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CONCEPTUAL METAPHOR AS A BASIS FOR SCIENTIFIC THEORY

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Когнітивний підхід до вивчення метафори, розвинутий на противагу її традиційному витлумаченню як літературного прийому, визнає метафоричність загальною властивістю людського мислення. Зазначена перспектива дозволяє не тільки пояснити процес усвідомлення метафор, а й розглядати концептуальну метафору як підґрунтя наукової теорії.
Ключові слова: метафора, концептуальна метафора, наукова метафора, наукова методологія.

Когнитивный подход к изучению метафоры, противостоящий ее традиционному пониманию как литературного приема, признает метафоричность общим свойством человеческого мышления. Данная перспектива позволяет не только объяснить процесс осознания метафор, но и рассматривать концептуальную метафору как основание научной теории.
Ключевые слова: метафора, концептуальная метафора, научная метафора, научная методология.

The cognitive view of metaphor, opposed to its traditional understanding as a literary device, defines metaphor as an attribute of thought. This perspective not only explains the process of metaphor understanding, but also suggests an interpretation of conceptual metaphor as a basis for scientific theory.
Key words: metaphor, conceptual metaphor, scientific metaphor, scientific methodology.

The objectivist view, deeply inherent in our Western culture, defines the purpose of language as communication and states that language expresses thoughts that have already been there before their expression [16, p. 8]. The given idea reflects the so-called “conduit metaphor” according to which communication is misleadingly taken to be the means of a direct description of reality. Representing languages as containers for thoughts that should be packed into words, the “conduit metaphor” completely ignores the background knowledge and experience that language speakers necessarily possess and the crucial contributions they themselves make into the process of communication. Pursuant to this is the claim that the meaning of a word is fixed no matter what the context or cultural entailments seem to suggest.

The position extremely opposed to the one described above is that cognition involves understanding things exactly the way they are in terms of their inherent properties [10, p. 122; 13, p. 14]. Words are not viewed as containers for thoughts, and meaning is never disembodied since it is always meaning to someone [10, p. 184]. As Gibbs says, our judgment that a particular word or sentence has a literal meaning is actually composed of a complex set of tacit knowledge that is highly dependent on the context in which such judgments are made [4, p. 435]. The extent to which this “literal” meaning is motivated by figurative language is explored within the scope of cognitive linguistics.

The expression *figurative*, or non-literal, *language* is sometimes referred to by such a general term as *metaphor*. Identified as existing in varieties [15, p. 13] and classified into several kinds [Miller 1982, cited in 17], metaphor has quite an ambiguous definition that varies according to theoretical perspectives. Müler [12] argues that theories of metaphor turn out to be affected by underlying conceptions of language. Thus, classic approaches to metaphor, regarding it as an implicit comparison, based on rules of analogy, pertain to the previously described objectivist view of language representing real facts about the world and reporting these facts to other people. Comparison and substitution theories of metaphor, developed under this view, as well as their recent elaborations [2; 3; 5; 6] serve well in explaining simple and complex metaphors but appear to be useless in telling how metaphors are understood. Categorization [7] and relevance theories [19], called forth by the

necessity to resolve this problem, suggest an understanding of metaphor as a category inclusion statement. Proposing a creation of an ad hoc category in one case, and describing metaphor as a form of "loose language", allowing expansion and contraction of the category, in the other, both theories still imply the traditional view of metaphor as a figure of speech, based on some prominent common attributes of two entities that can be compared.

Although the enumerated theories can be recognized effective in explaining some of what we do with metaphors [15, p. 60], they do not provide a satisfactory explanation of what exactly happens in the brain when a metaphor is encountered, containing a "circularity" problem [14] produced by the assumption of a prior act of metaphorical interpretation. A key to this puzzle was given by an approach to metaphor radically different from those mentioned above.

Conceptual metaphor theory, proposed by Lakoff and Johnson in 1980 [10], suggests that metaphor is an attribute of thought, and metaphorical words and phrases in language express underlying conceptual metaphors. Thus, metaphor gained a new definition as "understanding and experiencing one kind of thing in terms of another" [10, p. 5]. For instance, such metaphors as 'Sally is *a block of ice*' and 'a *warm* relationship' are considered to express an underlying connection between the concepts of *emotion* and *physical temperature* that can be summarized as EMOTION IS WARMTH [15, p. 69]. Conceptual metaphor theory implies that the broader metaphorical concept EMOTION IS WARMTH designates an underlying relationship between the concepts of *emotion* and *warmth*, and not between the words expressing these concepts. Lakoff and Johnson [10] claim that conceptual metaphors originate in experience, when an abstract concept is repeatedly experienced in connection with a physical sensation, and therefore characterize them as "embodied" metaphors. Conceptual metaphors are also reinforced through cultural practice and get so profoundly fixed in language that it is often difficult to identify the metaphorical nature of words and phrases expressing them. Tracing the metaphorical mappings between emotional and physical concepts to correlations in physical experience is a way in which Lakoff and Johnson's theory of conceptual metaphors seems to solve the circularity problem appearing in the traditional accounts of metaphor.

Stemming from the presumption that conceptual metaphors arrange perception and thinking processes, is the conclusion that most of our abstract thought is metaphorical, and science as a kind of cognitive activity allows conceptual metaphors as well. Scientific metaphor is often recognized to be a methodology of scientific research and characterized as unification of understanding and choice, a way to unite experience and concepts, a conjunction of semantic structure and metaphorical domain, and a method in which rationality and irrationality can be connected [9].

Together with the recognition of the metaphorical feature of thought, conceptual metaphor theory provided a basis for considering metaphor as a means of description and categorization of reality. Experiments on metaphor comprehension [8] have conclusively proved that people are not able to ignore metaphorical meanings of language, and allowed to understand metaphorization of reality as a way of constructing a picture of the world.

It is namely this view of metaphor developed by the contemporary cognitive approach that permits regarding metaphor as a methodology of scientific research and a basis for a scientific theory in general. The five methodological functions of metaphor in science described by Guichun Guo [9, p. 447-51] can be interpreted to provide examples of scientific metaphors expressing underlying conceptual metaphors based on experiential implications.

The function of inventing scientific theories specifies metaphorization as a way of getting out of the boundaries of literal meaning, and supply the means for theoretical innovation to the existing system of semantic rules used by scientists. Examples of metaphor in this function include understanding light as a stream of particles and as a wave in physics. Opposing the corpuscular theory of light (LIGHT IS A PARTICLE), Huygens created a theory of light waves defined by the conceptual metaphor LIGHT IS SOUND. Both models are presently used in science depending on the kind of situation requiring description. Another example of metaphor functioning as a source of a theoretic model is conceptualizing DNA as a cybernetic

programme (DNA IS A PROGRAMME) in genetics. Thus, metaphors for abstract concepts often generate entire families of metaphorical expressions: *DNA editing, (DNA) operator, (DNA) copy error*.

The function of representing scientific theories proceeds from the view of metaphor as the foundation of a theoretical model. Serving as a link to connect "pre-science" intuition and conceptualization of scientific experience, metaphor offers a specific language to represent certain technical entities, conditions or events. In particular contexts, metaphorical representations may appear more acceptable than their non-linguistic alternatives, as in the metaphor known as *Schrödinger's cat*[1] that is often featured in theoretical discussions of the interpretations of quantum mechanics. Here the problem depicting superposition of states of a quantum system is conceptualized in terms of an unopened box, which is defined by the conceptual metaphor STATE IS A CONTAINER.

The function of explaining scientific theories lies in the ability of metaphorical representation to explain new developments grounding on the norms of conventional syntax, accepted semantics and shared pragmatics. In cases when the descriptive language of science can no longer meet the demands of its revolutionary progress, metaphorical explanation allows understanding and further growth of scientific knowledge. A meaningful example of explanatory metaphor is *Maxwell's demon*[2] that explicates violation of the Second Law of thermodynamics picturing a little creature within a box that sorts faster and slower gas molecules causing one side of the box to heat up while the other one cools down. The conceptual metaphor underlying the given representation can be defined as TEMPERATURE IS A CONTAINER.

The function of evaluating scientific theories is realized through the two aspects of metaphorical explanation wherein a metaphor is an empirical description and a hypothetical supposition at one and the same time. The comparison of these two aspects makes it possible to evaluate a theory according to the standards of scientific acceptability. In physics, the complementarity of the wave and particle theories of light, which may be able to explain phenomena that defy interpretation by means of each theory taken separately, demonstrates the functional complementation of two metaphorical evaluations. This very function can be seen as constituting foundation for the possibility of multiple theory choices in the situation of empirical equivalence.

The function of communicating scientific theories signifies the exchange of knowledge employing the metaphorical language equally understandable for scholars and scientific communities from different cultural backgrounds. As relatively few

[1] Schrödinger's cat is a thought experiment, sometimes described as a paradox, devised by Austrian physicist Erwin Schrödinger in 1935. It represents a cat penned up in a steel chamber, along with the following device (which must be secured against direct interference by the cat): in a Geiger counter, there is a tiny bit of radioactive substance, so small, that perhaps in the course of the hour, one of the atoms decays, but also, with equal probability, perhaps none; if it happens, the counter tube discharges and through a relay releases a hammer that shatters a small flask of hydrocyanic acid. If one has left this entire system to itself for an hour, one would say that the cat still lives if meanwhile no atom has decayed. The psi-function of the entire system would express this by having in it the living and dead cat mixed or smeared out in equal parts [18]. In quantum computing the phrase 'cat state' often refers to the special entanglement of qubits wherein the qubits are in an equal superposition of all being 0 and all being 1: $|\psi\rangle = \frac{1}{\sqrt{2}}\left(|00\ldots0\rangle + |11\ldots1\rangle\right)$.

[2] Maxwell's demon is a thought experiment created by the physicist James Clerk Maxwell to show that the Second Law of thermodynamics has only a statistical certainty. Maxwell conceived a thought experiment as a way of furthering the understanding of the second law. He imagined a being whose faculties are so sharpened that he can follow every molecule in its course, such a being, whose attributes are as essentially finite as our own, would be able to do what is impossible to us. Molecules in a vessel full of air at uniform temperature are moving with velocities by no means uniform, though the mean velocity of any great number of them, arbitrarily selected, is almost exactly uniform. Then he supposed that such a vessel was divided into two portions, A and B, by a division in which there was a small hole, and that a being, who could see the individual molecules, opened and closed this hole, so as to allow only the swifter molecules to pass from A to B, and only the slower molecules to pass from B to A. He would thus, without expenditure of work, raise the temperature of B and lower that of A, in contradiction to the second law of thermodynamics [11].

concepts are based on direct physical experience common to all, conceptual metaphor theory suggests understanding of abstract concepts as expressions of conceptual metaphors that originate in correlations with the common physical experiences and the 'embodied' concepts associated with them. Thus, metaphors become widely shared because of the commonalities of embodied experience and their reinforcement in scholarly conversational practice.

All in all, conceptual metaphor theory manifests a new approach to the interpretation of science as a kind of cognitive activity. Supplying a foundation for a scientific theory, conceptual metaphor may also set certain limits to its further development, thus, requiring a constant process of re-metaphorization to secure the possibility for new theoretical models to emerge. Uniting notions from different branches of knowledge and experience, conceptual metaphor allows formation of new connections between separate sciences (e.g. Maxwell's demon and the concept of entropy in thermodynamics and information theory), as well as appearance of novel disciplines (e.g. memetics based on the metaphor of "selfish gene" [1], reconsidered in information theory), mediating our understanding of the world.

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