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On Understanding Metaphor: The Role of Context

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Some metaphors, such as *All jobs are jails,* can be understood immediately and unambiguously, even when encountered in isolation. Others, such as *All marriages are iceboxes,* require an appropriate context if they are to be so understood. The paper explores the question of what constitutes a minimal appropriate context. It is proposed that any context that activates a property of the predicate term, for example, *iceboxes,* that is informative about the topic of the metaphor, for example, *all marriages,* will be sufficient to trigger immediate comprehension. To test this idea, the relative effectiveness of three types of contextual priming for metaphor comprehension was assessed: activation of the figurative sense of a metaphor ground, activation of the literal sense of that ground, and activation of the general semantic field of that ground. All three types of contexts led to immediate and automatic metaphor comprehension. These results suggest how context may be used to disambiguate both literal and nonliteral speech messages, and how both literal and nonliteral comprehension mechanisms share important features, including the automatic deployment of general discourse-processing strategies.

How do people understand utterances that are not intended to be taken literally? A predominant view in linguistics and in the philosophy of language, as well as in psychology, is that people need more contextual information and need to do more inferential work to understand nonliteral than to understand literal utterances. According to this view, people always and unconditionally derive a literal meaning first. Only if this meaning does not work—that is, makes no sense in the context of utterance—do people then proceed to do the additional work of finding a nonliteral meaning that does work (Clark & Lucy, 1975; Lyons, 1977). Searle (1979), writing about metaphor from the point of view of speech act theory, puts it quite simply: "Where the utterance is defective if taken literally, look for an utterance meaning that differs from sentence [literal] meaning" (p. 114). One clear implication of this view is that nonliteral understanding is optional. It is optional because it will occur if and only if a literal meaning is "defective," where defective means uninterpretable in the context of use.

We have shown that this view is wrong. At least some types of simple metaphors are understood nonoptionally. Instead, they are understood automatically—not in the sense that metaphor processing does not stress capacity limitations, but only in the sense that processing is initiated by appropriate linguistic and semantic inputs without subject control (cf. Schneider & Shiffrin, 1977). That is, people normally have no control over whether metaphors are understood or not.

To show this we used an analog of the Stroop (1935) color–word interference paradigm. Stroop had demonstrated that fluent readers cannot inhibit reading words that are shown to them. We wanted to demon-

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strate that fluent speakers of a language cannot inhibit understanding the metaphorical meanings of at least some types of sentences. The logic of our technique is straightforward. People are asked to decide as quickly and accurately as possible whether sentences that appear on a CRT display are literally true or false. This task ensures that attention is paid to each sentence, and this also renders all literal meanings, whether true or false, perfectly interpretable in context. There should thus be no motivation for people to seek alternative nonliteral meanings for any of the test sentences they encounter in this context.

In our first set of experiments (Glucksberg, Gildea, & Bookin, 1982), college students made literal true–false decisions to four types of such test sentences: True, for example, *Some fruits are apples;* Standard False, for example, *Some desks are melons;* Metaphors, for example, *Some surgeons are butchers, Some roads are snakes;* and Scrambled Metaphors, for example, *Some surgeons are doors*. Literal truth value was stressed, and so the correct response to both the Metaphors and the Scrambled Metaphors is "false." If the subjects in such an experiment ignore the nonliteral meanings of the Metaphors, then the metaphor sentences should take no longer to reject than the scrambled metaphors. This is because in neither case would "true" nonliteral meanings interfere with or conflict with their "false" literal meanings. If, on the other hand, people automatically register any nonliteral, metaphorical meanings that are available, *and do so quickly enough,* then the metaphor sentences should take longer to judge as false than their scrambled counterparts. This is because there would now be a conflict between the true nonliteral meanings and the false literal ones, producing a form of response competition. This *metaphor interference effect* can thus serve as a sensitive index of how quickly and automatically metaphorical meanings are registered.

We found just such an effect. Even though subjects had no difficulty deciding that such statements as *All jobs are jails* are literally false, the availability of a "true" nonliteral interpretation—that people can feel trapped in their occupations—interfered with that "false" decision. When metaphorical interpretations of literally false sentences were available, subjects took significantly longer to decide that those sentences were false (Glucksberg et al., 1982). These results convinced us that our subjects had apprehended the "true" metaphorical sentence meanings automatically, that is, nonoptionally, and that they did so quickly enough so that it interfered with a rather straightforward literal–false decision. Why should this have happened, particularly in the rather literal and impoverished context of a speeded sentence-verification task?

One possibility is that people routinely and automatically apply those strategies that are used in everyday discourse to the laboratory task, even though those strategies may not be appropriate to that task. In particular, we would expect people to apply just those strategies that are quite general, and hence so pervasive and well-practiced that they have become automatic and so are no longer under conscious control. Two candidates for such strategies come from (a) Grice's (1975) cooperative principle, and (b) the conventions for marking given and new information (Clark & Haviland, 1977). When people try to understand a statement of the form *X is a Y,* they presumably follow Grice's cooperative principle and assume that the statement is informative. If people also assume that the statement conforms to the conventions for marking given and new information, then they will look for new information in Y that would be informative about X. When people do so, then those properties of Y that are salient (or are normally activated in the mental representation of Y) are applied to X. If those properties are applicable to and informative about X, then this provides a ready interpretation of the statement. Consider *some surgeons are butchers*. In this statement, a

stereotypically salient property of the metaphor vehicle, *butchers,* is predicated of (said to apply to) the metaphor topic, *some surgeons*. This is clearly a negative comment about those surgeons. For *some butchers are surgeons,* the given–new strategy provides an analogous interpretation that is opposite in evaluation. Salient and stereotypical properties of *surgeon* are predicated of *some butchers,* namely, that some butchers are skillful and precise. Note that potentially applicable properties of the vehicle that are uninformative about the metaphor topic rarely, if ever, provide suitable grounds for interpretation. For example, in the case of butchers and surgeons, the properties of being human, having a specifiable occupation, and so forth are simply not informative, and so these properties are ignored unless they are either explicitly pointed out, or they are used in a context where they are informative.[1]

According to this general account, a nominative metaphor will be understood quickly and nonoptionally if the sentence predicate—in Richard's (1936) terminology, the metaphor vehicle—has a salient property that is both applicable to and informative about the metaphor topic. Such metaphors require no extrasentential context to be understood rapidly and unambiguously (Glucksberg et al., 1982). For metaphors that do not employ just the right vehicle–topic combination to be so understood, how might extrasentential context facilitate comprehension?

Consider a poor metaphor such as *all marriages are iceboxes*. In our metaphor interference paradigm, this metaphor does not work. People have no trouble deciding that it is literally false, indicating that its metaphorical interpretation is not apprehended quickly enough to interfere with and slow down a literal–false decision. One plausible ground for the interpretation of this metaphor is *coldness* in the interpersonal sense. This literal property of the vehicle *iceboxes* is applicable to and potentially informative about the topic *all marriages*. If this potential ground concept—the concept that relates the vehicle and topic—is available and accessible when the metaphor is being processed, then that metaphor should be understood automatically and rapidly. One way to make such a relevant ground concept available would be to activate it by a priming stimulus. If people were to be primed with a word that activated a relevant ground concept, would the metaphor be rapidly understood? The experiments we report here were designed to discover whether or not such a minimal extrasentential context would suffice.

General Method

We modified our original sentence-verification paradigm so that we could assess the relative effectiveness of various types of contexts for metaphor comprehension. People are asked to respond to the literal truth value of simple sentences. A small proportion of these sentences are nominative metaphors that are literally false but could be figuratively true. Our index for whether or not a metaphor is understood rapidly and automatically is whether or not a literal–false decision is interfered with, that is, whether or not we obtain a metaphor interference effect with that metaphor. The metaphors that we used here do not ordinarily produce such an effect, suggesting that the relevant ground concepts of such metaphors as *marriages are iceboxes* are not sufficiently activated. To activate the relevant ground concept, *coldness,* for this metaphor, we can use any one of several different priming words: *cold* in its figura-

[1] In Ortony's (1979) terms, such noninformative predications would constitute a match of properties that are high-salient for both vehicle and topic. They can be informative when they are used as literal comparison or similarity statements, such as *limes are like lemons*. Nonliteral comparison statements are characterized by matches between properties that are high-salient in the representation of the metaphor vehicle, but low-salient in the representation of the metaphor topic. Thus, when such properties are ascribed to the topic, a reader or listener learns something about that topic. This could be one source of metaphor aptness.

tive sense of interpersonal lack of caring, *cold* in its literal sense of low temperature, or simply a word in the general semantic field of temperature, such as *warm*. Whichever of these words is used—figurative, literal, or general semantic field—it is used unobtrusively. Specifically, the critical word appears as the last word in the sentence that is verified on the trial preceding the target metaphor. Thus, the metaphor *all marriages are iceboxes* could appear either unprimed, or it could appear immediately after a priming sentence such as *some people are cold* or *some winters are cold.*

Experiment Ia compares the relative effectiveness of figurative and literal primes. If RT to judge a metaphor literally false is slower than its scrambled counterpart, then we infer that it had been understood rapidly enough to interfere with that literal–false decision. This means that effective priming in this paradigm *increases* RT. It slows literal–false decisions by increasing the likelihood of a subject's apprehending a "true" nonliteral meaning.

Experiment Ia: Figurative vs Literal Activation of Figurative Meaning

Conventional wisdom and linguistic intuition suggest that figurative primes would be more likely to facilitate metaphor comprehension than literal primes. There are several reasons for thinking that this should be so, some specific to the demands of the experimental task, some of a more general nature. First, the figurative prime uses the same sense of the critical word as the metaphor target does. If the literal and figurative senses of a word are psychologically distinct from one another (e.g., if they are stored as separate entries in semantic memory), then a figurative prime should be more effective with a figurative target than a literal prime. This would be expected on the basis of prime–target similarity alone. In addition to this rather task-specific effect there might also be a more general effect of figurative priming per se. Figurative usage might be more likely to prepare a subject for subsequent figurative usage, perhaps by inducing a momentary expectation for nonliteral language. On these two counts—the closer match between word senses, and the general set for nonliteral interpretation—we might expect more effective priming of figurative meanings with figurative primes than with literal primes.

Alternatively, there may be no functional distinction between literal and nonliteral comprehension strategies. If this is so, then one should not expect any general facilitation in this experiment from processing nonliteral word senses per se.[2] One could also argue that, psychologically, the various senses of a word such as *cold* all represent the same core concept of coldness. This core concept is neither physical nor interpersonal. Instead, it is instantiated as one or the other depending upon context of use and perceived speaker's intent. If this is so, then any use of the word *cold* in any of its usual senses should activate the core concept of coldness in semantic memory. This implies that a priming sentence may use either the literal or figurative sense of a relevant word with comparable effect for activating the figurative meaning of a metaphor.

To evaluate these two alternatives we used both figurative and literal primes as contexts for a set of 24 target metaphors that do not produce a metaphor interference effect when they appear in unrelated contexts. If conventional wisdom and linguistic intuition are correct, then figurative primes should be more effective than literal. Indeed, literal primes may not be effective at all. If, however, the figurative and literal

[2] We do not intend to imply that a theoretical distinction between literal and nonliteral language may not be useful in linguistics, the philosophy of language, or other aspects of the psychology of language. After all, the work described in this paper presupposes people's ability to judge whether an utterance is intended figuratively or not. The claim of no functional difference between literal and figurative is explicitly limited to the psychological mechanisms and strategies that people use for sentence and discourse comprehension.

senses of words are not psychologically distinct, but instead represent alternative instantiations of unitary core concepts, then both literal and figurative primes should be effective in activating figurative meanings. Furthermore, if a general set for figurative processing is unnecessary because literal and nonliteral processing strategies share the same mechanisms and strategies, then we would not expect figurative primes to be more effective than literal.

Method

Subjects. Twenty-four undergraduate students at Princeton University served as paid volunteers. The data of two additional subjects were discarded because they made too many errors (over 5%), and one subject's data were lost because of equipment failure.

Materials. We used six types of sentences: Standard True, Standard False, Metaphors, Scrambled Metaphors, Figurative Primes, and Literal Primes. Table 1 provides examples of each type, and the Appendix provides a list of the metaphors and their priming sentences. The priming sentences and their target metaphors were related in specific ways. Each target metaphor described a topic in figurative terms, for example, *all marriages are iceboxes*. The priming sentences were true statements of the form *some X are Y,* where X is a concrete noun and Y a property that can sensibly be predicated of that concrete noun concept. More specifically, the predicate term Y always referred to a property of the target metaphor vehicle that was relevant to that metaphor's ground concept, that is, the intended relation between the metaphor vehicle and metaphor topic. For example, the figurative priming sentence for the metaphor *smiles are razors* was *some remarks are cutting*. The corresponding literal priming sentence for the same target metaphor was *some tools are cutting*. Notice that in the figurative prime the critical word *cutting* is used in the same figurative sense as *razor* in the target metaphor. In the literal prime, the word *cutting* is used literally.

The metaphor targets themselves were chosen from an earlier study in which they proved to be poor metaphors, that is, they failed to produce a metaphor interference effect. Would preceding such metaphors with (a) figurative primes or (b) literal primes facilitate their comprehension sufficiently to interfere with literal–false decisions?

An 80-item practice list was formed, consisting of 40 true and 40 false sentences. Half of these used the quantifier *some,* half used *all*. The true sentences included 24 Standard True, 8 Figurative Primes, and 8 Literal Primes. The false sentences consisted of 24 Standard False, 8 Metaphors, and 8 Scrambled Metaphors. These sen-

TABLE 1
TYPES OF STIMULUS SENTENCES USED IN EXPERIMENTS Ia, Ib, AND II

Sentence type	Examples
Filler sentences:	
Standard true	Some birds are eagles
	All trout are fish
Standard false	Some birds are trout
	All eagles are fish
Primes/Target metaphors	Some foods are unhealthy/ All criminals are germs
	Some songs are soothing/ All hands are medicine
Scrambled metaphors	All criminals are medicine
	All hands are germs

tences were similar to those used in the test list, but were not repeated in that test list.

Each subject received a 160-item test list, composed as follows. A total of 48 Standard True and 32 Standard False sentences served as filler items; half of these were quantified with *some,* half with *all.* Each list also contained 24 Metaphors and their 24 Scrambled counterparts, along with 16 priming sentences. In any one list, one-third of the Metaphors and of the Scrambled Metaphors were preceded by a figurative priming sentence, one-third by a literal priming sentence, and one-third by a randomly selected filler sentence. This produces a list with 80 true and 80 false sentences. Twenty-four test lists of this type were constructed, one for each subject. Each list used a different assortment of primed and unprimed metaphors such that over all lists each metaphor appeared equally often in figurative, literal, and unprimed contexts. In any single list, those priming sentences that were not paired with their target metaphors were paired with a related scrambled metaphor, namely, the scrambled metaphor that used the same predicate noun (vehicle) as that prime's target metaphor. For example, if the metaphor *marriages are iceboxes* appeared unprimed in a given test list, then its scrambled counterpart *roads are iceboxes* would be preceded by either the relevant figurative or relevant literal priming sentence, *some winters/people are cold.* In any given list one-third of the Scrambled Metaphors appeared with a figurative prime, one-third with a literal prime, and one-third with a randomly selected filler sentence. This provided a control for the effects of a priming sentence on literal false decisions. This also takes into account the potential effect of a priming sentence on a literally false sentence that uses a related predicate noun. We thus have an appropriate baseline against which to assess the effects of priming contexts on metaphor decision latencies. This design also systematically confounds subjects with items, and so separate analyses for subjects and for items are unnecessary. To avoid warm-up effects, both the practice and test lists began with 12 warm-up filler sentences, 6 true and 6 false.

Design and procedure. We used a within-subjects design in which every subject verified every sentence type in a single session. Subjects were tested individually in a sound-attenuated booth equipped with a CRT display and electronic response keys. One key was operated with the left-hand index finger. This key simultaneously initiated a trial and started a millisecond timer. Two other response keys were operated by the index and middle fingers of the right hand. For half the subjects, the index finger was designated "true" and the middle finger "false"; this was reverse for the remaining subjects.

Subjects were told that sentences of the form *Some/All X are Y* would appear, one at a time, on the CRT screen. Their task was to decide, as quickly and accurately as they could, whether each sentence was true or false, and to indicate that decision by pressing the appropriate response key. We then provided 20 prepractice trials in which subjects responded "true" and "false" to the words "true" and "false" as they appeared on the screen. This ensured familiarity with the apparatus, the general testing procedure, and the response key assignment. We then presented the 80 practice trials and any errors were pointed out. This ensured that subjects understood that the task required decisions about literal truth values. The test list followed immediately.

At the beginning of each trial, subjects viewed a fixation pattern (an asterisk) that was located where the first word of each test sentence appeared. When the left-hand start button was pressed, the asterisk was replaced by a sentence and a timer would start. This timer was stopped when the subject pressed either decision button. Stimulus display and response timing were under computer control (Commodore PET Model 2001, with 1-millisecond timing accuracy).

Each subject received one-third of the Metaphors with a figurative priming sentence, one-third with a literal priming sen-

tence, and the remaining third with a randomly selected filler sentence (unprimed). Each subject also received one-third of the Scrambled Metaphors with a figurative priming sentence, one-third with a literal priming sentence, and the remaining third with a randomly selected filler sentence. This provided an appropriate planned comparison for each of the three priming conditions: figurative, literal, and unprimed.

Results and Discussion

Mean RT's were derived from correct responses only, and responses exceeding 4000 milliseconds were automatically discarded as errors. Error rates were uniformly low: 0.7% for the metaphors and 0.3% for the scrambled metaphors. Thus, longer RT's for the metaphors relative to their scrambled controls would not be attributable to a speed–accuracy trade-off. The response times for the conditions of interest—metaphors and their scrambled counterparts in the three priming conditions—are shown in Figure 1. Planned comparisons revealed a significant metaphor interference effect in both priming conditions, but no such effect in the unprimed condition. Without the context provided by a figurative or a literal priming sentence, unprimed metaphor sentences took no longer to reject than did unprimed scrambled metaphor sentences, $t(23) = .72$, $p > .05$. With the context provided by the figurative priming sentences, we did obtain a metaphor interference effect. Figuratively primed metaphors took 123 milliseconds longer to reject than did figuratively primed scrambled metaphors, $t(23) = 2.97$, $p < .01$. Interestingly, we obtained a virtually identical effect with literally primed metaphors. These took 126 milliseconds longer to reject than their literally primed scrambled counterparts, $t(23) = 3.04$, $p < .01$.

These results strongly suggest that both the literal and the figurative priming contexts facilitated metaphor comprehension. However, this conclusion must be tempered because of two potential problems. First, there was an unanticipated overall effect of figurative primes. The mean RT's for both the Metaphors and the Scrambled Metaphors were increased when preceded by these primes, relative to the Metaphors and Scrambled Metaphors in the other two contextual conditions (unprimed and literally primed). We have no ready explanation

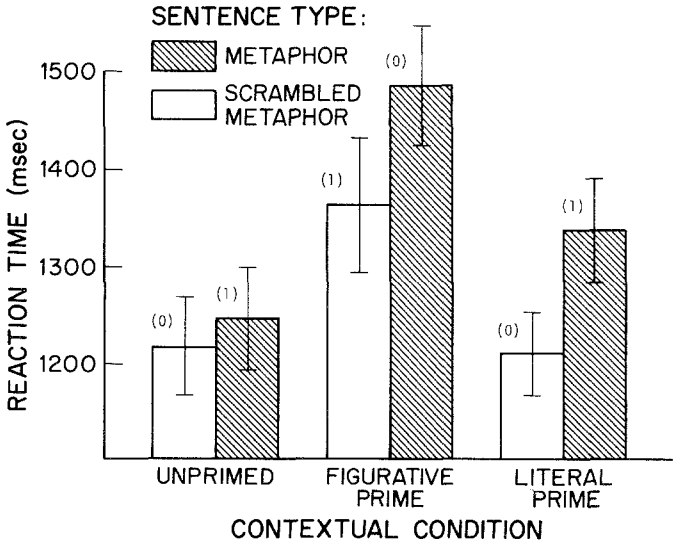

FIG. 1. Mean reaction time (and standard errors of the means) to make literal true–false decisions as a function of sentence type and priming condition, Experiment Ia. Percent errors in parentheses.

for this other than the possibility that processing a figurative priming sentence in the context of a literal verification task might momentarily distract a subject, and so increase reaction time on the immediately subsequent trial. Whatever the reason for this effect, the important comparisons involve the differences between metaphors and their scrambled controls within each priming condition. Therefore, this unanticipated effect, even if replicable, does not pose a serious interpretive problem.

The second potential problem concerns the scrambled controls, and is more serious. In Experiment Ia, each primed metaphor was yoked with a scrambled metaphor that received the same priming sentence. This enabled us to assess the effects of a priming sentence on both the target metaphor and a scrambled metaphor that used the same predicate noun. This predicate–noun control is necessary if we are to attribute the effects of priming to metaphor comprehension, and not to any adventitious effects of the priming sentences on word or sentence processing per se. For the same reason, we also need a subject–noun control to ensure that priming sentences do not increase reaction time to sentences that have a related subject noun. Experiment Ib provides such a control by replicating Experiment Ia, but with one difference. Instead of pairing priming sentences with scrambled metaphors that use a related predicate noun, we paired priming sentences with scrambled metaphors that use a related subject noun.

Experiment Ib: Do Priming Sentences Increase RT to Target Sentences with Related Subject Nouns?

Method

Subjects. An independent sample of 24 undergraduate students at Princeton University served as paid volunteers. The data of two additional subjects were discarded because of excessive error rates (over 5%), and one additional subject's data were lost when equipment faltered.

Materials, design, and procedure. We used the materials of Experiment Ia, but re-paired the priming and scrambled metaphor sentences so that the subject nouns of those scrambled metaphors were related to the primes. In all other respects Experiment Ib was a replication of Experiment Ia.

Results and Discussion

As in Experiment Ia, mean RT's were derived from correct responses only, and responses exceeding 4000 milliseconds were treated automatically as errors. Again, error rates were low: less than 1% for the metaphors and their scrambled controls. The RT data replicate those of Experiment Ia in every detail. Planned comparisons revealed a significant metaphor interference effect in both priming conditions, but no such effect in the unprimed condition. Unprimed metaphors took no longer to reject than did unprimed scrambled metaphors, 1279 versus 1242 milliseconds, $t(23) = 0.91$, $p > .05$. With a figurative priming context, the metaphors took 219 milliseconds longer to reject than did their scrambled counterparts, 1515 versus 1296 milliseconds, $t(23) = 5.39$, $p < .001$. Similarly, in a literal priming context, the primed metaphors took 164 milliseconds longer than did their literally primed scrambled controls, 1397 versus 1233 milliseconds, $t(23) = 4.04$, $p < .001$. Finally, the result that we could not readily explain—the general interfering effect of the figurative primes on both metaphors and scrambled metaphors—was replicated. A separate 2 × 2 analysis of variance applied to the figuratively and literally primed metaphors and scrambled metaphors revealed a significant effect of priming type. Both the metaphors and the scrambled metaphors took longer to respond to when preceded by figurative primes than when preceded by literal primes, $F(1,23) = 10.57$, $p < .01$. Both prime types increase RT to metaphors relative to their scrambled controls as indicated by the significant main effect of sentence type, $F(1,23) = 31.37$, p

$< .001$. However, the interaction of prime and sentence type was not significant, $F(1,23) = 1.14$, $p > .05$, indicating that the effects of prime type (literal versus figurative) were not different from one another. Each prime type effectively facilitated metaphor comprehension.

These results seem unambiguous. Metaphors that appear in the immediate context of stimuli (sentences) that activate a relevant ground concept are understood more rapidly than those same metaphors that appear in an unrelated immediate context. Furthermore, within the constraints of this experiment, literal contexts were as effective as figurative ones. If this result can be generalized beyond our laboratory situation, then it would be consistent with the notion of a core concept that is common to both the figurative and literal senses of a word. Either the literal or figurative sense of a given word in a given context of use should be capable of activating its core concept in semantic memory, and via this activation should in turn be capable of activating any of its usual senses. However, caution is in order here. First, such a conclusion is based, at least in part, on a null finding—failure to detect a difference between the figuratively and literally primed metaphors. This null finding may reflect a true state of affairs, but it may also reflect accidental, idiosyncratic properties of our experiment. One such property might be a ceiling effect with respect to the amount of interference that one would ordinarily detect in our experiments. Another problem concerns the particular materials that we happened to use. The strongest conclusion to be drawn from these results is that the literal sense of a word can activate the figurative sense of a related word concept, and that this in turn can facilitate comprehension of a simple nominative metaphor. The broader implication of this is that one of the ways that a context can facilitate metaphor comprehension is by making a specific and relevant concept available and accessible at the time of processing. This raises the question, how specific must that context be in order to be effective?

Consider statements such as *John is an elephant*. What kinds of information would enable a listener to interpret such statements unambiguously? The minimal information might simply be the dimension of the implicit comparison—in what way is John to be likened to elephants? The local topic of conversation can often provide the answer to this question. If we are talking about people's relative sizes, then it would be clear that the statement asserts that John is a big person. If the conversation were to be about people's appetites, then John has a hearty appetite. If the topic of conversation is about memory, then John would be understood to have a prodigious one. This example suggests that metaphor comprehension might be facilitated by a truly minimal context—one that provides nothing more than the relevant dimension of the implicit comparison. In naturally occurring conversations, such information would ordinarily be part of the topic of that conversation, and would be known to both the speaker and the hearer. Such information can thus be thought of as an intrinsic component of the common ground that must be shared by speakers and hearers if comprehension is to occur (Clark & Carlson, 1981).

Experiment II compares the effectiveness of specific primes with that of more general ones. The general primes are sentences that use words that are in the same semantic field as the ground of the target metaphor. Consider, yet again, *marriages are iceboxes*. Several dimensions of comparison might be implied by the vehicle, *iceboxes:* temperature, broadly speaking, or capacity for long-term storage and preservation of things that might spoil, and so on. Would a temperature term such as *warm,* as in the sentence *some summers are warm,* restrict the alternative interpretations to those involving temperature, and so facilitate comprehension of this metaphor? Experiment II asks if such a momentary general priming context can be effective.

Experiment II: General Activation of Figurative Meaning

Method

Subjects. Twenty-four paid volunteers were recruited by advertising in the local newspaper. These volunteers were all undergraduate or graduate students enrolled in various institutions during the academic year but who were all living in Princeton, New Jersey, during the summer of 1981 when this experiment was conducted. The data of three additional subjects were discarded because of excessive error rates (over 5%)

Materials. We used the materials of Experiment Ia, but substituted general literal priming sentences for the figurative priming sentences of that experiment. These general priming sentences used predicate terms that were in the same semantic field as the predicate terms of the specific priming sentences. This means, of course, that they were also in the same semantic field as the ground of their target metaphors. An example will make the relationships among specific primes, general primes, and target metaphors clear. For the target metaphor *cats are princesses,* the specific priming sentence was *children are pampered* and the related general priming sentence was *children are deprived.* For the metaphor *all desks are junkyards,* the specific and general primes were *kitchens are messy* and *kitchens are tidy,* respectively (see Appendix for list of the items used).

Design and procedure. As in Experiment Ia, one-third of the metaphors for each subject were unprimed, one-third were paired with a specific literal prime, and one-third were paired with a general literal prime. Over the group of 24 subjects, each metaphor appeared equally often in each of the three priming conditions. The scrambled metaphors were distributed in the same way, providing an appropriate comparison condition for each priming condition. In all other respects the procedures and design of Experiments Ia and II were identical, including the predicate–noun control of Experiment Ia.

Results and Discussion

Mean RT's were derived as in Experiment I—only correct responses were used, and responses exceeding 4000 milliseconds were automatically treated as errors. The error rates for the metaphors and their scrambled counterparts were 2.7% and 0.3%, respectively, again making a speed–accuracy trade-off interpretation of the expected RT differences implausible. Mean response times as a function of priming condition are shown in Figure 2. Essentially, the results of Experiments Ia and Ib are replicated in every important detail: a significant metaphor interference effect in both priming conditions, and no such effect in the unprimed condition. With no context to provide the dimension of the implicit comparison, unprimed metaphor sentences took no longer to reject as literally false than did their unprimed scrambled controls, $t(23) = .73$, $p > .05$. We again obtained a significant effect of specific literal priming sentences. Metaphors that appeared in this context took 99 milliseconds longer to reject than their similarly primed scrambled controls, $t(23) = 2.27$, $p < .05$. The new finding of interest is that the general contexts provided by the general priming sentences were just as effective. Metaphors in these general contexts took 131 milliseconds longer to reject than their scrambled controls, $t(23) = 3.00$, $p < .01$. This last result suggests that activating the semantic field of a metaphor ground can effectively make available the relevant dimension of comparison that is implicit in a nominative metaphor. The overall pattern of results suggests that making this dimension of comparison available at time of processing significantly facilitates metaphor comprehension. Without such minimally informative contexts, the metaphors that we used were not understood rapidly enough to pro-

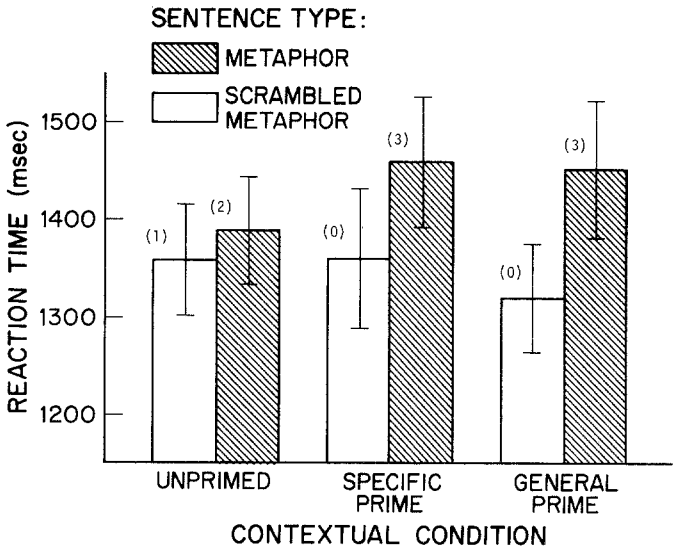

FIG. 2. Mean reaction time (and standard errors of the means) to make literal true–false decisions as a function of sentence type and priming condition, Experiment II. Percent errors in parentheses.

duce interference with literal–false decisions. With such contexts, they were understood rapidly and automatically—they produced the metaphor interference effect.

It might be argued that the effects of our priming contexts were mediated by subjects becoming aware of the possibility of metaphors appearing from time to time during the experimental task. We think that this is quite unlikely. First, no subjects indicated any such awareness during the post-experimental debriefing when we explained the purpose of the experiment to them. Second, if such an awareness did develop, then we would expect it to affect the processing of the unprimed metaphors as well as the primed metaphors, thus greatly attenuating any differences between them. We saw no evidence of this. Finally, the absolute number of prime–target pairs is far too small to permit such a practice effect. Any single subject saw only 8 such pairs of each type for a total of only 16 in the entire 160-item list. It would be inordinately difficult to obtain statistical significance with only 24 subjects if the selective metaphor interference effect required the development of awareness of expectations over trials. This argument applies, of course, to all three experiments reported here.

GENERAL DISCUSSION

Our results can be succinctly summarized. We had shown in an earlier study that simple nominative metaphors may be understood rapidly and nonoptionally without extrasentential supporting context. Presumably, such easily understood metaphors employ a topic and a vehicle whose relationship is immediately apparent and unambiguous, as in *some jobs are jails*. When a topic–vehicle relationship is ambiguous or vague, as when either several alternative relationships or none at all come to mind, then a context that provides information about that relationship can facilitate metaphor comprehension by suggesting the ground of the metaphor. Experiments Ia and Ib showed that such a context may be either literal or figurative, with comparable effect. Experiment II showed that a context that merely provides the dimension of the implicit comparison between metaphor ve-

hicle and topic can be sufficient for immediate comprehension. When are such disambiguating contexts necessary?

One possibility is that apt and automatically comprehensible metaphors use conventional vehicle–topic combinations, as in *my surgeon is a butcher, my cabinetmaker is a butcher, my editor is a butcher.* Metaphor vehicles such as *butcher* can, by implicit convention, provide a general property that is instantiated by an appropriate metaphor topic. In the case of butcher, an appropriate topic is one that can sensibly be described as crudely incompetent. Therefore, an appropriate topic for the vehicle *butcher* is an adult human whose occupation or profession can be evaluated in these terms. For example, to say that *some file clerks are butchers* seems odd because the tasks of file clerks do not require the level of skill that may be denied by being likened to a butcher. These examples suggest that when a conventional vehicle is used to describe a topic within its normal scope of attribution, then no additional context is required for immediate and unambiguous metaphor comprehension.

However, when a metaphor vehicle is too general to be unambiguously interpreted—as in *Goerge is an elephant*—then additional information would be needed to determine just which aspect of elephants is intended. Is George to be taken as large, or as having an enormous appetite, or a fondness for peanuts, or as someone who never forgets? Similarly, a vehicle that may be unambiguously interpretable when used with one topic may be ambiguous when used with another topic. Consider the vehicle *iceboxes* as in (a) *his heart was an icebox* versus (b) *all marriages are iceboxes.* Statement (a) is clearly interpretable in terms of interpersonal warmth of some kind (or lack thereof). Statement (b) can also be interpreted in this way, but it also allows for other interpretations more readily than does statement (b), for example, that marriages are devices that preserve perishable things. For such ambiguous vehicle–topic relations, a context can provide the information that is needed for immediate disambiguation. The facilitative effect of the subtle and minimal contexts that we used in our experiments suggests that people can use such information unconsciously and automatically.

The apparent ease with which people seem to use contextual information to disambiguate metaphors suggests that nonliteral comprehension mechanisms share important functional properties with literal comprehension mechanisms. At the most general level, mechanisms such as those implied by Grice's (1975) cooperative principle would seem to be involved regardless of whether an utterance is intended literally or nonliterally. Also at this general level, the conventions for marking given and new information should not differ as a function of utterance type. At a more specific level, figurative language may present nothing more unique than a special case of ambiguity; more precisely, special cases of two quite general types of ambiguity, pragmatic and lexical.

Pragmatic ambiguity is involved in what Miller (1979) refers to as the recognition problem. For any given utterance, a listener must recognize the communicative function of that utterance—whether it is a question, a request, or an assertion, to mention just three possibilities. This is a real problem because the surface form of an utterance does not determine that utterance's communicative function. For example, an utterance in question form, such as "Can you please shut up?" need not be a question at all, but a request. For assertions of the form *X is a Y,* there is a further recognition problem: what is the precise relationship between X and Y that is expressed? Consider four simple sentences and the relationships that they may express:

(a) A tree is a plant (entailment relationship);

(b) A tree is a landmark (attributive relationship);

(c) A tree is a factory (an implicit simile in the form of a nominative metaphor);

(d) A tree is a plant (entailment, as in (a), or implicit simile, as in (c)?

Notice that statements (a) and (d) above have exactly the same surface form and content. If the word "plant" is interpreted as a form of living thing, as in "plant or animal," then those statements express an entailment relationship. Everything that is true of plants must be true of trees if the statement is true. However, if the word "plant" is interpreted as "factory," then the statements are nominative metaphors. Trees are not literally factories, but are like factories in certain interesting ways, for example, they manufacture various compounds, have a supply system that transports water and nutrients from the ground to their branches, and so forth. As this example shows, even a literal statement, such as (a) above, poses the recognition problem. With respect to this problem, literally intended utterances are, in principle, no less ambiguous than metaphors such as *some jobs are jails,* where the intended relationship is attributive, not entailment.

In addition to the pragmatic ambiguities of the kind described above, both literal and figurative utterances often pose lexical ambiguities. Lexical ambiguity must be dealt with when such terms as *jails* and *iceboxes* are used to refer to selected properties of these concepts, not to the concepts themselves. In literally intended statements such as *trees are plants,* exactly the same kind of ambiguity is present as in our metaphors, and such ambiguities can be resolved only by using contextual information. And for both literal and figurative utterances, the kind and amount of context that is needed will vary, depending upon the particular expressions used. A minimal and local context, such as the topic noun of a sentence, can by itself provide enough information to resolve ambiguity. Compare *his heart was an icebox* with *all marriages are iceboxes.* The former usage of "iceboxes" is relatively unambiguous, the latter less so. But here too there seems to be no functional difference between disambiguation of figurative expressions and disambiguation of literal ones. Consider *he drank the port* versus *he enjoyed the port.* In the first use of "port," it is most likely a beverage; in the second, it is either a beverage or a harbor. For both the metaphorical *iceboxes* statements and the literal *port* statements, sentence content can make a differnce. One sentence content can minimize ambiguity, another maximize it. When sentence content does not constrain interpretation sufficiently, then the general topic of conversation may provide the necessary information. In normal discourse, such information is usually available, and may be used in the same ways for dealing with both literal and nonliteral expressions. In either case, such information is used, ultimately, to resolve the many kinds of ambiguity that prevades natural language.

Precisely how such information is used, either for literal or for figurative disambiguation, is not known in detail. For example, there is still disagreement as to whether context constrains initial lexical access to contextually appropriate meanings of words, or merely permits selection of those meanings after all possible meanings have been accessed (see Marslen-Wilson & Welsh, 1978; Onifer & Swinney, 1981; and Simpson, 1981, for various views on this issue). However these issues are eventually resolved, there is general agreement that ordinary, literal comprehension requires the same kinds of inferences, decisions, and reliance on contextual information that metaphor comprehension does. If so, then it may be unnecessary, and certainly unparsimonious, to postulate special processing mechanisms for the latter. Metaphor may be just one of the many sources of potential ambiguity in natural language, and so the comprehension mechanisms that resolve the ambiguities of literally intended language may suffice for nonliterally intended language as well.

APPENDIX

THE METAPHORS AND THEIR THREE TYPES OF ASSOCIATED CONTEXTUAL PRIMING SENTENCES

	Primes (contexts)		
	Experiments 1a and 1b		Experiment 2
Metaphors	Specific–Figurative	Specific–Literal	General–Literal
Marriages–Iceboxes	People–Cold	Winters–Cold	Summers–Warm
Smiles–Razors	Remarks–Cutting	Tools–Cutting	Comments–Nice
Cats–Princesses	Pets–Pampered	Children–Pampered	Children–Deprived
Diplomas–Money	Years–Investments	Stocks–Investments	Stocks–Worthless
Words–Daggers	Opinions–Painful	Wounds–Painful	Sounds–Comforting
Jobs–Jails	Careers–Deadends	Streets–Deadends	Doors–Open
Hands–Medicine	Arms–Soothing	Songs–Soothing	Songs–Irritating
Hearts–Closets	Thoughts–Private	Clubs–Private	People–Open
Hearts–Ice	Feelings–Frozen	Foods–Frozen	Foods–Hot
Minutes–Hours	Days–Long	Books–Lengthy	Books–Short
Surgeons–Butchers	Hands–Murderers	Criminals–Murderers	People–Neat
Desks–Junkyards	Ideas–Messy	Kitchens–Messy	Kitchens–Tidy
Salesmen–Bulldozers	Commercials–Bullies	Children–Bullies	Children–Timid
Criminals–Germs	Gangs–Unhealthy	Foods–Unhealthy	Foods–Healthy
Fogs–Coats	Mists–Veils	Clothes–Veils	Clothes–Revealing
Drugs–Dreams	Poisons–Calm	Oceans–Calm	Oceans–Stormy
Icicles–Knives	Winters–Sharp	Axes–Sharp	Axes–Dull
Roosters–Clocks	Animals–Alarms	Bells–Alarms	Songs–Lullabies
Fugitives–Birds	Feet–Runaways	Children–Runaways	People–Sedentary
Offices–Icebergs	Hours–Impersonal	Letters–Impersonal	Teachers–Friendly
Shirts–Tents	Fashions–Big	Mountains–Big	Gloves–Tight
Stomachs–Barrels	Diets–Round	Balloons–Round	Dancers–Thin
Roads–Snakes	Maps–Treacherous	Swamps–Treacherous	Tunnels–Safe
Ideas–Diamonds	Inventions–Brilliant	Stars–Brilliant	Stars–Dim

Note. Metaphors were presented in the form *All X are Y;* primes in the form *Some X are Y.*

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