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PHILOSOPHY OF INFORMATION AND THE FUNDAMENTALS OF INFORMATICS

Konstantin Kolin

Institute of Informatics Problems of RAS, Moscow, Russia
kolinkk@mail.ru

1. The urgency of the problem

The role of Informatics in basic science and complex research area in recent years, fast and very significantly increased. This is due not only to increasing use of informatics tools and methods in almost all spheres of social activity of modern society, but also the logic of modern science. Currently, a new scientific paradigm and new research methodology, based on a deeper use of concepts and methods of Informatics. Scientists carrying out research in many traditional areas of science, in solving their problems increasingly faced with the need to incorporate information aspects of the studied objects, processes and phenomena. In the process of research ever more important place is occupied by information and network technologies, methods and tools for information modeling, informational approach as a fundamental method of scientific knowledge.

The methodology of modern science is now much more information-oriented compared to how it was before, even 20-30 years ago. Therefore, Informatics is objectively not only the rapidly developing and promising area of science, but also a fundamental component of the whole process of scientific knowledge. That it should be a scientific basis for the formation of a society based on knowledge. In this regard, it is clear that increased interest in the foundations of Informatics and, in particular, to its philosophical and scientific and methodological aspects, which is now observed in the field of science and education. The education systems of many countries are experiencing today phase of its radical modernization. Its purpose is to substantially improve the quality of education, formation of the modern scientific worldview, a new information culture of the individual and society. This, in turn, requires a transition in the education system to the new principles of informatics as a fundamental science and general education ubjects.

All this causes problems of studying the relevance of the philosophical foundations of Informatics. And here an important role to play in research in the field of philosophy of information, which has long been conducted in Russia, but in recent years - also in China and the U.S.

2. The philosophy of information as a fundamental scientific base Informatics

Philosophy of information developed in Russia for over 40 years. Here the first thing to note the work AD Ursula [1-4], which laid the scientific foundations of research areas and are well known to specialists. He obtained fundamental results remain valid today, when the philosophical problems of information and Informatics is increasingly discussed in scientific literature [5-11]. A good incentive for this is to increase interest in such new areas of Informatics as a Social Informatics, Physical Informatics and Bioinformatics. In recent years, information approaches are increasingly used in the analysis of problems of cosmology, quantum mechanics, cosmology, earth sciences, general physiology, genetics and psychology. We can therefore say that the philosophy of information becomes a key focus for the development of not only Informatics but also in many other areas of modern science.

The most pressing fundamental problems here are:

1. Study of the conceptual nature of information as one of the manifestations of the reality around us.
2. The need for understanding the role of information in the evolutionary processes that occur both in physical and biological systems, as well as in human society.

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3. Identify the fundamental laws of the implementation of information processes in nature and society. There is reason to believe that these patterns are common for both physical and biological systems, and they determine the patterns of their evolution [5,8,9,13]. This philosophical hypothesis is fundamentally important for the whole system of modern science.

4. Current philosophical problem of Informatics is to identify and articulate the general laws of Informatics and establish its relationship to laws that 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 are quite active [5,9,10,11].

5. Further development of basic scientific methods of Informatics: information approach [6], simulation techniques, as well as methods of deep virtual reality. These methods, according to current projections, will be in the next few years are highlighted in the methodology of scientific research of both natural and human sciences.

6. Scientific - methodological problem lies in the adequate positioning of the Informatics of modern science. All the more obvious need to review the current situation of Informatics in the system of science. Studies show that computer science should be classified as an independent branch of scientific knowledge, which has both natural sciences and humanitarian significance [14].

7. An important issue is the need to form a new, forward-looking structure domain of Informatics, which would have been more adequate to modern trends of science and education. Suggestions for this structure have already been developed in the Russian Academy of Sciences [9,14].

8. Philosophy of information also means exploring new opportunities and new threats to human and social development in the rapid development of processes of global informatization. Studies show that this direction of scientific and technological progress may be a critical factor for the development of civilization in the 21 st century.

3. Philosophy of information and scientific outlook

Studies in Philosophy Information and fundamentals of Informatics is very relevant for the formation of the modern scientific worldview. In recent years, these studies are beginning to take place not only Russian but also by Chinese scientists [12]. One such challenge is the problem of comprehension of the conceptual nature and essence of the information. It is known that 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 were made by many scientists for several decades, since the mid 20 th century. However, the generally accepted ideas about the conceptual nature of the information has not yet worked out. Perhaps the main reason here is that the phenomenon of information is diverse and specific ways manifests itself in various conditions of information processes, as well as at different stages of their implementation [14].

The structure of reality and the phenomenon of information. In [7,14] showed that the phenomenon of information is closely linked with the structure of reality and is the result of interaction between an image of this structure of material and ideal components. This makes the following findings:

1. The structure of the reality around us has the property dualism, since it also includes two main components - the physical and ideal reality. Both of these components exist objectively and continuously interact with each other, since they possess the property of mutual reflection. Physical reality are all available in the world of material objects, as material and immaterial (eg, electromagnetic, gravity and other fields), as well as all of them done with these objects of the process of their movement and internal changes. The ideal objective reality exists regardless of the activity of consciousness and is as important a part of reality as physical reality. It arises from the interaction of objects (or processes), physical reality, and

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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 of mutual reflection is its fundamental property, which, in fact, makes it possible to display different aspects of the phenomenon of information. One of the first scientists, who pointed out the fundamental relationship between the phenomena of reflection and information is AD Ursul [3].

3. Information is not a physical object or process, and belongs to the world of ideal reality. However, for its manifestation information it needs to objects (or processes) of physical reality, and who are its bearers. Without these objects (or processes) information to show a fundamentally can not. The physical nature of media in principle do not matter. It is only important that these carriers have the ability to perceive information through an adequate change its 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) can affect the other object (or process) of the physical world, which becomes its new carrier. This is realized through the mechanism of information transfer from one object (or process) of physical reality to another.

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

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

7. In recent years, Russian scientists obtained some new results that show that among these laws would be important to take a pattern display information in different systems, as well as implementing them information processes. It turned out that these laws may impose certain restrictions on the feasibility of physical processes [11].

All this demonstrates the need for further philosophical understanding of the phenomenon of information and, above all, its conceptual nature, way of expressing a system of physical and ideal reality as well as its interactions with matter and energy. The results of these studies will create a fundamentally new opportunities to identify the most common information laws in the world around us and, therefore, will not only better understand its laws, but also use them in practical activity. This includes the creation of new tools and informatics systems, analysis and synthesis of biological and social processes and structures.

4. Philosophy of information and philosophical foundations of Informatics

Conducted in Russian study [8], allowed to formulate scientific principles, which can be regarded as the philosophical foundations of informatics as a fundamental science of information and the processes of information interaction in nature and society. Briefly, these provisions may be summarized as follows.

1. The information in the broadest sense, is an objective property of reality, which manifests itself in the heterogeneity (asymmetry) of the distribution of matter and energy in space and time, the uneven flow of all processes occurring in the world of 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 root cause of the motion of matter and energy and determines the direction of the movement in space and time.

3. Information is a decisive factor in the evolution, it determines the direction of development of all evolutionary processes in nature and society.

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4. The amount of information is a measure of the complexity of organized systems of any nature and allows to obtain quantitative estimates of the level of complexity.

5. Information is a multifaceted phenomenon of reality which manifests itself in specific ways in different contexts flow of information processes in a variety of information environments animate and inanimate nature: a natural inanimate nature, the technical facilities and systems of 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 manifestation of information that are common to the information process in the facilities, processes or phenomena of any nature. Study of these very laws and should be one of the most important tasks of Informatics as the fundamental science. And this is its interdisciplinary role in the system of scientific knowledge.

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