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Key words: philosophy of information, modern Informatics, the fundamental problem.

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Abstract

Actual philosophical and scientifically-methodological problems of modern Informatics as fundamental science and a complex scientific direction are considered. Communication of these problems with prospects of development of Informatics and fundamental science as a whole is shown.

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1 Relevance of the problem

In recent years, the role of Informatics as basic science and complex scientific field increases. This is because the very logic of modern science, where a new scientific paradigm, and new research methodology, based on the use of concepts and methods of Informatics. In doing so, one of the most pressing challenges is the need to study the conceptual nature of information as one of the manifestations of objective reality.

Today, scientists doing research on many traditional areas of science (physics, chemistry, earth sciences, biology, sociology, psychology, etc.), in addressing their problems are increasingly faced with the need to take into account information of their study sites, processes and phenomena, and therefore very interested in using new tools and methods of Informatics. Among the most important place is occupied by information and network technologies, methods and tools for information modeling, informational approach as a method of scientific knowledge. The whole methodology of modern science is now much more information-oriented compared to how it was before, in the past century.

Therefore, Informatics is not only one of the rapidly developing and promising areas of modern science, but also a fundamental component of the whole process of scientific knowledge, scientific basis for the formation of a knowledge-based society. In this regard, the increased interest to understand the grounds of Informatics, as well as its philosophical and scientific and methodological aspects, which is observed as in science, and education.

Educational systems in many countries today are experiencing a new phase of its radical modernization. Its goal is to significantly improve the quality of education, formation of the modern scientific worldview and the new personal information culture. This, in turn, requires a shift in the educational system to the new principles of studying Informatics as basic science and general education courses. The combination of research results obtained by Russian scientists in recent decades, could become the basis for the formation of a new paradigm of education that takes into account the need to use the latest achievements and capabilities of information technology in virtually all spheres of social activity [1].

2. Philosophy of information and philosophical problems of Informatics

Philosophy of information developed in Russia for more than 40 years. Here in the first place it should be noted that basic research problems, which were conducted by academician A.D. Ursul. His books, published more than 30 years ago [2-5], are the classical works in this area and are well known to specialists. They remain relevant today, when the philosophical problems of information and Informatics has been increasingly discussed in the pages of scientific journals and conferences.

A good incentive for this is to increase interest in such new areas of Informatics as quantum computing and Bioinformatics. New approaches to the analysis of information issues of Cosmology, Quantum mechanics, General physiology, Genetics and Psychology. Therefore, it can be reasonably argued that the present line of work in this research becomes a key to the development of not only

Informatics, but also many other areas of modern science.

The most urgent fundamental problems here are:

1. Investigation of *the conceptual nature of information* as one of the manifestations of the reality of the world around us.

2. The need for a more complete understanding of *the role of information in the evolutionary processes* that occur both in physical and biological systems, as well as in human society. There is reason to believe that the most fundamental laws of Informatics are common, both for physical and biological systems, and they determine the regularity of their evolution [6-13]. This philosophical hypothesis is crucial for the whole system of modern science.

3. Current philosophical problem of Informatics is to identify and articulate *the general laws of Informatics* and to establish their relationship with the laws, which are exploring other fundamental sciences, such as General systems theory, Cybernetics, Synergetics, Quantum mechanics, Chemistry, Biology, Genetics, Psychology and Sociology. Work in this direction by Russian scientists in recent years being quite active [12,13].

4. Further *development of basic scientific methods of Informatics*: information approach [8], methods of simulation, as well as a deep virtual reality. It is these methods to the existing projected to be in the next few years brought to the fore in the methodology of scientific research as a science, and humanitarian areas of world science.

5. Actual scientific - methodological problem lies in *the adequate positioning of Informatics in modern science*. Today there is an objective need to review the current situation of Informatics in science and continue to characterize it as an independent branch of knowledge, which is a science, and humanitarian importance [1].

6. An important problem is the need to create *a new, forward-looking structure* of the subject area of Informatics, which would be more appropriate modern trends of development of science and education. Proposals on the structure already developed at the Institute of Informatics Problems of the Russian Academy of Sciences. They are published in the scientific press [11] and may serve as a real basis for scientific discussion and practical applications.

Studies show that it is the development of Informatics as an integrated scientific field can be a critical factor for the development of the scientific and technological progress in the 21- st century.

3. Philosophy of information and scientific outlook

Research in the field of philosophy of information today is very relevant, because their results are needed for the formation of the modern scientific worldview. It may be noted that in recent years, these studies are beginning to take place in and China [14]. An analysis of relevant scientific, philosophical and methodological problems of modern science has shown that one of these problems is *the problem of understanding the conceptual nature and essence of the information*.

According to many authoritative scholars, the information is one of the most important and at the same time mysterious phenomena of the world around us. Attempts to comprehend the essence of this phenomenon by many researchers for several decades beginning in the mid 20 - th century. However, universally accepted ideas about the conceptual nature of information in science is still not yet developed. Therefore, these attempts are continuing today, in the 21- th century, which is often called the information age.

Why do we still know so little about the nature of the information about the deep philosophical essence of the phenomenon and its fundamental relationship with the other philosophical sciences, such as matter and energy? In fact, many researchers have intuitively understood that these concepts are the notions of a level of generality. Most likely, they indicate the most fundamental realities of the world around us. Perhaps the main reason here is that *information is a multifaceted phenomenon*. Therefore, it is specific to itself in terms of implementation of various information processes, as well as at different stages of their implementation.

The structure of reality and the phenomenon of information. In [10] shows that the phenomenon of information is closely linked with *the structure of reality* and is the result of interaction between them forming the structure of material and ideal components.

At the same time the following main conclusions:

1. The structure of the reality of the world around us has a *property dualism*, since it simultaneously includes two main components - the Physical reality and Ideal reality. Both of these components exist objectively and continuously interact with each other, as they possess the property of *mutual reflection*.

Represent all the physical reality of the world physical objects, as material, and immaterial (eg, electromagnetic, gravity and other fields), as well as everything that happens with these processes are the objects of their movements and internal changes. The ideal objective reality exists, regardless of the activity of consciousness, and is as an essential component of reality as physical reality. It arises from the interaction of objects (or processes), Physical reality, and manifests itself as a reflection of the properties of some objects (or processes) in the structure of other objects (or processes).

2. The ability of Physical reality and the Ideal reality of mutual reflection of their fundamental properties, which actually creates the possibility of various aspects of the phenomenon of information.

One of the first scientists, who pointed out the fundamental connection between the phenomena of reflection, and information is A.D. Ursul [3].

3. Information is not a physical object or process, and belongs to the world of ideal reality. However, to expression of its information it needs to objects (or processes), physical reality, which serve as its carriers. Without these objects (or processes) information to show themselves not to be. The physical nature of media in principle does not matter. It is important only to those carriers have the ability to perceive information through appropriate changes in their internal structure (for physical objects) or its parameters (for dynamic processes).

4. Despite the fact that the information belongs to the world of ideal reality, it is being associated with one physical object (or process) may affect the other object (or process) the physical world, which becomes the new bearer. This is realized through the mechanism of information transfer from one object (or process) physical reality to another.

5. In order to identify information related to some of its bearers (objects or processes of physical reality), there are special procedures, the most important of which is the procedure for comparison.

6. Information is one of the basic concepts of Informatics - the science of the principles and laws of the implementation of information processes in the systems of different nature. It is through the development and dissemination of Informatics, the concept of information has become today greatly contributes to the formation of the modern scientific picture of the world, based on the concept of unity of information laws and regularities.

7. In recent years, Russian scientists obtained some new results which show that among these patterns should hold an important place of regularity information in different systems, as well as the implementation of information processes. It turned out that these laws may impose certain limitations and feasibility of physical processes [13].

All this demonstrates the need for further philosophical reflection on the phenomenon of information and, above all, its conceptual nature and methods of systems in the physical and the ideal of reality, as well as its interactions with matter and energy.

Philosophical concept of open systems. Studies show that information is a major factor in the processes of self-organization and evolution of complex systems. This is true both for the living, and for natural beauty. Nevertheless, the question of whether there is information in inanimate nature, some philosophers are still debating. The answer to this question by various scholars depends on the philosophical concept of views on the nature of the information they hold - or the same functional identity.

Supporters of a *functional concept* argue that the information represents only one of the functions of human consciousness, and therefore, in inanimate nature, it can not exist in principle. With respect to the laws of the functioning and development of natural beauty, they are quite well described by the relevant scientific disciplines (Physics, Chemistry and other sciences), in which the notion of information was little used.

This view is still widespread in science and in our days. However, while still open, two basic issues. The first of these is how to combine the concept of functional information to the main provisions of the general theory of systems. In fact, according to this theory, not only functioning, but also the very

existence of any system of stable organized structure implies interaction between its elements, ie their mutual exchange of information on his condition.

According to the *concept of open systems*, proposed by academician B.B. Kadomtsev [12], the whole world around us, from atomic structure to the galactic formations, is a set of nested into each other at different levels of hierarchical systems. These systems continually interact with each other not only on the energy level, but also carry out information and interaction that are fundamentally necessary for their development.

The second issue is that even supporters of the functional concept still admit the existence of information in the biological structures that do not possess consciousness. For example, in the cells of living organisms and plants. Otherwise, how can then explain the principles of their genetic apparatus? In fact, all genetics by its very nature is a science of the origin, storage, transfer and change of genetic information.

Thus, in both of the above principle, the concept of a functional nature of the information can not give now any convincing answers.

Supporters of same *attributive concept*, and believe that information is an attribute of all objects as living or inanimate nature, their inherent property. This concept directs the attention of researchers to study aspects of the information, development and interaction of all natural systems, including - of facilities and systems of inanimate nature. This concept is more efficient because it encourages the nomination of the new information hypothesis on the structure and evolution of natural systems.

In addition, the concept is fundamentally important for the development of theoretical foundations of computer science. After all, it allows for the analogy and make necessary the results of studies of information processes and phenomena that take place in other scientific disciplines: physics, chemistry, biology, astronomy, earth sciences and others.

Analysis of these results creates fundamentally new opportunities to identify common patterns in the information world around us and, therefore, not only to better understand its laws, but also use them in practical activities of people. Including, and in the creation of new tools and information systems, analysis and synthesis of biological and social processes and structures.

4. Philosophy of information and the philosophical foundations of Informatics

Conducted in recent years in Russia the study of philosophical problems of Informatics [10], have allowed scientists to formulate some regulations which can be seen as *the philosophical foundations of Informatics* as basic science and processes of information interaction of nature and society. Very briefly, these provisions may be stated as follows.

1. The information in the broadest sense of the term, is an objective feature of reality, which manifests itself in the *heterogeneity* (asymmetry) of distribution of matter and energy in space and time, the erratic course of all processes occurring in the world, animate and inanimate nature, as well as in human society and consciousness.

2. Information permeates all levels of organization of matter and energy in the world around us, *it is the main reason for the movement* of matter and energy, and determines *the direction of their movement* in space and time.

3. Information is *a crucial factor in evolution*, it determines the direction of evolutionary processes in nature and society.

4. Number of information is *a measure of the complexity* of organized systems of any nature, and provides quantitative assessment of this complexity.

5. Information is *a multifaceted phenomenon of reality*, which manifests itself in specific ways in different contexts leakage of information processes in a variety of information environments, animate and inanimate nature: in a natural non-living nature of the technical facilities and the artificial nature created by man, in biological systems, as well as in human society and consciousness.

6. We can assume that there are *some fundamental laws of information* that are common to information processes, implemented in the objects, processes or phenomena of any nature. Studying these patterns and should be one of the biggest challenges of Informatics as a fundamental science. And therein lies its interdisciplinary role in a system of scientific knowledge.

5. Philosophical Problems of Informatics in Education

In the last decade Informatics as basic science has become a key component of the entire system of scientific knowledge and will to a large extent determine the way of a global information society based on knowledge. In this regard, it is clear that the increased interest in clarifying the status of Informatics in the sciences, as well as its fundamentals, historical and philosophical aspects, which is observed today, as in science, and education. At the same time in the education and training of scientific personnel of higher qualification, as in Russia as in other countries, including - in the United States is still dominated by instrumental and technological approach to the study of Informatics, and many of its fundamental aspects are considered as secondary [15].

Yet it is these aspects of scientific and methodological switching, semiotic and philosophical foundation of Informatics, are today the most relevant. That they are necessary to improve the quality of training of scientific personnel and specialists of different profiles, as well as for the formation of a new information culture of the society adequate to the challenges of the 21- st century.

In recent years, the United States and Western Europe to reactivate interest in the scientific and methodological and educational aspects of Informatics. In 2005, the U.S. President was presented a special analytical report on these issues. This Informatics is characterized as the strategically important area of science and practice necessary for the development of the economy, industry, high technology, national security, vocational education and training of scientific personnel.

The approach of the Russian scientists to study the problems of Informatics has always been more fundamental and comprehensive. It was in Russia was first formed about the Informatics as basic science, which has an important interdisciplinary, scientific, methodological and philosophical significance. It is Russia at the 2- nd International UNESCO Congress «Education and Informatics» has proposed a new concept of studying the problems of Informatics as basic science and general discipline in the system of advanced education. This was proposed as a new structure and the general course «The fundamentals of Informatics » for the future of the education system and it is shown that the transition to this structure will be an important step towards the integration of basic science and education

The study of the philosophical problems of Informatics today is a mandatory requirement in the training of graduate students and included in candidate exam course «History and Philosophy of Science», approved by the Ministry of Education and Science of Russia. However, analysis of the content of this program showed that many of the current philosophical and scientific and methodological problems of Informatics are considered, it is not enough. Therefore, the Institute of Informatics Problems of the Russian Academy of Sciences developed a pilot program training course «Historical and philosophical introduction to the problem of Informatics» [16], as well as a monograph that can serve as training tool for graduate students, masters and teachers of universities [17]. The experience of studying the course, applicants degree in the humanities, and engineering sciences, has shown that it is of great interest students and help them not only the modern understanding of the fundamental problems of Informatics, but also the modern scientific worldview.

Conclusion

The study of philosophy and philosophical problems of Informatics today is very important and urgent problem of science and education. In this study the subject of Informatics, as basic science, should be the basic properties of information, patterns of information exchange in nature and society, as well as methods of organizing the processes of technological, biological and social systems. Thus, science today is to examine not only the instrumental and technological challenges of collecting, storing, processing and transmission of information in computer information and communication and other technical systems, and information processes in animate and inanimate nature, as well as in human society.

Especially relevant to today, bringing together scientists from various fields of science (Physics, Chemistry, Biology, Psychology, Informatics) to explore the features of information in biological systems, as well as in the processes of inanimate nature. Indeed, the results of these studies should enable scientists to identify common patterns that might be fair to information processes in the information media of different nature.

All this should give the man new opportunities for more effective organization of information processes, not only in technology but also in social systems. Based on this knowledge, people can more deeply explore the processes of vital activity of biological systems, as well as, perhaps, and principles of his conscience.

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