.

Results and Discussion

The mean ratings for conditions were: within-domain, 1.89; across-domain, 2.04; control, 2.07. A Friedman test for matched groups showed no significant difference between conditions in how well last sentences followed what preceded them, $2r(2, \underline{N} = 14) = .250, \underline{p} < .90$.

The fact that last lines followed what preceded them equally well across conditions suggests that differences we might find in Experiment 4b between the conditions cannot be ascribed to more difficulty in understanding the passages' last sentences in some conditions than in others. Therefore, these materials were used in Experiment 4b, in which we returned to the basic question of this research: whether subjects process consistent metaphors more readily than inconsistent ones.

Experiment 4b

Method

Subjects. Fifty-five undergraduate subjects from the University of Illinois at Urbana-Champaign participated in this experiment to fulfill a course requirement. Three subjects were removed from the final analysis because they missed four or more questions on a comprehension post-test, and four additional randomly selected subjects were dropped to achieve equal numbers in each experimental cell. The subjects had not participated in any of the previous experiments.

Materials. The materials consisted of the 15 sets of key passages rated in Experiment 4a, the 15 filler passages used there, and an additional 11 filler passages.

Design. The design was the same as that of Experiments 1 and 2: Condition (3) x Group (3) x Order (2).

Procedure. The procedure was the same as that in Experiment 1 with three exceptions: 1) all subjects read six filler passages before reading any experimental passages; 2) at most four subjects were tested at any time; and 3) the comprehension post-test had 10, 4-answer multiple-choice questions.

Data trimming. Data trimming was done in the same manner as in the previous experiments. Two data points below 700 msec were deleted from the analyses and eleven data points more than three standard deviations above the individual means of subjects were dropped, leaving a total of 677 data points.

Results

As predicted by the domain-mapping hypothesis, the last sentences of passages were read faster when they continued an established base to target mapping than when they required changing the base domain: the mean reading times in the within-domain and across-domain conditions were, respectively, 3162 and 3377 msec. Both of these conditions showed faster reading times than the control condition (M = 3655 msec). The

standard deviations for these conditions were, respectively, 930, 995, and 1147 msec. An ANOVA confirmed a significant effect for condition, $F(2, 84) = 10.94$, $p < .001$. Planned comparisons showed that reading times were faster in the within-domain than in the across-domain condition, $t(47) = 2.43$, $p < .01$, and faster in the across-domain than in the control condition, $t(47) = 4.14$, $p < .001$. An item analysis supported these findings; the effect of condition was significant, $F(2,28) = 6.71$, $p < .004$. A min F' analysis, as suggested by Clark (1973), also confirmed a significant effect of condition; $F'(2, 65) = 4.16$, $p < .03$.

The overall ANOVA also showed a significant main effect of order $F(1, 42) = 4.83$, $p < .03$, with order 1 being read more rapidly than order 2. Additionally, a Group × Condition interaction was noted, $F(4, 84) = 3.05$, $p < .02$. Scheffé post-hoc comparisons ($p < .05$) conducted on this interaction indicated that group B had generally faster reading times than the other two groups: while there were no significant differences between the groups in the within-domain condition, group B was faster in the across-domain and control conditions than group C, and faster in the control condition than group A. Also, the only significant difference found in within-group comparisons was that group B had faster reading times in the within-domain than in the control condition.

Discussion

The results of Experiment 4b confirm and extend the results of Experiment 3. After reading a metaphoric passage, subjects read metaphoric sentences that continued the passage's base to target mapping faster than sentences that utilized a different base domain. This difference was found even though the target sentence in a given set had the same meaning in both conditions, and even though both the within- and across-domain passages in a set followed the same story line and had metaphors in the same relative locations.

Subjects' performance in the control condition supports the domain-mapping interpretation of the difference between the within- and across-domain conditions. If final sentences following control passages had been read as fast as those following within-domain passages, it would have been possible to attribute the facilitation for the within-domain passages to word-by-word associative priming, and not necessarily to the consistency of the metaphoric mapping. However, reading times for the control passages (which used metaphoric terms literally) were longer than those for the within-domain passages. This finding replicates Shinjo and Myers' (1987) finding that semantic associations in a context do not facilitate metaphoric target reading times. Thus it is reasonable to suppose that the difference between within-domain and across-domain reading times was due to the difference in the consistency of the base to target mappings.

General Discussion

According to the domain-mapping hypothesis; (1) people construct base to target mappings when they read extended metaphors, and (2) they attempt to make these mappings structurally consistent across connected systems within the base and the target. This hypothesis predicted that metaphoric sentences would be read faster when their mappings were consistent with the mapping that preceded them than when they created a new mapping, even when the conveyed meaning in the target was equivalent.

In contrast, a localist account of metaphor would predict no difference in reading time for the last lines of consistently and inconsistently mapped passages, since the same metaphors are being read and the conveyed meaning in the target is the same for both conditions. While few if any researchers would argue for an exclusively localist account of metaphor, a localist frame of reference is implicit in much of the research literature, as suggested by the focus of researchers on single metaphors and the paucity of research on extended metaphors. Theories that focus on single metaphors, such as

Ortony's salience imbalance model (1979) and Glucksberg and Keysar's (1990) class-inclusion theory of metaphor, do not explain the links between even two-sentence extended metaphors: they incorporate no mechanisms for linking several discrete base to target mappings and thus cannot explain the current findings. Tourangeau and Sternberg's (1982) domains-interaction model also fails to account for the current findings because it lacks the representational richness necessary to represent state changes and causal relations, both of which are important in understanding these metaphors.

The dual-stage hypothesis, which is essentially a modality-centered hypothesis focusing on the figurative-literal distinction, also cannot account for the current findings. Two central ideas drive this approach: the primacy of literal over figurative material in processing (a processing issue) and the distinction between these two (a representation issue). Thus, the dual-stage hypothesis is not attuned to potential differences within one of its two fundamental categories; to differences between types of metaphoric material. The current study showed, however, that all types of metaphoric material cannot be grouped together, and suggests that at least for novel metaphors, it is important to distinguish between systematic and nonsystematic mappings. This concern with the systematicity of base to target mappings in metaphor has been noted by others (e.g., Kittay & Lehrer, 1981; Lakoff & Johnson, 1980).

However, before further discussing this issue of systematicity, we must consider further the results of the first two experiments, which did not support the domain-mapping hypothesis.

Experiments 1-2: Conventionality

The crucial difference between Experiments 1-2 and 3-4b seems to be that the first two used very conventional metaphors, while the last two used novel metaphors.

Although care was taken not to use obvious idioms in these experiments, the first two experiments may have used metaphors so common that they acted like idioms.

Research into real-time idiom processing suggests the results of using potentially idiomatic stimuli. Gibbs, Nayak, and Cutting (1989) distinguish between decomposable idioms, whose meanings can be deduced from their parts (e.g., pop the question), and nondecomposable idioms, whose meanings cannot be so deduced (e.g., chew the fat). Nondecomposable idioms seem relatively identifiable as idioms, while decomposable idioms, which may be linked to conceptual metaphors, seem less so. We suspect that although nondecomposable idioms were excluded from the experiments, some of the stimuli used in Experiments 1 and 2 would qualify as decomposable idioms. Gibbs, et al.'s findings suggest that people do not always analyze the literal meanings of idioms; rather, they perform a componential analysis which assigns a figurative interpretation to each of an idiom's components. Someone reading, "pop the question", then, would ascribe to it the meanings "suddenly say" and "a marriage proposal". No explicitly 'literal' interpretations of the idiom (i.e., "burst" and "an inquiry") would be produced. However, activation of literal meaning is called for by the domain-mapping hypothesis: only by activating the literal meanings of the base and target of a novel metaphor can one activate the base and target domains and prepare to map their relevant features or relations. Therefore, if indeed some of the materials involved decomposable idioms, we would not expect to see effects of base domain shifts.

An alternative view of idioms suggests that their figurative interpretations are stored in memory as single lexical items (Cacciari & Tabossi, 1988; Ortony, Schallert, Reynolds, & Antos, 1978). This "idiom as a dead metaphor" hypothesis posits that, at least in the lexicon, idioms' stored figurative meanings are interpretations stripped of their base to target mappings. Accessing the figurative meaning of the idiom pop the question, then, would tell one that the idiom referred to a marriage proposal; it would not tell one about the action of popping or the nature of questions.

Gibbs and O'Brien (1990) have contested this notion that idioms are stripped of their base to target mappings. In a study analyzing protocols, they found a great deal of regularity in subjects' descriptions of their mental images of idioms (e.g., "lose your cool"), a regularity they did not find in other subjects' descriptions of similar literal phrases (e.g., "lose your wallet"), or in descriptions of figurative interpretations (e.g., "to get angry"). They interpreted this regularity as indicating that conceptual metaphors such as Lakoff and Johnson's (1980) (e.g., ANGER IS HEAT, THE MIND IS A CONTAINER), motivate idioms and tie them to their figurative meanings.

While their results suggest that idioms retain their base to target mappings, Gibbs and O'Brien explicitly reject the idea that conceptual metaphors play an on-line role in idiom processing, given that idioms are understood so rapidly. Furthermore, Cacciari and Tabossi's (1988) findings suggest that the figurative meanings of idioms are stored in memory, and that therefore it is not necessary to return to a conceptual metaphor to process an idiom.

In addition to the "idiom as a dead metaphor" hypothesis, another possible explanation for why stored figurative meanings do not play a part in the domain-mapping hypothesis could rest on a horse-race model of access to figurative interpretations. Such a model might predict that once one figurative interpretation is available, no other figurative interpretation would be likely to affect interpretation of material. This prediction would assume that it is faster to retrieve a stored figurative interpretation than to create a new such interpretation by mapping a base and target's domains. Thus, even if a different interpretation might be arrived at by a base to target mapping via a literal interpretation of the material, this interpretation would not affect processing because a stored figurative interpretation would already have been accessed.

By understanding the metaphors in the first two experiments as borderline idioms, it could be argued that they, like idioms, already had stored figurative interpretations and that either their metaphoric underpinnings were not employed in

processing or they were accessed more quickly than and thereby precluded the consideration of such alternative mappings. While we consider the conventional-novel distinction a continuum and not a dichotomy, the differences betweeen these materials could explain the failure to find effects of disrupting the mapping in the first two experiments.

Experiments 3-4b: Systematicity

In these latter experiments, care was taken to use metaphors which were not highly conventional. This nonconventionality seems a critical variable in the results of Experiments 3-4b because, as was noted above, conventional metaphors may not access or may prevent the formation of base to target mappings. Seemingly unlike some conventional metaphors, novel metaphors require base to target mappings to be understood, even in contexts favoring figurative interpretations. Combining this factor of conventionality with the factor of systematicity discussed above allows a framework for organizing figurative comparisons.

Conventionality and Systematicity

This discussion of the current experiments and of related research points to two important dimensions operating in metaphor research: the dimensions of conventionality and of range of systematicity of mapping. The first dimension concerns frequency of usage of figurative language, and encompasses the range at the extremes of which are idioms and novel metaphors. The second dimension concerns how extensive the system of base to target mappings is in an item of figurative language, and varies from local (operating within a single metaphor) to extended (operating over two or more sentences). We suggest that a consideration of both of these dimensions provides a framework for understanding and organizing research on figurative language, as shown in Table 6.

Insert Table 6 about here

As Table 6 shows, taking these two dimensions into consideration captures important differences between the major types of figurative language. The first category in this figure, high conventionality-low systematicity (in the upper left-hand corner), contains idioms such as "kick the bucket". Idioms in this box are very common and are not part of any identified conceptual metaphors.

The second category, high conventionality-high systematicity, is the conventional metaphor category. Examples include the systems of anger metaphors identified by Lakoff and Johnson (1980) and Lakoff and Köveces (1987). These extended metaphors and idioms are very common, but unlike the idioms found in the first category, are linked to conceptual metaphors. The metaphors used in Experiments 1-2 were of this type. This category combines idioms and highly conventional metaphors because the distinctions between the two are arguably weak.

The third category, that of low conventionality-low systematicity, is that of novel 'one-shot' metaphors such as "The billboard was a wart on the landscape" (Verbrugge & McCarrell, 1977). These novel metaphors have only one or two base to target mappings and so are local in scope. Such metaphors are often used to make a single point, rather than to convey a well-developed system of mappings.

The fourth category, low conventionality-high systematicity, contains metaphors that utilize systems of base to target mappings rather than isolated pairs like those in the third category. These mappings are both systematic and uncommon, in that these particular base to target mappings are not usually made. The metaphors in Experiments 3 and 4 are examples of this type of metaphor. These metaphors, like those in the first two experiments, permit the creation of a system of base to target mappings.

This focus on the importance of systematic mappings in metaphor is a hallmark of studies which have seen metaphor as a subset of analogy (e.g., Gentner & Clement, 1988; Hobbs, 1979). Like the extended metaphors studied here, analogies are systematic (e.g., Gentner, 1983), and like the metaphors in the fourth category, the bases and targets linked in analogies are often not conventionally linked.

Table 6 provides a framework within which to understand figurative language such as idioms, metaphors, and analogies. Metaphor research has roots in both the idiom and the analogy literature. Idiom research has typically focused on conventionality, while analogy research has focused on systematicity, but the concerns of both are clearly relevant to the study of metaphor.

Implications for other research

The results of this study indicate that people are sensitive to systematicity of mappings in extended metaphors. The type of mapping used in an experiment employing extended metaphors, therefore, is an important variable in the interpretation of its findings. For example, Inhoff et al. (1984) showed that subjects read two-line stimulus items fastest when both of these lines had the same structural context: when both were literal or both were metaphoric. Inhoff et al., however, only used consistently mapped stimulus items for their metaphoric materials, and it is not clear that they would have made the same findings if they had used inconsistently mapped metaphors. While the current study showed that inconsistently extended metaphors were read more quickly than controls, they were also read more slowly than consistently extended metaphors.

These findings also focus attention on the fact that the term "metaphor" has been applied to very different types of linguistic material: material which is literal and metaphoric only in relation to the preceding context (Ortony et al.,1978), material which figurative and is consistently mapped (Inhoff et al.,1984), and material which is

figurative and inconsistently mapped (Keysar, 1989). A reasonable practice in a literature often intent on contrasting literal and figurative material has been to combine different types of metaphoric material under the same rubric. In light of the current findings, however, it may be more productive to control for and/or manipulate different types of metaphoric material, and in particular to attend to the variables of conventionality and systematicity in such materials.

In sum, processing an extended metaphor involves setting up a mapping from the base to the target whereby this mapping creates an interpretive context. A disruption of this mapping interferes with processing of the metaphor.

References

Black, M. (1962). Metaphor. In M. Black (Ed.), <u>Models and metaphors</u>. Ithaca, NY: Cornell University Press.

Cacciari, C., & Tabossi, P. (1988). The comprehension of idioms. <u>Journal of Memory and Language, 27,</u> 668-683.

Camac, M. K., & Glucksberg, S. (1984). Metaphors do not use associations between concepts, they are used to create them. <u>Journal of Psycholinguistic Research, 13,</u> 443-455.

Campbell, P. (1975). Metaphor and linguistic theory. <u>Quarterly Journal of Speech, 61,</u> 1-12.

Clark, H. H. (1973). The language-as-fixed-effect fallacy: A critique of language statistics in psychological research. <u>Journal of Verbal Learning and Verbal Behavior, 12,</u> 335-359.

Clark, H. H., & Lucy, P. (1975). Understanding what is meant from what is said: A study in conversationally conveyed requests. <u>Journal of Verbal Learning and Verbal Behavior, 14,</u> 56-72.

Clement, C. A., & Gentner, D. (in press). Systematicity as a selection constraint in analogical mapping. <u>Cognitive Science</u>.

Falkenhainer, B., Forbus, K. D., & Gentner, D. (1989/90). The structure-mapping engine: Algorithm and examples. <u>Artificial Intelligence, 41,</u> 1-63.

Gentner, D. (1982). Are scientific analogies metaphors? In D. Miall (Ed.), <u>Metaphor: Problems and perspectives</u> (pp. 106-132). Brighton: Harvester Press.

Gentner, D. (1983). Structure-mapping: A theoretical framework for analogy. <u>Cognitive Science</u>, <u>7</u>, 155-170.

Gentner, D. (1988). Analogical inference and analogical access. In A. Prieditis (Ed.), <u>Analogica</u> (pp. 63-88). Los Altos, CA: Morgan Kaufmann.

Gentner, D. (1989). The mechanisms of analogical learning. In S. Vosniadou & A. Ortony (Eds.), <u>Similarity and analogical reasoning</u> (pp. 199-241). New York: Cambridge University Press.

Gentner, D., & Clement, C. A. (1988). Evidence for relational selectivity in the interpretation of analogy and metaphor. In G. H. Bower (Ed.), <u>The psychology of learning and motivation</u> (pp. 307-358). New York: Academic Press.

Gentner, D., & Gentner, D. R. (1983). Flowing waters or teeming crowds: Mental models of electricity. In D. Gentner & A. L. Stevens (Eds.), <u>Mental models</u> (pp. 99-129). Hillsdale, NJ: Erlbaum.

Gibbs, R. (1984). Literal meaning and psychological theory. <u>Cognitive Science</u>, <u>8</u>, 275-304.

Gibbs, R. (1985). On the process of understanding idioms. <u>Journal of Psycholinguistic Research</u>, <u>14</u>, 465-472.

Gibbs, R., Nayak, N. P., Cutting, C. (1989). How to kick the bucket and not decompose: Analyzability and idiom processing. <u>Journal of Memory and Language</u>, <u>28</u>, 576-593.

Gibbs, R., & O'Brien, J. E. (in press). Idioms and mental imagery: The metaphorical motivation for idiomatic meaning. <u>Cognition</u>.

Gildea, P., & Glucksberg, S. (1983). On understanding metaphors: The role of context. Journal of Verbal Learning and Verbal Behavior, 22, 577-590.

Glucksberg, S., Gildea, P., & Bookin, H. B. (1982). On understanding nonliteral speech: Can people ignore metaphors? Journal of Verbal Learning and Verbal Behavior, 21, 85-98.

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

Hobbs, J. R. (1979). Metaphor, metaphor schemata, and selective inferencing (Technical Note 204, SRI Projects 7910 and 7500). Menlo Park, CA: SRI International.

Hoffman, R. R., & Kemper, S. (1987). What could reaction-time studies be telling us about metaphor comprehension? Metaphor and Symbolic Activity, 2, 149-186.

Inhoff, A. W., Lima, S. D., & Carroll, P. J. (1984). Contextual effects on metaphor comprehension in reading. Memory & Cognition, 12, 558-567.

Kelly, M. H., & Keil, F. C. (1987). Metaphor comprehension and knowledge of semantic domains. Metaphor and Symbolic Activity, 2, 33-51.

Keysar, B. (1989). On the functional equivalence of literal and metaphorical interpretations in discourse. Journal of Memory and Language, 28, 375-385.

Kintsch, W. (1974). The representation of meaning in memory. Hillsdale, NJ: Erlbaum.

Kittay, E., & Lehrer, A. (1981). Semantic fields and the structure of metaphor. Studies in Language, 5, 31-63.

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

Lakoff, G., & Köveces, Z. (1987). The cognitive model of anger inherent in American English. In D. Holland and N. Quinn (Eds.), <u>Cultural models in language and thought</u> (pp. 195-221). New York: Cambridge University Press.

Malgady, R., & Johnson, M. (1980). Measurement of figurative language: Semantic feature models of comprehension and appreciation. In R. Honeck & R. Hoffman (Eds.), <u>Cognition and figurative language</u> (pp. 239-258). Hillsdale, NJ: Erlbaum.

Marschark, M., Katz, A., & Paivio, A. (1983). Dimensions of metaphor. <u>Journal of Psycholinguistic Research</u>, <u>12</u>, 17-40.

Nagy, W. (1974). <u>Figurative patterns and redundancy in the lexicon</u>. Unpublished doctoral dissertation, University of California at San Diego.

Norman, D. A., & Rumelhart, D. E. (1981). The LNR approach to human information processing. <u>Cognition</u>, <u>10</u>, 235-240.

Ortony, A. (1979). Beyond literal similarity. <u>Psychological Review</u>, <u>86</u>, 161-180.

Ortony, A., Schallert, D. L., Reynolds, R. E., & Antos, S. J. (1978). Interpreting metaphors and idioms: Some effects of context on comprehension. <u>Journal of Verbal Learning and Verbal Behavior</u>, <u>17</u>, 465-477.

Petrun, C., & Bellmore, S. (1981, August). <u>Metaphor comprehension and cognitive effort</u>. Paper presented at the annual meeting of the American Psychological Association, New York.

Quinn, N. (1987). Convergent evidence for a cultural model of American marriage. In D. Holland and N. Quinn (Eds.), <u>Cultural models in language and thought</u> (pp. 173-192). New York: Cambridge University Press.

Reddy, M. (1979). The conduit metaphor. In A. Ortony (Ed.), <u>Metaphor and thought</u>. Cambridge: Cambridge University Press.

Roediger, H. (1980). Memory metaphors in cognitive psychology. <u>Memory and Cognition, 8,</u> 231-246.

Rumelhart, D. E., & Ortony, A. (1977). The representation of knowledge in memory. In R. C. Anderson, R. J. Spiro, & W. E. Montague (Eds.), <u>Schooling and the acquisition of knowledge</u>. Hillsdale, NJ: Erlbaum.

Shinjo, M., & Myers, J. L. (1987). The role of context in metaphor comprehension. <u>Journal of Memory and Language, 26,</u> 226-241.

Spears, R. A., & Schinke-Llano, L. (1988). <u>NTC's American Idioms Dictionary</u>. Lincolnwood, IL: National Textbook Company.

Tourangeau, R., & Sternberg, R. (1981). Aptness in metaphor. <u>Cognitive Psychology, 13,</u> 27-55.

Tourangeau, R., & Sternberg, R. (1982). Understanding and appreciating metaphors. <u>Cognition, 11,</u> 203-244.

Tversky, A. (1977). Features of similarity. <u>Psychological Review, 84,</u> 327-352.

Verbrugge, R. R., & McCarrell, N. S. (1977). Metaphoric comprehension studies in reminding and resembling. <u>Cognitive Psychology, 9,</u> 494-533.

Woolf, V. (1953). <u>Mrs. Dalloway</u>. New York: Harcourt Brace & Janovich.

APPENDIX A

Metaphoric Stimulus Items in Experiments 4a,b

Note. Metaphoric terms identified here by italics were presented in normal typeface to subjects. Stimulus items were presented a sentence at a time. 1. The Mind

A. Within-domain: The Mind is a Greyhound Janet's courtroom performances showed her mind *sped as fast* as a *greyhound*. She was known to quickly find flaws in her opponent's arguments. After all, she had been the best student in her class at law school. Today, however, she was tired. She had been at the office all day, trying to finish work on her latest case. Janet decided to try and take a big *bite* out of the work for her client's case. Usually she just *raced* right through her work. After a full day of hard work, though, Janet's mind was *crippled* with fatigue. It just *lay on the ground* and *refused to move*.

B. Across-domain: The Mind is a Machine Janet's courtroom performances showed her mind *worked efficiently* as a *machine*. She was known to quickly find flaws in her opponent's arguments. After all, she had been the best student in her class at law school. Today, however, she was tired. She had been at the office all day, trying to finish work on her latest case. Janet decided to try and *crank out* responses for her client's case. Usually she just *chugged* right through her work. After a full day of hard work, though, Janet's mind *ran out of fuel*. It just *lay on the ground* and *refused to move*.

C. Literal: Janet's courtroom performances showed she could represent the *greyhound* owner. She was known to quickly find flaws in her opponent's arguments. After all, she had been the best student in her class at law school. Today, however, she was tired. She had been at the office all day, trying to finish work on her latest case. Her client's dog had *raced* at and taken a big bite out of a visitor. The visitor *crippled* it with a blow, and now Janet was working to sue him. After a full day of hard work,

though, Janet was tired and her mind was useless. It just <u>lay on the ground</u> and <u>refused to move</u>.

2. Children

A. Within-domain: <u>Children are Investments</u> The O'Tooles <u>deposited</u> their hopes in their children. The children <u>paid them dividends;</u> they got good grades and were polite. Other parents were impressed with the children's abilities. Their friends tried to imitate them unsuccessfully. As the O'Toole children <u>matured</u> they began to <u>cash in</u> on their potential. They struck out on their own when they became adults. The O'Tooles' <u>investment</u> paid off: their children brought them joy. They were always <u>money in the bank</u> to their parents.

B. Across-domain: <u>Children are Plants</u> The O'Tooles made sure their children had their <u>roots planted</u> deeply. The children <u>sprouted well;</u> they good grades and were polite. Other parents were impressed with the children's abilities. Their friends tried to imitate them unsuccessfully. As the O'Toole children <u>matured</u> they began to <u>yield the fruit</u> of much labor. They struck out on their own when they became adults. The O'Tooles' children <u>blossomed:</u> their children brought them joy. They were always <u>money in the bank</u> to their parents.

C. Literal: The O'Tooles <u>deposited</u> all they had for their children's educations. While their stocks paid them <u>dividends,</u> the children got good grades in school. Other parents were impressed with the children's abilities. Their friends tried to imitate them unsuccessfully. As the children grew, the bonds <u>matured</u> and their parents <u>cashed them in</u>. The children went to good colleges when they became young adults. The O'Tooles <u>investment</u> in education paid off: their children brought them joy. They were always <u>money in the bank</u> to their parents.

3. Alcohol

A. Within-domain: Alcohol is Electricity A <u>current of electricity</u> ran through Joel as he drank from the bottle. "Drinking gives me a <u>charge</u> nothing else does!", he would roar. Then, he would yell and carry on for hours. In the morning he could be found asleep, surrounded by empty bottles. Looking at him as he lay there, it was easy to forget Joel had ever been sober. Actually, he didn't know how much liquor <u>flipped on</u> his <u>switch</u> till he was 35. As if he had been <u>wired</u> for it, Joel became an alcoholic. He said liquor was his friend because there was no <u>static</u> between them. Only the <u>voltage surge</u> he got from liquor could <u>light up</u> his eyes.

B. Across-domain: Alcohol is Magic A <u>magical feeling</u> ran through Joel as he drank from the bottle. "Drinking <u>bewitches</u> me like nothing else does!", he would roar. Then, he would yell and carry on for hours. In the morning he could be found asleep, surrounded by empty bottles. Looking at him as he lay there, it was easy to forget Joel had ever been sober. Actually, he didn't know how <u>possessed</u> by liquor he was until he was 35. As if he had been born to <u>fall under its spell</u>, Joel became an alcoholic. He said liquor was his friend because there was no <u>hocus-pocus</u> between them. Only the <u>voltage surge</u> he got from liquor could <u>light up</u> his eyes.

C. Literal: A <u>current of electricity</u> ran through Joel's distillary apparatus. "I never pay for a drink, I just <u>charge</u> up my still!", he would roar. Then, he would yell and carry on for hours. In the morning he could be found asleep, surrounded by empty bottles. Looking at him as he lay there, it was easy to forget Joel had ever been sober. Actually, he hadn't <u>flipped on</u> the <u>switch</u> on his equipment until he was 35. But once the parts were <u>wired</u> together, Joel became an alcoholic. He said liquor was his friend, as he listened to the still's crackle of <u>static</u>. Only the <u>voltage surge</u> he got from liquor could <u>light up</u> his eyes.

4. A Debate

A. Within-domain: A Debate is a Race Dan saw the big debate as a <u>race</u>: he was determined to win it. He knew that he had to <u>steer his course</u> carefully in the

competition. His strategy was to go <u>cruising through</u> initial points and then make his move. After months of debating practice, Dan knew how to present his conclusions. If he could only <u>keep up the pace</u>, he had a good chance of winning. Before long, he felt the audience was receptive to his arguments. Then, he <u>revved up</u> as he made his last key points. His skill left his opponent <u>far behind him</u> at the <u>finish line</u>.

B. Across-domain: A Debate is a War Dan saw the big debate as a <u>war</u>: he was determined to be victorious. He knew that he had to use every <u>weapon</u> at his command in the competition. He <u>mapped out</u> his strategy to insure he established a dominant position. After months of debating practice, Dan knew how to present his conclusions. If he could only <u>marshall his forces</u>, he had a good chance of winning. Before long, he felt the audience was receptive to his arguments. Then, he <u>intensified the bombardment</u> as he made his last key points. His skill left his opponent <u>far behind him</u> at the <u>finish line</u>.

C. Literal: Dan's topic in the big debate was "how to win a <u>race</u>": he had to be convincing. His first argument was on the proper way to <u>steer a course</u> in a competition. He argued strongly for <u>cruising through</u> initial laps and then making a move. After months of debating practice, Dan knew how to present his conclusions. If he could prove the need to <u>keep up the pace</u>, he had a good chance to win. Before long, he felt the audience was receptive to his arguments. His concluding remarks focused on <u>revving up</u> near the end of a race. His skill left his opponent <u>far behind him</u> at the <u>finish line</u>.

5. Ideas

A. Within-domain: Ideas are Commodities Our factory's directors are realizing that ideas are valuable <u>commodities</u>. They asked our work group to <u>package</u> some innovative ideas on recycling. It has become extremely important for us to encourage recycling. Public outcry has focused on the amount of garbage we produce. After weeks of discussion, we have a <u>stockpile</u> of suggestions. We think the ideas we have

will be <u>snapped up</u> by the public. We are testing several ideas, looking for <u>flaws</u> or <u>imperfections</u> in them. We think we can <u>sell</u> our <u>well-crafted</u> ideas to the directors.

B. Across-domain: Ideas are People Our factory's directors realize that ideas have <u>lives</u> of their own. They asked our work group to <u>conceive</u> of some innovative ideas on recycling. It has become extremely important for us to encourage recycling. Public outcry has focused on the amount of garbage we create. After weeks of discussion, we are <u>pregnant</u> with suggestions. We think the ideas we have <u>given birth to</u> will be popular with the public. We are testing several ideas, looking for any <u>defects</u> that could <u>paralyze them</u>. We think we can <u>sell</u> our <u>well-crafted</u> ideas to the directors.

C. Literal: Our factory's directors realize we need ideas on how to <u>package</u> our products. They asked our work group how to encourage recycling of our <u>commodities</u>. It has become extremely important for us to encourage recycling. Public outcry has focused on the amount of garbage our products produce. After weeks of discussion, we have ideas for eliminating this trash <u>stockpile</u>. We think our products will by <u>snapped up</u> by the public once they're recyclable. We are testing recycling equipment to find some without <u>flaws</u> or <u>imperfections</u>. We think we can <u>sell</u> our <u>well-crafted</u> ideas to the directors.

6. A Problem

A. Within-domain: A Problem is a Maze Our company was trapped in the tortuous <u>maze</u> of a difficult problem for days. No matter <u>where</u> we <u>turned</u>, we couldn't escape. You see, our small company specializes in manufacturing soaps for personal use. At this time of year we are usually busy taking company inventory. The discovery that several key ledgers were missing shocked our bookkeeper. She suspected who had taken them, but every <u>path</u> to him led to a <u>dead end</u>. She even tried calling him at home, but that too led to a <u>blind alley</u>. Then she went to his home and found the <u>route</u> to free us: she made him confess. We would still be lost in the <u>labyrinth</u> if she hadn't been so persistent.

B. Across-domain: A Problem is a Knot Our company was tied up in the tortuous knot of a difficult problem for days. No matter how we twisted, we couldn't escape. You see, our small company specializes in manufacturing soaps for personal use. At this time of year we are usually busy taking company inventory. The discovery that several key ledgers were missing shocked our bookeeper. She suspected who had taken them, but the lines leading to him formed a snarl. She even tried calling him at home, but that didn't help tie him to the crime. Then she went to his home and found how to untangle us: she made him confess. We would still be lost in the labyrinth if she hadn't been so persistent.

C. Literal: Our bookeeper was trapped in the tortuous maze of our warehouse for days. No matter where she turned, she couldn't find what she was looking for. You see, our small company specializes in manufacturing soaps for personal use. At this time of year we are usually busy taking company inventory. The discovery that several key ledgers were missing shocked our bookeeper. She suspected a former employee had taken them, and called him at home. The path she took to his house was a complex route ending in a dead end street. Then in his home on a blind alley she did what we needed: she made him confess. We would still be lost in the labyrinth if she hadn't been so persistent.

7. Pain

A. Within-domain: Pain is a Knife When she heard of his betrayal she felt she'd been stabbed in the soul. She had never suspected another woman in Paul's life. The hurt gushed out of her as she questioned him on the phone. The sharp pain continued as she sank into a chair. Joan started to cry, and buried her face in her hands. "How could you?", she sobbed, her whole body shaking. She dug her nails into the deep cut in her spirit and continued crying. He didn't realize how gaping a hole he had carved in her heart.

B. Across-domain: Pain is a Blow When she heard of his betrayal she felt she'd been <u>hit</u> brutally in the soul. She had never suspected another woman in Paul's life. She seemed <u>broken</u> as she questioned him on the phone. She felt <u>black and blue</u> all over as she sank into a chair. Joan started to cry, and buried her face in her hands. "How could you?", she sobbed, her whole body shaking. She dug her nails into the <u>darkening bruise</u> in her spirit and continued crying. He didn't realize how <u>gaping a hole</u> he had <u>carved</u> in her heart.

C. Literal: When she heard of his betrayal she <u>stabbed</u> her sofa with a pair of scissors. She had never suspected another woman in Paul's life. The tears <u>gushed out</u> of her when she questioned him over the phone. The <u>sharp pain</u> in her head continued as she sank into a chair. Joan started to cry, and buried her face in her hands. "How could you?", she sobbed, her whole body shaking. She dug her nails into the <u>deep cut</u> in her sofa and continued crying. He didn't realize how <u>gaping a hole</u> he had <u>carved</u> in her heart.

8. Jealousy

A. Within-domain: Jealousy is a Volcano Bob's jealousy was a <u>volcano</u> that had been <u>building</u> for years. He had always rejected the possibility of competition with other men. He usually could <u>let off steam</u> slowly, but the <u>pressure was building rapidly</u>. Then, his girlfriend called and told him she had found someone else. His jealousy turned <u>molten</u> and his ego was <u>ablaze</u>. Bob tried desperately to <u>keep his lid on</u>, but his jealousy overcame him. It <u>erupted</u> in an uncontrollable <u>explosion</u>, <u>destroying everything in its path</u>.

B. Across-domain: Jealousy is a Disease Bob's jealousy was a <u>disease</u> that was <u>growing</u> stronger every year. He had always rejected the possibility of competing with other men. He usually could <u>control his outbreaks</u>, but <u>recent attacks had weakened him</u>. Then, his girlfriend called and told him she had found someone else. His jealousy spread like a <u>cancer, invading his entire being</u>. Bob tried desperately to <u>check its</u>

progress, but his jealousy overcame him. It <u>erupted</u> in an uncontrollable <u>explosion</u>, <u>destroying everything in its path</u>.

C. Literal: The <u>volcano</u> usually <u>let off steam</u> slowly, but <u>pressure was building rapidly</u>. It's <u>lid wasn't on</u> and <u>molten</u> lava flowed down its sides, setting trees <u>ablaze</u>. Bob was jealous because his girlfriend was chosen to cover the <u>volcano</u> story. He had always rejected the possibility of job competition between them. Then, his girlfriend called and told him she had found someone else. Bob tried desperately to keep his self-control, but his jealousy overcame him. It <u>erupted</u> in an uncontrollable <u>explosion</u>, <u>destroying everything in its path</u>.

9. Anger

A. Within-domain: Anger is a Chasm Their animosity towards one another created a deep <u>chasm</u> between them. They refused to talk to one another for weeks at a time. Other family members tried to <u>span the gap</u> in their relationship, but couldn't. Jennie thought that she could help them <u>cross the divide</u> between them. Everybody figured it was worth a try, and they gave her the go ahead. She asked each one the reason why they were mad at each other. She helped <u>rebuild the bridge</u> by which they had once been <u>linked</u>. At last, the <u>rift</u> between them was healed.

B. Across-domain: Anger is Ice Their animosity towards one another was solid block of <u>ice</u>. They refused to talk to one another for weeks at a time. Other family members tried to <u>thaw</u> their relationship, but couldn't. Jennie thought that she could help <u>melt</u> the bitterness between them. Everybody figured it was worth a try, and they gave her the go ahead. She asked each one the reason why they were mad at each other. She slowly <u>chipped away</u> at the absurd reasons for their anger. At last, the <u>rift</u> between them was healed.

C. Literal: The two towns were separated by deep <u>chasm</u> that neither wanted. The people were unable to visit one another for weeks at a time. Many townspeople suggested trying to <u>span the gap</u> between them, but couldn't. Jennie thought that she

could help them cross the divide between them. Everybody figured it was worth a try, and they gave her the go ahead. She asked each town what resources they had to put towards the project. She helped rebuild the bridge by which they had once been linked. At last, the rift between them was healed.

10. Love

A. Within-domain: Love is a Well Gloria and Jack thought their love was a well they could drink from forever. They loved each other dearly when they were first married. They bought a nice house in the suburbs and began to raise a family. They seemed to have it all, but their troubles had already started. Unseen by their friends, their love was being siphoned off. Jack worked late every night, and Gloria wanted more from their marriage. They went to see a marriage counselor, but by then it was too late. Too many cracks had developed in their relationship. Their love had dried up due to their neglect.

B. Across-domain: Love is a Rock Gloria and Jack thought their love was a rock that would last forever. They loved each other dearly when they were first married. They bought a nice house in the suburbs and began to raise a family. They seemed to have it all, but their troubles had already started. Unseen by their friends, their love was being worn down by the river of life. Jack worked late every night, and Gloria wanted more from their marriage. They went to see a marriage counselor, but by then it was too late. Too many cracks had developed in their relationship. Their love had dried up due to their neglect.

C. Literal: Gloria and Jack loved each other dearly when they were first married. They bought a nice house in the suburbs and began to raise a family. They seemed to have it all, but their troubles had already started. Jack worked late every night, and Gloria wanted more from their marriage. Their town used a well that was being siphoned off and not replenished. Cracks developed in the pipes and the town couldn't drink from the well. For Gloria and Jack, the stress this caused worsened their existing

problems. They went to see a marriage counselor, but by then it was too late. Their love had <u>dried up</u> due to their neglect.

11. Intelligence

A. Within-domain: Intelligence is Detective Skill Dr. Ban is the <u>Sherlock Holmes</u> of literature. He loves to piece together the <u>clues</u> of a novel to find the <u>hidden</u> meanings. He imparts this enthusiasm to the students who line up to take his classes. This semester Dr. Ban is teaching classical English literature. Each week he <u>decoded</u> the <u>cryptic</u> details of one of the great works. Dr. Ban was ill for two weeks and a guest lecturer filled in for him. Upon his return, he was given a standing ovation by the students. They were eager to see him <u>decipher</u> yet another work. Few professors are as able an intellectual <u>sleuth</u> as he.

B. Across-domain: Intelligence is a Light Dr. Ban is the great <u>illuminator</u> of literature. He loves to <u>shine the spotlight</u> on a novel to find the <u>shadowy</u> meanings. He imparts this enthusiasm to the students who line up to take his classes. This semester Dr. Ban is teaching classical English literature. Each week he was a <u>prism</u>, spreading out the intricate details of a great work. Dr. Ban was ill for two weeks and a guest lecturer filled in for him. Upon his return, he was given a standing ovation by the students. They were eager to see him <u>cast light</u> on yet another work. Few professors are as able an intellectual <u>sleuth</u> as he.

C. Literal: Dr. Ban is a literature professor and an avid <u>Sherlock Holmes</u> fan. He loves to find the <u>clues hidden</u> by the author so he can solve the mystery. He imparts this enthusiasm to the students who line up to take his classes. This semester Dr. Ban is teaching classical English literature. Each week he <u>decoded</u> his <u>cryptic notes</u> and gave a fantastic lecture. Dr. Ban was ill for two weeks and a guest lecturer filled in for him. Upon his return, he was given a standing ovation by the students. They were eager to see him <u>decipher</u> his notes and discuss yet another work. Few professors are as able an intellectual <u>sleuth</u> as he.

12. Dying

A. Within-domain: Dying is a Journey Susan saw death as a <u>journey</u>. Her friends noticed that she was getting her things in order. It was as if she was going to take a long <u>trip</u>. Susan was <u>packing up</u> before their eyes. Her doctors said she had a bad heart, and that they would do what they could. They tried to halt her <u>voyage</u> with some new drugs to no avail. Her friends came to her funeral and mourned her <u>departure</u> from them. Susan had <u>booked her passage</u> and <u>left everyone behind</u>.

B. Across-domain: Dying is Draining Away Susan's zest for life was <u>flowing away</u> rapidly. Her friends noticed that she was getting her things in order. It was as if her life was being <u>drained</u> from her body. Susan's vitality was <u>spiralling downward</u> before their eyes. Her doctors said she had a bad heart, and that they would do what they could. They <u>pumped</u> her full of some new drugs to no avail. Her friends came to her funeral and mourned how she'd <u>trickled away</u> from them. Susan had <u>booked her passage</u> and <u>left everyone behind</u>.

C. Literal: Susan was preparing to go on a <u>voyage</u>. Her friends noticed that she was getting her things in order. Susan was <u>packing up</u> for a long <u>trip</u>. The doctors said she had a bad heart, and that they would do what they could. They tried to halt her <u>journey</u> with promises of some new drugs to no avail. Susan insisted on going anyway, but her <u>departure</u> never took place. Her friends came to her funeral and mourned their loss. Susan had <u>booked her passage</u> and <u>left everyone behind</u>.

13. A Brain

A. Within-domain: The Brain is a Computer Patty had a <u>computer</u> for a brain. She had a difficult exam coming up and she knew she would have to study hard. She would <u>process</u> the information she read and <u>store</u> it in her vast memory. All of her friends marvelled at the way she would study. On the day of the exam everyone was nervous, including Patty. She knew this affected her performance. Before entering the

testing room she shut herself down and relaxed. She later retrieved necessary information and integrated it into her answers.

B. Across-domain: The Brain is a Muscle Patty had a powerful muscle for a brain. She had a difficult exam coming up and she knew she would have to study hard. She would include the information in her mental workout and train on it. All of her friends marvelled at the way she would study. On the day of the exam everyone was nervous, including Patty. She knew this affected her performance. Before entering the testing room, she did her mental relaxation exercises. She later retrieved necessary information and integrated it into her answers.

C. Literal: Patty had a computer to help her study. She had a difficult exam coming up and she knew she would have to study hard. She processed the material with the computer and stored it in its vast memory. All of her friends marvelled at the way she would study. On the day of the exam everyone was nervous, including Patty. She knew this affected her performance. Before entering the testing room, she shut down the computer and relaxed. She later retrieved necessary information and integrated it into her answers.

14. Eating

A. Within-domain: Eating is an Addiction Ed is addicted to eating sweets. He has to have his sugar fix when he gets home from work. His parents had always kept cookies and candy in the house. Now that he is on his own, he can't always afford to buy the food he loves. When he finds a new food, he is like a junkie. Ed gets annoying, getting up often to search the shelves for a snack. His girlfriend Mary keeps trying to get him to eat healthy foods. She is trying to break his junk food habit. Unfortunately, sugar withdrawal is hard to undergo and Ed experiences relapses.

B. Across-domain: Eating is a Science Ed has eating sweets down to a science. He likes to experiment with food when he gets home from work. His parents had always kept cookies and candy in the house. Now that he is on his own, he can't

always afford to buy the food he loves. When he finds a new food, he is like a <u>mad doctor</u>. Ed gets annoying, getting up often to search the shelves for new <u>materials</u>. His girlfriend Mary keeps trying to get him to eat healthy foods. She is trying to <u>close down</u> his little <u>laboratory</u>. Unfortunately, <u>sugar withdrawal</u> is hard to undergo and Ed experiences <u>relapses</u>.

    C. Literal: Ed is <u>addicted</u> to nicotine and loves sweets. He has to have his cigarette <u>fix</u> and maybe a snack when he gets home from work. His parents had always kept cookies, candy and cigarettes in the house. Now that he is on his own, he can't always afford to buy these things. When he runs out of cigarettes it is obvious he is a nicotine <u>junkie</u>. Ed gets annoying, getting up often to search his drawers for a pack. His girlfriend Mary keeps trying to get him to eat healthy foods. She is trying to improve his diet and <u>break his</u> nicotine <u>habit</u>. Unfortunately, <u>sugar withdrawal</u> is hard to undergo and Ed experiences <u>relapses</u>.

15. Virtue

    A. Within-domain: Virtue is Cleanliness Steve has always thought his behavior should be perfectly <u>clean</u> and proper. He wouldn't play a <u>dirty</u> trick on anyone if his life depended on it. Unfortunately, the same cannot be said of his ex-roommate, Tommy. After signing a lease with him, he learned Tommy had a criminal record. Tommy specialized in forgery and counterfeiting. What a <u>sordid</u> character! It was <u>filthy</u> of him, but inevitable, that he would forge Steve's signature. One more <u>blot</u> on a <u>stained</u> history: that was all Tommy saw. Clearly, not everyone has as <u>spotless</u> a reputation as Steve.

    B. Across-domain: Virtue is Smoothness Steve has always thought his behavior should be perfectly <u>polished</u> and proper. He wouldn't play an <u>uneven</u> trick on anyone if his life depended on it. Unfortunately, the same cannot be said of his ex-roommate, Tommy. After signing a lease with him, he learned Tommy had a criminal record. Tommy specialized in forgery and counterfeiting. What a <u>rough</u> character! It was

abrasive of him, but inevitable, that he would forge Steve's signature. One more scratch on a scarred history: that was all Tommy saw. Clearly, not everyone has as spotless a reputation as Steve.

C. Literal: Steve has always thought he should keep clean and have proper behavior. He wouldn't wear a dirty suit or be mean to anyone if his life depended on it. Unfortunately, the same cannot be said of his ex-roommate, Tommy. After signing a lease with him, he learned Tommy had a criminal record. Tommy specialized in forgery and counterfeiting. Besides his bad character, he always looked filthy and wore sordid clothes. It was evil of him, but inevitable, that he would forge Steve's signature. Just his profit and the new blot on his stained shirt: that was all Tommy saw. Clearly, not everyone has as spotless a reputation as Steve.

APPENDIX B

Poorly Written Passages in Experiment 4a

Note. Subjects were required to rate how readable the last line of a passage was, given what preceded it, on a scale of 1 = "easy", to 7 = "hard". 1. The new director of the library has started several programs. He wants to get people to come to the library regularly. His programs have been very successful but not. There are many are many area residents who almost never visit. Now, a lot of students are enrolled in a summer program at this place nearby. More amd more people are attending the free movie screenings. Children are encouraged to come and read on Saturday mornings. Few, however, have come so far. Their cars are very old and problems occur because of this. 2. Growing up near mountains, Judy feels best in areas with lots of mountains. She and her sister go on hiking trips a lot of the time. They like the quietness and noisiness of the mountains. Both like winter weather and even in the summer there is snow. They will often spend several days climbing a mountain. They do not rush to the mountain. They both enjoy photography and take rolls of pictures. Each night they will pitch a tent and build a small campfire. They know what to do when they have to do it.

Author Identification Notes

Table 1 Sample Stimuli Set from Experiment 1

Within-domain metaphor: A Debate is a Journey

Dan wanted to guide the audience through his debate speech. He did not stray from his line of argument. He showed that the opposition's arguments went off in the wrong direction. He won the debate because he oriented the judges to his interpretation.

Across-domain metaphor: A Debate is a War

Dan wanted to devastate the audience with his debate arguments. He did not desert his line of argument. He attacked the opposition's arguments from the start. He won the debate because he oriented the judges to his interpretation.

Control passage:

Dan's directions guided him through the building to the debate room. He did not stray from the lines drawn on the map. He was well-prepared to discuss problems with the opposition's arguments. He won the debate because he oriented the judges to his interpretation.

Table 2 <u>Metaphoric Stimulus Items from Experiment 1 (E1) and Experiment 2 (E2)</u> Note.
W = Within-domain; A = Across-domain

1. The Mind is a: W: Knife   A: Machine

    E1: Their minds were too <u>dulled</u> with fatigue to work

    well.

    E2: Her mind was too <u>dulled</u> with fatigue for her to

    think well. 2. Faith is a: W: Plant

                                                A: Money

    E1: It is now that we are <u>reaping</u> the benefits of being

    religious.

    E2: They could then <u>reap the bountiful harvest</u> of their

    good labors. 3. Love is (a): W: Magnetic force A: Magic

    E1: They felt strongly <u>pulled</u> to each other.

    E2: They knew they loved each other even though they were

    <u>polar opposites</u>. 4. A Debate is a: W: Journey   A: War

    E1: He won the debate because he <u>oriented</u> the judges to

    his interpretation.

    E2: He won the debate because he got the judges to

    <u>follow</u> his argument. 5. Memory is a: W: Computer   A: Lens

    E1: She could <u>process</u> information in memory at <u>great</u>

    <u>speed</u>.

    E2: Patty could <u>process</u> information in memory at

    <u>great speed</u>. 6. Virtue is:

                        W: Cleanliness   A: Height

    E1: Not everyone has as <u>spotless</u> a reputation as Steve.

    E2: (same) 7. Ideas are:

                        W: Commodities   A: People

E1: They will pick the most <u>valuable</u> idea from among

   these.

E2: The group hopes that the workers will <u>buy</u> its ideas

   for the recycling program 8. Problem is a:

W: Knot   A: Uncharted territory

E1: We are responsible for <u>disentangling</u> it. 9. Problem is a: W: Puzzle   A:

Knot

E2: We have no <u>clue</u> about how to solve this <u>puzzle</u>. 10. Rudeness is: W: Ice

A: Stone

E1: His frown did not <u>thaw</u> for an instant.

E2: (same) 11. Life is a: W: Container   A: Jailer

E2: It was the end of a life which had been <u>full to the</u>

   <u>rim</u> with adventure. 12. Anger is a:

W: Contained substance   A: Opponent

E1: But, he could only take so much and he finally <u>blew</u>

   <u>his top</u>. 13. Anger is a(n):

W: Contained substance   A: Animal

E2: But, he could only take so much and he finally <u>blew</u>

   <u>his top</u>. 14. Financial speculation is a(n):

W: Tidal wave   A: Explosion

E1: Few survivors <u>buoyed</u> to the surface. 15. Intelligence is (a):

W: Detective skill   A: Light

E1: Few professors in the department were as keen an

   <u>intellectual sleuth</u> as he.

E2: (same)

Table 3 <u>Sample Stimulus Set from Experiment 2</u>

Literal context section (precedes all passages)

     Janet was the best student in her law school class. She joined the most prestigious law-firm in the city after graduation. Janet was respected by her fellow workers. She had been working all day, but wanted to finish work on her latest case.

Within-domain metaphor: The Mind is a Knife She took a serious <u>stab</u> at trying to resolve her client's case. Usually Janet just <u>sliced</u> through her work, but not that day. After just three hours she had lost her <u>edge</u>. Her mind was too <u>dulled</u> with fatigue for her to think well.

Across-domain metaphor: The Mind is a Machine She tried to <u>crank out</u> responses to her client's case. Usually Janet just <u>chugged</u> through her work, but not that day. After just three hours she had <u>run out of steam</u>. Her mind was too <u>dulled</u> with fatigue for her to think well.

Control passage: Her client had been <u>stabbed</u> and one of his fingers had been <u>sliced</u> off. Despite Janet's hard work, the case against the mugger was going slowly. Tired, she put her papers on the <u>edge</u> of her desk and went home. Her mind was too <u>dulled</u> with fatigue for her to think well.

Table 4 <u>Metaphoric Stimulus Items from Experiment 3 (E3) and Experiments 4a,b (E4)</u>

<u>Note</u>. W = Within-domain; A = Across-domain

1. Faith is a: W: Tree   A: Money

    E3: When they recovered they <u>harvested the ripened</u>

       <u>fruit</u> of their steadfast faith.

    E4: They could then <u>reap the bountiful harvest</u> of their

       good labors. 2. Love is a: W: Well   A: Rock

    E3: Their love had <u>dried up</u> due to their neglect.

    E4: (same) 3. A Debate is a:

W: Race   A: War

    E3: His brilliant maneuevering left his opponent <u>a mile</u>

       <u>behind the finish line</u>.

    E4: His skill left his opponent <u>far behind him at the</u>

       <u>finish line</u>. 4. Memory is a: W: Computer   A: Workout

    E3: She <u>accessed</u> the information and integrated it into

       her answers.

    E4: She later <u>retrieved</u> necessary information and

       integrated it into her answers. 5. Virtue is: W: Cleanliness   A:

Smoothness

    E3: Clearly, not everyone has as <u>spotless</u> a reputation

       as Steve.

    E4: (same) 6. Ideas are: W: Commodities   A: People

    E3: Hopefully, the other workers will <u>buy</u> our ideas for

       the recycling program.

    E4: We think we can <u>sell</u> our <u>well-crafted</u> ideas to

       the directors. 7. A Problem is a:

W: Maze   A: Knot

E3: We would still <u>be wandering lost</u> in this problem if

the thief hadn't confessed.

E4: We would still be <u>lost in the labyrinth</u> if she

hadn't been so persistent. 8. Anger is (a): W: Ravine   A: Ice

E3: She was able to <u>bridge the gap</u> between them and

they met in the middle.

E4: At last, the <u>rift</u> between them was healed. 9. Dying is (a): W: Journey

A: Draining away

E3: Susan had <u>booked her passage</u> and <u>left them</u>

<u>behind</u>.

E4: Susan had <u>booked her passage</u> and <u>left everyone</u>

<u>behind</u>. 10. Intelligence is (a):

W: Detective ability   A: Light

E3: Few professors are as able and interesting an

<u>intellectual sleuth</u> as he.

E4: Few professors are as able an <u>intellectual sleuth</u>

as he. 11. Alcohol is: W: Electricity   A: Magic

E3: It certainly <u>energized</u> him like nothing else did.

E4: Only the <u>voltage surge</u> he got from liquor could

<u>light up</u> his eyes. 12. Betrayal is a:

W: Cut   A: Blow

E3: He didn't realize <u>how big a hole he had cut in her</u>

<u>heart</u>.

E4: He didn't realize <u>how gaping a hole he had carved in</u>

<u>her heart</u>. 13. The Mind is a:

W: Rabbit   A: Machine

E3: She just wanted to <u>burrow</u> into her bed and go to

sleep. 14. The Mind is a:

W: Greyhound   A: Machine

E4: It just <u>lay on the ground</u> and <u>refused to move</u>. 15. Jealousy is a(n):

W: Acid   A: Volcano

E3: He sank to the floor and cried, <u>his will had been</u>

<u>dissolved</u>. 16. Jealousy is a(n):

W: Volcano   A: Disease

E4: It <u>erupted</u> in an <u>uncontrollable explosion,</u>

　　<u>destroying everything in its path</u>. 17. Children are:　W:　Investments　　A:

Plants

E3: They were always <u>money in the bank</u> to their

　　parents. 18. Eating is a(n):

W: Addiction   A: Science

E4: Unfortunately, sugar <u>withdrawl</u> is hard to undergo

　　and Ed <u>experiences relapses</u>.

Table 5 <u>Sample Metaphoric Passages from Experiments 4a,b</u>

Within-domain metaphor: A Debate is a Race

    Dan saw the big debate as a <u>race</u>: he was determined to win it. He knew that he had to <u>steer his course</u> carefully in the competition. His strategy was to go <u>cruising through</u> initial points and then <u>make his move</u>. After months of debating practice, Dan knew how to present his conclusions. If he could only <u>keep up the pace</u>, he had a good chance of winning. Before long, he felt the audience was receptive to his arguments. Then, he <u>revved up</u> as he made his last key points. His skill left his opponent <u>far behind him at the finish line</u>.

Across-domain metaphor: A Debate is a War

    Dan saw the big debate as a <u>war</u>: he was determined to be <u>victorious</u>. He knew that he had to use every <u>weapon</u> at his <u>command</u> in the competition. He <u>mapped out his strategy</u> to insure he established a dominant position. After months of debating practice, Dan knew how to present his conclusions. If he could only <u>marshall his forces</u>, he had a good chance of winning. Before long, he felt the audience was receptive to his arguments. Then, he <u>intensified the bombardment</u> as he made his last key points. His skill left his opponent <u>far behind him at the finish line</u>.

Table 6 <u>Interrelations of Conventionality and Systematicity Variables</u>

	Systematicity	Conventionality
		Local Extended
		<u>Anger is Heat</u>
High	kick the bucket	She is boiling mad.
	pop the question	He lost his cool.
		<u>The Mind is a Machine</u>
Low	The billboard was a wart on the landscape.	Her mind ran out of fuel. A belt snapped
	He has cardboard hair.	under the pressure of the decision.