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THE EFFECT OF THE CONTEXT IN METAPHOR
COMPREHENSION

A Master's Thesis Presented

By

MAKIKO SHINJO

Submitted to the Graduate School of the
University of Massachusetts in partial fulfillment
of the requirement for the degree of

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Psychology

THE EFFECT OF THE CONTEXT IN METAPHOR
COMPREHENSION

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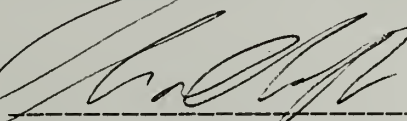
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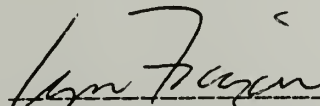
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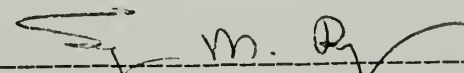
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I thank Linda A. Greces for running some of the experiments. She tried everything to avoid sounding like a broken tape recorder in an experiment in which she had to give a feedback to subjects every ten seconds or so.

ABSTRACT

The Role of Context in Metaphor Comprehension

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The role of context in metaphor comprehension was investigated. Schematic view focused on the effect of contextual support in general on metaphor comprehension, while semantic view emphasized semantic relations between the metaphor ground and an active concept in memory prior to metaphor comprehension. In two norming studies comprehension difficulty of metaphors with or without context was rated. Reading times for metaphors were measured with or without sentential context in two experiments.

The semantic priming did not affect the following metaphor comprehension in the presence of supportive sentential context. When the context was removed, the primes showed significant effects. Two primes interfered with target comprehension while one prime facilitated it slightly. The effects of primes on literal comprehension were strikingly similar to those on metaphor comprehension. A possible mechanism for the effect of each prime was discussed in detail.

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CHAPTER I

INTRODUCTION

Different views of metaphor

What is a metaphor? My pocket-size Webster's New World Dictionary gives a vague definition of a metaphor: a metaphor is a figure of speech in which one thing is spoken of as if it were another. A standard dictionary definition is that a metaphor is a word or phrase applied to an object or concept that it does not literally denote. This non-literalness is the first and most important requirement for something to be a metaphor. However, what is not literally true does not necessarily constitute a metaphor.

The meaning of "literal truth" is actually two-fold; one is the literalness value of a sentence, the other is the truth value of the sentence content. A sentence can be literal or non-literal quite independent of its contextual meaningfulness. Thus we need to consider three classes of sentences; the literal and contextually meaningful (most common sentences), the non-literal and contextually meaningful (metaphor), and the literal and contextually anomalous (anomalous sentences). Though a mechanical combination of two independent conditions suggests the fourth category, the non-literal and undifferentiated from the third.

Therefore, what is not literally true can be either a

metaphor or an anomalous sentence. In order to separate metaphors from literally false, anomalous sentences, Ortony (1979) suggested a second requirement for metaphors: there is an intended meaning to be recognized in a metaphor while an anomalous sentence does not convey any meaning to be recognized in the frame of the context.

As the metaphor is one case of an indirect speech form, what is truly asserted in a metaphor differs from what the sentence literally means. This dissociation of the asserted meaning from the literal meaning should not be random, otherwise the metaphor can not be an effective communication form. The fact is that the metaphor is widely used not only as one form of rhetoric in literature but also as a common form of expression in everyday language. Then what is the underlying relation between the literal and asserted meaning of a metaphor? Black (1962) has described three approaches in explaining this relation: the substitution view, the comparison view, and the interaction view.

The traditional substitution view treats metaphor as a kind of error in diction and logic. This view explains away the metaphoric predicate in a metaphor (the vehicle) as an error and ignores the role of the metaphorical subject (the topic). For example, the sentence "A BASIC program is spaghetti." is considered to be a case of misclassification of a computer program as food. This sentence can not be literally true; however, it has some recognizable meaning, namely that the structure of a BASIC program can be very

entangled. We need to substitute a literal property of the literal referent of the predicate, a kind of food, for the intended metaphorical property, entangledness, in order to understand the assertion of this metaphor. According to this view, a metaphor is understood best when the properties asserted of its topic are already very clear. However, it is not necessarily true of all metaphors that comprehension is so effortless.

The comparison view treats a metaphor as a well-structured comparison of two domains of knowledge of the topic and the vehicle. This view ascribes equal importance to the topic and the vehicle in the comprehension of a metaphor. In this view, a metaphor is considered to be as an incompleting simile without the preposition "like". The above example of a BASIC program being spaghetti is presupposed to have an underlying expression that a BASIC program is like spaghetti. In the comparison view, this metaphor means that spaghetti and a BASIC program are similar in that both have the property of being entangled. This view, unlike the substitution view, offers a clearer explanation of how two apparently dissociated levels of meaning are actually connected through a shared property, the ground of a metaphor. Its implication for a process model of metaphor comprehension is clear: a shared property of the topic and the vehicle is sought in order to achieve a sentence interpretation. But imagine how complicated

comprehension should be in this view when there is very little similarity between the topic and the vehicle.

The third view of the metaphor, the interaction view, was espoused by Black in his thesis. This view argues that the topic and vehicle play distinct roles: they no longer have symmetrical roles in the comprehension process. According to this view, the dominant feature associated with the vehicle is to be attached to the topic, altering the topic's system of implications. Using our meager BASIC program-spaghetti example again, the property of entangledness of the spaghetti is to be attached to the BASIC program when this metaphor is comprehended. At the same time, the salience of the entangledness of the BASIC program is enhanced relative to the other features associated with it. Black (1962) characterized this process as a "filtering" of the topic by the vehicle. These asymmetrical roles of the topic and the vehicle created a renewed interest in metaphor in the discipline of psychology as they held a rich implication for a process model of metaphor comprehension. Particularly after Tversky (1977) published his influential article on features of similarity, the hypothesis of asymmetrical roles has been widely tested in the rigorous experimental tradition of the information processing school (Connor & Kogan, 1980; Kroll et al., 1982; Malgady & Johnson, 1980; Ortony et al., 1985; Verbrugge, 1979; Verbrugge & McCarrell, 1979).

Verbrugge (1979) proposed a fourth view of the metaphor,

criticizing Black's interaction view on several counts. He emphasized the importance of the perceptual experience of this knowledge-system transformation which co-occurs with the comprehension of a metaphor. His intention in doing so was to avoid the heavy dependence on abstract meaning representation which is one of the characteristics of the comparison and interaction views. Another distinctive characteristic of his transformation view is its specification of the extent to which the knowledge-system of the topic is transformed. An underlying assumption in this view is that a metaphor puts constraints on structural identity and on transformations in which two structures can participate.

According to Verbrugge's transformation view of metaphor, to comprehend a metaphor is to perceive familiar structures or transformations in an unusual context. In this view, our program-spaghetti metaphor can mean that invariants of spaghetti apply to the BASIC program: the property of the program is modified by the property of the spaghetti. This modulating process is hypothesized to be no different than the process evoked by an adjective or a class-membership modifier in a literal sentence. This claim distinguished the transformation view from other views, asserting the similarity of the metaphor comprehension mechanism to that of a literal sentence.

Different classes of metaphor

Four different views of metaphor have been introduced here, yet we have encountered only one example of a metaphor so far, i.e., "A BASIC program is spaghetti." Then what are the class of metaphors being studied? Several extensive taxonomies of metaphor have been presented by Searle (1979), Miller (1979), and Lakoff & Johnson (1980) from philosophical and/or linguistic points of view. In empirical studies of cognitive psychology, the categorization of metaphor is rather brief and pragmatic. We recognize only a few classes of metaphor; the first distinction is between the nominative metaphor and the whole sentence metaphor. A formal comparison of these two types of metaphor is not commonly made in the literature of metaphor comprehension perhaps due to the rare utilization of the whole sentence metaphor; nevertheless a distinction is in order because of their different implication for process models.

The nominative metaphor has been popularly used in conjunction with testing hypotheses about feature similarity between the topic and the vehicle (Gildea & Glucksberg, 1983; Glucksberg et al., 1982; Marschark & Hunt, 1985; Ortony et al., 1985) Our BASIC program-spaghetti example belongs to this class of metaphor. This class of metaphor is structured by two nouns, that do not have a category-instance relation between them.

The use of whole-sentence metaphors was first proposed

by Ortony (1979) as an alternative, and they were typically utilized in experiments in which the role of context in metaphor comprehension was investigated (Ortony et al., 1978; Inhoff et al., 1984). For example, a whole sentence metaphor "The troops marched on." can be interpreted differently depending on the preceding context. "The troops" may be a group of soldiers in the context of a battle field, or it may be children in the context of naughty kids annoying a babysitter.

A whole sentence metaphor can be interpreted either literally or metaphorically, whereas a nominative metaphor has only a metaphorical interpretation. In this sense, a whole sentence metaphor meets the first definition of the metaphor, i.e. non-literality, only partially, unlike a nominative metaphor.

When the preceding context promotes a metaphorical interpretation of a whole sentence metaphor, the topic of the sentence already requires a metaphorical interpretation and the vehicle interpretation follows in accord with the nature of that interpretation. Here, what is crucial in achieving a sentential interpretation is the nature of the interpretation of the topic. The vehicle may or may not receive a metaphorical interpretation; however, its role in the sentential interpretation is clearly secondary. In contrast, a nominative metaphor invariably calls for a literal interpretation of the topic, and it is the vehicle that

requires a metaphorical interpretation. The latter's role in the sentential interpretation is hypothesized to be more crucial than the former.

In short, the onset of metaphorical interpretation in the two classes of metaphor is quite different. What is problematic with a whole sentence metaphor is that this type of metaphor has two different interpretations: the literal and the metaphorical. When a context induces a literal interpretation, people may search for and arrive at only one interpretation. However, this same sentence may have two interpretations when a preceding context induces a metaphorical interpretation: namely, the literal and the metaphorical. A reaction time difference may arise because there are two meanings to process in a metaphor and only one in a literal sentence. Or it may arise because metaphorical comprehension is truly different from its literal counterpart. This causes a serious problem for reaction time studies designed to test whether metaphorical and literal comprehension processes are different. In contrast, a nominative metaphor does not have any literal interpretation; thus the interpretation of reaction time data is relatively clear. No extensive effort has been devoted to the development of process models for whole sentence metaphor comprehension, whereas the nature of the metaphorical interpretation of the nominative metaphor has been hypothesized and tested.

The second distinction we encounter among different

classes of metaphor is one of a dead metaphor and a novel metaphor (Glucksberg et al., 1982; Gildea & Glucksberg, 1983; Lakoff & Johnson, 1979; Searle, 1979). This distinction depends on the type of vehicle and its combination with the topic. An example of a dead metaphor is "Time is money". This expression has been so commonly used that it has become idiomatic, and everyone would know its intended meaning immediately. In contrast, if someone says "That building is a sun", the intended meaning may not be automatically clear to the hearer. It is hypothesized that a dead metaphor is understood by people quite differently than a novel metaphor (Glucksberg et al., 1983). People would instantly know what is the appropriate feature of a vehicle to be selected in a dead metaphor, whereas a novel metaphor may require an effort to find an appropriate feature of the vehicle to attach to the topic. Perhaps there is a representational difference between the two types of vehicles.

Lakoff & Johnson (1979) particularly emphasized the role of cultural expectation and belief on the production and comprehension of a metaphor. These factors are influential in a process in which a novel metaphor becomes a dead metaphor over time. If a new metaphor fits the cultural frame well, there is a tendency for the same metaphor to be used repeatedly by many people. As a result, a specific feature of the vehicle becomes more dominant than before. People no longer need to search for an appropriate feature of the

vehicle to attach to the topic. Such extensively used vehicles are called stock vehicles, and their function in a metaphor may be very similar to that of an adjective in a literal sentence.

Another distinction worth noting is the difference between simple metaphors and open-ended metaphors (Searle, 1979; Marschark & Hunt, 1985). In some metaphors only one interpretation may be available, whereas in others several interpretations are immediately available. For example, a metaphor "Sam is an elephant." may mean that Sam is big or that Sam never forgets, given that Sam is specified as a human being. The process involved in the comprehension of simple and open-ended metaphor may be the same. But an immediate implication here is that an open-ended metaphor may require a longer time for comprehension because several meanings must be processed.

Dimensions of metaphor

Rather than imposing abstract and arbitrary dichotomous categories, some researchers have developed scales to measure metaphors. A recent work by Marschark & Hunt (1985) has summarized 10 attribute dimensions that are of current theoretical interest in metaphor research.

The dimension of felt familiarity maps continuously on the dichotomous distinction between a dead metaphor and a novel metaphor. The comprehensibility scale allows us to

compare degrees of difficulty with which different metaphors are understood. They are useful in deriving a prediction for reaction time studies. So is the dimension of the estimated number of alternative interpretations: perhaps the more interpretations a metaphor has, the longer time it may take to be understood, if all possible meanings are calculated obligatorily. This dimension captures the classification of a simple and an open-ended metaphor. The degree of metaphoricity and semantic relatedness of topic and vehicle may be measures of particular interest when the interaction view of a metaphor is being tested. The three imageability scales, imageability of a metaphor, of the topic, and of the vehicle, would help clarify the role of imagery in the comprehension of a metaphor. These scales may be used to characterize a class of metaphors of interest.

Marchark & Hunt (1985) demonstrated in their study the importance of the estimated number of alternative interpretations in the recall of a metaphor: the more alternative interpretations a metaphor has, the more often the metaphor was recalled. Also the role of topic imageability was partially credited as a reliable measure of recall performance: the higher the imageability of the topic, the better the recall of the metaphor.

These ten dimensions have been gradually developed by many researchers over a decade in the hope of finding

factors to guide the study of metaphor comprehension. Johnson (1980) suggested that comprehending and appreciating a metaphor would require two different processes. It appears that nine dimensions are closely related to the process of comprehension, and the last dimension, the goodness of a metaphor, may be related to the appreciation process. This scale is still very broad and general in meaning. An effort has been made to define what makes a metaphor a good metaphor, searching for systematic relations among the attribute dimensions (Tourangeau & Sternberg, 1981).

The comprehension process has received the most attention. As a result, a variety of theories have diverged on the issues of the representation and comprehension of metaphors. It is this issue that we now turn to briefly.

Models for metaphor comprehension

The traditional three-stage model of metaphor comprehension was first proposed by Searle (1969, 1979). In the first stage people achieve a literal interpretation of a metaphor; then in the second, they check this interpretation against the context. Literal and metaphorical processes are exactly the same until this point. The only difference is that the literal interpretation of a metaphor falls outside the contextual frame, and people have to reinterpret the metaphor nonliterally in the third stage.

This model appealed to many researchers because it explicated the status of metaphor comprehension relative to its literal counterpart. However, reaction time studies designed to test this model generally have failed to support it. Consistent findings of no difference in response time measures led many to hypothesize that there is perhaps only one comprehension process for literal and metaphorical sentences (Glucksberg et al., 1982; Gildea & Glucksberg, 1983; Inhoff et al., 1984; Miller, 1979; Paivio, 1979).

Hoffman & Kemper (1985) have argued that models for metaphor comprehension are not sufficiently constrained to test the hypothesis of dual comprehension mechanisms for metaphors and literal sentences. A longer reaction latency in comprehending a metaphor than in comprehending a literal sentence may be interpreted in two ways. The first interpretation is that the two mechanisms of comprehension are essentially the same and there are only two stages in both of them; namely people achieve a sentential interpretation in the first stage of any sentence, and they check it against the context in the second stage. As a metaphor is more difficult to understand, the first stage for a sentential interpretation may take a longer time for a metaphor than for a literal sentence, resulting in overall longer latencies for metaphors. The alternative interpretation of a longer reaction time is that metaphor comprehension indeed involves an extra stage. This interpretation assumes that

there are different mechanisms for literal and metaphorical comprehension. Without further specifications of the two models, critical tests are difficult to construct. Thus at present, both models appear equally plausible.

Psychological approaches to the comprehension of metaphor (and possibly of literal language) can be divided into two groups in terms of their underlying representational system. One approach focuses on the feature similarity in the abstract representation (Glucksberg et al., 1982; Gildea & Glucksberg, 1983; Ortony, 1979). The representation in this approach is said to be semantic, with the feature as a fundamental unit of representation (McCloskey & Glucksberg, 1979; Smith, 1978; Smith et al., 1974; Tversky, 1977; and Ortony, 1979, specifically on the representation of metaphor). Many studies of metaphor comprehension are explicitly or implicitly based on these representational assumptions. Some researchers have theorized that the abstract representation is not the sole mediation for metaphor comprehension.

The second approach answers this criticism by taking imagery into account (Marschark & Hunt, 1985; Paivio, 1979; Verbrugge, 1979; etc). Though no adherent of this approach claims that imagery is the sole mediator in metaphor comprehension, some ascribe a greater role to imagery (Verbrugge & McCarrel, 1977) than the others (Paivio, 1979; Marschark & Hunt, 1985).

Regardless of one's preference for the type of mediation in the comprehension process, it is largely agreed that

there is one common comprehension process for literal and metaphorical statements. Therefore, despite the apparent disagreement on the issue of representation, the process models conceived by the two approaches are almost identical: perhaps metaphors are understood in the same way as literal expressions are. What makes metaphors different from literal expressions may be the difficulty people have in understanding unfamiliar metaphors. What is this difficulty and how it affects comprehension mechanism? The investigation of metaphor comprehension appears to be a promising approach to studying the language comprehension mechanism in general.

C H A P T E R I I

THE ROLE OF CONTEXT IN METAPHOR COMPREHENSION

It is known that people can tell metaphors from literal expressions and that they can decide what is a good metaphor and what is not with considerable agreement (Glucksberg et al., 1982; Tourangeau & Sternberg, 1981). However, some sentences can be interpreted either literally or metaphorically (Ortony, 1979a). Some metaphors have more than one possible interpretation (Searle, 1979; Marschark & Hunt, 1985). Furthermore, some metaphors are understood easily in isolation while others are not (Glucksberg et al., 1982). People need the guidance of context in deciding what is meant by some metaphors.

Theorists have emphasized the importance of the context in the comprehension of metaphor (Gildea & Glucksberg, 1983; Ortony, 1980; Searle, 1979). A word meaning is not contextually invariant; rather an appropriate meaning is largely dependent on the contextual frame. Apprehension of the appropriate meaning is largely a function of linguistic and extralinguistic cues in the preceding context (Malgady & Johnson, 1980). This is especially the case when a sentence is relatively hard to understand.

Schema and metaphor comprehension

In explaining the ease or difficulty of metaphor comprehension, Ortony et al.(1978) focused on the sufficiency of the preceding context from a schematic point of view. If the context has provided enough information to activate an appropriate schema, later sentences will be understood easily in its frame. If not, subsequent comprehension will suffer (Bransford & Johnson, 1972; Haviland & Clark, 1974). Schema theory predicted the same context effect on the comprehension of metaphor and literal expressions.

Ortony et al.(1978) reported that metaphors were as quickly understood as literal sentences when the context was long, but that metaphors required longer times to comprehend than literals when the context was insufficient. They concluded that when the context provided sufficient information, metaphor comprehension occurred essentially in the same way as literal comprehension. However, when the context was impoverished metaphor comprehension required more time.

Inhoff et al.(1985) noted that Ortony et al.'s short contexts provided meaningful frames for the comprehension of literal targets, but they were anomalous in relation to the metaphorical targets. They introduced a control condition in which a literal target was preceded by an unrelated context. They concluded from their study that metaphor comprehension with an insufficient context may have been similar to literal comprehension with an unrelated context.

These two studies (Inhoff et al., 1984; Ortony et al., 1978) have shown that a metaphor may be comprehended differently when a context is long and presumably sufficient to support a metaphorical interpretation than when a context is short and insufficient. Was this because of the dual meaning of their metaphors?: Were people calculating two meanings in the short context condition because the context does not clearly direct them to one meaning? Or were people actually doing something different in comprehension of a metaphor depending on the amount of contextual information?

These two studies were designed more to investigate the difference between literal and metaphorical comprehension processes than to explore the question of what in context facilitates metaphor comprehension. Their results showed the importance of relations between the context and the subsequent metaphorical sentences, and suggested that tighter control should be exerted over these relations. Yet the questions still remained largely unanswered: how do literal and metaphorical comprehension differ and how does the context facilitate the comprehension of metaphors?

Feature similarity and metaphor comprehension

We hypothesized that the comprehension process for metaphors has at least two components: one is encoding of the vehicle which is literally anomalous in relation to the topic and the preceding context; the other is finding an appropriate connection between the vehicle and the topic and the whole preceding context in turn. The first component is not specific to the comprehension of metaphor; it is a purely lexical process without facilitation from the preceding context. The second component is more interesting, because it contains the key that may differentiate metaphor comprehension process from its literal counterpart. Although it is generally assumed that both comprehension processes are qualitatively the same, the issue has not been settled due to the lack of adequate evidence. Thus keeping the possibility of different processes in mind for the time being, let us now turn to this second component of the comprehension process. It is this component on which our discussion will focus for the rest of this paper.

A detailed model for the metaphor comprehension process is no more available than for its literal counterpart; however, a possible difference between literal and metaphor comprehension processes has been suggested by Ortony (1979). There is only a slight feature overlap between the topic and the vehicle of a metaphor and it is hard to recognize, thus difficult to utilize in sentential interpretation. In

contrast, a feature overlap between subject and predicate of a literal sentence is easy to detect. Ortony hypothesized that this difference in the amount of feature overlap makes metaphor comprehension somewhat different from its literal counterpart.

Various researchers have hypothesized and tested models for judgments of the similarity of two nouns (e.g., McCloskey & Glucksberg, 1979; Smith et al., 1974; Tversky, 1977). Invariably they have assumed that a judgment would be based on the relative amount of feature overlap between the two nouns against some criteria. In the case of metaphors, the amount of feature overlap between the topic and the vehicle is very small. This particular property of metaphors would pose a serious problem for the feature comparison mechanism which is presumably necessary to achieve a meaningful joint interpretation of words (Tversky, 1977).

Context may aid the comprehension of metaphors by making an appropriate feature of the vehicle (the ground of a metaphor) more salient (Gildea & Glucksberg, 1983; Hoffman & Kemper, 1985). There are two possible reasons for this effect: (1) increased saliency of the ground may induce a faster selection of the appropriate feature from the feature list of the vehicle. (2) The ground feature, which has very low dominance among the features of the topic (Ortony, 1979), may also become more salient; therefore, it may

become easier to connect the topic and the vehicle through the ground. Thus, increased saliency of the ground may affect either the selection of the ground or the integration of two words or both. This first factor may be peculiar to the comprehension of a metaphor, while the second factor may affect comprehension of metaphoric and literal language as well (Foss, 1982; Foss & Ross, 1983; Paivio, 1979). The first factor peculiar to metaphor comprehension may lead us to either two separate models for literal and metaphorical comprehension, or to a single process model in which a metaphor may be understood slower than a literal sentence.

Effect of semantic activation

Glucksberg et al.(1982) developed a metaphor interference paradigm in which subjects were asked to decide whether a sentence was literally true or not. They used four kinds of sentences: standard-true, standard-false, metaphor, and scrambled metaphor. The subjects were slower to make literalness judgments for metaphors than for scrambled metaphors despite the fact that both type of sentences were equally false literally. Sentence examples are as follows.

Metaphor	Some jobs are jails.	(1)
	Some roads are snakes.	(2)
Scrambled	Some jobs are snakes.	(3)
Metaphor	Some roads are jails.	(4)

Glucksberg et al.(1982) argued that the difference in the time between judgments of literalness for metaphors (1,2) and scrambled metaphors (3,4) was due to the metaphorical interpretation of the former (1,2) which was apprehended as meaningful although it was literally false. They hypothesized that this metaphorical truth interfered with the literal falseness and slowed the subjects' response.

Gildea & Glucksberg (1983) used a group of metaphors which were hard to understand in isolation; i.e., they had not shown the metaphor interference effect in the previous experiment. They prepared three kinds of priming sentences to be presented just prior to these difficult metaphors. The priming sentences differed in their relation to the ground of the metaphor. For example, their primes for a metaphor "Marriages are iceboxes." (5) are:

Specific-Figurative (SF)	People are COLD.	(6)
Specific-Literal (SL)	Winters are COLD.	(7)
General-Literal (GL)	Summers are WARM.	(8)

These sentences were actually preceded by "some" or "all" in their experiment. Which sentence had which quantifier is unclear in their report.

Here the concept of coldness was presumably the ground of the metaphor (5). The two specific primes (6,7) used this word as predicates of sentences, whereas the general

prime (8) used a concept of a different value within the same semantic field (e.g. WARM) as the predicate. When there was no prime preceded a metaphor, it was judged to be literally false as fast as a scrambled metaphor. When a metaphor followed a prime, a latency in literalness judgment was longer significantly compared to when its scrambled counterpart followed a prime. All three type of primes (6,7,8) interfered more with the literalness judgment of metaphors than with scrambled metaphors. Gildea & Glucksberg found no significant effect of the prime type. Therefore they concluded that activation of the semantic field of the metaphor ground facilitated the comprehension of a metaphor, slowing the literalness judgment in turn.

The issue of the relative effectiveness of the three primes (SF,SL,GL) was of particular interest. The first hypothesis investigated by Gildea & Glucksberg (1983) in relation to this issue was whether the representation of figurative and literal meanings are separate from each other. They reasoned that if they are separate, then the effects of figurative and literal primes should be different. Consequently, the SF prime should be more effective than the SL prime, because the former directly activates the ground, whereas the latter does not. An alternative view of the representation of the meaning may be that there is some core meaning common to both literal and figurative meanings, and priming one meaning would sufficiently activate the other through this core concept. It follows that both types

of primes would be equally effective.

The implication of different meaning representations is not limited to the issue of the representation. It has been hypothesized that there are two different comprehension processes, figurative and literal (Searle, 1979). The comparison between the two types of primes also taps this issue of the difference in processes. If there are different comprehension strategies, the figurative primes may induce subjects to be more prepared for subsequent metaphorical comprehension than literal primes may. Inhoff et al. (1985) presented data which can be interpreted as supporting this hypothesis.

There was another issue about the primes addressed in Gildea & Glucksberg's study: if a prime is to activate the semantic field of the metaphor ground, how specific need a prime be? This issue was investigated by comparing the SL and GL primes (e.g. COLD vs WARM).

In Gildea & Glucksberg's experiments, the three primes (SF, SL, and GL) were equally effective. This result supported the view that there is a core concept common to literal and figurative meaning and the process of comprehension for literal and figurative language is essentially the same. Furthermore, their data supported the conclusion that as long as the same semantic field is primed, the specific value of the priming feature does not affect the magnitude of the facilitative effect.

However, the bulk of studies on the effect of semantically related words (e.g. Conrad, 1974; Fischler, 1977; Swinney, 1979; Whitney et al., 1985) concluded that a priming word activates a related concept of the target word. The degree of the activation may be a function of how closely two words are related through the common concept (Collins & Loftus, 1975; Lorch, 1982; Simpson, 1981; Warren, 1974). Then the relative effectiveness of the primes should be in the descending order of SL and GL.

Gildea & Glucksberg (1983) reported this study with a reservation about its generalizability because their metaphor interference task was quite different from normal reading. For one thing, people do not read a text in order to decide the literal truthfulness of each sentence. For another, what they read in normal circumstances is not a group of unrelated sentences; there is a theme or topic which combines sentences in a meaningful fashion. It is also known that people develop a strategy specific to some decision task (Holyoak & Glass, 1975; Seidenberg et al., 1984). It is possible that the existence of universal and existential quantifiers in Gildea & Glucksberg's study may have encouraged subjects to develop a strategy specific to their task.

Gildea & Glucksberg's conclusion about what constitutes a minimal appropriate context was stated within the limits of their task. We do not know yet if their result was largely due to their judgment task and the specific material

or if it can be generalized to normal reading.

CHAPTER III
EXPERIMENTS

In the first experiment we hoped to investigate three issues: (1) Does semantic activation of the ground feature facilitate the comprehension of a metaphor in a laboratory reading task? (2) Do different primes differ in the magnitude of their facilitation? This question has two parts: (a) Do literal and metaphorical comprehension differ with respect to their representation and mechanism? (b) Does specifying the metaphor ground facilitate comprehension more than merely activating the semantic field of the ground in general?

Our subjects read a meaningful context which consisted of a few sentences. The last sentence of each context served as a priming sentence, ending with a prime word. Instead of using anomalous sentences (scrambled metaphors), a fourth category of priming sentence was used as a base line; this class of priming sentence did not include any word semantically associated to the vehicle of a target metaphor (Neutral sentence, hereafter abbreviated as N). We also included literal paraphrases of target metaphors as a possible base for comparison. An example is shown below.

Bob and Mary's marriage was ending.
They seldom talked to each other these days.
The happy past was a fading memory.
She remembered the first time they met.
She had been feeling unhappy then,

- (SF) because people around her were COLD.
- (SL) because that winter was very COLD.
- (GL) because that summer was very HOT.
- (N) because people around her were sad.

- (Tm) Now, her marriage was an icebox.
- (Tl) Now, her marriage was disastrous.

In the actual experiment, semantically related words were not presented in capital letters.

In this experiment, the subjects' task was to read sentences for comprehension. The reading time for each sentence was the measure of comprehension difficulty. If reading of target metaphors is influenced in the same way as judgment, then target metaphors should be read faster after semantically related primes than after unrelated primes (SF,SL,GL<N). Furthermore, target metaphors after metaphorical primes should be read as fast as after literal primes (SF=SL) if we are to replicate their finding. An alternative result (SF<SL) would support separate processes and representations for literal and metaphorical comprehension. Third, reading times of target metaphors after specific primes and general primes should be the same (SL=GL) according to Gildea & Glucksberg. Finding an alternative result (SL<GL) would be in accord with the results of studies of semantic priming.

One other pattern of results is conceivable given Ortony et al.(1978) finding: when a preceding context provided sufficient information for the target sentence comprehension, a metaphor was as quickly understood as a literal

sentence. It follows that when a preceding context sufficiently establishes the ground of the metaphor, semantic activation by the primes would not affect target comprehension. Then there should be no difference among the efficacies of the primes; the semantically related primes should offer no advantage over the neutral prime (SF,SL,GL=N).

In our experiment the subjects also engaged in an immediate cued recall task after they finished reading all sentences. They were asked to recall the last target sentence given the whole context as a cue. This cued recall task was to provide a measure of the ease of target sentence comprehension. If a sentence is well understood in relation to its context, then the context should serve as a sufficient cue to retrieve the target sentence (Black & Bern, 1981; Keenan et al., 1984; Walker et al., 1983). Then the difference in the cued recall probability should reflect both the differential efficacy of primes as well as the difference in contextual support. If metaphors are understood less well than literal sentences, this difference should appear in cued recall, also.

Prior to the reading time experiment, a norming study was done in order to assess whether there was any systematic difference in contextual flow as a function of prime type. This was done in order to simplify the later interpretation of reading time data as a function of the prime type.

Norming Study

Method

Subjects. Forty-eight University of Massachusetts undergraduates participated as subjects in partial fulfillment of a course requirement. A norming session was completed within 20 minutes.

Materials. Each material set consisted of one warm-up passage, twenty experimental, and twenty filler passages. The experimental and filler passages were randomly ordered, and the same order was preserved for all the eight material sets.

A passage consisted of four to six short sentences with no systematic difference between the experimental and the filler material. A typical experimental passage had three context sentences, a priming sentence, and then a target sentence. There were four priming conditions: Specific-Figurative (SF), Specific-Literal (SL), General-Literal (GL), and Neutral (N). All subjects read five passages in each prime condition.

Two target conditions, metaphorical (M) and literal (L), were varied between subjects. Counterbalancing them created eight material sets. When a subject read all experimental targets in the metaphor condition, all the last sentences of filler passages were literal, and vice versa. A subject read an experimental target in one of eight combinations of prime and target.

The experimental passages were derived from the material used by Gildea & Glucksberg (1983). Their combination of prime, topic, and vehicle was preserved with minor exceptions. Changes were made when a word in their list had a very low frequency count in the word frequency norm (Kucera & Francis, 1967), and when it was impossible to smoothly connect the context to a prime and a target. The universal and existential quantifiers were not used in our experiment unless they fit with the preceding context.

Filler passages were different from the experimental passages in one respect: they did not involve semantic manipulation. They were used so that a subject would read a metaphorical last sentence only half of the time. This was done to discourage subjects from developing a strategy specific to this experimental situation. As the filler passages did not involve the prime manipulation of interest, the ratings of filler passages were not included in the statistical analysis.

Procedure. Subjects were run in groups of four to eight. The passages were printed in a booklet with brief instructions on the front page. Subjects were instructed to read the passages in order and were told that there were no relations among passages. Each passage was printed on a separate page with an instruction to rate the difficulty with which the last sentence was comprehended given the preceding context. Subjects circled a number ranging from 1 to 5 to indicate the difficulty they felt in comprehending

the last sentence; a value of 1 denoted "not difficult", and 5 denoted "very difficult".

Results and discussion

The results of the norming study are shown in Table 1.

Table 1
Difficulty in Target Sentence Comprehension
as a Function of Target and Prime

Target type	Prime type				Average
	SF	SL	GL	N	
Metaphor	2.242	2.250	2.550	2.550	2.398
Literal	2.200	2.175	2.400	1.917	2.173
Average	2.221	2.212	2.328	2.233	2.286

Subjects judged that the metaphor sentences were slightly more difficult to comprehend than the literal sentences even after the context provided general knowledge of each episode. Although this trend was consistent in every prime condition, the overall effect of the target sentence type was not statistically significant ($F(1,38)=2.117$, $P>0.25$).

The prime did not have a systematic effect on the diffi-

culty with which the target sentences were understood ($F(3,36)=1.913$, $P>0.15$). However, subjects judged a literal target sentence easier to understand following a neutral prime than following other primes ($t(1,19)=3.118$, $P<0.05$, using Bonferroni t-statistics for planned comparisons). The reason why subjects felt that the literal-neutral condition was particularly easy to understand was unclear. This trend was not observed when the target sentence was a metaphor. Rather, a metaphorical target after a neutral prime was judged to be more difficult than after other primes, although this trend was not significant. This variation in difficulty ratings for metaphorical target sentences paralleled the magnitude of the semantic relationship between the prime and target sentences.

Because the prime affected metaphorical target comprehension differently than literal target sentences, the interaction of the target and the prime was significant ($F(3,17)=3.975$, $P<0.02$). The norming study provided evidence that the context was equally supportive of target sentence comprehension regardless of the prime. If reading times of target sentences show the same pattern as the ratings, target sentence reading times should be unaffected by the primes. One possible exception is that a literal target after a neutral prime may be read faster than in other conditions. The other possible effect is that a literal target may be read faster than a metaphorical target.

An alternative view is that reading times of target sentences may not reflect the pattern in the difficulty ratings. The reading time measure may be more sensitive to the semantic manipulation than the ratings. If this is true, then the reading times should reflect the magnitude of semantic relations between prime and target.

Similarly, if the cued-recall task is to reflect the pattern in the ratings, then there should be no effect of prime on recall probabilities of target sentences. If cued-recall task is sensitive to the semantic manipulation, then it should show the effect of semantic relations as a function of the prime.

Experiment 1

Method

Subjects. Sixty-four University of Massachusetts undergraduates participated in the experiment in partial fulfillment of a course requirement.

Materials. The same materials were used as in the norming study. Three additional passages were written and a total of four passages were used in practice trials at the beginning of each experimental session.

Procedure. Subjects were run individually. The presentation of each passage began with a word "READY" on a video monitor screen at the position where the first word of each

sentence would appear. Subjects pressed a trigger to initiate the presentation of a passage. All materials were displayed sentence by sentence on the video monitor which was controlled by a Zenith Z100 microcomputer. Reading of each sentence was self-paced. Subjects were instructed to press the response trigger as soon as they understood a sentence. Reading times for each sentence were automatically recorded by the computer.

Comprehension questions followed half of the passages; 10 of them were about the experimental passages, the rest were about the filler passages. These questions typically required recall of an early part of the context sentences. This was done to ensure that subjects read sentences for comprehension and to discourage subjects from pressing the trigger without comprehending sentences. Subjects orally answered "Yes" or "No" through an intercom which connected the subject room and the experimental room. The experimenter in the experimental room gave feedback to subjects and recorded their answers. Then a row of asterisks appeared in the center of the video monitor for two seconds, and then another "READY" signal replaced it to indicate the start of a new passage. Subjects required approximately 20 minutes to read the entire material and answer comprehension questions.

After the reading task, subjects were given a booklet with instructions to write down everything they could remember about the last sentence of each passage. On each page

of the booklet a passage without the last sentence was printed as a recall cue. This cued-recall task typically required 20 minutes to complete. The recall protocols yielded two sets of data: percentage verbatim recall and percentage gist recall.

Results

Reading times. Three out of sixty-four subjects who gave five or more wrong answers to probe questions were replaced. Reading time data were trimmed using two rules: (1) any reading time which exceeded an average reading time for an individual by more than three standard deviations was not used in the later analysis (14 out of 1280, 1.904%). (2) any reading time longer than 5000 msec was also omitted from a further analysis (16 out of 1280, 1.250%). A total of 27 reading times (2.109%) were discarded from the data, and the corresponding recall data were also thrown out. There was no systematic trend in the way the data points were discarded. The average reading times of the target sentence as a function of the target and the prime are shown in Table 2. An analysis of variance was carried out on these results using error terms based on subject variance and item variance (F_1 and F_2 , respectively).

Table 2

Mean Reading Times (in msec) of Target Sentence
as a Function of Target and Prime
in Experiment 1

Targer type	Prime type			N	Average
	SF	SL	GL		
Metaphor	1941	2010	1926	1998	1969
Literal	1845	1894	1906	1859	1876
Average	1893	1952	1916	1928	1922

The metaphorical target sentences were read slower than their literal paraphrases, and this was true for all prime types. This result was similar to that observed in the difficulty ratings. However, just as this effect was not significant in the difficulty ratings, it was also not significant in reading times ($F_{1, F2 < 1}$).

There was virtually no effect of the prime on the reading time of a target sentence ($F_{1, F2 < 1}$). Nor were any of the subsequent pairwise comparisons among different primes significant. Having a semantically related word in a priming sentence did not speed up target comprehension.

It was conceivable that comprehension of each prime sentence affected the target sentence reading time differently. In order to test this possibility, reading times of

prime sentences were analyzed. Table 3 shows mean reading times for each prime type.

Table 3

Mean Reading Times (in msec) of Prime Sentence
in Experiment 1

Prime type			
SF	SL	GL	N
2163	2136	2167	2010

There was some indication that the neutral primes (N) were processed more quickly than other primes ($t(1,59)=4.449$, $P<0.01$). It is possible that a part of the target reading time reflected continued processing of the previous sentence. O'Brien & Myers (1985) have presented evidence for such spillover effects: reading times of sentences were longer when a preceding sentence was difficult to understand than when a preceding sentence was easy. If this is the case here, then a possible facilitative effect of the semantically related primes (SF,SL,GL) might have been cancelled by the greater spillover effect from these same primes.

An analysis of covariance was done on the target sentence reading time to examine this possibility; the covariate

was prime sentence reading times. Even after adjusting for the effect of the prime sentence reading time, the effect of the prime was not significant ($P > 0.30$). This further supported the conclusion that semantic activation did not affect target comprehension.

Recall. Each target sentence was scored for two points, one for the topic (or subject in a literal sentence) and the other for the vehicle (predicate). The verbatim recall probabilities were obtained by dividing actual points by the maximum possible points. The results are shown in Table 4.

Table 4

Cued-Recall Probabilities of Target Sentence
as a Function of Target and Prime
(verbatim recall)

Target type	Prime type			N	Average
	SF	SL	GL		
Metaphor	0.43	0.43	0.43	0.42	0.43
Literal	0.32	0.38	0.38	0.39	0.37
Average	0.37	0.41	0.40	0.40	0.40

It can be seen that the metaphorical sentences were recalled more often than their literal paraphrases. This result is reasonable given the fact that subjects attended longer to a metaphorical target than to a literal target.

However, this effect on the target recall probability was not significant ($F_1(1,59)=2.232$, $P>0.10$, $F_2(1,38)=1.411$, $P>0.20$). There was no effect of the prime on the probability of target sentence cued-recall: F_1 , $F_2<1$. A subsequent analysis of percent gist recall produced the same pattern.

Subjects often added a preposition "like" in front of the vehicle when they recalled a metaphorical target sentence. This indicated that people were aware of the difference between literal and metaphorical sentences.

Discussion

In contrast to Gildea & Glucksberg's (1983) finding, the semantically related primes had no effect on target comprehension in our experiment. This is true for both metaphorical and literal targets. There are two possible reasons why the prime did not affect target comprehension in our experiment: (1) Gildea & Glucksberg's finding was specific to their experimental paradigm (i.e. literalness judgment); (2) when the context sets up the ground for subsequent metaphor comprehension, semantic relations did not add a further facilitative effect.

Gildea & Glucksberg's experiment was different from ours on several counts. It is possible that their judgment task and our reading task involve different mechanisms, and are thus susceptible to different factors. Their materials were

also different from ours. In their experiment, metaphorical targets may have been understood differently when they followed prime sentences, because the prime sentences they used were syntactically different from the rest of their material (Noun + Adjective and Noun + Noun, respectively). Though there is no evidence that an adjectival sentence creates more spillover effect than a noun sentence, it is conceivable that subjects slowed down in their judgment of a metaphor after reading a prime sentence simply because they had to read a different kind of sentence. Therefore it could have boosted the effect of the primes on the literalness judgment of a metaphor.

Another possible reason for the difference between Gildea & Glucksberg's result and ours is the presence of sentential context in our experiment: the context may have sufficiently supported comprehension of a following metaphor in our experiment so that the semantic manipulation did not affect the target comprehension. Perhaps the context made the meaning of a metaphor so apparent that subjects may not have needed much help from a prime.

Experiment 2

The second experiment was designed to test the possibility that the prime in Experiment 1 did not facilitate target metaphor comprehension because the context already set up a ground that enabled target comprehension. If it is

the case, the prime should affect the ease of target comprehension in the absence of the context. In order to avoid a possible spillover effect from reading a priming sentence to cancel a possible facilitative effect, we also removed the priming sentence. Only a word, semantically related or unrelated to the following metaphor, was presented prior to that metaphor. The subjects' task was still to read a sentence for comprehension.

Because we no longer used a sentence for a prime, there was no way to differentiate a Specific-Figurative prime from a Specific-Literal prime; we used only one kind, a Specific prime. The General-Literal prime of Experiment 1 will be referred to as a General prime. In place of a neutral prime, the word "blank" was used. We added a new type of prime in which a word was semantically related to the topic of the following metaphor (Topic prime). This was done to compare topic and vehicle priming effects on comprehension of a metaphor. As a result, we had four priming conditions as before. For example, when the target metaphor is "Mary's marriage was an icebox.", subjects read a word "cold" prior to it in the specific prime condition, "warm" in the general, or "bridal" in the topic prime condition. The word was always "blank" in the blank prime condition.

The prime may affect either an encoding or a subsequent comprehension stage. A separate experiment unreported here in detail has provided evidence that the specific prime is not lexically related to the vehicle whereas the topic prime

is to the topic. If encoding is the primary locus of the facilitative effect on understanding a target, then the topic prime should reduce metaphor reading times more than the specific prime. As the general prime is less strongly associated to the vehicle than the specific prime, it should reduce metaphor reading times less than the specific prime and the topic prime. Alternatively if the primary locus of the facilitation is in the comprehension stage, then the specific prime should have greater effect on target comprehension than the topic prime, because only the former is related to the sentential meaning of a metaphor. However, the topic prime may show a small advantage over the blank prime by reducing the time for encoding.

Gildea & Glucksberg's (1983) data supported the idea that priming the semantic field in general is as effective as priming the specific value of the semantic field (SL=GL). If it is true, then the general prime should be as effective as the specific prime in reducing time spent in the comprehension stage (G=S). Alternatively if the semantic relatedness is the main facilitative factor in comprehension stage, the specific prime should reduce metaphor reading times more than the general prime.

For example, when a target metaphor is "Mary's marriage is an icebox.", the prime "cold" would pinpoint what is the appropriate feature of an icebox to attach to marriage. An icebox is a container to reserve perishables, and it may

need electricity. When the prime is "warm", it suggests the relevant semantic field of the metaphor ground, namely the temperature, but an icebox is hardly warm. Thus this prime would not help selection of the appropriate feature: it may be rather confusing in relation to the metaphor ground. Therefore it is possible that this prime slows down the target comprehension. The reading times after the general prime may be even slower than after the blank for this reason. Thus the effect of the general prime relative to the blank is not immediately clear.

Method

Subjects. Forty-eight University of Massachusetts undergraduates participated in the experiment in partial fulfillment of a course requirement.

Materials. Subject read a priming word before a target sentence; an example of the prime conditions was:

(Specific prime)	cold
(General prime)	warm
(Base line)	blank
(Topic prime)	bridal

The target sentence was either metaphorical or literal and a subject read all experimental target sentence either in metaphorical or literal condition. An example of each type is shown below:

(Metaphor)	Mary's marriage is an icebox.
(Literal)	Mary's marriage is disastrous.

A metaphor sentence typically consisted of a proper

name, and two nouns which did not have a category-instance relation between them. A literal sentence was a paraphrase of the metaphor, and it shared the same proper name and the subject noun phrase. Instead of the vehicle, the literal paraphrase had an adjective to complete a sentence. The adjective was selected so that the sentence preserved the gist of the metaphor and that the adjective was not semantically related to the metaphor ground. A separate norming study provided evidence that metaphorical targets were more difficult to understand than their literal paraphrases when presented in isolation. This difference was highly significant ($P < 0.01$).

Subjects read a total of 44 word-sentence pairs, 4 practice, 20 experimental, and 20 filler materials. The experimental and filler materials were randomly ordered, and the same order was preserved throughout the experiment. Filler materials were constructed the same way as the experimental material. Filler sentences were used such that when subjects read experimental targets in the metaphorical condition, they read the filler sentences in the literal condition, and vice versa. Counterbalancing the target and the prime conditions resulted in eight material sets.

The experimental materials were again derived from the Gildea & Glucksberg (1983) study. Their combination of prime, topic, and vehicle was preserved with minor exceptions. Changes were made when a word in their material had

a very low frequency count in the word frequency norm (Kucera & Francis, 1967) and when the experimenters felt that subjects might not understand the word meaning.

The specific prime was the same as the Specific-Figurative and Specific-Literal primes (SF and SL); the general prime was the same as the General-Literal prime (GL) in Experiment 1. In place of the neutral prime (N) in the previous experiment, the word "blank" was used to establish a base line. The topic prime consisted of words that were judged to be semantically related to the topic but unrelated to the metaphor ground of the target metaphor.

Procedure. Subjects were run individually in an experimental session that lasted approximately 15 minutes. Subjects saw a brief presentation of a prime word, read a sentence, and answered a comprehension question.

All the materials were displayed on a video monitor which was controlled by a Zenith Z100 microcomputer. Subjects engaged in their task in one room while the experimenter supervised the progress of the experiment in an adjacent room using another video monitor and an intercom.

Each trial began with the word "READY" on the screen. Subjects pressed a response trigger to initiate the presentation. A prime word immediately replaced the word "READY" and remained on the screen for 350 msec. Then a target sentence replaced the word and subjects read it, then pressed the trigger when they understood it. Reading time for the sentence was automatically recorded by the computer.

After reading a target sentence, a row of question marks signaled to subjects the onset of a comprehension question. A question appeared on the screen replacing the question marks after one second. Subjects gave either a "Yes" or "No" response orally through the intercom; the experimenter gave them immediate feedback and recorded their responses.

Subjects were instructed to pay attention to the words as well as to the sentences because some of the words were related to the following sentences and they would help comprehend the sentences. It was made clear in the instruction that the word "blank" was never related to the following sentence so that subjects would not try to relate the word "blank" to the following sentence.

The comprehension questions were used to ensure that subjects understand sentences before pressing the trigger. Most of them were simple paraphrases of the target sentences. When subjects gave a wrong answer, the experimenter asked them to explain how they arrived at their answer. Subjects answered in a few sentences describing their reasoning. This was done to further ensure that subjects would do their best to comprehend the sentences.

Results and Discussion

The overall average reading time for the first 48 subjects was 2230 msec with a standard deviation of 601

msec. Twelve subjects were replaced because reading times for at least two out of the five items in at least one condition exceeded 4033 msec, three standard deviations above the mean. Reading times of under 700 msec were omitted from the data (3 out of 1920, 0.16%). The resulting average reading times are presented as a function of target and prime in Table 5.

Table 5

Mean Reading Times (in msec) of Target Sentence
as a Function of Target and Prime
in Experiment 2

Target type	Prime type				Average
	S	G	B	T	
Metaphorical	2293	2627	2404	2516	2460
Literal	1867	2031	1837	1967	1926
Average	2080	2329	2121	2242	2193

The metaphorical target sentences were read slower than the literal paraphrases, and this was true for all prime types. An analysis of variance showed this effect to be significant ($F_1(1,43)=13.718$, $P<0.01$, $F_2(1,38)=35.890$, $P<0.01$). The effect of the prime on target reading times was also significant ($F_1(3,41)=6.334$, $P<0.01$, $F_2(3,36)=3.857$, $P<0.02$). The interaction between the target and the prime was far from significant ($F_1, F_2<1$).

Bonferroni t-statistics for planned comparisons revealed the detailed picture of the effect of the prime. First, a target sentence was read faster after the specific prime than after the general prime ($t(1,43)=3.917$, $P<0.01$). This is contradictory to what Gildea & Glucksberg (1983) found in their paradigm. The second finding was that a target sentence was read faster after the blank prime than after the general prime ($t(1,43)=3.309$, $P<0.05$). A target sentence was read faster after the blank prime than after the topic prime, though this difference missed the significance level of $P=0.10$ ($t(1,43)=2.297$).

When metaphors only were considered, the prime had significant effect on target reading times ($F(3,18)=3.383$, $P<0.05$). Metaphors were read significantly faster after the specific primes than after the general primes ($t(1,20)=3.191$, $P<0.05$). Metaphors were read faster after the blank prime than after the general prime; though this effect was not significant ($t(1,20)=2.256$, $P>0.10$). Metaphors were also read faster after the blank prime than after the topic prime, however, neither was this effect significant ($t(1,20)=1.455$). These results suggested that the general and the topic primes interfered with the subsequent comprehension of metaphors. A result of item analysis provided the same pattern with lesser significance.

When only literal target sentences were considered, the prime showed the same trend in the effect on target reading

times as when the targets were metaphors; however, the magnitude of the effect was smaller ($F(3,18)=2.569$, $P<0.05$). None of the subsequent pairwise comparisons reached the significance level of $P=0.10$.

CHAPTER IV

GENERAL DISCUSSION

How do semantically related primes affect metaphor comprehension in the absence of sentential context? Our second experiment answered this question with interesting results. Indeed, semantically related primes did affect metaphor comprehension compared to the base line, but did not necessarily facilitate it. A facilitative effect, if any, was observed only when the prime was related to the following metaphor through the metaphor ground. When the primes were related to a metaphor differently, their effects were rather opposite: they interfered with comprehension of the metaphor. It seems that subjects had substantial difficulty in understanding a metaphor when a prime guided their attention to a concept different from the metaphor ground.

The fact that metaphors were read slowly after the general and the topic primes compared to after the blank suggests that subjects were trying to integrate the metaphors with the preceding words. This integration process must have been at work also when a prime was the specific one. It appears that the specific prime reduced the time for selection of an appropriate feature of the vehicle, the metaphor ground, but the process of integration dulled its facilitative effect compared to the base line.

The comparison between the specific prime and the topic

prime supported the importance of sentential comprehension in understanding a metaphor. The topic prime was lexically related to the topic, while the specific prime was not related to the vehicle. If encoding is the primary locus of facilitative effect, then the topic prime should be more effective than the specific prime in reducing metaphor reading times. The result was opposite: the topic prime created an interference effect whereas the specific prime had a small facilitative effect. The specific prime did not ease encoding of the vehicle, however, it appears to have eased the comprehension stage. The effects of two primes were clearly different on the overall comprehension of a metaphor. It suggests that encoding is not the primary locus of the priming effect.

In an effort to describe the difference among the prime effects, we have introduced three components of the comprehension mechanism: encoding, selection, and integration. Let us briefly redefine each component here. By "encoding" we mean perceptual encoding of a target sentence. Selection is defined as selection of an appropriate feature of the vehicle (or predicate) to attach to the topic (subject). Integration occurs when more than one word meaning is combined. We feel that there is one more component in comprehension of a target sentence when there is a word prime to precede the target: retrieval of the prime word. It is necessary if the prime word is to be integrated to the target sentence.

Different combinations of four components may explain the different effects of the primes on target comprehension. A possible combination is shown in Table 6. We do not intend to claim sequentiality of components in this order except for the case where a plus sign is used.

Table 6
Comprehension Mechanisms
as a Function of Prime

Prime	Comprehension components
Specific	(E), (R), (I)
General	(E), (R), (I) + (S), (I)
Topic	(E), (R), (I) + (S), (I)
Blank	(E), (S), (I)

(E) Encoding of a target
(R) Retrieval of a prime word
(S) Selection of a feature
(I) Integration of word meaning

When a specific prime precedes a target sentence, subjects first encode the target and retrieve the prime word. Because the prime is the appropriate feature of the vehicle to attach to the topic, the integration words would take place smoothly and successfully. In contrast, when a preceding word is either a general or a topic prime, this integration fails. Warm-marriage-icebox, Bridal-marriage-

icebox? Subjects have to select an appropriate feature of the vehicle themselves and try to integrate them after the initial integration fails. They may have to repeat this process more than once if the second try is also unsuccessful.

Though neither is easy, the general prime and the topic prime may affect target comprehension slightly differently. The general prime directs subjects' attention to the right semantic field of the ground, but there is a contradiction attached to it (e.g. warm-icebox-cold). As a result, subjects may decide to ignore this semantic field and try to find a different, but meaningful one fruitlessly. Or even if they do not discard this semantic field, resolving the contradiction may take some time. The task of integration may be somewhat simpler with the topic prime, as it is not related to the metaphor ground. Though this prime is equally not helpful for finding the appropriate feature for integration, it certainly does not offer a contradiction. This offers a plausible explanation, however, we do not have a clear understanding of how two primes differed in creating an interference effect. Neither the difference between their effects on metaphor reading times in Experiment 2 was significant.

A very different thing may be happening when a prime is the "blank". After encoding the target sentence, it is not necessary to retrieve the prime word. Selection of an appropriate feature of the vehicle and integration would

occur directly following the encoding. Because there is no clue as to what feature is appropriate, subjects may choose the most salient feature of the vehicle and try to integrate the topic and the vehicle. It is no accident that the most salient feature of the vehicle is often the metaphor ground (e.g. cold for icebox). Thus integration can be as smooth as the one in the specific prime condition. In this model, their relative effects upon comprehension times are not immediately clear. Their effects did not differ reliably in our experiment, either. To resolve this issue, the model requires further specification.

Our experiment has shown that target comprehension took longer after the general prime than after the specific prime. We have argued that integration difficulties account for this. Then why did the two primes show the same effect on judgment time in Gildea & Glucksberg's study? We note that their judgment task involves a decision stage in addition to the encoding and comprehension stages we have described above. In other words, subjects decided whether a sentence was literally true or not against some criteria after they understood the sentence.

When a prime was the specific one a longer latency may have been produced in the decision stage as Gildea & Glucksberg assumed: because the metaphorical truth interfered with the literalness. When a prime was the general one, the comprehension stage may have been slowed down as we

have shown in our experiment; it does not necessarily entail that the metaphor was understood. Thus the two primes may have exhibited the same overall effect on target comprehension by quite different mechanisms. However, as our model does not encompass the decision stage, it can not account for other findings by Gildea & Glucksberg in their metaphor interference paradigm.

The last point, but not least important, is that the prime had a similar effect on metaphors and on literal sentences. The fact that its magnitude was greater with metaphors than with literal sentences seems reasonable given the difference between them in comprehension difficulty. Our metaphors were more difficult to understand than their literal paraphrases; therefore the prime could have had more influence on metaphor comprehension. But how could the prime influence comprehension of literal sentences if their sentential meanings were relatively clear?

When someone says "Mary's marriage is disastrous." we may immediately understand that her marriage is unhappy. However, the way her marriage is unhappy is not readily apparent. Mary's marriage can be in financial trouble, or her mother-in-law may be distressing her. When this same sentence is preceded by the word "cold", we may arrive at a more precise knowledge of Mary's marital problem: the interpersonal relation is cold. Thus it is possible that selection of an appropriate feature in comprehension of a literal sentence may proceed in the same way as the metaphor ground

is selected in metaphor comprehension. The fact that the prime affected both literal and metaphorical comprehension similarly strongly suggests that comprehension mechanisms may be very similar.

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APPENDICES

APPENDIX A

The sentential contexts, priming sentence, and target sentences for each passage are presented. The priming sentences appear in the following order: Specific-Figurative, Specific-Literal, General-Literal, and Neutral. Target sentences appear in the following order: metaphorical and literal. The semantically related words in priming sentences are underlined.

- 1 Bob and Mary's marriage was ending.
They seldom talked to each other these days.
The happy past was a fading memory.
She remembered the first time they met.
She had been feeling unhappy then,

because people around her were cold.
because that winter was very cold.
because that summer was very hot.
because people around her were sad.

Now, her marriage was an icebox.
Now, her marriage was disastrous.
- 2 Phil's cat was very selective about her food.
She ate only fresh fillet of fish.
She ate little and left the rest untouched.
Phil's wife complained to him about it.

He thought his wife was spoiled.
He thought the fish was spoiled.
He wanted to keep the fish fresh.
He thought his wife was unfair.

His cat was a princess.
His cat was very fussy.
- 3 Sandy saw her housemate repairing his old car.
She said hello and smiled at him.
He came to her, throwing his screw driver away.
He murmured something, and grabbed her arm.

His remarks were very sharp.
His fingernails were sharp.
His fingernails were dull.
His remarks were quite rude.

His smile was a razor.
His smile frightened her.

- 4 Ann had a job cleaning house.
There were a lot of rats where she worked.
She hated her job, because she hated rats.
There was one again at the bottom of a jar.
She had to kill it, but it would be messy.
- Staring at the rat, she felt trapped.
The rat was unlucky to be trapped.
The rat struggled hard to be free.
She wouldn't dare to touch the rat.
- Her job was a jail.
Her job was boring.
- 5 The day of Mary's operation was approaching.
She was becoming nervous about it.
She heard negative things about the surgeon.
- His fingers were crude.
His manners were crude.
He was obsessively neat.
He was very unpleasant.
- They said the surgeon was a butcher.
They said the surgeon was incompetent.
- 6 Judy went to her boyfriend's house.
They planned to do homework together.
He complained that it was difficult.
There were papers all over his desk.
- She thought that his ideas were messy.
She thought that his bedroom was messy.
She thought his bedroom should be tidy.
She looked for the assignment paper.
- His desk was a junkyard.
His desk was disorganized.
- 7 Their new electric bulbs were a big failure.
They were losing the market to a competitor.
They held a meeting to find good ideas.
A young manager thought of a new product.
- His presentation was just brilliant.
The glow of his bulb was brilliant.
The glow of the old bulb was dim.
His presentation was successful.
- His idea was a diamond.
His idea may save them.

- 8 Slums present problem that can be complicated.
Criminals tend to hide there from the police.
Education and hygiene are below standard.

The streets are very unhealthy,
The people there are unhealthy,
Only the mice there are healthy,
The people are always hungry,

and the criminals are germs.
and the criminals thrive there.

- 9 The tourist's drive was turning out to be a disaster.
It seemed they had lost their way.
They hadn't seen a wide road for a while.
The driver alone seemed peculiarly calm.
They became suspicious of his intention.

They thought the driver was crooked.
The trees around them were crooked.
The trees stood tall and straight.
The trees stood tall and thick.

The roads were snakes.
The roads were dangerous.

- 10 Winter was coming quickly this year.
It began snowing heavily a few days ago.
Icicles hung from the trees.
Everyone went into the forest for wood.

The winter was sharp.
The axes were sharp.
The axes were dull.
The axes were heavy.

The icicles were swords.
The icicles were dangerous.

- 11 Joe got a job at a high school.
He didn't like the office schedule.
He wrote memos suggesting changes.
The administration responded to him.

The hours there were impersonal.
Their letters were impersonal.
All the teachers were friendly.
He explained his idea to them.

The office was an iceberg.
The office was unpleasant.

- 12 Ed bought stocks while going to college.
But his stocks didn't make money at all.
He did well academically for four years.
He received his diploma with honors.

His college years were investments.
The stocks he bought were investments.
The stocks he bought were worthless.
His college years had been pleasant.

The diploma was money.
The diploma was precious.

- 13 Kate was cooking a pie for dessert.
She opened the oven and burned her fingers.
Her husband, John, laughed at her carelessness.
She cooled her finger with running water.
She didn't want to hear his critical words now.

His opinions were painful.
The burns were painful.
The water was comforting.
The wounds looked terrible.

John's words were daggers.
John's words were harsh.

- 14 Ray and Joan decided to take turns making supper.
Ray hated cooking with all his heart.
He never made supper without problems.
One day his supper was particularly bad.
Joan criticized Ray's cooking.

Her expression was frozen.
Her meat was still frozen.
Her soup was sizzling hot.
Her soup was oddly sour.

Ray thought she was made of ice.
Ray thought she was very unkind.

- 15 The salesman kept explaining his products.
But Ron didn't want any of them.
He wanted the man to leave his house.
Ron tried asking him to leave in a mild way.

Ron's words needed to be more aggressive.
Ron's tactic was far from aggressive.
Ron's tactic must have been passive.
Ron's tactic wasn't effective at all.

The salesman was a bulldozer.
The salesman was relentless.

- 16 The child looked a little tired and feverish.
His mother sent him to bed early after supper.
She tucked him in and patted his head gently.
She sang a song while he fell asleep.

The sight of her was soothing.
The cool crisp sheet felt soothing.
The fever was less irritating.
The boy dozed off into a dream.

The mother's songs were medicine.
The mother's songs sounded lovely.

- 17 Allen's family were driving on the highway.
Their car was stuck in a Sunday traffic jam.
The cars crawled forward only very slowly.
People around them were already impatient.
They beeped their horns repeatedly.

Everyone's nerves began screaming.
People in the cars began screaming.
Allen wished the cars would be quiet.
Allen tried to ignore the beeping.

The highway was a zoo.
The highway was noisy.

- 18 Jane overslept her first class this morning.
She jumped out of bed and dressed in a second.
She tied her shoe laces hastily and clumsily.
She bolted out of her room without combing her hair.
She was very upset about being late for the class.

Her morning was becoming tangled.
Her shoe laces were a little tangled.
Her hat was not on quite straight.
She should have gone to bed earlier.

Her hair was still spaghetti.
Her hair looked very messy.

- 19 Sally skipped classes often with her friends.
Her parents would have been enraged if they had known.
One day her father called her into the study.

Her father stared at her violently.
Her father shut the door violently.
Her father shut the door silently.
Her father shut the door in a hurry.

His rage was a volcano.
His rage was apparent.

20 Tina went to New York city for the first time.
Her friend did not show up at the train station.
She had to take the subway to the friend's place.
She felt unsure about how to get there by herself.

Her feelings became complicated.
The map of the city looked complicated.
Her friend's explanation was too simple.
She had to ask directions repeatedly.

The New York subway was a maze.
The New York subway was confusing.

APPENDIX B

The prime words appear in the following order: Specific, General, and Topic. A metaphorical target sentence is followed by a literal paraphrase.

round/thin/hungry

Danny's stomach is a barrel.
 Danny's stomach is stuffed.

spoiled/fresh/furry

Phil's cat is a princess.
 Phil's cat is very fussy.

crude/neat/medical

Some surgeons are butchers.
 Some surgeons are incompetent.

brilliant/dim/thoughtful

Tony's idea is a diamond.
 Tony's idea is excellent.

noisy/silent/commercial

The highway was a zoo.
 The highway was jammed.

messy/tidy/old

Judy's desk is a junkyard.
 Judy's desk is unorganized.

soothing/irritating/dextrious

Mothers' hands are medicine.
 Mothers' hands are helpful.

unhealthy/healthy/dishonest

Criminals are germs.
 Criminals are spreading.

cold/warm/bridal

Mary's marriage is an icebox.
 Mary's marriage is unhappy.

impersonal/friendly/business

Joe's office is an iceberg.
Joe's office is unpleasant.

dangerous/safe/paved

This road is a snake.
This road is winding.

violent/peaceful/angry

Ron's rage was a volcano.
Ron's rage was apparent.

sharp/dull/frozen

Icicles are knives.
Icicles are dangerous.

trapped/free/clerical

Ann's job is a jail.
Ann's job is boring.

sharp/dull/laughing

Sandy's smile is a razor.
Sandy's smile is frightening.

precious/worthless/graduate

Ed's diploma was money.
Ed's diploma was important.

private/open/merciful

Kate's heart is a closet.
Kate's heart is lonely.

tangled/straight/blond

Jane's hair was spaghetti.
Jane's hair was very messy.

painful/comforting/verbal

John's words are daggers.
John's words are harsh.

aggressive/passive/travelling

That salesman is a bulldozer.
That salesman is very pushy.

