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**ON STAGES AND LINGUISTIC MEANS
OF FORMATION OF SUBSTYLES
(on the example of verbal structures of scientific
and natural and scientific and technical texts)**

The article presents the stages of the formation of scientific-natural and scientific-technical substyles. The method of linguistics and translation studies were used to study the speech patterns investigated. The scientific journal article is considered as the highest level in the activity of scientific communication. The main focus is made on the speech patterns based on these associations. The language lexical features of speech patterns, the communicative strategy of selecting the speech situations from the reality were shown. The three-level classification was proposed which relies on the main stages in the process of the formation of communicative speech. The importance and novelty of the materials of this research is correlated with the theoretical and problematic issues of translation in English-Russian scientific sphere. The materials of this paper and others on the given topic are used in the teaching practice of English for the students of natural science specialties of Al-Farabi Kazakh National University.

Key words: article, informative text, scientific substyle, speech patterns, speech situation, communication, associative structures, language units, lexico-stylistic evaluation.

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**«Ғылыми стильдің түрлері:
қалыптастыру кезеңдері және лингвистикалық тәсілдері
(ғылыми-жаратылысы мен ғылыми-техникалық сөйлеу құрылыстары)»**

Мақалада сөйлеудің ғылыми-жаратылысы мен ғылыми-техникалық қалыптасу кезеңдері сипатталған. Сөйлеу құрылымы аударматану мен лингвистикалық әдістер арқылы зерттелген. Ғылыми мақала сол нәтижелердің негізінде сөйлеу қатынасы қызметінің ең жоғары деңгейі ретінде қарастырылған. Ассоциация негізінде сөйлеу құрылымына көп көңіл бөлінген. Сөйлем құрылымының тілдік лексикалық ерекшеліктері, ақиқат өмірден алынған сөйлеу кезіндегі коммуникативті стратегияны таңдау нақты көрсетілген. Осыны негізге ала отырып, коммуникативті сөйлеудің негізгі кезеңдеріне сүйенген сөйлеу құрылымының үш деңгейлі классификациясы ұсынылады.

Бұл зерттеу материалдарының өзектілігі мен жаңалығы ағылшын-орыстiлдi ғылыми саладағы аударма мәселесiнiң теориялық және практикалық проблемаларына негiзделген. Аталған тақырыпта жазылған бұл және басқа да зерттеу жұмыстарының материалдары әл-Фараби атындағы Қазақ ұлттық университетiндегi жаратылыстану факультеттерiнiң студенттерiне оқыту тәжiрибесiнде пайдаланылады. Оқу құралдары мен әдiстемелiк нұсқаулықтар дайындалған және жарияланған.

Түйін сөздер: журналдағы мақала, ақпараттық мәтін, ғылыми стиль, сөйлеу құрылымы, сөйлеу жағдайы, сөйлеу қатынасы, ассоциативті құрылым, тілдік бірліктер, лексика-стилистикалық бағалау.

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**Об этапах и лингвистических средствах формирования подстилей
(на примере речевых структур научно-естественного
и научно-технического текстов)**

В статье показаны этапы формирования научно-естественного и научно-технического подстилей речи. Речевые структуры исследованы методами лингвистики и переводоведения. Научная журнальная статья на основе этих результатов рассматривается как самый высокий этап в деятельности речевого общения. Большое внимание уделено речевым структурам на основе ассоциаций. Показаны языковые лексические особенности речевых структур, коммуникативная стратегия выбора речевых ситуаций из реальной действительности. На этой основе предложена трехуровневая классификация речевых структур, которая опирается на основные этапы в процессе формирования коммуникативной речи. Актуальность и новизна материалов этого исследования соотнесена с теоретическими и практическими проблемными вопросами перевода в англо-русскоязычной научной сфере. Материалы этой и других работ по данной тематике используются в практике преподавания английского языка студентам естественных факультетов Казахского национального университета им. аль-Фараби. Подготовлены и опубликованы методические разработки, учебные пособия.

Ключевые слова: журнальная статья, информативный текст, научный подстиль, речевые структуры, речевая ситуация, речевое общение, ассоциативные структуры, языковые единицы, лексико-стилистическая оценка.

Introduction

Scientific informative text from the field of natural or technical sciences is a constant object of research in linguistics and translation studies. «The language and the speech should be distinguished, since there is a corresponding deep distinction between them, and therefore, without taking this distinction into account, linguistics cannot exist as a special and genuine science, the science of language considers the most important means of people's communication» (Smirnytzky A.I., 2007: 12). In the processes of people's communication who speak different languages, this fact becomes very important and requires the study of speech and language units in relationships from different angles. The way of communication, the level of speech development, language competence, the goals of communication specify the direction and content of the study. The object of study is the informative text in the form of a journal article. A journal article is not only an express conductor of scientific knowledge in a certain scientific specialty. What is important is the communicative effect of the article. The author of the scientific informative text secures the right to the novelty of the information presented in the text. For linguistic sciences and translation studies, for the process of education in general, for learning and teaching foreign languages, the other side of the information presented in the text is important. Stylistic features of speech units associated with the transition from

one language to another, also acquire the character of priority.

Mutual linguistic transitions require a reasoned approach to the choice of translation meanings of words, to linguistic methods of forming the initial speech structures in the target language. In modern practice of translation, the problem becomes relevant in relation to speech units with a complex syntactic structure, speech units, complicated by the aspect of the language semantics of the words used. The novelty of research concentrates on speech structures that appear in scientific texts on the basis of correlation with the reality of animate and inanimate nature. In the theory of translation from Russian into English and, conversely, from English into Russian, the lexical-semantic nature of the speech structures of modern scientific-natural and scientific-technical texts has been less studied. The study of scientific sub-text is currently associated with the study of lexical units, where the main place is always occupied by terms. However, at the present stage, the stylistic features of a scientific text, expressed by the concepts of «logicality», «accuracy» and require the addition of definitions of «professional» and «informative». Not only the type of scientific activity, but also the division of this type of scientific activity into narrower profiles, became the cause of a differentiated perception of words. A word in speech reproduces communicatively useful information. Therefore, the language of the carrier of modern scientific information acquires the character of the purposeful use

of the meanings of words as part of more complex linguistic units. Sentences and phrases, as the main types of language units of a scientific text, express «in their given concrete cumulative application a more or less complex thought or chain of thoughts (only in special rare cases, only an emotion), which as a whole is not the part of the language, but belongs to the known sphere of human activity served by the language (Smirnytzky A.I., 2007: 14). The main goal of any scientific article is to describe scientific results which should be perceived by the specialist from the given professional sphere without error. In the formation of the speech structures of the text, the nature of mental activity inherent in this communication is clearly visible. It is based on scientific and communicative knowledge: laws, theories, hypotheses, the results of previous studies, which, of course, is reflected in the speech. This paper is aimed at studying the stages in the development of speech activity in scientific communications related to the field of natural and technical sciences. The choice of the materials of scientific-natural and scientific-technical texts for the study of the object «speech structures of an informative text» is conditioned by the fact that scientific translation and scientific-pedagogical work has been associated with these communications for many years.

The study was conducted by methods and means of linguistics, translation studies, as well as on the basis of logic techniques. The research results are ambiguous, both in theoretical and in practical terms. One of the many aspects of the application is related to the improvement of foreign language teaching methods in higher education institutions. In the methodology of teaching a foreign language,

not the last place is given to methods that develop speech skills.

For students of non-philological specialties, professional-communicative speech becomes relevant, especially at the final stage of training in the preparation of graduation papers and dissertations. Therefore, the process of teaching a foreign language should implement this aspect of vocational education with the help of special texts. The texts in the form of a «scientific journal article» are productive for this purpose. Teaching on such texts should be theoretically reasonable from the standpoint of linguistics and translation studies, where the main problem is the adequate interaction of the source and translating languages. The solution of these problems is impossible without the analysis of practical material – speech works of scientific informative texts (Borisova L.I., 2005: 12).

Experiment

The experimenter and the experimental activity is the main condition for the existence of scientific, natural and technical communications. Through the use of experimental methods of knowledge, scientific activity in these communications takes place based on the reality. The situation is considered as a certain stage or stage in the process of a scientific experiment (Makhmetova D.M., Apekova R.N., Lugovskaya E.I., 2012: 19-22). The complexity of scientific situations and connections between individual situations makes it more likely to turn to reality, that is, to well-known and well-described situations of human existence. This is confirmed by the lexical units of the text which are given in the tables 1 and 2.

Table 1 – Speech patterns from scientific journal articles

Speech patterns	New meaning
Copolymer <i>chains</i> ; 1.2. <i>Closed-packed</i> spheres; <i>Free</i> energy; 1.4. <i>Flat and identical</i> surfaces <i>Surface-copolymer</i> interactions play important role in determining final morphology of the system. The lower surface is flat, the upper surface is <i>zigzag</i> ; (Linli He, Linxi Zang, Haojun Liang, 2008: 1)	The italicized-typed words are used in scientific texts to characterize the shape and type of surfaces, polymers, structures and some scientific phenomena.
The results may serve for improving <i>the mixing</i> effect of polymer composites, especially in case of <i>dispersed highly viscous</i> phase. (Peng Chen, Jun Chen, Jiasong He, 2008: 25)	The italicized-typed word: mixing is used in combination with the word: effect to emphasize the nature of the influence being produced by composite polymers. The dispersed highly viscous is used in combination with the word: phase. The word combination dispersed highly viscous phase has the meaning of the state of the dispersion with a high viscosity. So the word phase in scientific text means a physical state while in real life it is a stage.

Speech patterns	New meaning
The resulting material is a sort of « <i>Swiss Cheese</i> » polymer with liquid crystal droplets filling in the holes. Dielectric measurements of crystal-polymer composites have been carried out using an impedance/gain-phase analyzer with <i>sandwiched</i> -type sample holders. (Agrawalla N.K., Madhusudanan K.P., Abshibek Kumar Srivastava, Rajiv Manohar, J.P. Shukla, 2008: 639)	Swiss cheese and sandwiched are the words meaning food but acquiring the meaning of the type of a shape based on visual associations.
These gels undergo a temperature-induced <i>collapse</i> from an extended coil to a globular structure.	Collapse means a sudden decrease.
Soot formation <i>threshold</i>	Threshold means an inception
The fullerene content is expressed in <i>weight</i> fraction of all extracted fullerenes from the soot. (Hiroaki Takehara, Masashi Fujiwara, Mineyuki Arikawa, Michael D. Diener, J. Michael Alford, 2005: 311)	Weight means mass

Table 2 – Lexical features of speech patterns

Speech pattern №	Language unit, lexical unit	Speech pattern correlated with reality	Lexical meaning in scientific text
1	Word: «threshold» belongs to common lexis	It is used in real situation which is widespread in everyday's life.	It is used in proper meaning in the scientific text.
2	The word: «collapse» is an international word of a Latin origin.	This word is common for various spheres including social sphere.	In the scientific text it is also utilized in proper meaning.
3	Words: composite which is an international word of a Latin origin and «sandwich» which belongs to common lexis and is a term being utilized in gastronomy.	The first word is used in literature, music and art, the second one is employed by gastronomy and is a type of food.	In the scientific text these two words change their meaning acquiring a connotation. In scientific sphere the word: «composite» means a complex nanoparticle whereas the second word: «sandwich» means the shape of a nanoparticle. In scientific text it fulfills the role of an adjective.
4	The word: chain is a word of common vocabulary	It means the piece of jewelry which is made of silver and gold	However in science this word acquires a different meaning. It means the shape of a structure.

Each stage in scientific activity is associated with the formation of scientific speech skills. To find a more correct and more accurate model of the mechanism by which a situation is realized in a holistic scientific experiment, traditional and non-traditional methods are used to compare the meaning of scientific situations with situations from human existence, that is, situations from the reality. Tradition is expressed by communicative standards and stereotypes. Most often these are speech structures, the formation of which is influenced by the subject base of higher professional education. At this stage, the speech structures are lexically and syntactically dependent, as they are influenced by the teachers' speech, books – of educational nature,

and methodological developments for practical exercises (Makhmetova D.M., Gumarova Sh.B., Lugovskaya E.I., 2016: 33).

We give only two examples that confirm our conclusion.

1. Statements from the chemical text: – «Determination of the sum of Cr and Mn», «Cr is determined by the difference.» The word «sum» is a mathematical term familiar to chemical communication with a well-known meaning, which is also preserved in the chemical text.

2. Statements from the scientific and technical text: – «Conical flame front»; «The flame maintains a highly wrinkled, somewhat unstable geometry.» The words «conical» and «geometry»,

in combination with the words «flame front», while retaining the meaning attached to them in mathematics, perform the grammatical role of definition. The phrase «flame front» has the meaning of an object with a regular or irregular geometric shape (Marcum S.D., Ganguly B.N., 2005: 27) Nontraditional expressions usually correspond to the stage of independent scientific activity. They reflect the nature of mental activity, which is influenced by communication, carried out in different ways. Speech structures become frequent with the words:

system, paradigm, pragmatics, classification, analysis, synthesis, scheme, symmetry / asymmetry, play / role, transition, interaction, symmetry, asymmetrical, cooperative, segment, section, case / example. The international words are becoming popular. The semantic tendency of their inclusion in sentences is revealed. For example, in order to reflect any specificity: complexity, frequency, structure and sequence international words are employed. Table 3 shows this process on the example of one international word.

Table 3 – Communicative features of speech patterns

Speech pattern and text type	Language unit	Lexical unit	Communicative strategy
Soot emission (Mansurov Z.A., 2005 :133)	Word combination	Emission – international word	The communicative intention of this word combination is to express the nature of a physical phenomenon which is connected with the release of soot particles and show the difference of this phenomenon from the chemical process relating to soot particle liberation too.

The mental activity is formed at the stage of scientific activity when the language context changes. The language environment has a direct and strong influence on language competence, contributes to the development of imitative perception of generally accepted concepts, the development of language. This phase is characterized by non-traditional associations. This may include speech structures built on the union of concepts from different sciences, or on the union of scientific concepts with ordinary concepts from ordinary reality.

We conventionally single out three levels in the communicative activity of speech communication, relying on the language features of the speech structures of scientific-natural and scientific-technical texts. The first level is the usual, stereotypical nature of speech works. The second level is an intermediate, professional which is characterized by the scientific character in the activity of speech communication.

The third level in the activity of speech communication is manifested by individual features of speech, which are associated with the ideological, psychological, aesthetic views of the scientist taking into account his/her educational background and creative abilities. Speech structures, which can be rightfully attributed to

the third level, are formed either on the basis of spontaneous or carefully considered associations. Speech structures of the third level in scientific informative texts constitute a small proportion in comparison with the first and second levels, due to the fact that they are in essence easily transformed into speech structures of the first and second levels. In addition, they usually function in the text as carriers of strictly defined narrow scientific information, for an adequate perception or explanation of which the best way is its figurative expression. Table 4 gives the examples of the speech structures which belong to the three levels described above.

Table 4 demonstrates the variety of vocabulary on the examples of speech patterns taken from the scientific texts on different spheres. These three examples illustrate the interaction of terminological units with the words of common lexis. This interaction leads to the appearance of the scientific word combination of a new generation the main aim of which give the more precise description of the scientific product obtained. When combining a word of common lexis and a terminological unit the scientist correlates his/her product obtained with the real life and tries to find an object which would remind partially it.

Table 4 – Associative speech patterns

Speech pattern	Main language unit	Language unit with an associative-communicative function	Communicative strategy of an association	The level of the development of speech structures
«Graphite rose» (the phrase is taken from the scientific text on physics)	The word: «graphite» is a term that is used in chemistry.	The word; «rose» is a flower with a petal structure and is used in botany.	The communicative strategy of this phrase is to show the petal structure of this graphite particle.	Third level
«Graphite nanotube» (the phrase is taken from the text on physics)	The word: «graphite» is term used in chemistry.	The word: «nanotube» is a compound word, nano means a degree 10^{-9} , and the word «tube» is a word of a common lexis which means an object from the real life.	The communicative strategy of this phrase is to show the cylindrical type of this graphite structure.	Third level
«Crowd of electrons» (the phrase is taken from the scientific text on chemistry).	The word: «electron» is a scientific term which means an elementary particle.	The word: «crowd» is a word of a common lexis which is used real life and nature and means the large accumulation of people and objects in one place.	The communicative strategy of this phrase is to demonstrate the stage of chaos and mess.	Third level

Results and discussion

Therefore modern scientific substyles are formed by not only conventional lexical units which include the use of terminological word combinations and certain grammatical constructions but also it is expressed through the words belonging to real life like threshold, rose, crowd, zigzag, collapse, composite, tube.

So the stages of style formation in natural science and scientific and technical communications are connected with the logical structures of the cognition process. The structures of knowledge that are formed in the process of vocational training naturally develop in the process of professional activity. The factors of modernity – the study of foreign languages, the use of intelligent mobile technologies – are expanding scientific contacts, spreading scientific information with a great speed.

Each stage of the development of scientific substyle shows the variety of lexical tools used by the scientists when writing a scientific article beginning with terms and finishing with the words of common lexis. This use of language can result in emerging very unusual for the scientific text word

combinations like ‘graphite rose» or ‘the crowd of electrons» where a terminological unit is combined with the language unit of common lexis thereby expanding the scientific vocabulary to the greater extent and turning it into the mixture of various styles.

Conclusion

Therefore the stages of the formation of speech style in scientific, natural, and scientific and technical communications are natural and logical linguistic structures. Scientific communicative activity is reflected in reality with the help of speech structures. The speech structures of each stage reflect the level of scientific competence, which is closely related to the development of speech skills.

Scientific speech is enriched by the manner of presentation characteristic of different spheres of human existence. Journal scientific article is considered as the highest stage in the formation of a scientific style of speech. Speech structures in the informative texts of natural and technical sciences are a special speech material that requires a further research

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