

Space of Cross-Disciplinary Researches of Life, Nature and Society

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Abstract

Journal of Biosemiotic Research is a new periodical devoted to a young, actively developing science. A review of recent scientific publications shows that in the broad scientific space of biosemiotics contemporary questions and "eternal themes" interact, not finding an answer in the private sciences - anthropology, semiotics of culture and philosophy^{1,2}. To solve them, the fundamental foundations of science and new achievements, the opportunities of the latest technologies and scientific communications are attracted.

Like all young sciences, biosemiotics has many definitions. We give here the most famous ones. "Biosemiotics: (bios, life + semion = sign) is an interdisciplinary field of theoretical and empirical research, analyzing communication and signification in living systems. Signed processes, ranging from molecular to ecological and evolutionary, have been studied throughout the history of biology; however, very often descriptions of information and communication aspects of living systems were considered only metaphorical, believing that the essence of them can be understood with the help of physical and chemical descriptions. In biosemiotics, on the other hand, information sign processes are considered as the primordial, basic system of phenomena of life, requiring a new understanding..."³.

"Biosemiotics explores sign systems of various levels: molecular biological (genetic code), intracellular (signal peptides), intercellular (mediators, immune interactions), intraorganism (hormones, conditioned reflex reactions) and interorganism (telergons, pheromones, attractants) ... In addition, biosemiotics covers all the problems associated with the problem of the existence of language and thinking in animals." However, today we can go further and add to the analysis the next stage of evolution, standing between animals and modern human (Homo sapiens sapiens).

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Introduction

In general, it can be mentioned that the subject of interdisciplinary research in biosemiotics is the properties of signs and the universal sign-information processes that underlie the internal and external connections of living systems (respectively, two areas of research: endo- and exosemiotics). In other words, in biosemiotics, the processes of self-regulation and communication at all levels of the organization of life are considered - from molecular to biospheric. Therefore, one of the definitions can be the following: *biosemiotics is the science of structure and functioning, dynamics and evolution of signs and sign systems in the biosphere of the Earth.*

For the first time, the questions that are part of the problem field of biosemiotics were discussed in publications in the 1950s, and the basic concepts of biosemiotics were formulated by the German biologist living in Estonia, Jakob von Exkül⁴. Academician Yu.S. Stepanov has been considered as the author of the term "biosemiotics" for a long time⁵, but the Estonian biosemiotic K. Kull⁶ showed that earlier this term had been used in his article by the neurologist F.S. Rodshild⁷. In the 1960s separate classical works were written, and only since the late 1980s this science has begun to develop as a collective product of the scientific community. Now, biosemiotics attracts universal interest and is rapidly developing. In addition, in the depths of the private sciences, many useful materials exist (for example, the general laws of G.F. Hilmi, developed in biogeophysics⁸. One of the important tasks of the journal is to introduce these achievements into the scientific circulation of biosemiotics.

It should be noted that the task of systematic understanding of signs cannot be correctly solved within the framework of only living nature. If any structure (including a sign) is created by a certain process and performs its function in the system, then life activity is in the field of view of biosemiotics - *the practice of using the natural resources and the conditions of our planet (matter, energy and information resources).*

Methodological Basis of Researches

There is an opinion that "the analysis of the extrinsic and the synthesis of the intrinsic" is the main function of the living⁹, perhaps this is so. But in our studies of the signs of geographical space and culture,

the conceptual formula "flow organizes space" is used as a universal theoretical tool, obtained for the first time in the analysis of aerial photographs in the mathematical morphology of landscapes¹⁰. This formula directs attention to the flows of matter, energy and information that form the structure and function of any objects – the structure of the landscape and soil cover, road and territorial networks, and even the system of signs and knowledge. The main difficulty of studying the signs of culture is that a continuous change in the surrounding reality fills them with new content, but the structure of the signs keeps information about the system in which they originated and performed their primary rational functions.

Discussion

As the creator of the theory of the biosphere and noosphere, the founder of biogeochemistry, V.I. Vernadsky¹¹ emphasized – living and inert matter exist in indissoluble unity, connected by the flow of migration of chemical elements. This scientific position is aimed at semiotic analysis of the material component of life processes – metabolism. It is the flows of matter, internal and external, in the system of horizontal and vertical connections, united by a time or coordinates of space, - constitute the subject of ecological, geographic, evolutionary semiotics.

No less significant is the development of biosemiotics in the plane of the processes of energy conversion in the biosphere. More than a hundred years ago, K.A. Timiryazev drew attention to the negentropic "cosmic role" of green plants and called the organic matter "a conserve of solar energy"¹². However, not only photosynthesis but also changes in rocks (weathering, denudation and sedimentation), hydroclimatic cycles and changes in landscapes are associated with the arrival of solar energy, and all this affects the processes of biological and over-biological adaptation. Since more than 90% of all processes depend on the solar energy, any objects of animate and inanimate nature can be considered here for the purpose of revealing universal algorithms for the natural course of rhythmically recurring events on the Sun. Consequently, from the perspective of biosemiotics, materials accumulated in heliobiology, rhythmology, geomorphology, evolutionary and historical geography can be analyzed.

A significant part of our results obtained in the geography of culture can be attributed to biosemiotics.

Analysis of navigational (including calendar) functions of prehistoric objects showed the influence of solar navigation not only on the organization of the person's living space, but also on the form of abstract signs. The methods of observing, calculating and modeling the shadow graphs allowed us to obtain a graphical matrix of sign systems and reconstruct algorithms for the formation of signs in the process of measuring-identifying parts of geographical space-time. On the basis of the proof of the astronomical nature of the sign, new - navigational, - models of culture genesis, anthropogenesis and sapientation were proposed.

If signs of *instrumental astronomical navigation* (including calendar) are *abstract in form but specific in content*, which ensures survival and success, then *on the basis of solar navigation an abstract thinking of prehistoric man could be formed*. This assumption is confirmed in the modern knowledge system: 1. the energy of the Sun serves both a nutrition source (for autotrophs directly) and a light signal that is the brightest and most reliable on Earth; 2. the stable connection between the light regime and the life cycle of organisms is genetically fixed (photoperiodism and biological clock); 3. nutrition reinforcement of the light signal makes it possible to form a conditioned reflex (experiments of the physiologist Academician I.P. Pavlov); 4. unconditional orienting reflex - primary; 5. orientation in space-time provides the opportunity to be at the right time in the right place; 6. the astronomical landmarks are more reliable than the landmarks of the landscapes (the Cosmos system is more inert than the Earth's nature). If the practice of using astronomical signs-knowledge formed the abstract thinking of man, then it can be generalized: "It was not man who created the sign, but the sign created man."

The concept of the astronomical nature of the sign also agrees well with the fundamentals of semiotics inherent in the classification of Peirce (types of signs: images, indices, symbols)¹³. The abstract signs of the solar calendar are the most striking example of index signs that connect space-time with the phenomena of nature and life events (this category of signs was ignored by the classics of culture semiotics¹⁴. In the solar calendar, graphic symbols represent a motion of light / shadow and are used as a tool for observing and predicting cyclically recurring events. Signs-symbols and signs-images could be formed on the basis of the

practically significant and well-known graphic matrix of the calendar due to its wide application in the systems of counting and recording events, preserving in the traditions of construction and decoration¹⁵.

At the same time, it should be emphasized that observing the sky from the Earth's surface is geographical information, since ray streams are refracted in a rotating spherical space. In this context, the mythological images of Heaven and Earth, as the divine ancestors of man, turn out to be artistic means, very accurately conveying the essence of the situation. This view corresponds to our time, which can be characterized by the level of technology as the cosmic era of mankind. At the same time, turning to the sources is not only a tribute to the previous generations, who laid the foundation stone of our civilization in the Stone Age. Clarification of our coordinates in the space of cultural development allows us to correct the direction of further movement. In addition, we can assume that in any system of "star-planet" the same invariant of the formation of signs is reproduced - the universal language of the universe.

Like all branches of semiotics (semiotics of culture, semiotics of geographical space), biosemiotics explores the relations of information and knowledge. But the peculiarity of biosemiotics is that it is closer to other sciences to understand the natural mechanisms of the formation, functioning of the human body, the development of abstract thinking and its biosocial essence.

Since all scientific knowledge is relative, they require constant editing taking into account new data and life realities. Throughout the twentieth century, the world has changed so rapidly that by the third millennium many scientific concepts and models have lost their relevance and / or efficiency. Humanitarian research in the field of culture semiotics during this period reached a deadlock, as the working models closed within the system, the elements of which were man, the form and content of signs. The basis for such a limitation was the recognition of signs as artificial - i.e. products of construction and contract, and not the results of the development of nature. The methods of operating with "pure meanings" (models that are separated from practice and *nature - the primary source of matter, energy and information*) have led to a number of methodological errors: in linguistics, to conclusions

about the unknowability of the origins of words, and anthropology to a simplified conception of the thinking of prehistoric Homo sapiens, in archeology and ethnography - to a mystification of the cultural memory and traditions of indigenous peoples. Today, these errors can be corrected, since the development of interdisciplinary research can enrich the methodology of research semiotics of culture and other human sciences by new theoretical tools based on knowledge of the fundamental laws of nature.

Undoubtedly, interdisciplinary research in the field of biosemiotics and active exchange of information will help to open new pages of knowledge. However, carried away by the search for universals (refrains), one should not forget about diversity as the basis for the stability of any system. An analysis of the structure of natural and prehistoric objects shows that their inner diversity, sometimes perceived by us as imperfection, serves as a defense against destruction-resonance. Here are a few examples: the nonsynchronous rhythms of cosmic objects at all times represented a serious problem for maintaining the calendar, but, try to imagine - what would be the multiplicity / coincidence of these rhythms?; ancient stone buildings in South America consist of "strange" blocks of irregular shape, but today in experiments on models it is shown that exactly these building elements vibrate differently at the time of the earthquake, which gives the elasticity of the entire structure; under the microscope, the cells of the leaf blade of plants appear in a seemingly chaotic variety, but this is what determines their resistance to rupture and allows the delicate tissues of the leaf to withstand the hurricane force of the wind; different types of higher nervous activity, unique talents in every person, diversity of cultural traditions saturate the social organism with a reserve of strength to any external and internal stresses. In this context, it seems that the ongoing desire for the unification of nature and culture leads to the expansion of the scope of economically viable template management and to the loss of stability of the system as a whole.

Thus, the development of all areas of biosemiotics, not only can have a significant impact on the scientific picture of the world, but can also make a significant contribution to the development of the ecology of civilization – the scientific methodology and strategy of preserving our biological species in a

dynamic world that continuously tests the strength of artificial models and structures.

Conclusion

The conceptual framework and methodology of biosemiotics are still at the stage of origin, and, undoubtedly, the expansion of the space of continuous exchange of relevant information will contribute to their development. The editorial policy of the journal is aimed at an open discussion of the latest scientific facts and concepts that reveal the nature and functions of signs in all spheres of life^{16,17}. We also hope that reading the pages of the journal will enable one to learn not only about new steps in classical biosemiotics, but also about the results of related geography and semiotics of culture. Such a publication will increase the variety and quantity of information about sign processes, the likelihood of interaction of similar or mutually exclusive results, the possibility of synergy or discussion of representatives of different directions, which is useful for each participant in the discussion and, in general, for the development of our knowledge.

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