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## RESEARCH OF COMMUNICATION

AS A SIGN PROCESS AT THE SEMANTIC AND BIOCOGNITIVE LEVELS

### INVESTIGACIÓN DE LA COMUNICACIÓN COMO PROCESO DE SEÑALES A NIVEL SEMÁNTICO Y BIOCOGNITIVO

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#### ABSTRACT

The article attempts to describe the way of storing and functioning of meanings of polysemous words in the linguistic lexicon. It presents mechanisms that provide quick access to lexemes with no need for scanning lists of meanings. The process of communication is described from cognitive viewpoints, from the point of view of the impossibility of literal transmission of information. It is shown that in the process of communication there is no transfer of information or thought through language, since the listener alone creates information, lowering uncertainty via interactions in their own communicative area. The hypothesis has been advanced that the use of a lexical invariant as the meaning core of the word allows in the process of communication to carry out an effective search and embedding of metaphorical meanings in the context of utterances. The lexical invariant acts as a general cognitive model of perception and understanding of outward things, and at the neurobiological level it leads to the build-up of new neural connections. The paper presents the results of invariant-component analysis on the definition of lexical invariants. Such formations play the role of effective substitutes for the entire content of a concept or meaning, relieving consciousness from the necessity to scan the entire spectrum of meanings and their images, confirming the principle of linguistic economy.

**Keywords:** Communicative process, cognitive linguistics, linguistic sign, meaning, polysemantic word.

#### RESUMEN

El artículo intenta describir la forma de almacenamiento y funcionamiento de los significados de las palabras polisémicas en el léxico lingüístico. Presenta mecanismos que brindan acceso rápido a lexemas sin necesidad de escanear listas de significados. El proceso de comunicación se describe desde puntos de vista cognitivos, desde el punto de vista de la imposibilidad de transmisión literal de información. Se muestra que en el proceso de comunicación no hay transferencia de información o pensamiento a través del lenguaje, ya que solo el oyente genera información, bajando la incertidumbre a través de interacciones en su propia área comunicativa. Se ha planteado la hipótesis de que el uso de un invariante léxico como núcleo de significado de la palabra permite en el proceso de comunicación llevar a cabo una búsqueda efectiva e incrustación de significados metafóricos en el contexto de los enunciados. El invariante léxico actúa como un modelo cognitivo general de percepción y comprensión de las cosas externas y, a nivel neurobiológico, conduce a la creación de nuevas conexiones neuronales. El artículo presenta los resultados del análisis de componentes invariantes sobre la definición de invariantes léxicos. Tales formaciones desempeñan el papel de sustitutos efectivos de todo el contenido de un concepto o significado, liberando a la conciencia de la necesidad de explorar todo el espectro de significados y sus imágenes, confirmando el principio de economía lingüística.

**Palabras clave:** Proceso comunicativo, lingüística cognitiva, signo lingüístico, significado, palabra polisemántica.

## INTRODUCTION

Despite the fact that many scholars, including F. de Saussure, wrote about an anthropocentric nature of sign language processes, in later works the description of various schemes of communicative processes is often presented, as it were, without participation of human consciousness. Meanwhile, each linguistic sign, expressed metaphorically, emerges, lives and dies in the silence of individual consciousness outside the immediate material connection with its own word forms, when thoughts about the subject and the form of a chosen word are combined in the focus of consciousness. The life of a sign is short, as it flashes up for one tiny snip of a moment when thoughts about an object merge in the focus of conscious mind. The form of a sign “belongs” to the objective material world, and its substance or content never exceeds the boundary of human consciousness. The latter, reacting to the shape of the sign, operates with semantics, which, among other parameters, distinguishes human consciousness, for example, from any IT device (Chernigovskaya, 2020).

Consequently, an individual comprehends not the whole sign, but its form as represented by configurations of sound vibrations or prints on paper. The perceiving consciousness alone creates information on the basis of available experience – visual-effective, visual-figurative or verbal-logical - reducing the uncertainty with the available possibilities, for example, linguistic forecasting, which is always much higher in native language than in foreign one.

Man as a perceiving being initially strives for understanding. In the process of perception, a person is open to the speaker and the world. But not all the information that he/she perceives sparks a response reaction. A word form perceived in the context acts as a switch that activates the corresponding concept in human lexicon (Solonchak & Pesina, 2015; Tandon, et al., 2019). New important information or acquired skills activate cognitive processes that refresh the content of the concept, and at the neurobiological level leads to the build-up of new neural connections.

Each new concept of interaction with the environment activates an existing mnemonic structure and creates a register of mental memory. The latter forms the basis of the mechanism of perception and cognitive interaction with the environment in order to orientate in it (Tandon, et al., 2019).

Within the scope of this paper we will answer the question of how the recognition of the contextual meaning of a word occurs and how access to the meanings of words in the process of communication is carried out. Since major part of our everyday words are polysemantic, we will

talk, first of all, about the numerous figurative meanings of polysemantic words and their representation in the lexicon. The process of assembling meanings from various configurations of semantic components occurs instantly and automatically, so that a person is not aware of this process. Consciousness instantly fixes the state “I know” and explicitly controls the process only in the case of production or perception of complex and incomprehensible concepts (Joue, et al., 2020).

A meaning becomes a sign for a person only after it enters with its semantic features into the system of fixed associations between objects and phenomena of the world, forming a certain mental construct (concept), which forms the basis of what is commonly called the meaning of a sign.

Consider a sign nature of communication on two levels – neuropsychological and semantic. The available neurobiological data confirm that our perception is based on groups of signs, and not on ready-made meanings and phrases. According to these studies, the visual cortex of the brain has a huge number of highly differentiated neurons, each of which reacts to only one feature of the perceived object (Baars & Gage, 2014).

When the speaker produces a material speech form in accordance with his/her intention, at the neurobiological level the corresponding parts of the brain, first of all, the Wernicke zone responsible for the perception, assimilation and understanding of oral speech are activated in the listener. In the process of speech reception, at first, sound at a speed of 343 m / s in the form of various density waves penetrates the ear and gives rise to vibrations of an eardrum, causing the activity of neurons (we hear from 20 to 20,000 vibrations per second). Sound hits the middle and inner ear through the external ear through the ear canal through the tympanic membrane. The impedance matching system can increase the signal in the middle ear by a sophisticated transmission system through the malleus, incus and stapes that transmit sound vibrations from the eardrum to the inner ear. Increasing the volume of a sound is carried out through a stirrup connected to an oval window. The same complex gating system protects against too strong sounds, working in two directions: during speech perception the system of the internal bones mutes the internal volume, when the communicant is active, the system mutes the external sound, squeezing the muscles (Pesina, et al., 2020).

Reaching the listener’s receptors, the signals turn on the cognitive mechanisms of constructing meaning, conventionally correlating with the images of the signal forms. The next act of understanding the perceived sound

forms occurs at the cognitive level. The connection of the perceived sound forms and the content available in consciousness into a single sign is carried out at the level of consciousness.

Since the content of a sign cannot exceed the boundaries of consciousness, it ceases to exist, being ousted from the focus of active attention by the next sign or signs, and the corresponding material form slips off the tongue of the speaker or the tip of the pen of the writer.

If these forms are in the sphere of active attention of the perceiving analyzers of an individual who knows the code of their interpretation, then the same (or almost the same, with allowance for individual experience) state arises in his/her consciousness as in the sender of the message. Consciousness having perceived the forms of signs, connects them together, thereby either re-creating signs via generating a new meaning, or activating existing information (concepts or neural circuits). In the second case, the perceived signs are interpreted with allowance for the surrounding speech context, which signals the refraction of a meaning.

In the process of decoding of the perceived we first comprehend the verbal sound form, but then we deal with the content. We do not keep the sound shell of a sign in the zone of attention without special installation. We remember the very events, feelings and images that accompanied them, and already at the stage of verbalization of concepts a thought takes on a specific linguistic and speech form. With a minimum of time for thinking in the process of communication, depending on the level of linguistic competence, grammatical and syntactic presentation often occurs automatically using models and structures known from past experience. That is, the linguistic form adapts to consciousness, and not vice versa.

Time saving is provided due to the fact that the perceiver does not process all linguistic units of information equally and misses some meanings and combinations of words, the meaning of which is derived from the previous speech context and is a cliché. This is possible due to the integral function of the higher levels of consciousness and the work of neural circuits which “know” what needs to be paid attention to and what needs to be found and identified.

The conditions of communicative time trouble “impose” narrow requirements on the nature of the connection between the signified and the signifier of the linguistic sign. They determine the connection of each form with only one content, ensuring the systemic uniqueness of the speech form at the time of its real functioning. Therefore, in linguistics there is an opinion that polysemy does not exist at the speech level (Kilgarriff & Palmer, 2000).

At the same time, according to the misinterpreted thesis on the dialectical unity of the signified and signifying sign, the material form often acts as a kind of container of meaning, a material means of transporting it from point A to point B. For example, meaning can be understood as “*a certain set of formation, correlated with these objects and phenomena of extra-linguistic reality, which is transmitted through the sound shell of the word*” (Mednikova, 1974, p. 269)

However, each of the speakers of a language acts exclusively within the framework of their own cognitive domain. The function of language is to orient a person in a given area. The speaker believes that “if his/her listener is identical to him/her, and therefore the cognitive area of the latter is identical to his/her own cognitive area (which never happens), and is sincerely surprised when this or that “misunderstanding” arises”. (Maturana, 1995, p. 119)

Based on the above, we can conclude that meaning as the unity of images of the signified and the signifier is created in the mind of the speaker, and then the listener. This unity is formed by the speaker in accordance with the intention of the utterance. Since the content is ideal and does not go beyond the limits of consciousness, the conceived meaning does not go out into the objective world in the form of final knowledge “attached” to the material form.

Modern linguistics does not come to a consistent idea of the functioning of polysemous lexemes in the human mind: there are well-known linguistic-cognitive theories of salience that highlight certain aspects of the functioning of words in the form of frames, conceptual metaphors, logogens, modules, cognitive prototypes, verbalized concepts, etc. Linguists do not agree on whether we use ready-made meanings, or whether they are assembled in the lexicon (Klein & Murphy, 2001).

If certain meanings are constantly activated, their semantic, graphic and sensory information becomes clearer, which further enhances the existing neuronal-signal connections. The more often a semantic feature is involved in the interpretation of a particular meaning, the more salient it becomes, acquiring the status of an invariant, and the greater synoptic connections the corresponding neurons acquire. A bundle of such important nuclear features participating in the interpretation of figurative meanings of a polysemantic word is called the lexical invariant.

That is, for efficient decoding of the content of a particular language sign, it is enough to know the basic identifying semantic components that explain the semantics of the signified in the most general form.

The listener perceives the form of a speech sign, which in his mind is associated with invariant meaningful features (its lexical invariant). Then, on this basis, the listener outputs the actual meaning in accordance with the speech context suggested by the sender of the message.

That is, as the meanings of a polysemous word become actualized, its abstract semantic core is formed in its structure. This core provides quick access to key nodes of the semantic network. The lexical invariant is formed over time as a complex of the most common basic semantic signs of meaning as a result of multiple contextual realizations of these signs in the process of understanding and constructing meanings. The increase in the occurrence of one or another word meaning makes its neural circuit more accessible, therefore, there is a quick understanding of frequency words in comparison with low-frequency ones.

## MATERIALS AND METHODS

We believe that the lexical invariant takes a direct part in constructing and combining the nodes of semantic networks, resulting in the linguistic unity of the polysemantic word (Pesina & Latushkina, 2014). The semantic network is similar to the neural network, the meanings in it are vectorially linked to their semantic components (similar to neural connections through synapses), making up the semantic structure of the word. Signs of meanings also form networks and clusters, making up configurations corresponding to a particular meaning.

We present below the derived lexical invariants using invariant-component analysis. The identification of the dominant elements of the structure of the word was based on introspection and use of methods such as the descriptive method and the method of analysis of definitions and introspection as a universal linguistic device.

So, the lexical invariant of the polysemantic word *head* is the construct *the top, round and the most important part of an object, the beginning or end of it*, covering the semantics of more than one hundred figurative meanings, for example, head of a *bed/grave (the most important part)*, head of river (*the beginning*), head of a school (*top, the most important*), head of beer/milk (top part of it), etc.

The lexical invariant of the polysemant *nose* can be formulated in the following way: *the front sticking out part of an object*. The semes *part of an object, sticking out* are integral, as they are basic to all metaphorical meanings, the component *front* is differential. For example, nose of a machine/tool is a *front, sticking out part of an object*, nose of fruit/berry, nose of a tread, nose of a vehicle/ ship/ boat/ rocket/ car/ airplane is also a *front, sticking out part of an*

*object*, nose of a rock/flexure is only a *sticking out part of an object*.

Finally, let us represent the lexical invariant of the polysemant *mouth*: *an opening through which something / somebody passes in either direction and something fills or empties*, covering the semantics of transferred meanings: mouth of a metallurgical furnace, mouth of an organ pipe/ flute/ horn (*an opening, through which something passes or something fills*), mouth of a volcano/ well/ mine (*an opening, through which something passes or empties*), mouth of a cavity/ canyon/ valley/ gorge/ shelter, mouth of a street (*opening, through which something passes in either direction*).

An indirect proof of the functioning of lexical invariant in the mind are abstract meanings, such as “something resembling ...”, given by dictionaries. They are a generalization of all fixed meanings and are formed on the basis of actualizations of figurative meanings in the semantic structure of the word.

There is an economy of cognitive efforts with the actualization of a lexical invariant, since there is no need to carry out semiosis directly from the first nominative-non-derivative meaning. It is the lexical invariant that represents a cognitive level, that is, the level of consciousness, linguistic lexicon (Pesina, et al., 2020).

## RESULTS AND DISCUSSION

In the context of a lack of time for careful thought in the process of communication, the most common semantic components behind the meanings of words are actualized. When decoding a meaning, consciousness does not immediately refer to a full dictionary meaning. It is enough to activate the most general nuclear semantic components of the word, which are interconnected by well-formed, established neural circuits. In this sense, the meaning of the word can be regarded with full justification as indefinite and unsteady.

The activation of the most common basic semantic components of meaning in the process of communication does not contradict the principle of linguistic economy, according to which the producing and receiving consciousness does not have an unlimited resource of time to process what is said or heard. In most speech contexts, invariant features are meant to convey the content as a whole, which is often necessary and sufficient for the continuation of communication. For example, in English phrases *head* of a bridge / train *head* means *the beginning* of these objects, *head* of a table – *head* means only *the important part*, *mountain* of butter / grain – *mountain* means *a lot*, in the combination *nose* of an aircraft – *nose*

is *a middle protruding part*, in *mouth* of a metallurgical furnace – *mouth* means *a hole (orifice)*.

But in a number of situations there is no use exaggerating the functional value of the general meaning, because the resulting misunderstandings of communicants often stem from uncertainty in good understanding of the contexts and nuances of what was said. Divergence of understanding of the context leads to frustration and a desire to eliminate this misunderstanding. In this case, explicitation of the meaning and the concept behind it with a more detailed focus on their content. These can be illocutionary utterances with the use of the so-called words of broad semantics. Then they ask to define the meaning of what was said, for example, “Please, frame the terms “this is unacceptable” (incorrect / unethical / not accepted, etc.)”.

We have shown above that an individual forms his/her own knowledge without sharing “ready-made knowledge.” In a real communicative process, almost no information can be exhaustively perceived and understood, since this requires the coincidence of too many parameters and conditions independent of each other.

As semantic structure of the word grows and new figurative meanings appear, the motivational connections of newly emerging meanings, for example, metaphorical ones, with the main meaning can weaken and the cognitive image can be erased. Therefore, it is the invariant meaning embracing all the meanings of the word that serves as the only core cementing the structure of a polysemantic word.

As the word is applied to new and new objects of the surrounding reality, in a word there is growing generalization and developing abstraction. At the same time, abstract non-objective phenomena are interpreted in the image and likeness of the objective world and the human body (anthropomorphism). The resulting image can be called hieroglyphic. It is rather a contour or outline of an object. However, this schematic representation is deliberate.

Many semantic “outputs” go to the same meaning: meanings are linked by relations of semantic and grammatical derivation, they are linked paradigmatically as synonyms or homonyms with words of their cognitive category or thematic field and are included in concepts and conceptual spheres, etc. (Pesina, et al., 2020). We consider the structure of a polysemantic word as a semantic network, formed in accordance with the experience of an individual. The new meaning is integrated into the network through various vectors of paradigms: the reflection occurs with various synonyms and antonyms, categorical integration based on the similarity of invariant features arises. The meaning is structured as a concept dominated by the

conceptual focus, which includes a set of the most general and necessary invariant features (Pesina et al., 2020).

This is a dynamic process because the more integrations occur at different levels, the more firmly the meaning takes its place in the overall semantic network (compare the child’s concept of a computer at an early age and the content of this concept when a young man / girl becomes a programmer). The formation of invariant features and beams is a mechanism inherent in human consciousness, which makes generalizations (not a single concept or meaning can be formed without generalization). Invariant generalizations are formed in all native speakers as a result of culturally and subjectively conditioned reflection of the surrounding world. On the one hand, lexical invariants provide a general range of meanings of a polysemous word, functioning at the level of the language system, and on the other hand, they are expressed in speech subjectively and contextually.

Meaning is understood through its heuristic comparison with the content of the lexical invariant. Thus, during decoding of a message, the brain quickly “connects” to the necessary semantic cluster of features, ignoring the “random noise” of the entire spectrum of irrelevant and numerous subjective components of meaning. If consciousness fails to quickly correlate the form and content of the sign, it has to analyze the full range of available semantic components in search of a correspondence that meets the meaning of the context.

## CONCLUSIONS

So, the study of the essence and patterns of the communicative process with allowance for biocognitive processing of information and the role of the word in an individual’s speech-and-thinking activity predetermined the study of the possibilities of effective access to the semantic content of his/her lexicon.

It is shown that in the process of communication, information is not transmitted to the listener as in a capsule, since the perceiving individual alone initiates his/her own neural connections, thereby reducing uncertainty through interaction in his/her own cognitive area. Each native speaker acts exclusively within his/her cognitive area, using language in order to orientate in his /her cognitive sphere and adapt in a communicative situation and the surrounding reality in general. Not only the speaker, but also the listener, is an active participant in communication, generating the content of verbal signs in their cognitive area (Pesina, et al., 2020).

The proposed invariant approach to understanding the semantics of polysemantic words allows communicants

to more effectively decode contextual figurative meanings and intensify the communication process by relying on invariant semantic features. Lexical invariants, presumably functioning as models or formulas of words, control the process of actualizing metaphorical meanings, for as an individual's vocabulary increases, the semantic data obtained are processed at a more abstract level. A set of certain cognitive dominants is formed in them which act as a kind of aspects of perception. Lexical invariant forms the linguistic worldview as the sum of all verbal knowledge of a native speaker, a worldview that changes and rebuilds throughout life.

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