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Technical Report No. 27

METAPHOR: THEORETICAL AND EMPIRICAL RESEARCH

Andrew Ortony and Ralph E. Reynolds  
University of Illinois at Urbana-Champaign

Judith A. Arter  
Phoenix Union High School System  
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March 1978

# Center for the Study of Reading

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## Abstract

Metaphor plays a major role in our understanding of language and of the world we use language to talk about. Consequently, theories of language comprehension and of language itself are incomplete if they do not handle the phenomenon of metaphor, and they are inadequate if they cannot. Traditional definitions and theories of metaphor are reviewed. It is suggested that they err in equating metaphors with comparisons rather than merely implicating comparisons. Empirical research is reviewed, revealing, for the most part, serious problems, particularly in the developmental research. These problems often relate to inadequate underlying theories about the nature of metaphor. Other difficulties include inadequate controls over preexisting knowledge, and overly hasty conclusions that children cannot understand metaphors. Related research on the comprehension of proverbs and analogies is discussed. Some recommendations for future research are made. These depend on a redefinition of metaphor and on the employment of an investigative approach that will permit adequate controls of preexisting knowledge, surface structure, and meaning. The approach recommended emphasizes and takes advantage of the context-dependent nature of metaphors. Finally, the role of comparisons is reexamined. It is of no avail to argue that metaphors are really implicit comparisons if, in so doing, one hopes to account for or explain their nonliteral nature. For even if metaphors can be transformed into comparisons, these comparisons are themselves nonliteral, and consequently still need to be explained.

## Metaphor: Theoretical and Empirical Research

In the simplest and most obvious case of language comprehension, readers or listeners understand what they read or hear in terms of a literal interpretation of what is written or said. It is not surprising, therefore, that the bulk of research in the psychology of language comprehension has concerned itself with the comprehension of literal uses of language. However, in both written and oral language it very often happens that speakers or writers do not intend what they say to be taken literally; if it is taken literally, it often either makes no sense at all with respect to the surrounding context, or it appears to express something that is either impossible or false. It is our thesis that if research into the comprehension of natural language is to have ecological validity, it is necessary that we go beyond the more traditional research goals, and extend our investigations to nonliteral uses of language, which, together with literal uses, constitute the whole range of linguistic communication.

One class of nonliteral uses of language that has recently started to receive attention from psychologists is "indirect speech acts." This class is not of primary concern here (but see Clark & Lucy, 1975; Schweller, Brewer & Dahl, 1976). Rather, we are concerned with metaphor and related figurative uses of language such as similes and, to some extent, analogies. Throughout our review we use the term metaphor somewhat loosely; sometimes we use it narrowly to refer to specific utterances that are, or contain metaphors in the usual sense of the word; sometimes we use it more broadly to refer to related nonliteral uses of language such as

similes or analogies.

Extant theory and research concerning the development of the production and comprehension of metaphor yields numerous opinions and contradictory findings. For example, one group of studies (characterized by the work of Gardner, 1974; Pollio & Pollio, 1974) has suggested that even young children (age 5 or younger) are capable of using and understanding figurative language. Other research (Asch & Nerlove, 1960; Schaffer, 1930), however, suggests that these capacities do not emerge until the child reaches adolescence. This kind of inconsistency is not uncommon in developmental research.

Implicit in our review is the suggestion that one of the reasons for the inconsistency of research findings in the area of the comprehension of metaphor is that the research seems not to have been grounded in an adequate understanding of what metaphor is. This is no criticism of the theorists whose work we review; it seems to be endemic in the history of thought about the problem. Metaphors may be easy to recognize, but they are difficult to define. It is not easy to give a psychological analysis of an ill-understood notion. This lack of understanding, however, is not widely acknowledged, and entrenched beliefs about metaphor are ubiquitous. Among these are such dubious claims as: Metaphors are comparisons; metaphors are (must be) semantic anomalies; and the folklore of classrooms and editors -- metaphors, like drinks, should never be mixed. As this review proceeds, we hope to show that the first two claims are false, but we will digress here to discuss the mixing of metaphors. First, let it be said that to our knowledge there is no theory of metaphor, no theory of language comprehension, and probably no theory of



literary style that has the dictum, "Don't mix metaphors," as a consequence. Indeed, the dictum is probably as groundless as many others in the educational folklore of English teaching. Why should one not split infinitives? Why should one use that rather than which? And, as Winston Churchill once objected, why should one not end sentences with prepositions? Churchill's objection was voiced in the House of Commons when he finished a sentence with the phrase, "up with which I will not put," to demonstrate the absurdity of the dictum. Mixed metaphors, far from being heinous, can be very powerful and often rather amusing. In the 1976 campaign for the Republican party presidential nomination Ronald Reagan probably expressed his intentions very vividly when he complained that the ship of state was sailing the wrong way down a one-way street! Canons of style should be recognized for the more or less widely held conventions they are, not confused with constraints imposed by a theory of language.

In a recent review of metaphor and psychological theory, Billow (1977) cited some of the studies that we do, but his perspective was rather different from ours and was certainly broader. For example, without comment, he cited a Freudian interpretation of I've wandered off the point and can't find it again (Sharpe, 1968, p. 159) as a metaphor referring to subconscious childhood failures of attempts to reach the mother's nipple. Billow acknowledged the confused state of the art by noting that "theory is incomplete and research is nonconclusive" (p. 89). This review attempts to identify the causes of this state of affairs and offers some suggested remedies.

### Traditional Theories of Metaphor

Although philosophers have been interested in the nature of metaphor at least since the time of Aristotle, there seems to have been relatively little progress since that time. It is our contention that a prime reason for this is the relative inexactness and inadequacy of the dominant philosophical theories and definitions of metaphor. A good definition is needed, not, as Richards (1936) claimed "to protect our natural skill from the interference of unnecessarily crude views" (p. 116) but to explicate that natural skill.

For a long time, metaphors were considered to be merely the direct substitution of a nonliteral phrase for a literal phrase that had exactly the same meaning. Black (1962), in discussing this substitution view, presented two reasons why authors would desire to replace a straightforward statement of what is meant with an imprecise phrase, the meaning of which must be deduced. The first reason was stylistic. Metaphors serve an ornamental function. In addition, the reader is supposed to feel delight at the discovery of the hidden meaning. Second, metaphors were seen as useful in coining terms for new concepts, such as the leg of a triangle (Breal, 1897/1964). The substitution view allowed metaphor only a minor role in language. In fact, it led directly to the conclusion that the use of metaphor was an affectation that only obscured literal meaning. A modern example of such an opinion can be found in Miller (1976), who maintained that "metaphors are often used in a misleading way to play upon the emotions or to carry an argument by means of distortion and overemphasis" (p. 174). Other approaches, however, have allowed metaphor

to play a more important role in language functioning and development.

In our discussion, wherever possible, we employ the terminology developed by Richards (1936). This terminology is both useful and widely accepted. Richards argued that a metaphor consists of two terms and the relationship between them. The subject term he called the "topic," or "tenor;" the term being used metaphorically, the "vehicle;" and the relationship, or that which the two have in common, he called the "ground." For example, in the metaphor, The question of federal aid to parochial schools is a bramble patch (cited in Barlow, Kerlin & Pollio, Note 1), the topic is federal aid to parochial schools, the vehicle is bramble patch, and the ground is the idea of impenetrable complication. Richards further introduced the notion of "tension" to denote the literal incompatibility of the topic and the vehicle. In the example above, the metaphorical tension arises from the literal incompatibility of federal aid and bramble patches. The identification of these various components of metaphor is not always as straightforward as in the example just given, but as an analytical tool, Richards' terminology is often useful.

### The Comparison Theory

From antiquity to the present the most widespread view of the nature of metaphor is that it is essentially a comparison between, or juxtaposition of objects that are literally disparate (Perrine, 1971; Barlow et al., Note 1). The exact nature of the comparison and the resulting implications concerning the use and comprehension of metaphor have varied from author to author. Some have argued, as did Aristotle, that metaphors are comparisons based on analogy or proportions. Others

(e.g., Alston, 1964) have argued that it is little more than implicit simile.

Since the comparison theory of metaphor originates in the writings of Aristotle, mainly in De Poetica (see McKeon, 1947), it is appropriate to consider his views first. Two aspects of metaphor recur in his treatment of the topic. The first is that metaphor is constructed on the principles of analogy and seems to be concerned primarily with the comparison of similarities between two or more objects. A second interesting aspect of Aristotle's view of metaphor concerns the range of metaphor usage in natural language. Aristotle believed the command of metaphor to be a sign of genius. According to this view metaphors are infrequent and are used almost primarily for stylistic purposes, to make language more elegant and beautiful rather than more meaningful. The most important contribution that Aristotle made to the study of metaphor was to initiate the still prevalent idea that metaphors are comparisons. At the same time he seems to have confused the relationship between metaphors and analogies (see the last section of this paper), and to have underestimated their influence on the nature of language.

In his famous book Essai de Semantique (wherein the word semantics was coined) Breal (1897/1964) took exception to Aristotle's implicit notion that the ability to use metaphor was an uncommon occurrence. He suggested that metaphor was a basic component of language use, rather than an ornament of language, as Aristotle had maintained. Breal claimed that

the metaphor remains such at the outset only; soon the mind becomes accustomed to the image; its very success causes it to pale; it fades into a representation of the idea scarcely more coloured than the proper word...it must be admitted that for the most part metaphors teach us little save what we knew already; they demonstrate only the universal intelligence, which does not vary from one nation to another. (p. 122)

For Breal, the original use of metaphor is common among most language users and is an important vehicle for language change. Some of these views were later to be echoed by Skinner (1957), although, of course, in a somewhat different context.

Stated in more modern terms, Breal also made a distinction between "novel" and "frozen" metaphor. In discussing this distinction, it is perhaps useful to think in terms of a continuum, with frozen or dead metaphors at one end and novel metaphors at the other. Frozen metaphors would be defined as metaphors that at one time were novel but through consistent use have become integrated into the language. Phrases like head of state and foot of the bed are examples of frozen metaphors, as are many colloquial and idiomatic expressions. In contrast, truly novel metaphors constitute an original contribution to the expressive power of the language. Most of the metaphors occurring in everyday language probably lie somewhere near the middle of the continuum rather than at either of the extremes. They are not totally original to each person who uses them, but they are not frozen either.

Embler (1966) took Breal's thesis one step further by suggesting that metaphor was not only a building block of language but also the essential transporter of meaning in language. Embler claimed that "both speech and thought are often fuzzy and vague, often poverty-stricken, often mere counters of approval or disapproval, often abstractions that have lost their power of expressiveness. But, if there is meaning at all, it is in the metaphor still" (p. 44).

Barlow et al. (Note 1) presented a simple comparison view of metaphor as part of a more general classification scheme for nonliteral language. Following Corbett (1965), they defined a metaphor as "an implied comparison between two things of unlike nature that have something in common" (p. 4). Using simple, indeed oversimple examples, such as my mind is a blank, they argued that the attributes of the vehicle are compared to those of the topic in order to generate the "meaning" of the metaphor. Other authors have developed more complex accounts.

For example, Campbell (1975) presented a theory of metaphor as comparison in which every metaphor is an implicit oxymoron. An oxymoron is a juxtaposition of two concepts that have opposite (as opposed to merely different or incompatible) meanings, such as the soft harshness of words. Even metaphors that do not contain such obvious opposites can be thought of as oxymorons because the tension in the metaphorical comparison comes about as a result of the incompatibility of the literal meaning of the topic and vehicle of the metaphor. Although the sphere of nonliteral language delimited by metaphors was not made explicit, Campbell had strong opinions about the implications of his view of metaphor for cognitive and linguistic

theory. The power of metaphor comes from its inability to be paraphrased. Campbell noted that "the more powerful the metaphor, the easier it is to perceive the multiple meanings nestled therein" (p. 8). These multiple meanings are, however, not static. New meanings can evolve for different individuals at different times. Therefore, any attempted literal paraphrase will of necessity miss some part of the metaphor's meaning. Campbell also noted that the multiple meanings of metaphor and the intelligible presence of opposites in the same sentence provide difficulty for many theories of semantic processing. Campbell was probably right about this, but the only theory he discussed in detail was the semantic theory of Katz and Fodor (1963), which is not a processing theory at all.

#### The Interaction Theory

Several authors (Black, 1962; Haynes, 1975; Richards, 1936; Wheelwright, 1962) have maintained that although metaphors can be merely substitutes for literal statements, and although they can be comparisons between objects, the psychologically interesting metaphors really involve more. Good metaphors actually relate the topic and the vehicle to produce a resulting meaning that is new and transcends both. As Haynes (1975) puts it:

Placing known characteristics of Y against X may provide new insights, either about Y or about X or about a new third Z, an irreducible synthesis by juxtaposition which is difficult to reduce to a simile or literal language -- the metaphor creates the similarity rather than [formulating] similarity previously existing. (p. 273)

Black (1962) viewed the interaction approach to metaphor as highlighting an interplay between both of the two major components (topic and vehicle) of metaphor, which he called the principal subject and the subsidiary subject. The metaphor works by selecting or suppressing features of the principal subject by using features from the subsidiary subject. For Black, an interaction metaphor could be characterized by the following conditions:

1. The metaphor has two subjects -- a principle subject and a subsidiary one.
  2. These subjects are often regarded as "systems of things" rather than "things."
  3. The metaphor works by applying to the principal subject a system of "associated implications" characteristic of the subsidiary subject.
  4. These implications usually consist of "commonplaces" about the subsidiary subject, but may, in suitable cases, consist of deviant implications established ad hoc by the writer.
  5. The metaphor selects, emphasizes, suppresses, and organizes features of the principal subject by implying statements about it that normally apply to the subsidiary subject.
  6. This involves shifts in meaning of words belonging to the same family or system as the metaphorical expression; and some of these shifts, though not all, may be metaphorical transfers.....
  7. There is, in general, no simple "ground" for the necessary shifts of meanings -- no blanket reason why some metaphors work and others fail.
- (p. 44)



Black suggested that since both substitution and comparison metaphors can be replaced by literal translation, they could be dropped from language with no loss of cognitive content. Interaction metaphors, however, are not expendable because they require readers to make inferences and to draw implications rather than merely to react.

Wheelwright (1962), in his influential text, Metaphor and Reality, proposed what he called a "tensive view" of metaphor. His concepts, however, seem amenable to interpretation in a broad interaction sense and are therefore discussed here. He analyzed metaphor into two component types, epiphor and diaphor. Epiphor "starts by assuming a usual meaning for a word; [then applies] that word to something else on the basis of, and in order to indicate a comparison with what is familiar" (p. 72). In essence, Wheelwright's notion of epiphor encompasses metaphor in the conventional sense, as we have discussed it. It expresses a similarity between relatively well known and relatively unknown subjects. His conception of diaphor, however, seems to add a new dimension to metaphor as previously discussed. Diaphor is exemplified by "'movement' (phora) 'through' (dia) certain particulars of experience in a fresh way, producing new meaning by juxtaposition alone" (p. 78). In other words, phrases and sentences that may or may not be metaphorical in their own right can create a metaphorical image when placed together in a communication. Wheelwright presented an example of diaphor: My country 'tis of thee, sweet land of liberty, higgledy-piggledy my black hen (p. 78). Apparently, the intention here is not to say anything concerning hens or countries but to make an unpatriotic statement. In diaphor, context, with all of its nuances, is

introduced into the study of metaphor.

The interaction view of metaphor approaches metaphor functionally rather than grammatically. Thus, instead of arguing that a metaphor is a simile without the word like or as, a true metaphor, for the interactionist, is characterized by a "eureka" effect, as the elements blend and the new whole is recognized. Haynes (1975) specifically mentioned that even similes can have this characteristic if the tensive force in the simile is great enough, as in, for example, My Luve's like a red, red rose.

Now, it may be true that proponents of the interaction view see metaphor in a radically different way from proponents of the comparison view, but it may be that interaction metaphors could be handled by comparison theorists. To see how this might be, it is useful to review the four-category classification scheme for metaphors and comparisons proposed by Perrine (1971). These categories represent the four possible combinations of explicit and implicit topics and vehicles. The first category is the one in which both the topic and vehicle are explicitly stated. Such a metaphor might be the issue of federal aid to parochial schools is a bramble patch. Here, federal aid to parochial schools is apparently being explicitly compared to a bramble patch. A second category contains metaphors in which the real vehicle is not explicitly stated, though the real topic is. One of Perrine's examples of this category was sheathe thy impatience. The topic is impatience and the unstated vehicle is sword. The metaphor, he claimed, compares the two. The third category that Perrine described contains metaphors in which the vehicle is

explicitly stated but the topic is not. Many proverbs fall into this category. For example, in Don't put the cart before the horse, the topic is some unstated action having the characteristic of being potentially out of sequence. Finally, the fourth category consists of metaphors in which neither the topic nor the vehicle is explicitly stated, such as Let us eat, drink, and be merry, for tomorrow we shall die, when used not to encourage merrymaking, but to assert that life is short and should be enjoyed while it can.

Of Perrine's four categories of metaphors, it seems that only metaphors in the first category (those having an explicit topic and vehicle) would be considered by interactionists as metaphors of comparison. The examples that the interactionists give to illustrate the process of interaction, however, could be merely examples of the other three kinds of comparisons. If this is true, then the eureka aspect of interaction metaphors, referred to by Haynes (1975), may really be only the result of discovering what the real vehicle and/or topic of the metaphor is.

Whether or not this is the correct interpretation, the interaction view presents an interesting picture of the power and usefulness of metaphor. Wheelwright (1962) held that "in order to speak as precisely as possible about the vague, shifting, problematic and often paradoxical phenomena that are an essential part of the world, language must adapt itself somehow to these characteristics" (p. 43). Thus figurative language, especially metaphor, is essential to creative thought. We cannot speak of new perceptions and insights about how objects or ideas fit together in terms of language that has only fixed meanings. These views

have been echoed by Haynes (1975), who believed that the new insight provided by a good metaphor suggests further questions, "tempting us to formulate hypotheses which turn out to be experimentally fertile" (p. 274). She suggested that good metaphors can literally lead to reasoning by analogy, which can give further insight into the extent and nature of concept interrelation, both in suggesting theoretical tests of hypotheses and in personal world views. An example in the scientific domain would be the comparison between the atom and the solar system, which suggested a new view of atoms and led to innovative experimentation to explore the extent of the analogy.

### Summary

Although metaphors have generally been regarded as serving only a communicative function, some theorists have argued that they play a much greater role in language and cognition. This for example, was Breal's (1897/1964) position. However, care has to be taken not to overstate this position. For instance, Shibbes (1974), represents an extreme case of this approach, viewing everything as metaphor. He viewed metaphors as nonliteral statements or representations of something else, thus permitting the term to cast its net too widely. According to this view, all of language and cognition is metaphorical. Consider, for example, the noun. A noun is not the same as the object(s) it designates; it only stands for the concept. Therefore, Shibbes believed, a noun is a metaphor. Likewise, such things as definitions, theories, systems of equations, and models are not the phenomena they hope to describe; they are only our descriptions of those phenomena. They designate only the features of the phenomena that

appear to be useful or consistent to us, according to our current knowledge. In other words, they are metaphors. Such a view of metaphor defines a domain too broad and too general to be useful. It requires that we still designate a subdomain of interest, namely, that domain covered by what we normally call metaphors, which leads us back to the original problem of definition. If literal uses of language are really metaphorical, as Shibbes' view implies, we still need to ask how those uses generally regarded as nonliteral are different.

It would seem that one should reject those accounts of metaphor that trivialize it by assigning it an insignificant role in language and cognition. There are good reasons for rejecting simple substitution views, for example. By the same token, views that are all embracing have to be rejected, for they distinguish nothing. Our own view is that metaphor is a pervasive, powerful, and necessary phenomenon that needs to be accounted for in both linguistic theory and psychological theory.

Metaphors serve many functions. They are vehicles for linguistic change, as Breal saw. This change is effected by the gradual absorption into the lingua franca of expressions that were once novel. We no longer think of cars running, or of legs of triangles, or of catching colds, as metaphors. The emergence of such dead metaphors in a language attests to the fact that there are gaps in what is, or was, literally expressible. Thus, one of the functions of metaphors must be to permit the communication of things that cannot (or could not) be literally expressed. They permit the formulation and recognition of new relationships (Campbell, 1975; Ortony, 1975, 1976; Wheelwright, 1962). In view of this, it is not

surprising to find claims that metaphors are powerful in their capacity to relate new knowledge to old. Consequently, they are said to have great pedagogical value (Green, 1971; Ortony, 1975). It can also be argued (see Ortony, 1975) that they may provide the possibility of communicating a more holistic and vivid impression of a phenomenon.

If metaphors have these features, then elements of both the comparison theory and the interaction theory come into play. On the other hand, it is by no means clear that metaphors are comparisons, although it is clear that they may involve comparisons. It is surely true that metaphors are sometimes used for the purpose of making or indicating a comparison, but on other occasions they may be used to engender a new way of seeing things, as the interaction view emphasizes. Thus, a more cautious account of the relationship between metaphors and comparisons would be to invoke the making of comparisons as a component in the process of comprehending metaphors rather than as necessarily the end result of that process. If, by way of explanation, it is asserted that metaphors are comparisons, we need to explain the difference between literal and metaphorical comparisons, a difference to which we will return in due course.

#### Review of Empirical Research

In spite of the lack of unanimity as to the nature and function of metaphor, there has been some empirical research that examines various aspects of the comprehension and production of metaphors both by children and adults. Our review is of selected work and is by no means exhaustive, but the research that we discuss is representative.

### Developmental Research

Developmental research into the comprehension of metaphor is becoming quite a fashionable pastime. It is a topic that is appearing more and more frequently in the pages of leading developmental journals. This increasing interest is an excellent sign, for questions concerning the child's ability to comprehend metaphors are not only of theoretical interest but of practical importance as well, particularly in reading. It appears to be the case that children need to be able to understand metaphors to understand the texts that they typically encounter in school. For example, Arter (1976) conducted an informal survey of readers and introductory social science texts that are widely read by fifth and sixth grade children. She found that in the Ginn 360 Reading Series, figurative language occurred at the rate of about 10 instances per 1,000 words. Even for the earlier grades (Ginn 360, Primer Level) the rate was about 2.5 per 1,000 words of text. Although a more detailed analysis of the frequency and use of metaphors in reading materials would yield more precise results, it is evident that in order to understand many school texts, children have to understand the metaphors that occur in them. It thus becomes important to know whether there are cognitive constraints on the comprehension of metaphor by children. If there are, then one needs to understand the relationship between the literal uses of language that children can understand, and the nonliteral uses that they perhaps cannot.

Asch and Nerlove (1960) examined the development of "double function" terms in children. Double function terms were defined as words that can refer to either physical or psychological phenomena. The physical

application was held to be literal, and the psychological application was regarded as metaphoric. Forty children between the ages of 3 and 12 were tested. Asch and Nerlove chose eight double function words, sweet, hard, cold, soft, bright, deep, warm, and crooked, and asked their subjects whether such terms could be applied to people. Children who said they could, were asked what such a person would be like and whether there was any connection between this and the physical meaning. Their results showed:

1. Children first master the object reference (i.e., the literal use) of double function terms.

2. Children acquire the psychological (i.e., metaphorical) sense of these terms later, and then apparently as a separate meaning, as if it were independent of the object reference.

3. The dual property of the terms is realized last, and even then, not spontaneously. (p. 55)

Asch and Nerlove concluded that the capacity to appreciate and produce good metaphors does not emerge until adolescence. There are some problems with this study, however. First, it could be argued that the double function terms that Asch and Nerlove investigated are ambiguous terms, having at least two distinct lexical entries. If this is the case, it would not be surprising to find that the psychological senses of them develop later, on the grounds that the domains to which they can be applied are less well understood by younger children. That the terms are not perceived as being related by children in fact provides some evidence for the ambiguity



interpretation. Consequently, the findings may have little to do with the development of the capacity to understand metaphors at all. A second problem concerns the relationship between comprehending metaphors and explaining the basis of the putative comprehension. To investigate cognitive/linguistic skills by making demands on metacognitive/linguistic skills is not a very promising approach. To be sure, if children can explain how they interpreted something, then one can draw inferences about their comprehension skills (as well as their skill at understanding their comprehension and articulating it). But the fact that a child cannot report how he or she understood something does not in itself justify the conclusion that it was not understood. Problems of this kind are widespread throughout the developmental literature (see, e.g., Brainerd, 1973; Brown, in press; Kuhn, 1974).

Billow (1975) attempted to show that the development of genuine comprehension of metaphor is related to the child's ability to deal with formal operations, although acknowledging that some primitive form of comprehension is in evidence even in 5-year-olds. Billow used children ranging in age from 5 to 13 years old. He distinguished between two kinds of metaphors, "similarity" metaphors and "proportional" metaphors. In similarity metaphors, he argued, two disparate objects are compared on the basis of a shared attribute, as in, for example, The branch of the tree was her pony, where both the branch and the pony are ridden. In proportional metaphors such as Summer's blood is in ripened blackberries, Billow argued that "four or more elements...must be compared, not directly, but proportionally" (p. 415). Thus, proportional metaphors are implicit

analogies. Billow also looked at the children's ability to comprehend proverbs. His results showed that where the similarity metaphors were accompanied by pictures, 5-year-olds could explain the basis of the metaphor about 30% of the time. However, the proportion correctly explained was nearly 75% for 7-year-olds and almost perfect for 11-year-olds. Billow also reported that "a stable use of concrete operations is not a necessary condition for metaphor comprehension" (p. 419). With respect to the "proportional metaphors" the results showed a high correlation between the child's ability to explain the metaphor and the development of formal operational thought. This part of the study was only undertaken with children aged 9 through 13 for whom performance improved from about 40% correctly explained to about 80% correctly explained. However, the ability to engage in formal operations, though apparently explaining performance on the proportional metaphors, failed to explain the poor performance on the comprehension of proverbs. One should note that the similarity metaphors, the proportional metaphors, and the proverbs were substantially different with respect to difficulty on all kinds of dimensions. It is clear, for example, that overall, the proverbs involved more complicated syntactic constructions, a greater proportion of relatively low-frequency words, and far more complicated demands on knowledge of the world, be it physical, social, cultural, or proverbial knowledge. The increase of comprehension with age may merely reflect a greater probability of an already learned acquaintance with more of the proverbs. Similarly, the proportional metaphors were much more complex in structure than the similarity metaphors, and they too involved more

knowledge of various kinds. Indeed, the authors of the present review found some of them very obscure. We are inclined to attribute the problem to the stimulus materials rather than to the absence of our own formal operations!

This study is noteworthy for its problems. Again we see the demand on metacognitive skills; they are as likely to be age and stage related as is the comprehension of figurative language itself. Again we see problems with the underlying theory. How can ponies and branches literally share the attribute of being ridden? The whole point of the metaphor is that the branch is being ridden metaphorically. Finally, the results seem to allow one to conclude little more than that more difficult linguistic/cognitive tasks are performed better as children grow older.

Good empirical work on the development of metaphoric understanding must control for preexisting knowledge. The failure to do this renders the Billow study rather unrevealing, and it also turns out to be a problem for an interesting study described by Winner, Rosensteil and Gardner (1976). They hypothesized three levels of metaphoric understanding prior to mature comprehension. The first level is the "magical" level, the second the "metonymic," and the third they referred to as the "primitive metaphoric." Each of these levels, they suggested, can be regarded as a stage in the development toward the mature comprehension of metaphors. At the magical stage the interpretation is made literal by the mental construction of a suitable scenario. At the metonymic stage the terms in the metaphor are taken to be somehow associated, and at the primitive stage true metaphoric comprehension is partially present. For example, one of the items they

presented was The prison guard was a hard rock. The magical interpretation would be that the guard was (turned into) a rock. The metonymic one might be that the guard worked in a prison with rock walls, and the primitive metaphoric, that the guard was physically tough or hard. Children between 6 and 14 years of age were read the "stories" -- actually just context-independent sentences -- and they either tried to explicate the meaning, or they selected the meaning in a multiple-choice test. The results showed that metonymic and primitive responses were predominant for 6-, 7-, and 8-year-olds. Genuine metaphoric responses were prevalent for 10-, 12-, and 14-year-olds. The younger children had fewer magical responses than metonymic and primitive ones, but more than older children. These results do suggest that older children are more likely to select or offer genuine metaphoric interpretations than are younger children. The results do not, however, establish that younger children cannot properly interpret metaphors. In the multiple-choice condition, for example, there may have been a response bias in favor of interpretations consistent with the kind of stories children read -- young children are frequently exposed to stories about magical worlds. Perhaps a more serious problem lies in the fact that the stories were not really stories at all; they were isolated sentences without contextual support. It is almost certainly the case that the ability to deal with isolated sentences improves with age. Finally, the explication task again makes demands on metacognitive skills. Such approaches simply fail to give children a fair opportunity to demonstrate their ability to comprehend metaphors if they have it. The real question to be answered is, Can young children understand metaphors? To answer it,

children must be given the maximum opportunity to do so, since their relatively impoverished knowledge of the world, and of the conventions of figurative language, may mislead them into selecting more familiar interpretations.

Gardner (1974) conducted a study to determine whether or not the ability to make metaphoric links could be found in preschool children. Also attempted was an examination of the development of the ability to comprehend metaphor. Gardner proposed that the ability to project "sets of antonyms, or 'polar adjectives,' whose literal denotation within a domain is known, onto a domain where they are not ordinarily employed" (p. 85) could be considered a demonstration of the ability to comprehend metaphors. The experimental procedure involved using five pairs of polar adjectives as stimulus items to be mapped onto diverse domains. These items were presented to 101 subjects at four ages levels. The mean age of subjects in each of the groups was 3.5 years, 7 years, 11.5 years, and 19 years. Subjects were given a set of stimulus words (e.g., cold-warm) and were told to relate them to other adjective pairs, which encompassed five different modalities (e.g., blue-red: Which color is cold and which is warm?). The results showed a decrease in the number of errors made with increasing age except for the two oldest groups. Preschoolers, however, averaged only 8.91 (of 25 possible) errors. Gardner noted that close analysis of the data revealed several factors that seemed to contribute to the superior performance found in older subjects. These factors included the knowledge of physical laws, cultural conventions, a variety of connotative meanings for words, and the ability to find abstract connecting terms.

Gardner's conclusions were that preschool children can handle metaphors as well as adults can, provided that the contents of the metaphors lie within their experience. There is a problem with the study however. The relatively good performance of even the young children might be a reflection of their previous acquaintance with expressions like "red hot", or "blue with cold." There is, therefore, a potential confounding between comprehending metaphors, on the one hand, and responding to pre-established associations, on the other.

Gentner (in press) compared children and adults on the basis of a task rather different from those used in the studies cited so far. She supposed that having children map facial features or body parts onto pictures of objects (mountains, cars, and trees) would provide a test of metaphorical ability, at least insofar as the latter had an analogical component. One of her reasons for investigating the issue in this manner was that she wished to avoid the kind of pitfalls that she noted had plagued the field. In the experiment, subjects (20 children aged 4-5 1/2 years, and college sophomores) were asked questions of the form, "If the mountain in the picture had a nose, where would it be?" The results of the study indicated that the children were as good at the task as were the adults. Gentner concluded that her results "weaken the position that young children lack metaphorical ability, and are compatible with the hypothesis that such ability is present at the outset of language use." (p.     )

A recent study by Honeck, Sowry, and Voegtli (in press) led the authors to a similar conclusion. Like Gentner, they argued that previous research had not satisfactorily demonstrated children's inability to handle

figurative language because the task demands in most experiments have been too complex. They argued that if less complex tasks were used, even young children might demonstrate some understanding of figurative language. In line with this reasoning, Honeck et al. developed a two-choice response measure that was presented pictorially. In the study, children (7, 8, and 9 years old) were read 10 proverbs and were asked to select the picture that meant the same thing as the sentence. On the basis of a strong tendency to select the appropriate picture, they concluded that, contrary to other evidence, "children age 7-9 are able to comprehend proverbs" (p. ).

Most of the research we have discussed so far seems to suggest that although the ability to comprehend metaphors increases with age, there is some rudimentary ability quite early on. We now move on to look at some more naturalistic investigations into both production and comprehension of metaphors. We also examine the effects of attempts to train children to comprehend metaphors.

Grindstaff and Muller (1975) reviewed and summarized a national assessment of response to literature. One aspect of this assessment consisted of determining the ability of children to comprehend metaphors. The data were obtained from individuals aged 9, 13, 17, and from adults. Results indicated that comprehension of metaphors increased with age up to age 17. Adult performance dropped off somewhat. This latter finding was attributed to the effect of adults being out of school. Even though comprehension increased with age, 45% of the 9-year-olds were able to understand each metaphor. Sweet (1974) looked at the use of nonliteral language development in writing in Grades 4-6. He took three kinds of

samples from 81 subjects: a poem, a description, and a story. Scoring of the samples was done in terms of the occurrence of alliteration, apostrophe, hyperbole, irony, metaphor, personification, and simile. Sweet found that more nonliteral language was found in the poems and the descriptions than in the stories. No increase in usage was found between grades. As a final analysis, Sweet had a panel of expert judges rate the quality of each of the students' productions. He found that the judges tended to consider the use of figurative language indicative of superior products. Because of this result, Sweet suggested that instruction in the use of figurative language should be built into composition curricula for Grades 4-6.

It is interesting to note that when formal instruction is attempted there is evidence (Horne, 1966; Pollio & Pollio, 1974) that it is effective. This seems to be true both for instruction in using figurative language and for instruction in understanding it. Pollio and Pollio (1974) examined the ability of third-sixth grade children to use figurative language. They also compared two methods for increasing such usage: a commercial series of instructional texts designed to increase figurative language production, and a set of author-made lessons. Tasks of composition, elaborating comparisons between objects, and generating multiple uses for objects were included as the dependent variables. Results indicated that (a) children used metaphorical language as early as third grade, (b) children used more dead than novel metaphors in their composition and descriptions of multiple uses for objects, (c) children used more novel than dead metaphors in making comparisons, and (d) this pattern changed somewhat with grade, achievement level, and socioeconomic status.



Horne (1966) attempted to teach sixth graders how to comprehend figures of speech. He presented 73 sixth graders with 24 work sessions spread over 7 months. The sessions were designed to increase comprehension of the analogical nature of figurative language and to increase the production of such language in the children's writing. The experimental group performed significantly better than an untrained control group on the comprehension of, but not on the use of figurative language. Age, sex, and socioeconomic status were not correlated with either comprehension or use of metaphor. Scores on standardized intelligence tests were related to comprehension but not to use. This study demonstrated that children can be taught to increase their comprehension of metaphor.

The studies by Gentner (in press) and Horne (1966) seem to presuppose that analogical reasoning underlies the comprehension of figurative language. Research by Khatena (1973) and Levinson and Carpenter (1974) was explicitly concerned with investigating the development of analogical reasoning. Khatena (1973) examined the ability of children and young adults between the ages of 8 and 19 to produce analogies in response to a request to do so, given single word stimuli. Two-hundred eighty-four "high-creative" subjects were selected for the task, namely those subjects with high scores on an independent test Khatena had developed called "Onomatopoeia and Images." Khatena classified the analogies he elicited into four categories; personal, direct, symbolic, and fantasy, based on Gordon (1961). Personal analogies were identified as attempts by the subjects to compare themselves to an object (e.g., I'm happy as a lark). Direct analogies were defined as direct comparisons between objects (e.g., comparing a woman's body to summer

in the phrase, But they eternal summer shall not fade). Symbolic analogies compared symbolic representations of objects, rather than the objects themselves (e.g., sharks tearing at a marlin to represent critics analyzing a writer). Finally, fantasy analogies were characterized as those in which a comparison involved an imaginary or magical phenomenon (e.g., Satan). Each analogy was also classified as either simple or complex. Of a total of 4,960 analogies, 83.6% were direct comparisons; of these 81.2% were simple. Although the ability to produce complex analogies did increase with age, Khatena concluded from these findings that relatively young children can produce creative analogies and that creativity can perhaps be taught by instructing people to use simple, direct analogies. Unfortunately, it is not at all clear that these conclusions follow from the results of Khatena's study. Genuine analogies involve four terms: the fact that an individual produces a phrase like I'm happy as a lark in response to a word such as delight does not warrant any strong conclusion about analogical reasoning. Neither the study itself, nor the report of it could be regarded as exemplary.

Levinson and Carpenter (1974) considered the ability of 42 children, aged 9, 12, and 15, to complete quasi and true analogies. True analogies were structures such as "Birds are to air as fish are to \_\_\_\_\_," whereas the corresponding quasi-analogy would be "Birds use air, fish use \_\_\_\_\_." Thus, quasi-analogies specified the relationships involved, and true analogies did not. The results showed that 9-year-olds did significantly better on the quasi-analogies than on the true analogies but were still able to complete 50% of the true analogies (8 of 16). Both the

12- and 15-year-olds performed the same on the quasi and true analogies and were significantly better than the 9-year-olds in both cases. The ability to give reasons for the choices made on the analogies increased with age. The implications of Levinson and Carpenter's study are threefold. First, 9-year-olds can use analogies, and the ability to do so increases with age, although performance is fairly stable between ages 12 and 15. Second, the ability to explain choices improves with age. Third, perhaps quasi-analogies can be used to increase skill in true analogies.

Summary. Developmental research into the comprehension of metaphor seems to be plagued with many and difficult problems. These problems tend to be shared, and include such things as inadequate control over preexisting knowledge, inadequate control over difficulty of materials, overreliance on metacognitive/linguistic skills, and utilization of experimental tasks not clearly related to the comprehension of metaphor. There also seems to be an excessive concern with metaphorical uses of words, perhaps because researchers have relied on a working definition of metaphor as a word or phrase used to denote something that is not its ordinary referent. As will be discussed below, this is too restrictive a definition.

It is interesting that children can be taught to improve their comprehension of nonliteral uses of language, and it is also interesting that they appear to have reasonable analogical skills at an early age. The possibility therefore exists that the decrements in performance for young children could be largely accounted for by a paucity of relevant experience of the world and of the use of metaphors, rather than by the constraining influences of cognitive development. A greater emphasis on determining

whether there are any conditions under which young children do comprehend metaphors, and if so, what those conditions are, is needed.

In defense of those who have been working in the field, it should be noted that the area is very difficult to investigate and many of the problems appear, at least at first sight, to be inherent in the nature of the field. Literal controls are often difficult if not impossible to generate, especially if the emphasis is on investigating metaphoric uses of individual words.

Finally, in looking at the production of metaphors and the results of training, care has to be taken in judging what is and what is not true metaphor. Matter and Davis (1975) addressed this problem in their discussion of the developmental research done on metaphor:

In early stages of language acquisition children produce categorical errors and mistakes that can be taken as metaphorical expression but are not. The child is in the process of learning to recognize and correct perceptual, cognitive, and conceptual "error."...As these "errors" are corrected, children develop a highly literal linguistic behavior. In this intermediate stage, children are getting their categories straight....Following the literal stage, children again enter the world of category mistakes intentionally...they discover metaphor. (p. 75)

While we do not necessarily agree with this statement in its entirety, it is important insofar as it draws attention to the fact that not all literally inappropriate uses of language are, ipso facto, metaphorical uses: Some children's productions may very well be metaphors, but others may just be

reflections of misconceptions. In short, the expressions scored as metaphorical in some of the research cited above might simply be the efforts of a child making a "perceptual, cognitive, or conceptual 'error.'" This cautionary note is also important for research on older subjects. Research With Mature Language Users

Serious empirical investigations into the comprehension of metaphors by adults have been much less widespread than developmental research.

Koen (1965) suggested a psycholinguistic orientation to the study of metaphor. A prerequisite of this orientation is the assumption that literal terms and metaphors can be connected by common verbal associations in a semantic interface. (The interface contains associations common to both the literal and metaphorical terms.) Differences between metaphorical and literal meanings of the same word are characterized by different sets of unique associations. Koen predicted that metaphorical meanings could be derived from literal meaning through a search for common, linking associations. He tested this hypothesis by having subjects view sentences like The sandpiper ran along the beach leaving a row of tiny stitches/marks in the sand. In accordance with the verbal associative hypothesis, Koen made three specific predictions: (a) Cue words originally generated from the metaphoric terms should most often elicit the choice of the metaphoric terms, (b) cues words associated more frequently with the literal term should promote the choice of that term, and (c) interfaced associations should cue both terms equally well. The results mirrored these predictions exactly, but as with so many of the developmental studies, this study suffers from a weak connection between the experimental task and the comprehension of metaphor.

Indeed, it seems to reduce to a demonstration that highly associated words tend to be good cues for one another. Furthermore, the verbal associative argument itself is not well developed. Complex metaphors with many different facets would not be easily handled by it, although to some extent, this criticism is a general problem for laboratory investigations into the comprehension of metaphor. Finally, Paivio (1971) has suggested that an imageability interpretation could be made of the data. The cue words might simply be arousing images of the choice words, thereby facilitating their selection.

Some of the best studies carried out with either adults or children are those reported by Verbrugge and McCarrell (1977). They took the position that metaphors are comparisons that are comprehended when the unexpressed ground between the topic and the vehicle is inferred. Verbrugge and McCarrell noted that if this assumption is true, the principle of encoding specificity (Thompson and Tulving, 1971) would necessitate that the ground be an effective recall cue. To test this hypothesis two lists of 14 metaphors and similes were prepared. An example of one of the items is, Billboards are warts on the landscape. Here billboards is the topic, warts the vehicle, and the ground is something like, an ugly protrusion on the surface. The topics for each list were held constant while the vehicles (and hence the grounds) were allowed to vary. For example, List A might compare billboards to warts and List B, billboards to yellow pages on a highway. The experimental lists were presented to subjects (via tape recorder) with instructions to think about and understand the sentences. After completion of the list presentation, subjects received booklets containing the written prompts and

were asked to respond to each by writing the appropriate original sentence. The prompts were the grounds (relevant and irrelevant), topics, and vehicles from the presented sentences. The results showed that topics and vehicles prompted the highest recall with relevant grounds close behind. The irrelevant grounds were significantly less effective than the other three prompts. Clearly, the most important finding was the high level of recall for the relevant grounds (10 of 14 sentences), which seems to suggest that subjects do indeed infer the implicit ground of a metaphor when they attempt to understand it.

Before accepting this explanation, Verbrugge and McCarrell noted that several other explanations could be applied equally well to their results. Simply stated these other explanations are: (a) The relevant grounds are predicates or features of the topic which could have been available to the reader at acquisition, and therefore would be effective recall prompts even if they were not encoded as part of the inferred ground. Consequently, the finding that relevant grounds are good recall cues does not necessitate that the relevant ground was inferred. (b) The relevant grounds are predicates or features of the vehicle and therefore, for the same reasons, would be good recall cues. (c) The relevant grounds are high associates of the topic and the vehicle and therefore would be effective prompts for the target sentence event if the subjects had not previously seen the sentence. This last hypothesis is not unlike the one suggested by Koen (1965) that was discussed above. Using experimental materials and procedures similar to those already described, Verbrugge and McCarrell reported three further experiments which dealt with and discarded each of the suggested hypotheses.

Results indicated that neither the topic nor the vehicle alone can be viewed as the dominant, meaning-giving component of a metaphor. The two must interact to produce the relevant ground. The exact nature of this interaction was not explained, but Verbrugge and McCarrell stated that they had found, "...several indications that the vehicle plays the major role in guiding the comprehender toward a resemblance. Schemata in the vehicle domain tend to be the predominant source of constraints by which the topic domain is interpreted." (p. 52) They were also able to conclude that a simple associative view is not sufficient to account for the interpretation of meaningful metaphors.

In summary, Verbrugge and McCarrell drew three main conclusions from their research. First, the comprehension of metaphors is both easy and consistent for adults. Second, the comprehension of metaphors involves inferring an implicit comparison between the topic and the vehicle. Finally, when a metaphor is comprehended, attention is directed to some aspects of the topic at the expense of others. Verbrugge and McCarrell raise several theoretical questions that they make no attempt to answer, but there is little doubt that the quality of their research is unusually high.

Although the next studies to be discussed did not deal specifically with metaphor, they were concerned with related subjects. A discussion of them is relevant to the more general functioning of figurative language. Bock and Brewer (Note 2) described a study concerned with the literal and figurative interpretations of proverbs. Their primary purpose was to demonstrate that subjects process at the literal and figurative levels, proverbs and that using a procedure designed to enhance figurative comprehension would greatly



improve the level of figurative recognition.

The experimental materials were composed of proverb sets containing a proverb, four manipulations of it, and a control. Specifically, each set contained (a) the OP, (b) a paraphrase of the OP that maintained its literal meaning, (c) a paraphrase that was an incorrect literal statement of the OP, (d) a paraphrase that was a statement of the figurative meaning of the OP, (e) an incorrect paraphrase of the figurative meaning of the OP, and (f) a control proverb with both figural and literal differences from the OP. Twenty different proverb sets of this form were developed. The manipulation consisted of two treatments. Subjects were presented with one of the several proverb lists and were given a two-alternative forced-choice recognition test. Another group of subjects received a similar proverb list but took a figural-comprehension test after each presentation (again, a two-alternative forced-choice test). These subjects then received a recognition test like that given to subjects in the first group. The results of the experiment suggested three main outcomes. First, improved comprehension of the figural meaning at acquisition (deep-comprehension condition) led to increased recognition of figural meaning on the criterion test. Second, at the time of the recognition test (5 min. after lists were presented) subjects showed good memory for the original syntactic structure, lexical information, literal meanings, and figural meanings. Bock and Brewer suggested that this illustrates the weakness of associative models such as (J. Anderson & Bower, 1973), which treat only one level of processing. Third, contrary to other findings (Sachs, 1967), subjects in this study demonstrated extremely good memory for items at all levels of processing, including surface structure.

It could be, however, that the two-choice testing procedure created this last result. This study seems to illuminate some interesting possibilities for research with metaphor. Since good memory was exhibited for both literal and figurative meanings, a reconstructive approach to metaphor might be feasible. That is to say, the figurative meaning of some metaphorical communication could be constructed at recall as well as at acquisition. The results suggest that if procedures are used that require the comprehension of a figurative level of meaning, memory for the figurative meaning will be quite good. It should be noted, however, that in Bock and Brewer's deep-comprehension task, subjects actually received two exposures to the correct figurative interpretation. This might account for the high figurative-recognition scores just as well as the deeper-processing hypothesis does.

Osborn and Ehninger (cited in Reinsch, 1971) examined the functions of metaphor in rhetorical discourse. On the basis of an informal, subjective evaluation they concluded that the metaphorical process was characterized by three mental events: error, puzzlement-recoil, and resolution. Error was thought to encompass the hearer's initial unsuccessful attempt to understand the metaphorical statement literally. Puzzlement-recoil describes the cognitive difficulty (dissonance?) that follows error and leads to the rejection of the literal interpretation. Resolution suggests the mental discovery of similarities between the topic and the vehicle of the metaphor. The Osborn and Ehninger paradigm seems to suggest rather naturally the approach recently taken by Brewer, Harris, and Brewer (Note 3).

Using proverbs again, Brewer et al. postulated that unfamiliar proverbs are understood in two sequentially ordered steps. The notion is that on

encountering a proverb, one first attempts to comprehend the literal meaning, and only after that is accomplished is the figural meaning processed.

Fifty-six proverb sets were constructed, each containing a proverb and the same 4 manipulations of it used in Bock and Brewer (Note 2). The subjects were instructed to read and understand two sentence (selected from the manipulations) and to determine if they had the same or different meanings. Experimental pairs were constructed by randomly combining OPs and their paraphrases. Half the time the OP was presented first, and half the time, second. It was found that it took subjects longer to understand the figural meaning when the OP was presented second, but not when it was presented first. This interaction was expected because when the OP was presented first, both figural and literal meanings were available to the subject. When the OP was presented second, the figural meaning had to be comprehended from the literal meaning. These results seem to support the hypothesis that comprehension of the literal level of meaning precedes the comprehension of the figural level. Brewer et al. concluded that since both metaphors and proverbs have figural and literal components, this finding should generalize to the more global case of metaphor.

Summary. Research into the comprehension of nonliteral uses of language done with adults has yielded only slightly more information than that done with children. The Verbrugge and McCarrell (1977) experiments do seem to reveal an interesting quality of metaphors. The fact that the inferred ground of a metaphorical relationship acts as a good recall cue seems to indicate that some additional inferential processing is done when a metaphor is comprehended. The nature or depth of this processing, however, is not

revealed. The research of Brewer and his associates (Bock & Brewer, Note 2; Brewer et al., Note 3) suggests that processing nonliteral uses of language involves processing the literal meaning first, although as will be discussed later, evidence to the contrary has been found by Ortony, Schallert, Reynolds and Antos (in press).

The adult research is scanty but promising. Many questions remain to be answered, perhaps the most important of which is: What is the relationship between the literal and nonliteral meaning? The box has been opened, but the contents have yet to be examined.

#### The Prognosis for Research

Traditionally, the study of metaphor has been predominantly undertaken by scholars of philosophy and literature; it has been slow to find its way into psychology. Yet, an understanding of metaphor, the processes underlying its comprehension, and the communicative functions it serves is not only an interesting and provocative area in cognitive psychology and psycholinguistics, but it also has important implications for educational psychology. The first part of this section is devoted to a discussion of the relevance of research in the area of metaphor with respect to its relationship to theories of language comprehension. Its implications for educational psychology will be discussed in the second part of the section.

#### The Relevance of Metaphor for Psychological Theory

During the last few years cognitive psychology has seen a surge of interest in models of semantic memory and language comprehension, but it seems that few theorists who have worked in this area have considered metaphor sufficiently important to warrant their attention. Kintsch (1972,

1974) and, to some extent, Collins and Quillian (1972) might be regarded as exceptions to this generalization, but still, although they acknowledged the problem, they had relatively little to say about it. Rumelhart and Ortony (1977) discussed the way in which schema theory might handle the comprehension of metaphor, but again the discussion was peripheral to their main concerns. Yet metaphors are not freak occurrences disturbing the otherwise smooth flow of ordinary literal language use, rather, they are widespread in the everyday language that people encounter. Consequently, we are of the opinion that any psycholinguistic theory that does not handle metaphor is incomplete, and any that cannot is inadequate. Admittedly, an account of the way in which people understand nonliteral uses of language is a fairly heavy demand to place upon a theory of language comprehension (indeed, it might be objected that it is an unfairly heavy demand!), but it is probably a crucial test. Different theoretical notions about language comprehension are likely to lead to different predictions about the comprehension of metaphors. However, it seems to be necessary to extend theoretical positions beyond their current form to make any such predictions at all.

In terms of the robustness of the models that psychologists have proposed for the way in which people understand language and the way in which they store the results of that understanding, metaphor could pose some quite serious problems. For example, propositional models, which are characterized by the representation of all knowledge and comprehended sentences as propositions (e.g., J. Anderson & Bower, 1973; Kintsch, 1974), seem to be forced to treat metaphors as semantic anomalies. Propositional theories seem

to be hampered by their reliance on too rigid a notion of word meaning (see, e.g., R. C. Anderson & Ortony, 1975), and this constraint is likely to lead to an overly hasty characterization of input sentences as semantically anomalous. The representation of word meanings in such models simply fails to permit the kind of flexibility that would be required to make sense of a metaphor. In any event, models of this type, were they to attempt to make sense of metaphors, would appear to require a two-stage process. The first stage would involve an attempt to impose a literal meaning on the input sentence, which presumably would fail. The second stage would involve an attempt to recover from the error.

Several instances of stage models have in fact been proposed. Kintsch (1974) proposed one for the comprehension of metaphors, Brewer and his collaborators proposed one for proverbs, and Clark and Lucy (1975) proposed one for the comprehension of indirect requests. Kintsch (1974) supposed that all metaphors are necessarily semantically anomalous. He proposed that a metaphor would be recognized as an anomalous input string and would therefore be converted into an explicit comparison. As Kintsch himself observed, this mechanism suffers from an inability to distinguish metaphors from uninterpretable nonsense and irrelevant falsehoods. Furthermore, it is by no means clear that every metaphor can be readily converted into an explicit comparison.

The model tested by Clark and Lucy\* (1975) lends itself fairly readily to application to the comprehension of metaphors. Indeed, such a model has been proposed as a quite general one for the comprehension of language that superficially fails to cohere with the surrounding context. This proposal was

made, most notably, by Grice (1975), who argued that linguistic interactions are governed by an implicit convention, the Cooperative Principle, whereby utterances are normally sincere, relevant, appropriately precise, and clear. Grice cast these expectations as maxims and proposed that sometimes one or more of the maxims might appear to be violated, but that in reality they rarely are. Apparent violations are resolved by a hearer through a variety of inferential strategies. Searle (Note 4), working in the same paradigm as Grice, addressed the problem of metaphor explicitly. He argued that the comprehension of metaphors involved the hearer determining the utterance meaning from the sentence meaning, given that the latter is judged to be defective. He argued that the difference between an indirect speech act (such as Clark and Lucy investigated) and a metaphor is that in the former the speaker means both the literal meaning and the conveyed meaning, whereas in the latter, only the conveyed meaning is intended. Searle's treatment requires that the hearer determine that the sentence meaning is defective. Consequently, the hearer must process the literal meaning of the sentence first so that this determination can be made. Then, when the hearer fails to comprehend the sentence in the context, it becomes necessary to seek some alternative meaning, presumably on the basis of the literal meaning. Both the proposal of Kintsch, and that implied by Verbrugge and McCarrell (1977), could be regarded as potential accounts of how this reinterpretation stage is achieved.

The account offered by Verbrugge and McCarrell lacks some of the pitfalls of the one offered by Kintsch, perhaps because it is not dependent on an underlying propositional model of comprehension and memory. Their

position seems more compatible with the kind of knowledge representations advocated by schema theorists (see, e.g., Minsky, 1975; Rumelhart & Ortony, 1977; Schank & Abelson, 1975). At least in some versions of this approach, knowledge is represented in a more flexible manner than in propositional models. In propositional models, word meanings are represented as propositions about the core meaning, but in schema theory what gets represented is knowledge associated with the things to which the words refer. Thus, what a schema contains is not so much information about what is necessarily the case, but information about what is usually or normally the case. For example, in a propositional model the meaning of a word like cow is pretty much exhausted, in the best Aristotelian tradition, by a statement of its species and differentia. A cow is a mature female of cattle. In contrast, the schema for cow would include a great deal of information people have about cows: that they are domesticated, provide milk, and so forth. The structure of a schema is of a series of variables together with relationships among them. There are constraints on the values that the variables may take, but these constraints are rarely absolute, although some values are more typical than others. This kind of representational system appears to offer greater flexibility for matching incoming information to previously stored knowledge, and with this flexibility comes a better prospect for dealing with nonliteral uses of language. The metaphorical interpretation would be achieved by finding that schema or those schemata which matched the input in such a way as to minimize the required changes in variable ranges.



So, if one is permitted sufficiently liberal speculations, one can be led to suppose that propositional models and schema theoretic models will make different predictions about the comprehension of metaphor. In particular, propositional models appear to be forced to specify special processes for the comprehension of metaphor, whereas schema based models perhaps need not. This is because propositional models seem likely to treat metaphors as anomalies whose recognition invokes reinterpretation procedures. Schema based models usually operate on finding the best possible account of an input, so that a metaphor may merely result in the same process finding a less complete account than it does for literal language (see, for example, Rumelhart, Note 5).

It might be argued that there is yet another class of theories that makes different predictions about the comprehension of metaphor. The theories in question are not really incompatible with propositional or schema theories. We refer to the so-called network theories (e.g., Collins & Quillian, 1969, 1972; Collins & Loftus, 1975; Quillian, 1968). Network theories are more process-oriented than structure oriented. They say nothing about the internal structure of the concepts that constitute the nodes of a semantic network. Rather, they concentrate on the consequences of a spreading activation mechanism for moving about within such a network. If some of the nodes represent propositions, then a propositional model can utilize such a mechanism, and if the nodes represent schemata, then a schema theoretic approach can utilize it (see, e.g., Ortony, 1978, in press). The basis of the spreading activation process is the notion of an intersection, namely, a node that is connected to and, consequently activated by two or more of the

concepts in the input string. An intersection has to be semantically close to the originating nodes so as to avoid every node in the network being an intersection of every set of originating nodes. Why should such a mechanism not be admirably suited to the comprehension of metaphors, as was implicitly supposed by Koen (1965)? Can the ground not be automatically determined by finding an intersection from the topic and the vehicle? The incompatible aspects of the two, namely the basis for the metaphoric tension, would be bypassed and only the ground of the metaphor would be accessed. It may well be that such a process plays a role by suggesting candidate schemata, but it cannot possibly be a sufficient account of the processing of metaphors. There are several reasons for this, but perhaps the most telling is the fact that it would fail to account for the asymmetrical nature of metaphors. Using Verbrugge and McCarrell's (1977) example of Billboards are warts on the landscape again, one observes that it means something entirely different from Warts are billboards on the landscape, yet a spreading activation mechanism would almost certainly result in the same intersection for both, even though the grounds of the two metaphors are rather different. So, the predictions made by network models alone are counterintuitive. The predictions that it makes in conjunction with a propositional or schema theoretic model will depend on exactly how the two are put together.

The manner in which competing theories deal with the comprehension of metaphors seems to constitute a challenge to the to the goodness of those theories, but such a challenge cannot be taken up until there exists a coherent and reliable body of knowledge about human performance on metaphoric comprehension. We have suggested that such a body of knowledge does not yet

exist and that the generation of one is a worthwhile enterprise.

If the study of metaphor is important in cognitive psychology, it is no less important in educational psychology. The most obvious reason for this is that a major concern in educational psychology is with the processes underlying the acquisition of knowledge. Since so much of what people learn is learned through the medium of language, and since metaphors are so prevalent in language, it follows that knowing how metaphors are processed and what constraints exist on their comprehension is bound to contribute to our understanding of the learning process. However, there are more profound ways in which metaphor is of concern in educational psychology, reasons concerned with pedagogy and radical conceptual change. In discussing the role of metaphors in education, it is necessary to broaden our notion of metaphor. For although metaphors occur in instructional materials and in instructional dialogue at the level of individual sentences, the really crucial role they play is in systems. We might call them extended metaphors, or analogies, or even models.

It is common sense that it is easier to understand new things if they are cast in terms of old. In the field of developmental psycholinguistics this fact has been expressed by Slobin (1971) in terms of the principle, "New forms first express old functions, and new functions are first expressed by old forms" (p. 317). Apart from the fact that this principle in itself is consistent with the generation of metaphors by children, it seems to be a general principle of learning. It follows that the manifestation of the principle will occur through a process which in some way compares, explicitly or implicitly, the old function served by the old form and the new function

served by it. One of the ways in which such comparative relationships can be drawn out is by the use of metaphors, similes, analogies, and models.

It would be a mistake to restrict one's concern with the role of metaphors in learning to the learning of subject matter. There are more global educational processes in which metaphor plays an important role. Petrie (1976) discussed these issues when he talked about problems of interdisciplinary work, particularly in the context of the problems posed by the fact that different disciplinary orientations give rise to different ways of perceiving the same phenomena. Petrie claimed that the reason for this is that different disciplines presuppose different cognitive maps, by which he meant

the whole paradigmatic and perceptual apparatus used by any given discipline. This includes, but is not limited to, basic concepts, modes of inquiry, problem definition, observational categories, representation techniques, standards of proof, types of explanation, and general ideas of what constitutes a discipline. (p. 11)

He argued persuasively that the key pedagogical tool for bridging disciplinary gaps is metaphor, conceived of in the same broad way in which we do here.

We are of the opinion that there are very good reasons for investigating metaphors from a psychological point of view. It is too important an area in both cognitive psychology and educational psychology to leave to the a priori ruminations of philosophers. Such efforts have not only failed to come up with a satisfactory account of what a metaphor is, they are also quite

sterile so far as accumulating empirical data is concerned. One shortcoming of almost all the research that we have cited is that the locus of a metaphor is assumed to lie in a word, or perhaps an expression, within a sentence. If research is to progress it will be necessary to adopt a less restrictive account of what a metaphor is. It is our hope that this review can make a positive contribution by proposing such an account, which, if adopted might have some immediate implications for the conduct of empirical research. An Approach to the Study of Metaphor

The general questions that need to be answered concern when and why people use metaphors, when and how they understand them, and how the processes presumed to underlie their use and comprehension relate to those involved in the comprehension of literal uses of language. It is our contention that the answers to these questions will not be forthcoming if one characterizes metaphors by attempting to diagnose peculiarities in the surface structure of an utterance. As discussed above, for example, the characterization of metaphors as semantic anomalies is accompanied by severe theoretical problems. It simply is not the case that all metaphors are semantically anomalous, so semantic anomaly cannot be a necessary condition for something to be a metaphor. Indeed, one of the most compelling facts about metaphors is that many are semantically perfectly well-formed. It is also one of the most widely ignored facts. Consider, for example, the final sentence of the Summary section above, The box has been opened, but the contents have yet to be examined. This is a perfectly normal English sentence, it is syntactically and semantically unremarkable. Yet it occurred in a context that required it to be interpreted metaphorically. In other

words, that sentence in that context was a metaphor. Of course, most contexts in which that sentence would be used would be contexts inducing a literal interpretation. Consider another example:

1. Regardless of the danger the troops marched on.

Again, this is a perfectly ordinary sentence which, in the context of an army marching to battle would normally receive a literal interpretation, but in other contexts it may have to be interpreted metaphorically, as in the context 2:

2. The children had been annoying their teacher all morning and she was becoming increasingly irritated by their unruly behavior. She simply did not know how to stop them from climbing on the chairs and tables and throwing all manner of objects about the room. She decided to threaten to punish every one of them if they did not stop. As loud as she could she shouted her warning. She would make them all stand outside in the rain. Regardless of the danger the troops marched on.

In the context of the ineffectual school teacher and her problem Sentence 1 is a metaphor. Definitions of metaphor that concentrate on words or phrases in sentences are going to have difficulty accounting for the metaphorical use of an entire sentence as opposed to a word or phrase within a sentence. Such definitions are common in dictionaries, and they appear to be the working definitions that have been presupposed in most of the empirical research that has been undertaken. The examples just given are not cases of a word or

phrase being applied to something it does not usually denote because none of the substantive words denote their usual objects or concepts. Thus, in Sentence 1 standing in the rain is hardly a danger, there are no real troops, and there is no real marching. Perhaps the metaphor is not be a very good metaphor, but that is beside the point. What matters is that we recognize it as a metaphor, as a whole-sentence metaphor, not a part-sentence metaphor. What makes the sentence a metaphor is not any characteristic of its surface structure, but the context. The fact that entire sentences can be metaphors has not been totally overlooked. It is implicit in Perrine's (1971) four categories of metaphor since in one of them the topic is implicit as it is in Sentence 1. While Perrine did not explicitly deny that semantic anomaly was a necessary condition for metaphor, there are linguists who have strenuously denied it, as have, for example, Reddy (1969) and Van Dijk (1975).

It is now possible to assert that any definition of metaphor must encompass not only part-sentence metaphors but whole-sentence metaphors as well. One way to achieve this end is to require that a metaphor be pragmatically, or contextually anomalous, rather than semantically anomalous. This is to say that literally interpreted the sentence must be incongruous in the context in which it appears. Since semantically anomalous sentences are incongruous in all contexts if they are interpreted literally, part-sentence metaphors are automatically included.

All metaphorical uses, be they of words, phrases, sentences, or even larger linguistic units, must have their metaphorical meaning characterized in terms of their literal meaning. In Sentence 1 the metaphorical meaning is related to certain components of its literal meaning. So, the metaphorical

meaning of Sentence 1 in the context of 2 will be those contextually relevant salient components of its literal meaning that do not conflict with the context. For example, one implication of the literal meaning of Sentence 1 is that a group of people continued doing what they were already doing without concern for the consequences. Another is that these consequences were undesirable, and another, that the people were aware of this but were stubbornly unconcerned, and so on.

The selection of salient aspects of the literal meaning of a metaphor that are not incompatible with the context was referred to as a process of tension elimination by Ortony (1975). In the case of a metaphor such as Sentence 1 in Context 2, the tension is caused by the incompatibility of the literal interpretation of Sentence 1 and the context in which it occurs. The notion of metaphoric tension is just as applicable to semantically well-formed sentences such as Sentence 1 as it is to semantically anomalous sentences such as Sentence 3, which constituted the prototypical metaphor for early research.

### 3. The ship plowed the seas.

In both Sentences 1 and 3, comprehension seems to require the elimination of aspects of the meaning of expressions that when interpreted literally give rise to tension.

Perhaps we should now try to reformulate a definition of metaphor. A first condition for something being a metaphor appears to be that it is contextually anomalous. This means that if it is interpreted literally, it fails to fit the context. This allows Sentence 1 to be a metaphor in Context



2 but prevents it from being one in those cases in which it is literally interpretable. Consequently, a metaphor is not a sentence, but a token of a sentence or an utterance. The contextual-anomaly condition also allows us to include Sentence 3. Part sentence metaphors, such as Sentence 3, are semantically anomalous, and if interpreted literally, semantically anomalous sentences are nearly always also contextually anomalous. The contextual-anomaly condition is a necessary condition, but it is not sufficient for it fails to exclude cases such as Sentence 4, which are unresolvable semantic anomalies:

4. Regardless of the wavelength, some anger programmed the bus sandwich.

It might be argued that in some possible context, Sentence 4 could be used metaphorically or even literally, and if this is indeed true, one would not want to exclude it. But for the sake of argument, let us suppose that it is an unresolvable semantic anomaly. This suggests a second condition, namely, that for something to be a metaphor, it must be possible, in principle, to eliminate the tension. Taken together, these two conditions are necessary and sufficient for a linguistic expression to be a metaphor. The expression should be contextually anomalous, and the metaphorical tension must in principle be eliminable. These conditions ought probably to be elaborated in terms of the speaker's intentions. One might, for example, claim that for a speaker to intend to utter something metaphorically, he must believe that both conditions hold. If he doesn't, he still might produce a metaphor, but by accident. It would be an accident in the sense that a

hearer might wrongly attribute to the speaker certain intentions he never had; consequently, communication might break down.

The definition of metaphor that has been offered has some attractive features when employed in empirical research, but before discussing these it is important to emphasize that it is only a definition. The definition does not itself entail anything about processing mechanisms, and in particular, it does not follow from the definition that metaphors are understood by first recognizing the contextual anomaly and then resolving the metaphoric tension. A simple example should make this clear. One of the most concise definitions of the factorial function (!) is a recursive one: for any integer greater than 1,  $n! = n \times (n-1)!$ . It does not follow from this definition, however, that people compute factorials by using recursion. The definition serves to delimit instances of the phenomenon, and that is all. The reason we have offered a definition is that we believe that the phenomenon of metaphor is not, typically, properly delimited.

If metaphor is defined as tension resolvable contextual anomaly, where tension resolution can be independently characterized, (see, Ortony 1975), it becomes possible to conduct empirical research that is free of many of the difficulties that seem to be so widespread in the literature. One can investigate the comprehension of metaphors with a variety of dependent measures, while controlling for surface structure characteristics. This can be done by comparing performance using a target item when its preceding context induces a literal interpretation with performance using the same target when the context induces a metaphoric interpretation. One can also control for meaning, since it is much easier to generate a literal paraphrase

of a whole-sentence metaphor than it is of a part-sentence metaphor.

(Compare the ease of generating a literal equivalent of Sentence 1 as opposed to Sentence 3.) Whether or not whole-sentence metaphors are easier or more difficult to understand than part-sentence metaphors is a question that cannot yet be answered. But our feeling is that much more can be learned using whole-sentence paradigms and that that is the place to start.

If the definition of metaphor just proposed is accepted, interesting implications follow for the relationship between metaphors and comparisons. As our review has shown, many theorists believe that metaphors are (intended to suggest) comparisons. The account that we have given suggests that the role of comparison is in the tension-elimination process itself. Undoubtedly some metaphors are intended by their authors to focus on comparative aspects, but others may be vehicles for understanding things in new ways or for expressing what is literally inexpressible. In such cases comparison may be better regarded as the means of comprehension rather than the purpose of it. In any event, invoking comparison to explain metaphor has its own problems. For one must distinguish between literal comparisons and nonliteral comparisons.

Assume that someone utters Sentence 5 with a view to asserting that encyclopaedias are of great (intellectual) value.

##### 5. Encyclopaedias are goldmines.

The futility of the comparison theory of metaphor as a basis for a psychological explanation of the comprehension process can be seen by considering the fact that the comparison theory entails that Sentence 5 means

the same as Sentence 6.

6. Encyclopaedias are like goldmines.

In a word, the problem is that they are not! Encyclopaedias are like dictionaries, not goldmines. People are very willing to agree that encyclopaedias are like dictionaries, but if asked whether they are like goldmines, they respond "not really", or "sort of". In other words, encyclopaedias are only like goldmines metaphorically. So, the explicit statement of comparison that is supposed to underlie the metaphor is itself metaphorical in nature. Thus, the comparison theory explains nothing about metaphor, since the problems all reappear in the comparisons. What would be needed for the comparison theory to work is a theory of similarity that could distinguish between literal and nonliteral similarity statements. Ortony (Note 6, Note 7) outlines the nature of such a theory starting from the theory of similarity proposed by Tversky (1977). This observation has one other consequence. Just as it is fruitless to attempt to reduce some metaphors to statements of comparison, so too is it fruitless to try to reduce others to analogies. For what is an analogy if not a statement of similarity between relations? This being the case, some analogies will be literal and others non-literal. All this means is that metaphors cannot be explained away by appeal to comparisons. It does not mean that comparisons are not heavily implicated in the comprehension process.

Conclusion

We have reviewed traditional theories of metaphor and found them inconclusive. We have reviewed the developmental literature and found it

inadequate. For the most part it establishes that as children get older they get better at doing certain things. We have reviewed the adult literature and found it wanting, although often of better quality. The diagnosis that we offered was that the empirical research suffered from the effects of an inadequate working definition of the phenomenon being investigated. These effects concern lack of adequate controls. All too often there is nothing with which to compare the comprehension of metaphors. Finally, we attempted to provide a definition of metaphor that would satisfy the needs of meaningful empirical research. We suggested that a profitable approach might be to manipulate contexts to induce different interpretations of a target sentence. Such targets offer better prospect for paraphrase than do part-sentence metaphors. Our own experience is that this paradigm is very effective. It was used by Ortony, Schallert, Reynolds and Antos (in press) in a reaction time study to show that the kind of analysis offered by Searle (Note 4) seems to best fit cases of metaphoric comprehension wherein there is minimal contextual support, perhaps reflecting a deliberate inferential strategy on the part of the comprehender. As the amount of contextual support increased, so did it become increasingly difficult to discriminate between the comprehension of literal language and the comprehension of metaphorical language in the sense that the evidence for the additional time required to engage in special processes disappeared.

The psychological study of metaphor is about to ripen. Its fruits promise to be useful both theoretically, in psycholinguistics, and practically, in education. Perhaps this review can contribute to the ripening.

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