

**PHENOMENA OF POLYSEMY IN VERBAL LEXEMES IN THE TEXTS  
OF SCIENTIFIC AND TECHNICAL DISCOURSE**

**ЯВИЩА ПОЛІСЕМІЇ В ДІЄСЛІВНИХ ЛЕКСЕМАХ У ТЕКСТАХ  
НАУКОВО-ТЕХНІЧНОГО ДИСКУРСУ**

**Dyachenko G.F.,**

*orcid.org/0000-0002-1657-1698*

*Candidate of Philological Sciences, PhD,*

*Associate Professor at the Foreign Languages Department*

*National University "Odesa Polytechnic"*

**Petrova O.S.,**

*orcid.org/0000-0003-0637-0806*

*Senior Lecturer at the Foreign Languages Department*

*National University "Odesa Polytechnic"*

**Vorobyova K.V.,**

*orcid.org/0000-0003-3474-502x*

*Senior Lecturer at the Foreign Languages Department*

*National University "Odesa Polytechnic"*

The article considers the cases of polysemy in the texts of one of the engineering specialties "Acoustics". The compiled text corpus is referred to scientific and technical discourse and is based on the scientific articles taken from the journals of corresponding field of engineering: Journal of Acoustic Society of America, Journal of the Audio Engineering Society, Applied Acoustics, IEEE Transactions of Antennae and Propagation, The Journal of the Society of America. The text corpus consists of 200 thousand tokens. The main methods used are as follows: statistical methods for compilation of probabilistic-statistical modal (frequency dictionary), calculation the verbal units and creating the verb list for the future research; contextual method for detecting the lexical semantic variants of polysemous verbs functioning in the text corpus; method of expert assessment – serving the specialists in the field "Acoustics" – in order to correctly choose the meanings of the verbs; method of consideration of definitions demonstrating the semantic structure of the distinguished polysemous verbs and fixed in the normative dictionaries Webster's and Hornby's; method of comparison of the units of semantic structures fixed in the normative dictionaries and their lexical semantic variants met in the real texts. The article includes some examples of polysemous verbs to demonstrate the principles of comparison. The experiment has showed that the thesis of some theoreticians about the decrease of semantic structure of words functioning in engineering texts is not correct enough since although all the meanings of semantic structure are not presented in the analyzed verbs but according to the facts they acquire the extra meanings which are absent in the dictionary entries. This allows to come to the conclusions that such facts will promote the further expand of the semantic structures of some words. In addition the results of the research evidently demonstrate the interaction between the language system and speech units. The experiment has showed a direct proportional relationship between the frequency of a word, its belonging to a definite stratification layer – commonly used, general scientific and terminological and the presence of polysemy. It appears that the higher the frequency of use of verbal unit the bigger the probability to become an element of commonly used or general scientific layers and be polysemous. The terms are usually concentrated in the low frequency zone of the verb list and certainly are monosemous.

**Key words:** normative dictionary, frequency of occurrence, stratification layer, probabilistic-statistical model, meaning.

У статті розглядаються випадки полісемії в текстах однієї з технічних спеціальностей «Акустика». Сформований текстовий корпус відноситься до науково-технічного дискурсу та базується на наукових статтях, взятих із журналів відповідної галузі техніки: Journal of Acoustic Society of America, Journal of Audio Engineering Society, Applied Acoustics, IEEE Transactions of Antennae and Propagation, журнал Товариства Америки. Текстовий корпус складається з 200 тис. слововживань. Основними методами, які використовуються, є наступні: статистичні методи для складання імовірно-статистичної моделі (частотного словника), розрахунку дієслівних одиниць та створення списку дієслів для майбутніх досліджень; контекстний метод виявлення лексико-семантичних варіантів функціонування багатозначних дієслів у текстовому корпусі; метод експертної оцінки – використання спеціалістів у галузі «Акустика» – з метою правильного вибору значень дієслів; методика розгляду дефініцій, що демонструють семантичну структуру виділених багатозначних дієслів і зафіксованих у нормативних словниках Webster's та Hornby's; метод зіставлення одиниць семантичних структур, зафіксованих у нормативних словниках, та їх лексико-семантичних варіантів, що зустрічаються в реальних текстах. У статті наведено кілька прикладів багатозначних дієслів для демонстрації принципів порівняння. Експеримент показав, що теза деяких теоретиків про зменшення семантичної структури слів, що функціонують в технічних текстах, є недостатньо коректною, оскільки хоча в аналізованих дієсловах не представлені всі значення семантичної структури, але за фактом вони набувають додаткового значення, яких немає в словникових статтях. Це дозволяє дійти висновку, що такі факти сприятимуть подальшому розширенню семантичних структур в дефініціях деяких слів. Крім того, результати дослідження наочно демонструють

взаємодію мовної системи та мовленнєвих одиниць. Експеримент показав прямо пропорційну залежність між частотністю слова, його приналежністю до певного шару стратифікації – загальноживаного, загальнонаукового та термінологічного та наявністю полісемії. Виявляється, що чим вища частота вживання вербальної одиниці, тим більша його ймовірність стати елементом загальноживаних або загальнонаукових пластів і бути багатозначною. Терміни зазвичай зосереджені в низькочастотній зоні списку дієслів і, звичайно, однозначні.

**Ключові слова:** нормативний словник, частота зустрічальності, стратифікаційний шар, імовірісно-статистична модель, значення.

### Statement of problem. Literature review.

Until recently, research dealing with linguistic units that were the part of the language system was a subject of many linguistic schools and directions, considering mainly artistic and journalistic subjects, the vocabulary of which is reflected in standard normative dictionaries (for example, Webster's [1], Hornby's [2] dictionaries). The functional aspect, the analysis of speech units implemented in text corpora, remained little studied.

Nowadays there is a real upsurge in the study of corpus linguistics, which is devoted not only to the accumulation of textual sets for creation of national languages, but also to the analysis of linguistic units functioning in texts. This also applies to such a huge array of texts as the languages of science and technology that are part of the scientific and technical type of discourse [3; 4].

Despite the huge variety of topics that the modern generation of linguists is developing, semantics is not very popular. In our opinion, the reason for this situation is the complexity of the issue. The need to use contextual analysis – one of the most labour-intensive among linguistic methods – has led to the fact that linguists prefer to develop topics related to statistical calculations of various objects of speech [5; 6; 7] or describe the problems of word-formation typology [8], etc. We can mention only a few studies that are closely related to the semantics of speech [9; 10; 11]. Therefore, this work is quite timely.

**Goal of the article.** The subject of the article is the text corpus of the specialty "Acoustics". The texts of this specialty have not been considered yet as a topic of study, and our probabilistic-statistical model (frequency dictionary) created on the basis of the texts of this specialty is the only lexicographic object in which the units are recorded that help describe the phenomena and processes of acoustics. The material for the text corpus was scientific articles published in journals in the USA and Great Britain on this specialty: Journal of Acoustic Society of America, Journal of the Audio Engineering Society, Applied Acoustics, IEEE Transactions of Antennae and Propagation, The Journal of the Society of America. The text corpus consisted of 200 thousand tokens.

The main units of analysis is a class of verbs, for which a list of verbs was selected from the frequency dictionary.

Thus to achieve the goal mentioned it was necessary to solve the following tasks:

1) to compile a semantic space, on the basis of which a text corpus is subsequently formed, for this purpose specialists-experts in the field of "Acoustics" were involved;

2) using the semantic space to select the appropriate texts from scientific articles in this field of technology, which can form the future text corpus;

3) with the help of statistical analysis and counting techniques, create a probabilistic-statistical model (frequency dictionary or list) that reflects the entire vocabulary of this specialty;

4) to extract a list of verbs from the frequency dictionary for further consideration of their characteristics of polysemy;

5) to compare the semantic structure of polysemous verbs presented in the definitions of normative dictionaries and general literary explanatory (normative) dictionaries in abstraction from their actual use [1; 2] with the lexical semantic variants of polysemous verbs recorded in the texts of the specialty "Acoustics".

**Base material.** The main thesis put forward in the article: there is a direct proportional relationship between the frequency of a word, its belonging to one or another stratification layer – commonly used, general scientific or terminological – and its polysemy.

When compiling a frequency dictionary, the polysemy of verbal lexical units functioning in the texts of the specialty "Acoustics" was determined 1) using contextual analysis in the process of examining the texts related to the mentioned subject area; 2) using normative dictionaries; 3) by the method of expert assessment, i.e. consultations with specialists dealing with acoustics.

In lexicography in order to determine the boundary of a polysemantic word, the definition of its main or central meaning is of great importance, therefore, in dictionary entries, the first meaning of a word is always the main one. The main meaning, around which the remaining minor meanings are grouped, reveals the semantic potential of a polysemantic word and determines the boundaries of its semantic structure. The minor meanings of a word constantly change in the process of human language practice, while it acquires new meanings or variants of mean-

ings, which, however, do not go beyond the limits of its semantic potential.

The scientific and technical discourse texts are supposed to be characterized by the absence or extreme limitation of polysemy. However a significant array of polysemous verbs was identified in the “Acoustics” text corpus. Moreover, the article will present the verbal units that are used in meanings not registered in the standard dictionaries.

The analysis demonstrates that there is a direct relationship between the polysemy of verbs, the frequency of their use and belonging to a certain stratification layer. Thus verbs located mainly in the high-frequency zone of the dictionary (in the frequency range 900 ... 11) and belonging to the commonly used layer of vocabulary have two or three meanings in terms of expression; verbs of the middle frequency zone (in the range of 253 ... 10) are included in the general scientific layer, and the polysemy of these verbs is characterized by the relationship of the plane of content and the plane of expression as 1:2; terms have only 10 units with an ambiguous relationship between the content plan and the expression plan, and most of them are concentrated in the low-frequency zone of the “Acoustics” dictionary and, accordingly, in the low-frequency zone of the list of verbs.

The examples of comparison of the semantic structures of polysemantic verbs presented in normative dictionaries [1; 2] with the lexical semantic variants of verbs functioning in the text corpus and reflected in the frequency dictionary “Acoustics” give an idea of the peculiarities of the polysemantic verbs functioning in this specialty texts.

For example, the verb ‘provide’ (F =253) belongs to the general scientific layer of vocabulary. There are three meanings in Webster’s Dictionary:

– “to take precautionary measures” – вжити запобіжних заходів;

– “to make a proviso or stipulation” – обговорювати;

– “to supply what is needed for sustenance or support” – забезпечувати засобами для існування.

Hornby’s dictionary also gives three meanings of the verb ‘provide’, but the order is different:

– “make ready, do what is necessary” – забезпечувати, утримувати;

– “give, supply (what is needed, esp, what a person needs in order to live)” – надавати, давати;

– “stipulate” – обговорювати.

If we take into account only the order of meanings in dictionary entries, it is difficult to conclude which meaning is the main one. In the “Acoustics” text corpus, the verb ‘provide’ has two meanings:

– “give, supply what is needed for smth.” – забезпечувати;

– “give smb. an opportunity to determine smth.” – давати можливість визначити щось. For example, [12]:

“The experimental program was conducted as part of the investigation to **provide** corroboration of the nearfield technique” – Експериментальна програма проводилася як частина дослідження, щоб забезпечити підтвердження можливостей методу у ближньому полі;

“The transducers were driven 180 out of phase to provide the dipole response” – Перетворювачі були розгорнуті на 180 по фазі, щоб дати можливість визначити/виміряти/характеристику диполя.

The example shows that in the texts “Acoustics” a meaning is identified that is not registered in the dictionary entries of the normative dictionaries used – “give smb. an opportunity to determine smth.”. This indicates the beginning of the expansion of the semantic structure of the word ‘provide’.

The frequency characteristics of the meanings recorded in the frequency dictionary “Acoustics” indicate the paramount importance of the meaning “give, supply what is needed for smth”. Taking into account the semantic and frequency properties of the meanings of the verb ‘provide’, implemented in the texts “Acoustics”, we can conclude that this particular meaning of the verb in the next corpus under study is the main one, and this fact may affect changes in the dictionary definitions of the verb ‘provide’ in the normative dictionaries and thereby on the language system itself.

An analysis of the meanings of polysemantic verbs has showed that in the normative dictionaries used for comparison analysis the meanings related to the common layer lexemes are presented first, and only then – the specialized ones. For example, the dictionary definition in Webster’s gives the following meanings for the verb ‘rear’: “to erect by building”; “to raise upright”; “to breed or raise (an animal) for use or mark”; “to cause (a horse) to rise up on the hind legs.”

In all likelihood the first and second meanings can be used in any area, while the third and fourth ones serve a special field of activity (preferably animal science or animal husbandry). In the “Acoustics” text corpus the verb “rear” (its frequency of use is F=28), functioning along with general literary meanings recorded in the normative dictionaries, for example, “to erect by building” – підіймати; “to raise upright” – споруджувати, performs a function of term. The lexical verbal unit ‘rear’ acquires a status of verb-term only as a unit

of the “Acoustics” terminology system, i.e. among other specialty terms.

One more example of polysemy, which is implemented in the “Acoustics” text corpus. The verb ‘transform’ functions with a fairly high frequency of use ( $F = 175$ ). In the specialty “Acoustics” it was referred to general scientific layer of vocabulary with the meaning ‘change in composition’ – *перетворювати*. There are three meanings registered in Webster’s dictionary:

- “change in composition or structure”;
- “subject the mathematical transformation”;
- “change (a current) in potential (as from high voltage to low) or in type (as from alternating to direct)”.

As we can see the first meaning is more general, neutral; the second and third are specific to certain branches of science and technology: the second is for mathematics, the third is for physics and electrical engineering.

**Conclusions.** Thus when comparing the dictionary definitions of the normative literary dictionaries [1, 2], which represent the semantic structure of words, and the lexical semantic variants of the same words included in the specialty “Acoustics” frequency dictionary, we can conclude that in the former, based on the clichés of colloquial speech and the language of fiction, many meanings of words remain unclear, their use is based on the interaction of team members or the originality of the author’s style, and sometimes the ambiguity is not removed not only by the micro, but also by the macro context. In the entries of these dictionaries, as a rule, the main meaning that determines the semantic capabilities of a word, and at the same time its connection with the concept it denotes, is not highlighted or is not clearly highlighted. When determining the main central meaning in the normative dictionaries, the emphasis is usually placed on the origin of the units.

As for the frequency dictionary “Acoustics”, lexical semantic variants are subjected to the regularity of functioning of text units of the specific scientific discipline being studied. This is associated with an accurate and systematic presentation of scientific issues in order to present new research results, proof of certain hypothesis, theories, and arguments. The linguistic material analysis shows that the main meaning is determined by the use of a word, and not by its origin. Basic meanings, as a rule, are the most frequent, and their place in a dictionary entry depends on belonging to a particular stratification layer.

We can come to the conclusion that when studying the semantic structure of polysemous words, one cannot rely only on normative dictionaries, because the meanings of words are empirically derived from linguistic material in them. They do not provide a complete set of meanings of polysemantic words, since they deal with isolated units of language. It is possible to understand the meaning of a word only by analyzing its functioning in speech.

The verbal units presented as examples confirm the assumption made at the beginning of the article about the close interrelation between the frequency of use of a verb, its assignment to a certain stratification layer and the presence of polysemy. We have determined that verbs with a high frequency of use in the text corpus are usually units of the commonly used layer of vocabulary and are polysemantic. Verbs with an average frequency of use belong to the general scientific layer and are characterized by a much smaller number of lexical-semantic variants. Terms usually have, firstly, a very low frequency of occurrence in the texts, and secondly, they are almost always monosemantic since by their nature they can denote only one exact concept in the system of concepts of a particular specialty.

Further research will be presumably related to the definition of polysemy of other parts of speech found in the “Acoustics” text corpus.

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