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## Language models in Russian linguistics

© O. P. Kasymova

Bashkir State University

32 Zaki Validi Street, 450076 Ufa, Republic of Bashkortostan, Russia.

Email: [olgakasymova@yandex.ru](mailto:olgakasymova@yandex.ru)

*In the article, the models of the language system are described represented in the works of Russian linguists. Russian language models that formed by the end of the 20<sup>th</sup> century in Russian linguistics are quite different and even contradictive. Level model of the language system is leading among the reviewed; it is the basis of most studies of language units. Other non-hierarchic models of the language system is less well known. The model of language units representing the field brings together different levels of language units on the basis of their common features. Strategic setting can be semantic, functional or combination of both. The basis of the dynamic model is the idea of conceiving the order of the language system formation in the human mind. In the dynamic model of the language system, the criterion of quality is the time of forming special knowledge and skills in the speaker's mind. In the multilayer model of the language, units are organized "in layers" and in the course of language dissolution we can trace their arrangement from the new complex forms to the deeper ones. Fourth non-hierarchical model is the associative-verbal network by Y. N. Karaulov. This model issuing from the fact that language is an open dynamic system. These models are an excellent illustration of General scientific principle of complementarity. Being so different, these models contribute to the creation of the general model both of the Russian and any other natural language.*

**Keywords:** modeling, language system, language model, systemology.

Modeling is one of the most widely spread ways of representing the knowledge about the systems, and in humanitarian sciences it is practically the only way of illustrating the knowledge of properties of the studied system. Modeling is widely presented in linguistics and, as some linguists note, in I. P. Raspopov's opinion, "in essence (although it was not accepted by the traditional grammar) building the so-called paradigmatic schemes of names declination and verbs conjugation is modeling, and these schemes are models, placing separate grammar forms of the word in a succession, convenient for observation. What is this succession like in language reality, we do not know, because the corresponding facts are presented to us separately. That is why, gathering them together, we build a model" [1, p. 19].

Modeling always issues from the fact that the object is systemic in itself, in other words, the systemic properties of the object (of the language system in our case) exist objectively. Researchers try to restore in the model (with varying success) these properties of the object, that is why models are always subjective, to this or that degree they are valid (close to the original) and correlate with each other on the principle of complementarity. Building the language model, we mainly use the method of description, more rarely the model is represented as a dictionary.

In the given article only some models of the Russian language system are studied; there the language system is represented differently and with different degree of completeness. The description of the models presented in this article was mostly based on the work by Z. D. Popova [2]. This survey does not claim to be complete, the author aimed to show that while constructing the model linguists

use (probably, intuitively) the basic notions of systemology. Other aspects of system of language research reviewed in the papers by O. P. Kasymova [3–4].

**The level model of the language system.** The level model of the Russian language is the most famous. It is most widely represented in the numerous grammars, it is exactly this idea of language system organization that most studies of the language realia are based on. The language system in this description is represented as a hierarchy of levels. This idea dates back to E. Benveniste, who, in his turn, refers to F. de Saussure [5].

Language is a system of heterogeneous, non-homogeneous units that enables us to speak about it as of a complex system – the system of systems. The idea, put forward by A. A. Reformatsky that there is a unity of different levels of the whole together with what joins special systems inside the levels “was not only timely, but led logically to the necessity of multilateral, multifaceted and, what is more important, differentiated approach to the organization of language and its relations” [6, p. 63]. That is why the introduction of the notion of the *level* became so important within this trend. With the introduction of this notion the so-called “stratification model of language” was defined.

The level model of the language presupposes the stratification of the language system into several large blocks, arranged in a special way. Usually the level model is described as a pyramid, a shelving unit, a chain, a staircase.

The exactness and even “toughness” of the level model of language is sufficiently attractive for linguists. This model is leading, it is represented in the grammars of the Russian language. The inner contradiction of the level model, providing only “a rough arrangement of the language system into blocks, whose system character is still problematic” [2, p. 80], contributed to the fact that within this model the stratum model put forward by American linguists arose (S. Lamb, D. Lockwood, H. Gleason and others).

Lately (from the beginning of the 70s) a new (**module, modular**) theory of language units organization became popular. According to the basic notions of cognitivism [7, p. 101–105], language units are organized on the principle of modules. The module is one of the basic notions of cognitivism, referring to the indication of those simple systems or parts, making up the whole infrastructure of the brain (mind), language, etc. The analogies are module technical devices and the framework in the cinema. In Ch. Fillmore’s doctrine the term module is used as a synonym of the term frame, it is associated with the section (module) furniture. Frames (modules) are combined into larger modules or frames. The module is a number of ideas, kept in memory.

Language can also be regarded from this module perspective – hence, the conception of module or modular grammar as a system of rules and representations, divisible into independent interacting subsystems. Figuratively the module system can be represented as parts of a mechanism, functioning autonomously, but coordinately to achieve a common aim, or as a system of blood circulation, where the venous and the arterial systems coexist, not intermingling and not substituting each other, on the whole, fulfilling the common function.

The module model of language units organization was not developed in Russian linguistics, although there are all the reasons for it. Within the level model of language there are many accumulated facts that are waiting for the explanation from the point of view of the module organization.

**The field model of the language system.** The model of functional-semantic field, including the lexical and grammatical language means with common semantic functions was built by A. V. Bondarko on the base of deep interaction of different level means through the example of aspectuality and temporality [8]. In the field model of the language units are united on the base of the common meaning

expressed by them or on the principle of their common function, that is the system-forming parameter can be semantic, functional or their combination. The groups of language units, selected according to this principle, are "system formations with connections and relations characteristic of any system and alongside with this having their own specific features" [8, p. 4]. The field consists of the core and the periphery, lately scientists have suggested singling out the near-core zone. The core is characterized by the maximal concentration of field-forming properties, these properties are weakened at the periphery. Between the units of one field opposite and non-opposite relations are possible. As the main properties of any field we can single out the following 10 properties: 1. The field is a set of elements, connected through structural relations; 2. The elements constituting the field have semantic commonality and the same language function; 3. The field can cover both homogeneous and heterogeneous elements; 4. The field structure includes microfields; 5. In the field structure there are core and peripheral constituents. The periphery has a zone organization; 6. The core constituents are the most special for the field functions; 7. Between the core and the periphery there is the distribution of the field functions; 8. The border between the core and the periphery and also between certain zones is vague; 9. The constituents of the field can belong to the core of one field and to the periphery of another field and vice versa; 10. Different fields partially overlap each other forming the transition zones [9, p. 5–6].

The functional-semantic fields described in Russian linguistics are rather different. Typologically the fields are classified into two groups: the monocentric, having a clear dominant, and the polycentric, not forming a single homogeneous system. The opposition of language units, characteristic of the level approach, is withdrawn, if the principle of their merging is the expression of the similar meaning, that is why within one field there may be words and grammar categories, syntactic structures, intonational means. In the field model of the language the meaning structure of the word is represented in the new light as multisided and dynamic.

On the whole the language system as a field is not represented, there are separate descriptions of certain fields, developed to different degrees of elaboration. In choosing the semantic property as a system-forming parameter there is always an opportunity of subjective interpretation of language facts, that is why the functional-semantic fields, available in the Russian linguistics, differ with different authors. In the studies it is mentioned that the complexity of field interaction would require their multisided field representation of language – as overlapping spheres.

**The dynamic model** of the language system was suggested by Z. D. Popova. The basis of this model is the idea of conceiving the order of the language system formation in the human mind. Because this process is relatively complex, it is not possible to build a strict and non-contradictory model, in the author's opinion. Nevertheless Z. D. Popova puts forward a relatively complete model of the whole language system in the process of its formation in the individual mind. The language system is represented in three blocks: the phonetic block, the lexicon, the block of structural schemes.

The *phonetic block* is thought primary: the formation of the language system in the child's or adult's mind, finding himself in a new language milieu, begins with the perception of audio phrases. Numerous repetitions help to assimilate the melodic scheme and to learn to break phrases into the intonational constructs – syntagms. The melodic scheme helps to identify the communicative aim of the speaker. Dividing the speech into parts (phonetic words), the learner isolates syllables – the smallest parts of the sound flow. Within the syllable, in Z. D. Popova's opinion, the prosodeme as the smallest intonational flow unit is realized. Proving her choice of the elementary sound unit, Z. D. Popova

says: "It is difficult to suggest that in human memory there are some abstract 'phonemes', whose number and quality cannot be defined by phonologists, or 'sounds', the majority of which are not pronounced and cannot be differentiated by ear, which is clearly expressed in illiterate writings (compare *зайиц, заеиц, заяиц, зайиц, заэиц* and so on). If speakers could clearly discern the sounds, which they pronounce, the rules of orthography would not be necessary in order to preserve a uniform writing of one and the same word" [2, p. 10].

The succession of syllables with the common stress makes up the phonetic word (lexeme). Comparing lexemes, the student finds out the same component parts – morphemes. Morphemes follow each other in words in a certain succession, dictated by the language laws. The rules of morpheme combinability are studied in morphonology, together with the rules of vowel and consonant changes in morphemes. Intonation is an important part of the phonetic block; it has a partially universal character: some communicative intentions are clear without translation, even animals can understand the communicative aim of the speaker through the intonation.

In the language memory of the speaker there are only those sound units, which are used as signs of some mental contents (concepts). In this way the word form – the language unit of the next block (*lexicon*) is formed: "a strong connection (association) of some sound succession (let us call it a lexeme) and a concrete mental image (let us call it a sememe) form a language sign, that is usually represented by a word form in a concrete locution" [2, p. 15].

Word-building cells and rows form an independent branch in the structure of the lexicon. This branch is built on the "skeleton" (multisided) model: there is no coordinating centre in it, each subsystem interacts directly with some other, word forming rows form the skeleton, on which word-building cells are put.

Together with word-building, generating new lexemes, morphemes can be used to change the forms of the same word. Word-changing serves to denote the syntactic position of the word form in the locution. In the languages with no flexions there is no part of speech system, only the differentiation of lexico-semantic fields is possible.

The block of *structural schemes* is formed on the base of phrases. Phrases are distinguished in the text due to the intonation of finality, they realize some communicative aim. The ability of the listener to divide the locution into word forms develops gradually. Each word form in the locution has a certain position, i.e. it denotes the doer, the action, the object of the action, its instrument, the place and so on. All the word forms of the locution make up the positional scheme of the locution, and their meaning set is called the proposition. The word forms that can take the same position are associated with each other in the language memory and form the groups that can be called lexico-semantic fields. They are traditionally called "ways of expressing sentence members".

The analysis of position schemes leads to the description of several structural relations of word forms with a certain abstraction from their lexical contents. In the locution there is always a mental construct, functioning as the subject of the judgment, and some other image is chosen as a predicate of thought. The combination of subjective and predicative forms makes up the structural scheme of a simple sentence. The knowledge of the structural schemes of a simple sentence is obligatory, if you want to speak the given language. On the whole in every language there are not so many structural schemes – two or three dozen, they also can be represented as a functional-syntactic field. There are core schemes, where it is possible to express any thought, there are peripheral, seldom used and lexically limited schemes.

The structural schemes of complex and complicated sentences and the ability to use them is formed in speakers much later than all the other subsystems. Children form such constructions by 12–14 years of age.

Text-forming means (words, set phrases, the actual division, expressed by the word order, particles, deictic means and so on) are placed by Z. D. Popova between the lexicon and the block of structural schemes and leaves open the question if they form a special subsystem, while phraseological units, thinks the author of the model, do not form a separate subsystem.

The given dynamic model of language quite correlates with the neurolinguists' opinion that subsystems of language are kept in different sections of the brain and are formed gradually during several years (mainly, from 2 to 5, some subsystems – from 12 to 14 years of age). So, in the dynamic model of the language system the criterion of quality is the time of forming special knowledge and skills in the speaker's mind. On this principle language units are grouped into 3 blocks, having different structure. On the whole, the model expresses the non-hierarchic organization of the language system. Z. D. Popova figuratively compares her model to a bush or a tree, whose large branches are relatively independent, but attached to one base: they are grouped into one whole and serve one aim.

**The multilayer model of the language system.** If linguists mostly study the modern state of the language system and its formation (the synchronic and the diachronic aspects), in the works of D. L. Spivak for the first time the question of the process of language knowledge loss came in the focus of attention: the researcher is interested in the breaking and disappearance of language, accompanying the dissolution (i.e. the breakage, the darkening) of consciousness [10–11]. The study of language in such conditions was based on the ideas of a group of researchers that in the 20-s of the XX century came to the conclusion about the relation between the frequency of occurrence of some parts of speech with a certain degree of emotional stability of a person. At the emotionally stressed moments the number of set phrases in speech increases, as well as of expressive words and verbs, with the decrease of the number of nouns and adjectives; the number of simple, non-complicated sentences increases. In the process of gradual increase of the changed state of mind there is the further change in the language use: gradually the frequency of nouns and adjectives, conjunctions and prepositions decreases and the frequency of set phrases, pronouns and particles increases, the average length of the word and sentence decreases. D. L. Spivak concludes that there is a special reflection of the Mueller-Haeckel dependence, known in biology and applied in other conditions, according to which the individual in the course of his development repeats the history of his species' evolution. During the consciousness dissolution there is the gradual dying out of genetically younger relations and structures of the brain. Like at the final stages of dissolution there remain the simplest reflexes (for example, taking "the position of an embryo" by the human), in the language it is possible to preserve the earliest relations and structures. In D. L. Spivak's model language units are organized "in layers" and in the course of language dissolution (which is experimentally testified) we can trace their arrangement from the new complex forms to the deeper ones. The experimental conclusions are compared with the conclusions of the linguists, who with linguistic methods studied the succession of appearance and the "depth" of relations in the language system. So, the carried out experiments testify to the fact that the category of state is present in speech up to the complete ruin of the language ability, and just in the beginning of this ruin most of the volunteers become unable to differentiate between the active and the passive voices, and at the end of dissolution all the verbs are perceived as active ones. As a result of the study the most stable layer of syntactic, morphological and lexical units was

defined: simple sentences, verbs in the Active Voice, the category of state, set phrases, highly emotional words, proper names, sound-imitating and swearing lexics. The unique position of phonetic and word-building units at this level, in D. L. Spivak's opinion, is not represented, so, not all the language material is represented in the given model.

The multilayer model of D. L. Spivak and the dynamic model of Z. D. Popova are not studied in comparison, although the idea of the mutual relation of the language phenomena assimilating order and of the order of language skills loss was expressed by R. Jakobson and M. Halle back in the middle of the XX century: "The language education of a child, especially the education in the field of phonetics, and the language degradation during aphasia submit to the same laws..." [12, p. 252].

**The associative-verbal network of Y. N. Karaulov as a language model.** Y. N. Karaulov builds his model issuing from the fact that language is an open dynamic system. The associative-verbal network (AVN) in Y. N. Karaulov's opinion, "is the realization not only of the lexical, but of the whole language system" [13, p. 255]. The associative-verbal network "is not a static formation, but a system in the state of unsteady balance, where the positions and relations of its elements fluctuate constantly and change dynamically, depending on the influences of the texts passing through it" [14, p. 248]. If in numerous descriptions of language phenomena lexics and grammar are usually represented separately, in Y. N. Karaulov's works there is the idea that all grammar is lexicalized, distributed among separate lexemes, spread in the associative-verbal network. Practically it looks like "the reaction, represented in a dictionary article (the AVN cell), which is either an indirect form of the corresponding lexeme, or, being direct, its lemmatized form, nevertheless makes up a complete word combination in pair with the stimulus ("the model of two words", in N. I. Zhinkin's words), which in its completeness can act as the grammaticalized fragment of a more extensive locution" [13, p. 9]. Syntactic reactions (of the type *бабушка – старая, бежать – на работу* and so on) are suggested to be viewed as the material, representing the complex of grammar forms of the language. Grammaticalized forms can be found on the whole in 50% or more (up to 90%) of cases from the general number of reactions.

In contrast to the usual descriptions of words on the base of one or several language relations (the proximity of the lexical or grammatical meanings, of the grammatical form, of the common root morpheme and so on) in Y. N. Karaulov's language model as a system-forming parameter words take the associative relation in our mind: "Any word in our mind, in our memory, as well as in the speech flow does not exist... separately: it is connected through dozens, hundreds of 'threads' to other words. Any word requires, as it is, 'the continuation', searches its pair, wants to turn into 'the model of two words'" [14, p. 191]. The associations can be quite different: semantic, morphological, syntactic, cognitive, pragmatic. Language relations themselves are already represented in the group of associated lexemes.

The unit of AVN is the word-stimulus and reactions to it. Any cell of associative-verbal network (microstructure) is classified by Y. N. Karaulov into the word-stimulus and the reaction to the stimulus that are in 4 groups:

The reactions in the initial form – lemmatized (*нести – везти, вести, вор, коробка, ноша* and so on; *чище – блестящий, грязно, грязный, грязь* and so on);

Each reaction coincides with the lemm in form, but each one constitutes together with the stimulus the model of two words (*нести – арбуз, бред, время, груз, портфель* and so on; *чище – белое, блюдец, быть, вода, дом, душа* and so on). Each pair can be treated as a ready-made speech pattern;

The indirect form of reaction is expressed explicitly and makes up a word combination together with the stimulus (*Нести – авоську, беды, время на плечах, в ладони, в люди* and so on; *чище – будет, воды, всего, душой, можно* and so on);

The reactions not related through formal relations with the stimulus, but representing some word-building or word-changing transformations of this or that lexeme or word combination (*нести – держать в руках, тяжел; чище – белее, голенище, грязнее, вернее* and so on).

So, in each cell paradigmatic and syntagmatic relations of words and phraseological units are represented.

Y. N. Karaulov thinks the principal and basic feature of AVN to be its ontological character. Unlike other net models of lexics, syntax, text or models of memory, which arose as artifacts, as a result of research activity, AVN is real, it just reveals itself in the experiment. Explicating all word relations available in mind forms AVN.

The author thinks another peculiar feature of AVN to be the variety of relations at the base of its elements' connections. All possible variety of relations among the elements covers the whole of the language structure and reflects the interaction of units on different levels and between the levels (excluding the phonetic one). This enables us to hold, besides the traditional semantic, also the culturological, the pragmatic, the socio-political, the psychological and other kinds of analyses [13, p. 252]. Phonetic units in AVN are practically not represented, because the associative relation is mainly of the semantic base.

In author's opinion, the analogy of AVN as an open and unstable, unbalanced system can be any turbulent movement, for example, a mass of water falling from a cliff (a waterfall) or the processes of urbanization and growth of the city population.

All the studied models answer the principles of the system; there is a clearly expressed criterion of quality, dictated by the milieu, and the units of the language system are arranged in certain order around this system-forming parameter. In the majority of models there is a list of units, the relations among the elements are characterized, the structural (compositional) blocks are represented. The detailed description of models and correcting their number is probably the task of the future researchers.

So, the language models represented in the present clause are built on the base of different criteria of quality and represent the language (the ontologically complete system) in different ways. The difference in the acquired "pictures" of the language system is quite expected, if we treat this question from the point of view of the theory of systems. The choice of different criteria of quality (the system-forming parameters) cannot lead to constructing the same models, that is why the language system looks so different in the models presented above. These models correlate with each other on the complementary principle. Taking the notion from physics, N. Bohr was the first who attempted to introduce the principle of complementarity into philosophy: in physics the notion of the "complement" is used to characterize the relation between the data, gathered in different conditions, i.e. in holding different experiments; they can be interpreted only as mutually eliminating ideas. Transferring this notion to the sphere of culture, N. Bohr stated further that different human cultures are complementary to each other. N. Bohr also used the notion of complement in biology, psychology. In V. A. Zvegintsev's opinion [15, p. 29–32], there is nothing new in the fact that different aspects of study mutually complement each other, and such mutual complement has been practiced for a long time. What is new in N. Bohr's doctrine, in his opinion, is that mutually complementing objects seem to contradict each other at the attempt of combining them into one picture, they cannot even be combined with the help of usual notions, because they are perceived as mutually excluding each other. The source of contradiction of the data and different interpretations complementing each other is the fact that in the experiments the object of study and the measuring instrument form the whole, hence,

the observer cannot be distinguished from the observed. For the study of the language and thinking over the separate fragments of the language system, as well as perceiving the whole language system in general this conclusion of N. Bohr is very important, because in the language the language system itself and the milieu, where the human belongs, are closely related. Linguists paid attention to these important conclusions drawn by N. Bohr, but usually the complementary principle was used in the analysis of the language pictures of the world, represented by different languages. We think that it is reasonable to consider the complementary principle wider, this is the new fact that is the result of linguistics interaction with other sciences.

Different models of the Russian language system are a good illustration of the general scientific principle of complementarity. Being so different, these models contribute to the creation of the general model both of the Russian and any other natural language. We think that the opportunities of language system modeling are not limited by the above-mentioned models.

We can suppose that ontologically the whole language system is built on the base of several quality criteria and has several functional aims, while in the studied language models one system-forming parameter, organizing language units is present. That is why it is very difficult to join into a whole all the language models, where there are different number of language units and different principles of their organization. It is obvious that much work is to be done, and its final result would be the creation of the general language system model, where the results of all the previous studies would be reflected.

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## Модели языковой системы в русском языкознании

© О. П. Касимова

*Башкирский государственный университет*

*Россия, Республика Башкортостан, 450076 г. Уфа, улица Заки Валиди, 32.*

*Email: olgakasymova@yandex.ru*

В статье содержится обзор моделей языковой системы, представленных в трудах российских лингвистов. Русские языковые модели, сформированные к концу XX века в отечественной лингвистике, являются совершенно разными и даже противоречивыми. Ведущей среди рассмотренных в статье является уровневая модель языковой системы, на ней базируется исследование большинства языковых единиц, их соотношений и взаимосвязи. Другие неиерархические модели языковой системы менее известны. Это полевая модель языковых единиц, динамическая модель, многослойная модель и ассоциативно-вербальная сеть Ю. Н. Караулова. Все они разработаны в разной степени. Эти модели являются отличной иллюстрацией общенаучного принципа дополнительности Н. Бора. Будучи такими разными, они способствуют созданию общей модели как русского, так и любого другого естественного языка.

**Ключевые слова:** моделирование, языковая система, лингвистическая модель, системология.

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