








## Functioning of Metaphor through the Prism of Invariant Theory in Polysemy

 Svetlana A. Pesina<sup>1</sup>,  
 Svetlana A. Vinogradova<sup>2</sup>,  
 Svetlana V. Kiseleva<sup>3</sup>,  
 Nella A. Trofimova<sup>4</sup>,  
 Svetlana V. Rudakova<sup>5</sup>,  
 Tatyana Yu. Baklykova<sup>6</sup>

<sup>1,5,6</sup>Nosov Magnitogorsk State  
Technical University

<sup>2</sup>Murmansk Arctic State University

<sup>3</sup>Saint Petersburg State University of  
Economics

<sup>4</sup>Higher School of Economics

**Corresponding Author:** Svetlana A.  
Pesina

**Email:** global@prescopus.com

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### ABSTRACT

The article attempts to address the problem of polysemy via metaphor, since metaphor is one of the constitutive conditions for the existence of language, the most important way of describing objects of a high degree of abstraction. Mechanisms that provide quick access to lexemes without the need to scan lists of meanings are presented, the mechanisms of functioning of metaphorical meanings are described. It is suggested that the use of the core of meaning that stands for the entire structure of a polysemantic word allows in the process of communication to carry out an effective search and to fit metaphorical meanings into the context of utterances. A lexical invariant acts as a general cognitive model of perception and understanding of the world, and at the neurobiological level it leads to the build-up of new neural connections. Such formations play the role of effective substitutes, dispensing consciousness with the necessity of scanning the entire spectrum of metaphorical meanings, supporting the principle of linguistic economy therewith.

**Keywords:** polysemous word, semantic structure of a word, metaphor, semantics, meaning, experimental study

### 1. Introduction

#### 1.1 Introduction into the Problem

The pragmatic interest in formulaic communication using colloquial low register being characteristic of so-cial networks is becoming a daily communication style these days. As being almost only speech resource, this may have far-reaching negative effects. Formed throughout the centuries and passed from generation to generation, culturally coded speech remains outside the focus of attention of communicants, meanwhile, the use of a rich fig-urative culturally coded language in the form of conceptual speech metaphors, figurative phraseological units, is a serious intellectual load on working memory and attention [Cho, Holyoak, & Cannon, 2007; Waltz et al, 2000]. We need certain good methods that can constantly develop the imagery and power of metaphorical thinking, other-wise the younger generation will cease to understand the classics. What is meant at the neuro-linguistic level is the formation of the corresponding stable neural circuits.

Available experimental data [Pesina et al. 2019] indicate that frequency trivial metaphors are easily decoded by the subjects, but as figurative complexity may increase, the need to use intertextuality, imagination and expanded associative connections, the overwhelming majority of the tested decreases the impossibility of decoding tropes and comprehension, and interpretations of objects may be not within reach. Metaphor (as compared to other tropes) is the essence of the strength and quality of thinking.

Being the key to understanding the foundations of thinking and the processes of creating a universal national-specific image of the world, it provides a connection with logic, categorization and schematization of the world. Metaphor uses the processes of recategorization and re-conceptualization as leverage, allowing cognitive knowledge acquired in one area to be applied to problem solving in another area, "There is nothing more fundamental to thinking and language than our sense of similarity" [Quine, 1997].

Presently, joint studies are needed in the field of cognitive linguistics, psycholinguistics, language teaching methods, linguistic pragmatics and neuro-linguistics to solve ambitious tasks for the development of mental activity by using special methods for the formation of interframe figurative-metaphorical connections that are of great heuristic power. We do not often realize that metaphors guide our thinking, for "there is no such word or description of intellectual operations that would not ascend a metaphor based on the description of some physical action" [Richards, 1990].

Our experimental data show that even those native speakers who go into higher education in the humanities do not always see the connection between meanings, cannot reproduce the structure of meanings of frequency polysemants [Pesina et al. 2019]. The order of storing the meanings of polysemous words in the mental lexicon does not correspond to the order given in explanatory dictionaries. In the first place a native speaker often puts the meaning that is actual to them at that moment. The very informants are often quite subjective, their interpretations of meanings are rather abstract and confused. In addition, having received the task to interpret a meaning, informants often interpret abstractions via abstractions, and phraseological units by means of phraseological units.

The fact of having ignored by some informants the first meanings may indicate the possible existence and functioning in the linguistic lexicon of a certain semantic dominant, to which there was the fastest access and which is the most frequent.

### 1.2 Topicality

It has not been possible to obtain a holistic, consistent idea of the ways of functioning of the meanings of a word in the lexicon by now: there are well-known semantic theories that highlight certain aspects of the functioning of words in the form of logogens, modules, cognitive prototypes, verbalized concepts, frames, conceptual metaphors, etc. Linguists disagree about whether we use ready-made meanings, or whether they are assembled in the lexicon.

Studies in the field of polysemy are in fact reduced to two diametrically opposite points of view: memorizing meanings as a whole list similar to dictionary entries or reducing word structures to invariant meanings [Falcum, Vicente, 2015 ; Pesina, Yusupova, 2015; Pesina, Latushkina, 2015]. Western publications have broadened support for the list theory of storage and functioning of words in the lexicon [Foraker S., Murphy, 2012], according to which the meanings of a polysemantic word are not semantically related and function separately in the lexicon as homonyms.

There are experimental data that in the linguistic consciousness direct meanings are stored separately from figurative ones: direct and metonymic meanings of nouns and verbs are stored in one mental representation, and metaphorical meanings are stored in separate representations [Klein D. E., Murphy, 2001; Belousov, 2018]. It follows that we are not aware of the proximity of metaphors that have the same form of expression or signifier, and dictionaries mistakenly place them in one dictionary entry, still grouping them according to the principle of common semantic attribute (for example, Longman Dictionary of Contemporary English, 2005). The question arises as to the need to separate polysemy and homonymy. In our opinion, connectivity is one of the fundamental principles of the human cognitive system, including the linguistic space, organized according to the principle of semantic network.

Attempts to address the semantics of polysemantic words by specialists in computer processing of text corpora have been made in recent times. The crucial problem that they cannot completely solve is the word sense disambiguation and the qualitative translation of metaphorical meanings by electronic dictionaries. So, today, semantic networks like WordNet are used as an inventory of word meanings.

Finally, experts in the field of neurolinguistics seek to shed light on the structure of the lexicon and answer a number of other fundamental questions on the semantic organization of words by studying how the brain neurons function. Thus, experimental data on encephalographic examination of cerebral activity indicate that at the moment of reaction to a presented word a test subject visualizes the activity of a whole group of interconnected neurons located in adjacent regions of the brain. The theory prevails that neurons being sensitive to certain semantic properties and participating in the formation of more than one semantic network function in the brain [Hodges, Patterson, 1997]. The studies make more and more analogies of the functioning of meanings and feature connections within words and neural networks.

It is thought that initially the human brain understands objects as a set of components in which the brain separates the received images or information, but the understanding of the object acquires a symbolized character with growth [Luria, 1998]. Personal subjective culturally and socially conditioned perception of the environment constantly corrects their linguistic world-image.

Another framework of problems in cognitive science concerns the postulation of a vague nature of meanings. The question of the efficient use of meanings with the properties of fluctuation and instability is under discussion. On

the other hand, there are statements, for example, by L. S. Vygotsky that meaning is the most stable unified and accurate zone [Vygotsky, 1997: 87].

## 2. Hypothesis

Apparently, the meanings of polysemous words containing metaphors are not arranged in our linguistic consciousness according to the dictionary principle, and by no means always the meaning presented in dictionary as the most frequent one functions as the first one in the individual lexicon. The order of meanings in the mental lexicon is influenced by the frequency of meaning and a number of extralinguistic factors (pragmatic goals, environment, etc.). Besides, it is problematic to give all the available meanings of a polysemantic word, any meanings are always omitted. This means that we do not store meanings in the form of lists or warehouses, meanings are linked by multiplex links and there are different outputs to the same meaning.

We call general features that combine source meaning and target meaning in a Lexical invariant. Invariant semantic components in the process of metaphor formation constitute what is actually “transferred”. This is the general part of semantics that occurs from the representation of juxtaposition and is the necessary basis for the formation of metaphor. Without the formation of such a generalized representation in the foreground (or “nearest”) plane which ultimately eliminates the background plane it is obviously impossible to form metaphor.

Awareness of the functioning of such invariants can help prompt decoding of metaphorical meanings through understanding a common thing that unites the contextual realizations of all figurative meanings of the word. Conscious use of metaphors allows to see not only the “raw material” from which a certain figurative meaning has been formed, but also to understand the logic of formation of the entire structure of a word, consciously use those invariant meanings that combine metaphors in one lexical structure.

## 3. Main Body

Like many metaphor analysts, we understand metaphor as a cognitive model that combines concepts from different lexical categories into one whole, with the obligatory preservation of two semantic domains and a figurative element. To describe metaphorical mechanisms, the terms “double denotation”, “double vision effect” / “double perception”, “two semantic areas”, etc. are used. These terms indicate that one semantic area is understood in terms of another with the extraction of a common feature and, as a rule, not explicitly expressed in the main meaning.

Before describing a functional mechanism of metaphor, let us first of all single out the mechanism of palimpsest overlapping of images. So, trying to understand the meaning of the Russian metaphor “человек в футляре” (literally, the man in a case), a speaker of another language who does not have such a transfer in his/her linguistic arsenal, will place a person in his/her imagination in a case and try to imagine what can change for him in this position. You can try parallelly to remember the main feature of the first meaning of the word “футляр” (case): to store the thing in a special box so as not to spoil it. And now we already have some answer: *человек в футляре* means that he/she hid from the world. In the Russian-language world-image, this metaphor means “a man who hides from the whole world and, being alone, acquires strange and unpleasant behavior patterns.”

The more unexpected the clash of overlapped images is and the more vivid the effect it causes, the more impressive and fresh the metaphor is perceived. The main tasks of metaphor scholars, in this sense, are to establish the nature of the interaction of two areas, the origins of the initial and final images related to the two areas, and to determine a common invariant feature that unites the source and target areas.

For example, when we use a rather frequent metaphor “лиса” (fox) to refer to a person, we are visualizing an animal that makes up the backplane. Correlation of two concepts corresponding to direct and rethought meanings in our minds leads to the formation of family similarities in the structure of meaning. A metaphor is a mutual cross-transference within a conceptual system. Consequently, the previous semes do not disappear, but fade in their intensity. Both areas in the structure of meaning are correlated in our consciousness because of the seme “наносить вред с помощью уловок и хитрости” (to harm with tricks and cunning), which, at the level of a naive world-image of a native speaker, exists in both areas of meaning. This metaphor “anthropomorphizes” the animal, thereby allowing two objects to jointly adapt in the reality. The metaphor allows us to “humanize” the reality as much as possible, minimizing the difference between man and animal.

The necessity and relevance of such rough comparisons has been questioned by many great minds. Even R. Descartes wrote that all our knowledge about the world should be expressed as clearly as possible and in strict accordance with the concepts: the ideal of complete objectification corresponds to perfect terminology reflecting the existence and accuracy of specific objects in certain concepts [Descartes, 1950]. Many analysts also believed that metaphors were functional in the early stages of language formation, however, having “matured”, humanity does not need such rudimentary remnants. So, A. Ayer believed that metaphor should be used only when it is impossible to find more precise words: we should always try to translate metaphorical statements into a more strict lexical form in order to check their content [Ayer, 1993].

D. Davidson also believed that such a concept as “figurative” or “obscure” meaning of a metaphor, different from the literal one, should not exist. According to his theory, metaphors mean what words mean in their most literal interpretation, and nothing more. In other words, nothing is introduced into a statement by means of the linguistic form, except for its own systemic meaning, and it is the literal interpretation that is used by the speaker in a special way to generate a metaphor. Only “literal meaning, albeit variable” can be theoretically understood. When we speak, we combine words in accordance with certain rules for summing feelings, which leads not to a sum of feelings, but to new meanings. A metaphorical phrase creates effects, not meanings. Everything else changes only in the eyes of each individual person. That is, along with the basic meaning there can be no variants of meanings (and, therefore, no metaphors) that do not meet the systematic requirements, comparable to those that are fulfilled by the literal meaning [Davidson, 1978]. J. Searle also argues against attributing any special meaning to the metaphor [Searle, 2002].

Such ideas have been criticized at various times. For example, in the 19th century F. Nietzsche wrote that oblivion of constitutive metaphoricity in language creates an illusion, as if language provides direct access to things and possesses “purest objects” and direct knowledge of facts [Nietzsche, 1912: 316]. Metaphor, by virtue of its form, indicates the reality of the object.

It is possible to agree with D. Davidson’s statements only partially regarding the functioning of phraseological units, when the structure underlying the semantics of each incoming word does not change the configuration of its semantic features. In the above reimagined expressions, “mouth” and “leg” are used in their direct meanings “mouth” and “leg”, respectively. For example, *he/she is all mouth – someone who talks a lot about doing something but never actually does it or not have a leg to stand on – to be in a situation where you cannot prove or legally support what you say*. Under the influence of the second obligatory component of each of these set combinations, a hyperbolized situation occurs when a person seems to become a mere mouth or appears without a leg.

To understand the interpretive mechanism of metaphor, an important cognitive component is the complex of images that arise when perceiving fragments of the reality that describe metaphors. The images accompany both poetic and dead metaphors and are conditioned by cultural traditions, the peculiarities of the life of society, human corporeality, etc. It applies the image generated in relation to one class of objects to another class, being a special bridge of interpretation: images of a hare, snake, eagle applied to man. So, despite the existing criticism, we agree with W. Chafe that when the idiom *red herring* is actualized, the image of a red fish appears in the mind [Chafe, 1975]. In our opinion, phrases such as *red herring* are more likely to elicit a figurative response to images. The more abstract the metaphor is, the more schematic the image is, although imagery is, to a large extent, a subjective phenomenon.

There is another problem in understanding metaphorical mechanisms, which we will briefly discuss in this article. It is known that in the process of metaphORIZATION, some areas, being structured according to the source model, form a metaphorical mapping or cognitive mapping. In the judgement of the author of the concept of cognitive metaphor (J. Lakoff), the source and target domains are conceptually separated. However, the question arises: can there be mutual influence of the source and target domains in metaphors. Can the source domain invoke an image of the target?

Let us make clear this problem using the example of the use of metaphor in political discourse. Thus, in American political discourse, Republicans are characterized metaphorically from the position of tougher characters, while Democrats are symbolically presented as softer. This conceptual mapping leads conservatives to insist that the family or American society, metaphorically speaking, needs a “strict father”, while liberals argue that it needs a “supportive parent” [Lakoff, Johnson, 2010].

When such a metaphor is created and activated, it inevitably triggers responsive sensory modalities. That is, a conceptual metaphor can shape the way we perceive proprioceptive sensations. Thus, Donald Trump’s handshake will probably feel stronger than J. Biden’s handshake. In this case, the opposite influence of the source of the metaphor (a hard handshake) on the concept of the corresponding policy (hard like a strict father).

There is, as it were, a muxing of the cognitive-communication channel, that is, the transmission of two-way information flows in both directions or multiplexing. At the neural level the mapping of conceptual metaphors is, at least, not yet possible. However, a synesthetic metaphor can serve as a powerful verifier (for example, *горячее рукопожатие/ a hot handshake, холодный прием / a cold reception, кричащий оранжевый / a loud orange, etc.*). A synesthetic metaphor can be a good model for understanding metaphors, as its structural and functional neural aspects seem to be more accessible to study.

In general, any metaphors are the key to understanding the foundations of thinking and the processes of creating a universal, nationally-specific image of the world. They demonstrate a connection with logic as they schematize and categorize our world. Remounting the above invariant theory of the holistic perception of the entire structure of a polysemous word, let us turn to another example taken from the same category “Human body”, more precisely, “Human head”.

So, the English polysemous word *nose* has about 20 figurative meanings, most of which are metaphors. Over time, a word can form a common semantic background that unites the domains of sources and targets. It is a lexical

invariant, a core of meaning of the entire lexeme: *the front sticking out part of an object*. Let us show further the degree of realization of invariant features in the metaphorical meanings of this polysemant.

- the metaphoric node *nose of a machine/tool* is based on the invariant components *a front, sticking out part of an object*;
- the metaphoric node *nose of fruit/berry, nose of a vehicle/ ship/ boat/ rocket/ car/ airplane* is based on the invariant components *a front, sticking out part of an object*;
- the metaphoric node *nose of a rock/flexure* is mere invariant components *a sticking out part of an object*.

Such invariant features solve important communication problems, providing a fast path to the desired meaning in the lexicon, effective speech interaction. In the process of communication, a common understanding of the situational context is often sufficient through the use of a dominant semantic feature, to which the fastest neural connections lead [Pesina, Zimareva, Vtorushina, 2019; Pesina, Latushkina, 2015].

In general, the whole lexicon can be represented as a polystructural entity permeated with a network of heterogeneous connections [Navigli et al, 2012]. The lexical network model assumes that meanings and their features do not exist in isolation, the implication of one of them will necessarily lead to the activation of others [Sullivan, 2013]. This fact does not require memorizing the entire system, sufficiently formed stable input data which serve as a kind of key to “unlock” or activate a necessary semantic chain.

#### 4. Conclusions

So, the delivery of meaning via metaphor plays a pivotal role in the genesis of linguistic meanings and concepts. Metaphor evokes the penetration of synthesis into the area of analysis, imagination into the area of concepts, the one single into the area of generality. Metaphor is the invasion of images into the zone of intelligence, it is a load on working memory and control of attention. There would be no inner emotional life of a person, abstract concepts without metaphor.

In general, our vocabulary is dynamically developing. On the one hand, it is generalization-prone, and on the other hand, it is a sufficiently socially, culturally conditioned repository of data, where personal interpretation of incoming information often prevails over objectively inferior information. The functioning of the conceptual system of a person is carried out according to the principle of a semantic network with many outputs as a complex multi-level system of paradigmatic connections that allow one to efficiently navigate in the environment, adapt to it and manage it.

The above studies, including the functioning of lexical invariants, metaphorical imagery, are aimed at further using the deep skills of systemic logical and, at the same time, figurative and linguistic thinking, which help to decode ambiguous metaphorical information.

Meaning is viewed as an unstable structure according to our conception, because of the fact that its contextual realization does not require a full complex of the underlying features; invariant components of a general nature are sufficient. Identification of algorithms for determining invariant components can significantly complement the semantic theory, as well as the theory of cognitive metaphors. Data on lexical invariants will reveal the true semantic features behind metaphorical rethinking and the entire semantic structure of the word as a whole [Pesina, Yusupova, 2015; Solonchak, Pesina, 2015]. Knowledge of lexical invariants significantly accelerates the comprehension of logical-semantic connections within metaphorical meanings of a word and, together with the above, allows to activate and qualitatively improve verbal and cognitive processes.

#### Conflict of Interests

The authors confirm that the presented data do not have any conflict of interests.

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