

DECODING OF METAPHORIC FORM OF HOMONYMOUS SCIENTIFIC TERM BY A LINGUIST AND AN EXPERT

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Abstract. The article considers the problem of distinguishing terminological homonymy as a semantic category, and an attempt to model the process of decoding (understanding) metaphorical homonymous scientific terms is made. Integrating the conceptual provisions of the term theory, the theory of metaphor and the category of homonymy, the author offers the scheme of logical (categorical) and semantic analyses of the dictionary definition of genetic homonymic terms - from the metaphorical form to the special concept. The process of the homonymous terms deciphering is limited in this research to two steps: 1) to establish the linguistic term form motivation, 2) to determine the denotation of special concepts designated by one form. As a result of the analysis of dictionary definitions of genetic terms four types of a homonymy - intralingual, lexical, interscientific and mixed have been identified, and also the features of associative chains forming by the linguist-terminologist and the expert in the process of distinguishing of homonymous terms content are described.

Keywords: term homonymy; metaphor; perception; motivation; decoding.

The declared subject integrates the term theory, the theory of metaphor and the category of homonymy.

The term theory begins with the fact that the term form and content come into a certain contradiction as the term like a “two-faced Janus” opens at once two “doors” - into the language system and the system of knowledge. At that it obeys the law of both systems. The term as a sign of special concept always aims for accuracy, unambiguity, systematicity and definition. While the term being a lexical speech unit acquires polysemy and synonymy. The specifics of the terminological sign, thus, calls for the combination of two perspectives to consider - as viewed by a linguist or by an expert. A term is a word through the linguist's eyes. A term is a piece of knowledge through the expert's eyes. Furthermore a linguist “goes” from a linguistic form to a concept. While an expert “goes” from a concept to a form. And, only the terminologist “passes” between. He models an aggregate picture of a term sign with the form and the content united [1: 40-49]. The linguistic term theory has been elaborated in the frame of the linguistic paradigms of the XX century: structural, functional, cognitive and discursive [2].

The theory of metaphor and the term theory are often intercrossed in the linguistic domestic and foreign researches generalized by such topics as - a metaphor in terminology [3-7], metaphor in science and scientific discourse [8-10], metaphor and knowledge [11-13]. Thus the assertion *language is metaphor* has been gradually developed into *scientific language is*

metaphor that in its turn fades as an issue. It appears to be evident today, that “Even scientific knowledge is based in metaphorical knowledge” [14].

The scientific paradigm change: from dissociation and narrow specialization - to an aggregate natural-science picture of the world is displayed today, first of all, in scientific terminology. So, for example, the integrative character of natural-science technical and humanitarian knowledge is brightly manifested in the attempts to interpret the concept “consciousness” in the context of NBIKS - nano - bio - info - kogno- socio-humanistic disciplines and technologies [15].

At the present stage of integrating scientific knowledge, the discourse analysis of terminology and the discursive term model development acquire special urgency [1, 5]. “It is the homonymy of the scientific term that becomes today the key discursive parameter and determines the discursive model of the term” [16: 66].

The homonymy of the word, and then of the term was traditionally defined as the form coincidence of linguistic units which meanings were not related to each other. Homonymy, until recently, had no linguistic category status and was of a formal, procedural character. Over time, the phenomenon of homonymy takes its place in lexical semantics and is defined as a lexical category: “it is the semantic relation of internally unrelated (unmotivated) meanings expressed by formally similar signs (lexemes) and differing in the text due to different contextual environments” [17: 209].

Homonymy in terminology begins with the coincidence of term form with other special and non-special words. The term is a secondary nomination, what means that the lexical form is selected for a new special concept according to the rules of term formation, primarily by metaphor and metonymy as means of terminological nomination [18]. The metaphorical nature of the term is thus determined by its nature, and “metaphorisation in the course of scientific communication is manifested primarily in the processes of term-generation” [3: 59].

The line between term and not a term is easily drawn when words outside the context are simultaneously assigned to a common and special meaning. For example, words like *sun*, *star*, *water*, *air*, *acid*, *man*, *market* first of all bear their common, everyday meaning. At the same time, they can also be used in special meanings as astronomical, biological, chemical, economic terms. Term signs are not followed by meaning as common words but they are followed by special concepts. It does not matter whether we are fully aware of the content of the special concept, its definition, but it is rather important that we cannot bring anything “non-special”, personal, figurative, as we do with common words. As Russell wrote: “The more we approach the complete abstractness of logics, the less becomes the inevitable difference in the meanings that people associate with the word” [19: 16].

Perception becomes more complicated and demands complex (semantic and conceptual) analysis when terms are accompanied by terms of other

areas, for example in the headings of scientific works: “*Sentences as biological systems*”, “*Life as an autolinguistic phenomenon*”, “*Genome as hypertext*”, “*Grammatical Man. Information, Entropy, Language and Life*”. Sometimes headings have problematic character and then the term “homonymy” acquires a discursive color: *Gene - as Text and Language: Metaphor or Theory? Genome - as Hypertext consisting of ordered Subset of other Texts. Genome - as Text and Text - as Organism. Protein Synthesis is like Semiotic Process. Whether Ribosome is capable to read?* [20]. In this case we are dealing with interscientific homonymous terms-metaphors

Here it should be noted that the concept “metaphoric term” begins with the most general definition of the linguistic term “metaphor”, enclosed as the first definition by Oxford Concise dictionary of linguistics: (*Metaphor1*) *Figure of speech in which a word or expression normally used of one kind of object, action, etc. is extended to another* [21: 224]. The second definition in the same dictionary^ (*Metaphor2*) *Used by G.P. Lakoff in the 1980s of a general pattern in which one domain is systematically conceived and spoken of in terms of another (as usual compare image schema)* will help us to consider the concept of metaphorical thinking of George Lakof [22] in the course of the analysis. Thus, the term when getting into communication enters certain semantic relations with other words and homonymy can be regarded as a semantic movement, a semantic process [23: 83], and not a formal category.

Especially often we are faced with inter-scientific homonymy in oral scientific discourse, when in the lecture on genetics the terms *text*, *letter*, *heart* are widely used, and the biologist's speech is full of chemical, physical and biological terms, such as *plasma* and *gas*. The metaphoricality of the homonymous term very often leads to long disputes about the meaning of this or that term form. Thus, in the preface to the book “Metaphor and Knowledge. The Challenges of Writing Science”, we read about the similar discussion which has acted as motivation for writing this book [11]. And then there is the question: “How do we disambiguate the terms at the stage of perception? At the same time it is possible to assume that different listener, whether it is a professional, a student, a linguist-terminologist or interpreter would have his own chain of metaphorical associations. It is quite obvious as well that a certain level of understanding of the scientific term for a listener or reader who has got different vocational education is modeled by the metaphorical and logical nature of a homonymous term.

In this research we will try to track the scheme of decoding (understanding) of a homonymous form of the term by linguist-terminologist and expert.

The process of comprehension the term in scientific discourse is considered to be a step-by-step mental process, based on linguistic and extra linguistic knowledge of term semantics and term system.

Language as a sign system and knowledge as structured information interact as form and content according to the language laws. The mediator in this interaction is a term which combines linguistic and special knowledge. And that is accordingly displayed in its lexical form and conceptual content. The lexical form, in turn, can be figurative and metaphoric as in common words, while the content is revealed by a special concept in the scope of definition and its place in the term system. In this case we observe how logical and imaginative content relate to each other in a scientific discourse [1: 82-86].

The constant interaction of logical and figurative in term-sign determines the strategy and tactics of disclosing the content of a special concept. The process of deciphering the homonymous term is limited to two steps

1. To motivate the lexical form of the term.
2. To define the denotation of the term.

At the stage of homonymous terms perception we focus, first of all, on their linguistic and therefore motivated form. Due to the fact that the term is a secondary nomination, motivation appears to be lexical when the term is homonymous to the common literary word – *wave*, *air*, *amber*. It can be also terminological when the term is homonymous to the term of another area of knowledge. For example, the term “morphology” is used in geology, biology, linguistics; the term “semantization” is used in mathematics, informatics, linguistics, and the term “satellite” - in genetics and astronomy. Note that in this case the metaphorical transfer is traced. At the same time, the perception of the linguist will be based, first of all, on the lexical motivation, and the associational chain will begin with the semantic features of the literary word. While the expert goes, as a rule, from a concept to form and his chain of associations will begin with special concept characteristic.

For example, in the definition of the biological term WAVE - *the form of a pulse* (Biology-Online Dictionary), the linguist will make a start with the general meanings of the word “pulse” and the indirect meaning of the word “form”. To trace the metaphoric change he needs to follow the second part of the dictionary entry - the example and the synonym: *e.g., an arterial pressure or displacement wave; or of the pacemaker pulse as demonstrated on the oscilloscope under a specified load*. Synonym: *waveshape*. Analyzing the definition of the astronomic term WAVE - *a propagating pattern of disturbance* (Astronomical Glossary) and the definition of the physical term WAVE - *a periodic disturbance in a medium or in space. In a travelling wave (or progressive wave) energy is transferred from one place to another by the vibrations* (Dictionary of Physics) he will base associations on the lexical meaning of the word “disturbance” transferred as the distinctive feature of both concepts. While the physicist will probably focus upon such special (as well metaphoric) concepts as *propagating pattern*, *travelling wave* and *progressive wave*.

2. At the stage of contextual restriction of term meaning within a certain subject domain, the logical conceptual analysis is carried out, to deter-

mine the special concept content. And capabilities of the linguist and expert will be different. Linguist, referring to the dictionary definitions, can distinguish homonymous terms through different generic concepts, for example, *a gene* in biology is defined as *a hereditary factor* and in genetics - as *a piece of DNA*. But a linguist not mastering the term system concepts can face with difficulties in establishing special concept distinctive features and distinguish, for example, the concept “gene” in the following four definitions:

1) *the sequence of nucleotides to which a certain function in an organism can be attributed;*

2) *the transcribed site of DNA coding either primary structure of polypeptide, or tRNA, or mRNA;*

3) *functionally indivisible unit of genetic material;*

4) *the site of DNA interacting with regular protein [24].*

While the expert’s associational metaphorical chain at the stage of the homonymous terms definition can be arbitrarily long, since it is based on the integrated system of special concepts.

Let us now turn to the results of the study of the homonymous genetic terms.

It must be said that genetic terminology is the best suited for inter-scientific homonymy decoding, because genetic processes are modeled “in the image and likeness” of the language as a means of communication and thinking. And terminology just reflects this analogy in its linguistic form. Only one homonymous term in genetics for example can be the subject of a separate independent study [25], as there are two fundamental sign systems - genetics and language behind it.

The relationship of language and genetic code was considered back in 1970 by R. Jacobson [26]. More than forty years have passed, and the problem of the correlation of language and genetic code is still being discussed by scientists and linguists [23, 27]. In addition, the metaphorical correlation of genetic and linguistic terms makes it possible to carry out a sufficiently deep semantic and conceptual analysis of inter-scientific homonymous terms.

The research was conducted in genetic term definitions of eight on-line thematic dictionaries:

1. Bioinformatics Dictionary.
2. NCI Dictionary of Genetics Terms.
3. Talking Glossary of Genetic Terms.
4. A glossary of molecular genetics.
5. Illustrated Glossary - GeneReviews.
6. A Molecular Biology Glossary.
7. Genome Glossary.
8. Genetic Terminology.

In the result of the semantic and categorial analyses the homonymous terms were grouped into three types of homonymy:

- Intra-scientific (gene, genome, genetic, genetics).
- Lexical (expression, repeat, library, nonsense, fish, reading, assembly, library, accuracy, entry, repeat, nick).
- Interscientific (text, letter, translation, synonym, transcription, annotation, reading frame, narration transcription).
- Mixed (genomic library, reporter gene, nick translation, transcription listen, nonsense mutation, gene expression).

It should be emphasized that such a classification in itself is the result of a linguistic analysis “from lexical form to concept” and it can be considered to be the first step in homonymous terms deciphering by a linguist.

We shall briefly illustrate all four types.

Intra-scientific. What we called “intrascientific homonymy” is directly related to the category of polysemy. The problem of demarcation of homonymy and polysemy is posed in recent domestic studies and its solution is proposed by using various courses of methods. Traditionally component and definitional analyses are performed to borderline polysemy and homonymy [28, 29]. The Definitional analysis is often supplemented with the contextual analysis as the most reliable criterion to differentiate homonymous and polysemantic terms [30-32]. In addition to the methods of structural analysis, the statistical methods [33] and case studies (Utt / Pado) [34] are successfully carried out. In our study, we do not consider homonymy in opposition to polysemy and proceed from the fact that any differences in denotation of two or more special concepts assigned to one form represent homonymy.

We shall consider an **intra-scientific homonymy** and exemplify it by two terms – GENETIC and GENETICS which are presented on the website <http://www.dictionary.com/> as polysemantic terms:

GENETIC

1. *Biology. pertaining or according to **genetics**.*
2. *of, relating to, or **produced by genes**; genic.*
3. *of, relating to, or **influenced by geneses** or origins.* The distinctive features marked above in bold allow defining all three concepts as different terms.

GENETICS

1. *Biology. the **science** of heredity, dealing with resemblances and differences of related organisms resulting from the interaction of their genes and the environment.*
2. *the genetic **properties** and phenomena of an organism.*

The generic notions highlighted in bold type also allow defining these two concepts as homonymous terms. In view of that the same lexical form is used for designation of different special concepts, we consider them to be scientific Intra-scientific homonyms. It is necessary to add that decoding of an intra-scientific homonymy both for a linguist and for an expert is based on the logical categorial analysis.

Let's move on to the **lexical homonymy**. By lexical homonymy we mean the transfer of the direct lexical meaning into a special concept meaning. Such a transfer can easily be traced, through the following example:

The term LIBRARY is defined as *a **collection** of DNA clones* (A glossary of molecular genetics). And we associate the term meaning to the direct meaning of the common word "collection". But most often, term motivation has been lost over time. To illustrate let us take the term FISH LISTEN. The motivated form of the term assumes the association to the general lexical meanings of both words - FISH (*cold blooded animal leaving in water*) and LISTEN (*try to hear, pay attention*). Therefore the linguist tries to track the meaning in the term definition:

FISH LISTEN. *A technique used to identify the presence of specific chromosomes or chromosomal regions through hybridization (attachment) of fluorescently-labeled DNA probes to denatured chromosomal DNA. Examination through a microscope under fluorescent lighting detects the presence of the colored hybridized signal (and hence presence of the chromosome material) or absence of the hybridized signal (and hence absence of the chromosome material). Also called fluorescence in situ hybridization [35].*

But in this definition, as we see, there is not a single metaphoric word but only special concepts. It follows that the motivation is lost and in order to reveal the metaphorical transfer, the linguist will need a more detailed description of this technology, or special commentaries of experts. At this lexical associative chain stops. The associational chain of an expert, who easily abstracts from the metaphoric meanings, will probably consist of special concepts.

Inter-scientific homonymy. It is necessary to emphasize here that research of cross-disciplinary, interscientific homonymy is of particular importance today, as fast moving integration of scientific and technical knowledge takes place that in turn is reflected in terminology integration. The homonymy of the integrated scientific domains is only beginning to be investigated by linguists and terminologists. Thus, there have appeared the works in which studying of homonymy is carried out in the cross-disciplinary material and interscientific fields of knowledge, such as terminology of nanotechnologies [36] and natural-science terminology [29].

To consider inter-scientific homonymy we shall analyze several definitions of genetic term "transcription". In order to trace the metaphorical transfer, we need, in addition to the terminological definitions, to take the definition of the linguistic term TRANSCRIPTION, in which, for the convenience of analysis, we have previously identified essential and distinctive features in bold: *Often in the sense of ***representation**. E.g. a 'phonemic transcription' is a representation of a form as **a sequence of phonemes*** (Oxford concise dictionary of linguistics: 381). And the generic concept **repre-**

sentation in its turn was defined in the same dictionary as **the structure assigned to a form at any *level of description or analysis.**

And now, having made a start from the linguistic concept, we can try to track the essential features (marked in bold type) in four term definitions. And it is necessary to note that the analysis is carried out by the linguist who usually isolates nonspecial concepts and figurative meanings in them to follow the transfer of meanings.

1. *The **synthesis** of RNA **from its corresponding** DNA **sequence*** (Illustrated Glossary. A glossary of molecular genetics).

Thus, in the first definition, the associative chain includes three key general concepts: **synthesis, from corresponding, sequence.**

2. ***Synthesis** of single-stranded RNA by RNA polymerase using DNA as a template. The process in the nucleus where by DNA is **transcribed into** mRNA* (Genetic Terminology).

In the second definition, the emphasis is done on the derivational structure **transcribed into.**

3. *The **process** of copying DNA to produce an RNA **transcript**. This is the **first step** in the **expression** of any gene. The resulting RNA, if it codes for a protein, will be spliced, polyadenylated, transported to the cytoplasm, and by the process of translation will produce the **desired** protein molecule* (A Molecular Biology Glossary).

In the third definition, the broader generic term **process**, the derivative **transcript** and three metaphoric characteristics - **first step, expression, desired** are added.

4. *The **process** of **making** an RNA **copy** of a gene **sequence**. This copy, called a messenger RNA (mRNA) molecule, **leaves** the cell nucleus and enters the cytoplasm, where it directs the **synthesis** of the protein, which it encodes.*

Narration Transcription. *Transcription is one of the fundamental processes that happens to our genome. It's the process of **turning** DNA into RNA. And you may have heard about the central dogma, which is DNA, to RNA, to protein. Well, transcription refers to that first part of going from DNA to RNA. And we **transcribe** DNA to RNA in specific places. **The most popular** places are those things that code for these protein-encoding genes. But there are **a whole host** of other RNAs that get transcribed, like **transfer** RNAs and ribosomal RNAs, that do other functions that are genomic **as well**.* (Talking Glossary of Genetic Terms).

The fourth definition, saturated with special and common words turns into a detailed description of the term - the so-called "Narration Transcription" in which the terms are "diluted" with a large amount of figurative vocabulary which allows the linguist to analyze the content of a special concept deeply enough.

The last type of homonymy - mixed homonymy is rather conditional one, since all three types of homonymy are traced within the same term form.

After analyzing and describing types of terminological homonymy, and opening up metaphoric transfers, the following questions arise: “What to do with this?” “Who needs it?” And “How can linguists and experts use it?”

One of the possible answers can be as follows: as a result of modeling the perception of homonymous form of the term becomes practically meaningful both for the linguist and for the specialist. A linguist deals with terminology primarily as an interpreter and translator and he is aimed to develop the modes of terms unification, standardization and lexicographical description. An expert and a scientist can use the model of a metaphorical homonymous term as a way to increase scientific knowledge developing the imaginative thinking in addition to categorial analysis.

Conclusion

We have tried to model the decoding process of the metaphoric homonymous terms and have come to the following generalizing conclusions:

1. Metaphorical nature of a term nomination requires the metaphorical transfer analysis and logical term nature requires the special concept categorial analysis. The combination of the dual nature of the term-sign appears to be the basis of the homonymous term decoding.

2. The metaphoric homonymic terms are related not only as categories with common characteristics. And term metaphor is not just a transfer of referent characteristics. The imaginative character of scientific concept needs the imaginative thought in addition to the abstract one.

3. The definitional analysis of genetic terms has allowed establishing four types of term homonymy - intra-linguistic, lexical, interscientific and mixed. Deciphering interscientific homonyms involves defining generic notions and distinctive features. For this both the linguist and the specialist conduct logical categorial analysis.

4. In the process of decoding of interscientific homonymy, the linguist focuses first of all on the lexical term motivation and undertakes the semantic analysis relying on figurative vocabulary in the definition. His associational chain can be interrupted if the definition consists only of unmotivated term forms. The expert think in terms and his associations are based on the conceptual relations within the term system.

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