dated', or 'Our relationship has come to a crossroads'. Once a target domain (e.g. love) has been described in terms of a source domain (e.g. journeys), new correspondences can be introduced, as in 'Let's walk off into the sunset together'. Whether the analogical coherence of metaphorical expressions constitutes conceptual knowledge *per se* (as argued by the linguist George Lakoff and colleagues) or simply an efficient means of communicating about complex domains remains largely an unresolved issue.

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Metaphor Processing, Psychology of

Introductory article

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CONTENTS

Introduction
Metaphor and literal similarity
Theories of metaphor comprehension
Psychological experiments on metaphor
'Dead' and living metaphors

A metaphor is a statement that characterizes one thing in terms of another thing, juxtaposing concepts from separate domains of experience. Metaphor can be used to describe abstract or unfamiliar topics, and to express ideas difficult to convey with literal language.

INTRODUCTION

A metaphor is a statement characterizing one thing in terms of another, where the two are normally considered to be unlike: for example, 'Time is a river'. Metaphors involve the juxtaposition of concepts from separate domains of experience; they ask us to think of something in terms of something else that is radically different. Aristotle regarded metaphor as the *master trope* – the figure of speech most associated with poetic genius. Such figurative juxtapositions of concepts can be expressed in a variety of ways.

Metaphors are closely related to similes, which have an explicit comparison term: for example, 'Time is like a river'. In a standard metaphor or simile, the first term ('time') is called the *topic* and the second term ('river') is called the *vehicle*. The interpretation of the metaphor is called the *ground*. In a good metaphor, the interpretation reveals something interesting about the topic, and sometimes about the vehicle as well.

Metaphors serve a number of cognitive and communicative functions. For instance, they can provide a compact and memorable way of expressing ideas that would be difficult to convey with literal language. Metaphors are often used to describe abstract or unfamiliar topics. For example, time (a relatively abstract dimension) is often described

using metaphors drawn from space, as in 'The holidays lie before us' or 'Summer is coming fast'. Metaphors are common in literary and poetic contexts. They are also associated with new discoveries in scientific domains, as in the water wave metaphor for light. Metaphors are also common in everyday discourse. Systems of metaphors pervade our language and are often used to discuss abstract ideas. For example, people speak of 'life as a journey' with its 'pitfalls' and 'rough places' and occasional moments of 'coasting'. Cognitive linguists like Lakoff, Turner, and Fauconnier have analyzed systems of metaphors such as 'marriage as a journey' and 'politics as war'. There is evidence that some conceptual metaphoric systems, such as the space–time metaphors noted above, are not just ways of talking, but are also used in thinking.

METAPHOR AND LITERAL SIMILARITY

Literal similarity comparisons differ from metaphors in that, in literal similarity, many or most properties match, whereas in metaphor only a few properties match. As Ortony noted, the matching properties in a metaphor are often far more salient in the vehicle than in the topic. The metaphor acts to highlight otherwise unnoticed properties of the topic. Gentner and her colleagues found that many of these highlighted properties are relational: for example, 'Sermons are sleeping pills' conveys that they both put people to sleep. Because properties of the vehicle are used to illuminate the topic, metaphors are strongly directional. This directionality is a key diagnostic of literal versus metaphorical comparison. Whereas literal comparisons can typically be reversed – for example, 'A sweater is like a jacket/A jacket is like a sweater', a metaphorical comparison cannot – for example, 'Some jobs are jails/Some jails are jobs'.

THEORIES OF METAPHOR COMPREHENSION

A central question in research on metaphor is how metaphors are understood. In the past, metaphor was viewed as a peripheral aspect of communication, secondary in status to literal language. Early models of metaphor comprehension treated metaphors as deviations from proper literal language – as literally false expressions that violate the usual norms of communication. Current models view metaphor more positively, as a normal part of language. However, theories differ in exactly how metaphor is processed.

One long-standing approach is to view metaphor comprehension as property-matching. In this view, metaphors are understood by means of finding common properties, and the interpretation of a metaphor is the set of properties shared by the two terms. For example, 'The road was a silver ribbon' conveys the common property of a long thin silver line. This idea that metaphor comprehension involves a search for commonalities is intuitively appealing and widely accepted. However, it is not the whole story. In general, metaphors also convey new information that can be imported from the vehicle to the topic. For example, the metaphor 'That senator is a puppet' can be used to convey that the senator is being manipulated by someone else. Thus, metaphors do more than highlight existing commonalities – they create new insights about the topic.

Metaphors thus involve both highlighting common information and projecting new information from vehicle to topic. There are two current theories that attempt to explain both these aspects of metaphor: one likens metaphor to analogy, and the other likens metaphor to category inclusion. Taking the analogy view, Gentner and colleagues propose that metaphors are processed by means of the same structure-mapping processes that are used to understand analogies. Analogies are often used to explain or predict the behavior of an unfamiliar complex or abstract system by comparing it to another, better understood system: for example, 'Electricity is like water flow' or 'Poverty is a disease'. Further, the information conveyed by an analogy is typically relational information, rather than simple object properties. For example, the electricity/water flow comparison does not mean that electricity is wet or blue like water, but rather that it obeys the same relational principles: it flows from a high place (high voltage) to a low place (low voltage), it is impeded by obstacles (resistors), and so on.

On this view, metaphors are like analogies. They are comparisons between two situations that highlight common information and invite inferences from the base (the vehicle) to the target (the topic). For example, to understand a metaphor like 'A suburb is a parasite' the hearer first compares the topic and vehicle (base) representations, arriving at a common relational system: for example, 'A suburb uses the resources of a city just as a parasite uses the resources of an organism'. Once this structural match is established, any additional properties connected to the common relational system are projected as possible influences – for instance, the knowledge that parasites can sap the strength of an

organism might be transferred to the topic concept, resulting in the inference 'Suburbs can sap the strength of a city'. By mapping the set of relations in the vehicle to the topic, one gains new insight into the topic.

Another prominent approach views metaphors as category statements. In the Attributive Category theory of Glucksberg and his colleagues, metaphors are understood as class inclusion statements. The idea is that in a metaphor one asserts that the topic is a member of the category of which the vehicle is a prototypical member: for example, the metaphor 'A suburb is a parasite' asserts that suburbs can be classified as parasites. Of course, suburbs do not fit the literal meaning of parasite – 'an organism that lives off another organism'. A metaphorical meaning such as 'something that lives off the resources of another entity without recompense' must be invoked or created from the vehicle. By assigning the topic 'suburb' to this metaphorical category, the properties of the metaphorical category derived from the vehicle can be attributed to the topic. On this account, metaphors are processed differently from literal statements. An open question for category theories is what signals the listener to create a metaphorical category instead of using the literal meaning of the vehicle.

PSYCHOLOGICAL EXPERIMENTS ON METAPHOR

Much early metaphor research was devoted to testing the claim that metaphors are deviant forms of language that require extra processing to be understood. According to the deviance view, hearers first try to derive a literal interpretation of the expression. They then assess whether that interpretation is plausible, given the context. Only if the literal interpretation is anomalous or false does the listener start over again and derive a metaphoric interpretation. One implication of this approach to metaphor comprehension is that, because literal interpretation precedes metaphoric interpretation, metaphors should take longer to process than literal statements. A second implication of deviance models is that, because literal interpretations are taken to be obligatory, metaphoric interpretations should be sought only when literal interpretations are defective. Neither of these predictions has been reliably borne out in empirical studies. Most researchers now believe that the processes involved in comprehending metaphoric language are much the same as those used for literal language.

An influential piece of early research by Glucksberg and his colleagues dealt a conclusive blow to the two-stage deviance view. Their studies provided strong evidence against the view that people first attempt a literal interpretation and resort to metaphorical interpretation only if the literal interpretation is anomalous. Participants were simply asked to make *true or false* judgments. The materials included true category statements (e.g. 'Some birds are robins'), false category statements (e.g. 'Some birds are apples'), and metaphorical statements (e.g. 'Some jobs are jails'). Note that the answer is 'true' only for the first class; the other two are 'false'. The key question concerned how people would process the metaphors. According to deviance theory, people should have been fast to reject metaphors; they simply had to press 'false' as soon as they realized that the literal meaning was false. However, the results showed the reverse. Participants took much longer to reject metaphors than ordinary false statements, suggesting that the metaphorical meaning was noticed early and interfered with participants' ability to classify it as false. This finding dealt a serious blow to the dual-stage theory, for it showed that processing of metaphorical meanings begins *before* the literal judgment has occurred.

More recently, the metaphor interference effect has been used to trace the mechanisms by which metaphor is comprehended. Wolff and Gentner showed that the metaphor interference effect is equally strong for reversed metaphors (e.g. 'Some jails are jobs') as for forward metaphors (e.g. 'Some jobs are jails'). This suggests that metaphor processing begins with a symmetric alignment, as in the structure-mapping model, rather than by a directional projection from the vehicle to the topic.

'DEAD' AND LIVING METAPHORS

Recent evidence suggests an evolution in metaphor processing. Metaphors with novel vehicles are processed as comparisons, whereas conventional metaphors are processed as categorizations. This occurs because initially novel vehicles become conventionalized over time. If a given metaphoric base is used repeatedly in the same way, the abstraction it conveys becomes more and more accessible. Eventually the metaphoric meaning can be stored as a secondary word meaning. For example, 'goldmine' once referred solely to a shaft in the ground from which gold is excavated. But it has taken on a secondary metaphoric meaning – now listed in most dictionaries – as 'anything that is a source

of something valuable' (as in 'A garage sale is a goldmine'). At this point the metaphor has a dual representation.

If this process of conventionalization continues, the metaphoric meaning can become quite stable and fixed. For example, the assertion 'My computer is a dog' conveys that the computer is no good, even if both speaker and hearer believe that dogs are loyal, intelligent, and reliable, because 'dog' has a stock metaphoric meaning. At this point the metaphor has become a stock metaphor and lost its early creative potential. Such metaphors are sometimes referred to as 'dead' metaphors.

If the conventionalization process continues still further, the metaphor may even lose its connection to the original literal meaning. For example, the term 'deadline' in the American Civil War meant a line around a prison camp; any prisoner crossing the line was shot. It was then metaphorically extended to a game of marbles, and then further extended from space to time: in newspaper parlance, it meant a time limit after which an article was unacceptable. Eventually, the literal meaning disappeared. The word 'deadline' now retains only its originally metaphorical sense of a time limit. In this way, metaphors can create new meanings.

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