
ANIMAL COMMUNICATION SYSTEMS AND THE RUBICON PROBLEM IN THE THEORIES OF THE ORIGIN OF LANGUAGE

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The modern theories of the origin of language have reached the parity in the argumentation. And now the knowledge of this sphere is expressed with the antinomies. It means that the conflicting approaches are veritable to the same extent. In the cognitive science there is the so-called “Rubicon problem”, which is unsolvable without breaking of the consistency of the one of the conflicting theories. Some researches recognize the deductibility of faculty of language from the animal communication system, whereas others do not recognize it. Both parties have the strong argumentation. This article deals with the ethological, semiotic and psychological approaches to language as abstract symbolic system on the one hand and as social and communicative activity on the other hand. In the context of the “Rubicon problem”, Vygotsky’s works obtain the “novel sound”. The heritage of the ideology-driven Soviet psychological school is relevant again even for the Western scientists. The social and cultural-historical determination of the faculty of language allows bridging the gap between cognitive-ethological and nativist approaches. We argue the idea of under-determination of the ontological status of language as the biological communicative system: the polemic between gradualists and saltationists is far from its completion.

Key words: emergence of language, gradualism, saltationism, language universals, ontology of language.

INTRODUCTION

Contemporary works on glottogenesis theory often utilize the method of correlations. This is primarily related to the fact that there is no exact date when language appeared as a fully functional system of codes and communications. Representatives of various knowledge areas try to link language inception to a certain phylogenetic or ontogenetic, or cultural stage of establishment. The most popular theories link human language origin to the evolutionary changes in ancient Hominidae’s physiology: modifications of larynx, jaws, methods of tongue muscles control, and transformation of brain language zones. Anthropologists also use archeological and ethological data and link language origin with the evolution of primitive forms of culture, complicating of social forms of interaction and cognitive processes in animals’ communication. There are many works in the genetics area, in which their authors try to extrapolate genetic information of mitochondrial DNA analysis to the problem of Homo sapiens dissemination and language groups’ affinity.

1. IN SEARCH OF THE “MIDDLE WAY”

The theories of language origins recognize language as the system and language as the characteristics of humanity conducting this system learning and make them both their subject matter. The issue of language origins includes the issues of origin of the world, living matter, man, and consciousness.

The Rubicon problem is quite typical in the modern theories. It is well-known that the classical issue of linguistic universals involves dichotomous approaches highlighting opposition of polar directions: analogism and anomalism, realism and nominalism, empiricism and rationalism, internalism and externalism, realism and counter-realism, behaviorism and functionalism, logocentrism and counter-logocentrism, naturalism and phenomenism, etc. Ultimately, knowledge of the universal properties of language comes down to the pairs of opposites. Conventionally, these pairs may be divided into three groups:

◆ **constitutive opposites:** material — ideal, natural — artificial, arbitrariness — substantiation, specific local — universal;

◆ **processual opposites:** following the rules — breaking the rules; logical — illogical, norm — deviation, language — mentality, language — speech, syntax — semantics;

◆ **subjective opposites:** conclusion — interpretation, individual — collective, speaking — listening, discourse — text.

The theories of language origins are the components of explanatory models dealing with the origin of man, consciousness, and evolvement of cognitive and intellectual functions. Therefore, the processes of human language activity development and proto-language parameters of the cognitive system in other biological species' communication become especially significant.

2. ANIMAL COMMUNICATION SYSTEMS AND ESTABLISHMENT OF LANGUAGE PROCEDURES OF CONSCIOUSNESS

Animal communication

Based on the above, proto-language cognitive processes observed in children and some apes become especially significant. This poses a question that seems trivial at first glance: what is the difference between language and non-language? When we consider this issue in details, it turns out that “language” is a term with vague meaning and indistinct scope. Definition depends on the criteria of intellectual, cognitive, communicative or social activities. Differentiating language from other forms of animal communication is a task, the results of which are materially dependent on the methods of its solving.

If we consider a language to be a form of evolutionary development of living matter and describe all symbolic structures as a sort of organismic adaptation, then whales, dogs, and bats, as well as squirrels, bees, ants and other faunal species have their primitive forms of language. Scent marks structures in addition to strictly chemical composition have fairly wide range of meanings — direction, amount of food, time periods, etc.

Up to now the following remains a key question: *what is the criterion differentiating a language (even the very initial and primitive) from non-language signal system (which may be very complicated and advanced)?* A clarification is required here: in biology, human language is traditionally compared only to the signal systems of the vertebrata since complicated communication systems of the invetrebrata have a very different morphology, the structure of which seems to be dead-locked in the light of questions about the essence of human language.

If we consider animals’ signal elements within the scope of the Peircean typology of signs, they will be recognized as both indexes and symbols. They are indexes because they symptomatically show the level of animal’s nervous system activation, and they are symbols because animals’ signals contain referentiality [1].

The comparative analysis of animal signal communication system and human language by Hockett’s classical criteria [10] shows ambiguous results. Below we present the description of language universal criteria from the viewpoint of language system characteristics, on the one hand, and from the viewpoint of the vertebrate mammals’ intellectual functioning characteristics, on the other hand.

Table 1

Comparative table for human language and animal communication system

Characteristics	Human language	Animal communication system
Semanticity	Existence of signs referring to denotata from extralinguistic world. Arbitrariness of a sign	Animal signals are a part of their meaning. A wail of horror is a reflectory consequence of the horror as such
Openness	An infinite multiplicity of statements may be built on the limited number of words	Signals range defines a set of “regular expressions”
Transferability	A language allows speaking of something, which has not been experienced yet	All animal signals are determined by the current events
Discreteness	Difference between signs has clear literal manifestation: sheep / ship, water / daughter, etc.	Material differences between animal signals are often barely noticeable and accompanied with the signal position of limbs, tail, ears, etc.
Indirectness	The meaning of statements may be related to fictitious worlds and arbitrary ideas	No arbitrariness of signal forms
Reflexiveness	A language may be used to talk about the language as such	Animals are not able to stand in meta-position in relation to their signal system
Duality of patterning	Ability to build complex meaningful units out of already meaningful units	Animal signals have neither morphological, nor syntactical combinability
Hierarchical pattern	Languages are built based on the hierarchical principle: they are becoming more complex starting from miscellaneous meaningless phonemes to sentences and texts	Animal signals do not create syntagmas or any other combinatorial sequences

When analyzing Table 1 data, a gap between human language and animal communication becomes obvious. Regardless of the obvious gap in communicative principles and syntactic-semantic architecture between the human language system and animal signal systems, the researches remain very interested in apes’ linguistic competence. Some authors claim that linear combinatorics of the learned gesture-words (grammar remains an insurmountable wall) allows apes to express complex pragmatic components such as a lie or a joke [19].

A fundamental question is posed here. If the primates are able to create primitive symbolization, do evolutionally transformations necessarily contain a certain attribute characteristic of the cognitive systems able to produce only symbol-signs?

Elements of symbolization do exist in behavior, yet, can we that a behavioral reaction not representing an intentional sign is a symbol? It is rather difficult to prove by experiments that generation of a fiction in human language and a foxes’ false alarm signal (used by adults in order to scare importunate cubs away from food and have a feed themselves) are of the same behavioral etiology.

At the same time, there is a counter comparison of universal language signs and animal communication systems. It means that in another interpretation the gap is not so wide. Zorina and Smirnova in their “What ‘Speaking’ Apes Told us about” give examples of human features in communications of anthropoid primates that learned AmSLan (American Sign Language) [4].

All of this data does not allow so far to answer the question whether the evolutionary amplification of brain structure actually develop flexibility of cognitive and communicative processes, and whether the difference between the signal systems of a wren, a gorilla, and a man actually lies only in the degree of brain tissue complicacy. In this context even more amazing are certain animal “communicative competencies” that may be called quite intelligent:

◆ *Capacity for cross-species communication* means that a communication channel of a different species is used for mutually beneficial relationships or for security; e.g. certain moths (owlet moths) are able to detect bats by ultrasonic signals they generate for echolocation purpose and thus promptly escape from these predators.

◆ *Signals generalization* means different species’ use of the same signals to warn of danger or in ritualized mating actions.

◆ *High specialization of roles* means e.g. multi-agent system of ant colony, which is able to function due to strict role determination (queen, workers, soldiers, etc.).

◆ *Use of languages of various modality (multi-channeling)* — acoustic, chemical, tactile.

◆ *Flexibility of social order for efficient communication* means “takeover of other’s property”, “slavery”, “cattle breeding”, and “crop farming” (aphid milking and fungus growing), legal rules for community members [11].

Today, the main tendencies in scientific and theoretical dispute about the nature of language may be reduced to several directions.

Substrate approach. Those who support this theory look for language bases in structural evolution of the living matter at the level of genetic transformation or mutations at the level of brain structure. Such thing as gradualism — conviction in gradual evolutionary generation of language skills based on mutations, brain cortex transformation, changes in climate, nutrition, social hierarchy in the primates groups, etc. — is present here [13; 15; 11; 9].

Radical nativism. Those who support this approach are also known as saltationists — proponents of the hypothesis of language capacities sudden evolution. This movement appeared due to N. Chomsky’s works, and within the scope of this approach the question of the stages of language capacities formation is inappropriate.

Linguistic determinism. This theory reinterprets Humboldt’s tradition and Sapir-Wharf’s theory of linguistic relativity from the anthropological viewpoint. Experimental part of the hypothesis has been formed through several stages; today, we recognize a “strong” tradition (the language fully forms thinking paradigm of the world and determines epistemological parameters) and a “weak” tradition (the language determines methods of objects denomination).

Social-communicative determinism. Language here is recognized as a result of complication of animal communication system. Protolanguage structures are determined by evolution of group tasks complexity. Communicative external challenges became

a reason for transformation of signal-index system into sign-symbol system. In the Russian science, this movement is related to the names of L. Vygotsky and representatives of Moscow psychological school. The role of the social-communicative approach is not understood sufficiently. Possibly, the ideas of L. Vygotsky, A. Luriya, A. Leontiev and their followers are still waiting to be applied to pacify discussion of the internalists and the externalists, the saltationists and the gradualists, the substantialists and the communicativists.

Informational approach. This approach may be characterized as a model approach. Explanatory characteristics of computer models of evolution of language and man’s language capacities are important, but probably the most important task for the representatives of this approach is systematization, visualization, and statistical representation of data from various disciplines dealing the problem of language origin. Within the scope of the computer paradigm, such areas as computer models of biological processes [18], statistic visualization of language evolution [17], computer models of brain neural activity [12; 16] overlap. In our opinion, informational and functional approach (also known as *computational* in the Western traditions) looks the most promising.

3. REVIVAL OF CULTURAL AND HISTORIC PARADIGM

From the viewpoint of the “Language Rubicon”, L. Vygotsky’s works [3] find their new meaning. Social and cultural-historic measurement of language skills allows bridging the gap between the cognitive-ethological and nativistic approaches. Surprisingly, the modern Western researchers base their works on the “law of sociogenesis» described by Vygotsky in the first half of the 20th century [8]. Kozintsev consistently proves that general philosophical provisions of Engels-Noire’s labor theory were confirmed by Vygotsky’s psychological experiments; in the end of the 20th century they were proved by the data of ethology, primates’ psychology, archeology, and paleolinguistics; and in the 21st century they were proved by the researches in the neurosciences area [5]. If we adopt Vygotsky’s idea of ontogenetic and phylogenetic arbitrariness of language and its independency of the level of intellect, then it would be logical to assume that preverbal phase of evolutionary development and pre-intellectual phase meet at a certain point where a language appears. Congenital reflectory signals with their genetic flexibility and automatism are a perfect communicational tool of the natural world but at a certain stage reflex connections start slowing down, then introspection, consciousness, and free will arise. A man “rejects” reflex-stimulus communicative mechanisms choosing intentional cooperation approach. Syntax (according to Tomasello, but in contrast to Chomsky and Pinker) becomes not a system of abstract rules but a method of practical purposes achievement. In this case the nature of language is expressed neither in the universal grammar nor in the connections between the significant and the signified, but in the functions of social interaction.

Hence, we see that eventually not syntax or semantics but social pragmatics takes place of a language universal in the modern cognitive researches. Status of recursion as a key cognitive mechanism [14] or the role of mirror neurons, along with the social and object-correlation hypotheses, act as additional contexts of a problem.

As A. Leontiev rightly noted, L. Vygotsky was the first one who managed to show theoretical unity of sign and communication, language and social activity, thus substantiating cultural and historic nature of mentality [7]. Activity approach to psychological procedures of language and consciousness establishment comprises seven significant aspects:

1. The notion of *meaning* is represented as a key psychological category (unlike logics, linguistics, and semiotics).
2. *Meaning* is represented not in logical-semantic static forms but in dynamics of sign operation, as a path from the idea to the word.
3. The idea of significance of objective and semantic aspect of meaning is developed.
4. Consciousness has semantic structure.
5. A sign (in addition to syntax, semantics, and pragmatics) has social-pragmatist dimension (very likely, this Vygotsky's idea resulted from his adherence to Marxism and recognition of communication as a result of social and historical development).
6. A sign is conceived in the consonance of communicative and cognitive processes.
7. Language and activity ("word and activity" in Vygotsky's terms) are unified in the common psychological system [7].

Heritage of the Soviet psychological school represents a significant methodological counterweight to the analytical philosophy of consciousness the theory of which is inspired by the philosophy of language, formal semantics, theory of artificial intellect, computer linguistics, etc.

Therefore, we can see that the ontological status of a language as biological communicative system is not fully determined: the dispute between the gradualists and the saltationists is far from being resolved. The heritage of the ideology-driven Soviet psychological school again proved to be in-demand. Modern data of archeology, paleoanthropology, cognitive ethology of neurosciences prove social-pragmatic principle of cooperation in formation of language skills both at the level of glottogenetic models and at the level of the psychology of child speech. In our opinion, social and cultural-historical language dimension provides new terms for proving of semantic nature of the consciousness.

CONCLUSION

Bringing up again the dispute between Humboldt's and Saussure's approaches, the problem of formation of language processes of consciousness refreshes the opposition of reductionism and holism in terms of various cognitive disciplines. Is it possible to reduce the language to certain structural universals without losing cognitive-transforming potential of the language as an activity? Referring to V. Voloshinov's "Marxism and Philosophy of Language", V. Lazarev describes opposition of the existing traditions of linguistic philosophy in terms of *anthropocentric pragma-oriented* linguistics (Voloshinov's "individualistic subjectivism") and *systemocentric structure-oriented* linguistics (Voloshinov's "abstract objectivism") [6]. Such differentiation partly substantiates the tendency manifesting itself in modern cognitive sciences dealing with the nature of language and language skills. Yet Voloshin himself, mentioning in his comments I. Present's

“Origin of Speech and Mind” (1929), does not recognize evolutionary ties between the animal signal-reflex system and the language system [2. P. 350], thus taking the cognitive “Rubicon problem” outside the scope of linguistic matters.

In context of *individualistic subjectivism*:

- ◆ language is a continuous pragmatic creative process;
- ◆ language creativity processes are individual-psychological laws;
- ◆ language creativity is meaningful creative work and requires involvement of consciousness;
- ◆ language as system is nothing but “dead deposit, solidified lava of language creativity” abstractedly engineered by linguistics in order to use it as a finished tool [2. P. 386].

This approach, as you know, is supported by fundamental works of such researches as W. von Humboldt, A. Potebnya, H. Steinthal, K. Vossler, W. Wundt, B. Croce and many others. These are the roots of continental linguistic philosophy, linguistic ethno-psychology and other post-Humboldt approaches recognizing language as a manifestation of national spirit, texts of culture, esthetics, congeneric archetypes, social-historical activity, etc.

Abstract subjectivism is characterized by the following postulates:

- ◆ language is a stable system of normative identical language forms;
- ◆ laws of language as a system are related to all components and properties of the system itself and represent objective laws for individual consciousness;
- ◆ language ties do not depend on cultural-historical or ideological content; connection between the expression plane and content plane of a sign is arbitrary;
- ◆ individual acts of speech are local distortions of normative-identical acts; there are no connections between history and language; speech may not be an object of linguistics.

Therefore, we see that philosophical antinomical issues of correlation between the name and the thing, of the nature of language universals, of the origin of language and language skills in context of lingual-philosophical studies took the form of “contact” paradigms: individualistic subjectivism of Humboldt’s type and abstract objectivism of Saussure’s type. In our opinion, special methodological potential in the issues of ontological status of the language can be found in the problem of computability of the semantic processes of the consciousness. Ontological role of the language semantics as a complex of cognitive-pragmatic procedures of the consciousness requires comprehensive philosophical examination.

BIBLIOGRAFY

- [1] Бурлак С.А. Переход от до-языка к языку: что можно считать критерием? // Разумное поведение и язык / ред. Т.В. Черниговская, А.Д. Кошелев. .: Языки славянских культур, 2008. С. 89—101.
- [2] Волошинов В.Н. Марксизм и философия языка // Фрейдизм. Формальный метод в литературоведении. Марксизм и философия языка. Статьи / ред. И.В. Пешков. М.: Изд-во «Лабиринт», 2000. С. 349—487.
- [3] Выготский Л.С. Орудие и знак в развитии ребенка // Психология развития человека. М.: Изд-во «Смысл», «Эксмо», 2005. С. 1039—1128.

- [4] Зорина С.А., Смирнова А.А. О чем рассказали «говорящие» обезьяны. М.: Языки славянских культур, 2006.
- [5] Козинцев А.Г. Зоосемиотика и глоттогенез // Антропологический форум. 2013. № 19. С. 326—359.
- [6] Лазарев В.В. Философия познания и лингвофилософия: парадигмальный подход. Пятигорск: Изд-во ПГЛУ, 2006.
- [7] Леонтьев А.А. Ключевые идеи Л.С. Выготского — вклад в мировую психологию XX столетия // Психологический журнал. 2001. Т. 22. № 4. С. 5—10.
- [8] Томаселло М. Истоки человеческого общения. М.: Языки славянских культур, 2011.
- [9] Фридман В.С. От стимула к символу: Сигналы в коммуникации позвоночных. М.: Либроком, 2012.
- [10] Хоккет Ч.Ф. Проблема языковых универсалий // Новое в лингвистике / ред. В.А. Успенский. М.: Прогресс, 1970. С. 45—77.
- [11] Черниговская Т.В. Что делает нас людьми: почему непременно рекурсивные правила? // Разумное поведение и язык / ред. Т.В. Черниговская, А.Д. Кошелев. М.: Языки славянских культур, 2008. С. 406.
- [12] A Large-Scale Model of the Functioning Brain / С. Eliasmith, Т.С. Stewart, X. Choo [и др.] // Science. 2012. Vol. 338. № 6111. P. 1202—1205.
- [13] Arbib M.A. Action to language via the mirror neuron system. Cambridge: Cambridge University Press, 2010.
- [14] Corballis M. From hand to mouth. Princeton, Oxford: Princeton University Press, 2002.
- [15] Deacon T. The symbolic species. London: Penguin Books, 1997.
- [16] Hlinka J., Coombes S. Using computational models to relate structural and functional brain connectivity // The European journal of neuroscience. 2012. Vol. 36. № 2. P. 2137—2145.
- [17] Minett J.W., Wang W.S.-Y. Language, evolution, and the brain. Hong Kong: City University of Hong Kong Press, 2009. P. 294.
- [18] Oudeyer P.-Y., Kaplan F. Language evolution as a Darwinian process: computational studies // Cognitive Processing. 2007. Vol. 8. № 1. P. 21—35.
- [19] Patterson F. The Mind of the Gorilla: Conversation and Conservation // Primates / ред. К. Венншчеке. New York, NY: Springer New York, 1986. P. 933—947.

СИСТЕМЫ КОММУНИКАЦИИ ЖИВОТНЫХ И «ПРОБЛЕМА РУБИКОНА» В ТЕОРИЯХ ПРОИСХОЖДЕНИЯ ЯЗЫКА

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В статье анализируются этологические, семиотические и психологические подходы к языку как абстрактной системе и как социальной деятельности. Современные теории происхождения языка достигли паритета в аргументации. В когнитивных науках появилась «проблема Рубикона», которую невозможно решить, не нарушив непротиворечивость одного из подходов. Одни исследователи признают выводимость языковых способностей из систем коммуникации животных, другие — нет. Мы аргументируем мысль о том, что онтологический статус языка как биологической коммуникативной системы недоопределен: полемика между градуалистами и сальтационистами далека от завершения.

Ключевые слова: происхождение языка, градуализм, сальтационизм, языковые универсалии, онтология языка.

REFERENCES

- [1] Burlak S.A. Transition from before-language to language: what is the criterion? *Razumnoe povedenie i jazyk*. Ed. T.V. Chernigovskaya, A.D. Koshelev. M.: Jazyki slavjanskih kul'tur, 2008. P. 89—101.
- [2] Voloshinov V.N. Marxism and philosophy of language. *Frejdzim. Formal'nyj metod v literaturovedenii. Marksizm i filosofija jazyka. Stat'i*. Ed. I.V. Peshkov. M.: Izd-vo «Labirint», 2000. P. 349—487.
- [3] Vygotsky L.S. Tool and sign in the child development. *Psihologija razvitija cheloveka*. M.: Izd-vo «Smysl», «Eksmo», 2005. P. 1039—1128.
- [4] Zorina S.A., Smirnova A.A. What did «talking» monkeys tell? M.: Jazyki slavjanskih kul'tur, 2006.
- [5] Kozincev A.G. Zoosemiotics and glottogenesis. *Antropologicheskij forum*. 2013. № 19. P. 326—359.
- [6] Lazarev V.V. Epistemology and philosophy of language: paradigmatic approach. Pyatigorsk: Izd-vo PSLU, 2006.
- [7] Leontiev A.A. Key ideas of Vygotsky's theory — a contribution to the world psychology. *Psihologicheskij zhurnal*. 2001. Vol. 22. № 4. P. 5—10.
- [8] Tomasello M. Origins of Human Communication. M.: Jazyki slavjanskih kul'tur, 2011.
- [9] Fridman V.S. From stimulus to symbol: the signals in vertebrata's communication. M.: Librokom, 2012.
- [10] Hockett Ch.F. The problem of universals in language. *Novoe v lingvistike*. Ed. V.A. Uspenskij. M.: Progress, 1970. P. 45—77.
- [11] Chernigovskaya T.V. What makes us human: why only recursive rules? *Razumnoe povedenie i jazyk*. Ed. T.V. Chernigovskaya, A.D. Koshelev. M.: Jazyki slavjanskih kul'tur, 2008. P. 406.
- [12] Eliasmith C., Stewart T.C., X. Choo [et al.] A Large-Scale Model of the Functioning Brain. *Science*. 2012. Vol. 338. № 6111. P. 1202—1205.
- [13] Arbib M.A. Action to language via the mirror neuron system. Cambridge: Cambridge University Press, 2010.
- [14] Corballis M. From hand to mouth. Princeton, Oxford: Princeton University Press, 2002.
- [15] Deacon T. The symbolic species. London: Penguin Books, 1997.
- [16] Hlinka J., Coombes S. Using computational models to relate structural and functional brain connectivity. *The European journal of neuroscience*. 2012. Vol. 36. № 2. P. 2137—2145.
- [17] Minett J.W., Wang W.S.-Y. Language, evolution, and the brain. Hong Kong: City University of Hong Kong Press, 2009. P. 294.
- [18] Oudeyer P.-Y., Kaplan F. Language evolution as a Darwinian process: computational studies. *Cognitive Processing*. 2007. Vol. 8. № 1. P. 21—35.
- [19] Patterson F. The Mind of the Gorilla: Conversation and Conservation. *Primates*. Ed. K. Benirschke. New York, NY: Springer New York, 1986. P. 933—947.