Artículo de investigación

Ontology of the nanoworld: system approach and the concept of evolutionism

Ontología del nanomundo: enfoque de sistema y el concepto de evolucionismo

Ontologia do nanoworld: abordagem do sistema e o conceito de evolucionismo

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Abstract

The article deals with the ontological subsystem of the philosophical foundations of the corresponding picture of the world, defining the typical understanding of the world as a unity in a variety of properties and relations typical of a particular historical period on the basis of appropriate philosophical interpretation of such categories as matter, motion, space and time, necessary and accidental, possible and real, and other categories, attracted from the classical philosophical heritage and non-classical philosophical teachings. The author points out an important event in the development of the system approach was the publication by Immanuel Kant in 1755 of the work "Universal Natural History and Theory of the Sky." The article describes the fundamental achievement which is the development of the so-called "physics of arising" that reads to express the principle ("From the existing to the emerging) in such a way: the evolutionary paradigm is expanded and elevated to the rank of the basis of all the processes entering according to the second law of thermodynamics. It is established modern holism synthesizes evolutionism, brought to the idea of self-development, with a systemic approach, in which ”zone of responsibility” not only isolated but open complex systems fall into. It is stated the support of nanotechnology and the NBIC tetrahedron as a whole, that is, the NBIC-initiative, is also a complex of self-organizing and self-developing system.

Resumen

El artículo trata del subsistema ontológico de los fundamentos filosóficos de la imagen correspondiente del mundo, definiendo la comprensión típica del mundo como una unidad en una variedad de propiedades y relaciones típicas de un período histórico particular sobre la base de la interpretación filosófica apropiada de categorías tales como la materia, el movimiento, el espacio y el tiempo, necesario y accidental, posible y real, y otras categorías, atraídos por el patrimonio filosófico clásico y las enseñanzas filosóficas no clásicas. El autor señala que un evento importante en el desarrollo del enfoque sistémico fue la publicación por Immanuel Kant en 1755 de la obra "Universal Natural History and Theory of the Sky". El artículo describe el logro fundamental que es el desarrollo de la llamada "física del surgimiento" que lee para expresar el principio ("De lo existente a lo emergente") de tal manera: el paradigma evolutivo se expande y se eleva al rango de la base de todos los procesos que ingresan según la segunda ley de la termodinámica. Se establece que el holismo moderno sintetiza el evolucionismo, llevado a la idea del autodesarrollo, con un enfoque sistémico, en el que la "zona de responsabilidad" no solo es aislada sino abierta los sistemas complejos caen en. Se afirma el apoyo de la nanotecnología y el tetraedro NBI 'en su conjunto, es decir, la iniciativa NBIC, también es un complejo de autoorganización y sistema de autodesarrollo.

Keywords: nanotechnology, existence of the Universum, technoscience, world picture, self-regulating and self-developing system, NBIC-tetrahedron, system approach, evolutionism.

Palabras clave: nanotecnología, existencia de Universum, tecnociencia, imagen mundial, autorregulación y sistema de autodesarrollo, NBIC-tetraedro, enfoque sistémico, evolucionismo

Resumo

O artigo lida com o subsistema ontológica dos fundamentos filosóficos da imagem correspondente do mundo, definindo a compreensão típica do mundo como uma unidade em uma variedade de propriedades e relacionamentos de um período histórico particular típicos com base na interpretação filosófica categorias apropriadas tais como matéria, movimento, espaço e tempo, categorias necessárias e acidentais, possíveis e reais, e outras, atraídas pela herança filosófica clássica e pelos ensinamentos filosóficos não-clássicos. O autor destaca que um evento importante no desenvolvimento da abordagem sistêmica foi a publicação por Immanuel Kant em 1755 da obra "História Natural Universal e Teoria do Céu". O artigo descreve a realização chave é o desenvolvimento de "física surgimento" chamada lê para expressar o princípio ("Desde o existente para emergentes") para: o paradigma evolucionário se expande e sobe para o posto de base de todos os processos que entram de acordo com a segunda lei da termodinâmica. Ele afirma que o holismo sintetiza evolucionismo moderno, levou à ideia de auto, com uma abordagem sistêmica, em que a "zona de responsabilidade" não só é isolado, mas sistemas complexos abertos cair. apoio da nanotecnologia e o tetraedro NBI 'como um todo, ou seja, a iniciativa NBIC é também um complexo sistema de auto-organização e auto-estados.

Palavras-chave: nanotecnologia, a existência de Universum, tecno-ciência, imagem global, auto-regulação e do sistema auto-desenvolvimento, NBIC-tetraedro, abordagem sistêmica, o evolucionismo.

Introduction

Successful substantive development and social functioning of modern technology, including nanotechnology, are impossible without an in-depth philosophical justification. Ontological grounds include ideas, principles and concepts that imply a picture of the origin and being of the Universe as a whole or in one or another of its actual parts. It is pertinent to present only one penetrating consideration on this subject, which belongs to Albert Einstein: "A man is trying in some appropriate way to create a simple and clear picture of the world: this is not only to overcome the world in which he lives, but also in order, to some extent, try to replace this world with the picture created by him. This is the work of the artist, poet, theorizing philosopher and natural scientist, each in his (her) own way. In this picture of the world and its design, a person carries over the center of gravity of his spiritual life in order to find peace and confidence in it ... " (Eynshteyn, Albert, 1965).

Materials and Methods

The ontological subsystem of the philosophical foundations of the corresponding picture of the world, defining the typical understanding of the world as a unity in a variety of properties and relations typical of a particular historical period on the basis of appropriate philosophical interpretation of such categories as matter, motion, space and time, necessary and accidental, possible and real, and other categories, attracted from the classical philosophical heritage and non-classical philosophical teachings. The picture of the world, the basic ontological principles for it, is summarized in the historically changing "categorial grid", that is, in a more or less complete set of corresponding philosophical categories. In a comparative analysis of the foundations of classical, non-classical and post-non-classical science, V.S. Styopin considered the categories "part-whole", "element-system", "space-time", "interaction", "causality" and others. However, even taking into account the results obtained by him and a number of other researchers, it should be recognized that the research has not yet been completed. In the framework of post-non-classicism, first of all, "new meanings of the categorical grid of self-developing systems are being actively developed" (Stepin, V.S, 2003).

Results and Discussion

It is recognized that the classical ontology "worked" with relatively simple mechanical systems, the nonclassical - with self-regulating systems, and post-nonclassical passes to self-developing systems. Systems of the latter kind include, among other things, "objects of modern nano- and biotechnology and, above all, genetic engineering," V.S. Styopin acknowledged himself (Stepin, V. S, 2003). Therefore, we can conclude that the philosophical foundations of nanotechnology in the NBIC-tetrahedron assume a concept of universal evolutionism and a systematic approach, recognized by the philosophical foundations of post-non-classicism as a whole.

Although the notion of a systematic approach was established in the scientific and philosophical discourse in the 70s of the 20th century, its roots step down to the depths of Antiquity, in particular to the Greek atomists. Leucippus and Democritus of Abder discovered the possibility of explaining various realities in the form of sets of the same smallest indivisible particles, or atoms, ordered in different ways. Their follower - the Roman philosopher Lucretius Car - very clearly expressed the basic idea of the system as an ordered multitude in his poem "On the nature of things" (Lukretsiy, 1958).

Do you see, at last, about what we just said,
What constantly has great significance with which
And in the position which will be included in the combination of the same
The first principles and how they will be move mutual;
How, only slightly changing the combination, they generate
Tree or fire? And in the same way,
If only a combination of letters is changed,
All sorts of words of completely different meaning.

Thus, not only the composition of the initial aggregate of atoms, but also their particular "combination", or structure, determine the properties of compound realities. It is also important to emphasize that when entering into a particular system, atoms, according to Democritus, do not change. In this respect, the elements of the system are identical to the corresponding initial ingredients and decomposition products. Finally, the systemic enlightenment of ancient thinkers initially grasped not only the "bodies", but also reality of a completely different kind – language of which countless words and expressions are formed by this or that "combination" of a small number of letters-atoms.

Interest in atomism for many centurie had been lost due to the domination of Plato and Aristotelian philosophy in the philosophical thought of the Middle Ages and the Renaissance. However, already the founder of the philosophy of New times - Francis Bacon - spoke highly of the thinker from Abder. The philosophy of Democritus, he wrote, "penetrated more deeply and subtly into the secrets of nature" (Bekon, F, 1978). Bacon, with certain reservations, adopted a number of basic provisions of the atomic concept, in particular, the idea of a "system of peace", of structurality, or "schematism" (Bekon, F, 1978).

As one of the foundations of the understanding of the Universum, the idea of systematics was used by French educators. Thus, Pierre Henri Holbach titled his main work "The system of nature, or the laws of the physical world and the spiritual world."

"Diverse substances, combining in thousands of their own fashines constantly receive and communicate to each other various movements. The various properties of substances, their various combinations and various modes of action, which are the necessary consequences of these properties and combinations, constitute for us the essence of all phenomena of being. And different orders, series or systems, into which these phenomena enter, depend on those different essences, are what we call the nature in the aggregate, "the French thinker (Golbah, P. A, 1963). From these and related statements it is not difficult to see that nature as a whole and in its concrete components is understood as a multi-level hierarchy of systems, the causative relationship of a mechanical kind is the forming factor in which cause-and-effect relationships are of a mechanical kind (see, for example (Golbah, P. A, 1963).

An important event in the development of the system approach was the publication by Immanuel Kant in 1755 of the work "Universal Natural History and Theory of the Sky." Here, the "subcritical Kant" developed its version of an understanding of the systemic structure of the Universe. "In fact, all the planets and comets that belong to our Universe form already a system by the fact that they revolve around a common

central body. I, however, use this expression in a broader sense, bearing in mind the exact proportions by virtue of which the connection between heavenly bodies has become regular and uniform, confermed "Königsberger (Kant, I, 1963). Later, already within the "critical period", Kant did not abandon the idea of systemic nature, but limited it to a world of phenomena. At the same time, the source of the systemic nature was brought out of noumenal nature and was transferred, ultimately, to the human psyche: "... not an object contains a connection that can be borrowed from it by the perception, only through which it can be discerned by reason, and itself connection is a function of the reason , and the reason itself is nothing but the ability a priori to connect and lead the diverse content of these conceptions to the unanimity of apperception." (Kant, I, 1963). Developed over time in the framework of Newtonian physics, the representation of the world as a hierarchy of sets of atoms that have exact values of dynamic variables naturally confirmed the conclusion about the completely deterministic evolution of any object. The most precise formulation of the classical mechanistic form of determinism was given by the Frenchman Pierre Simon Laplace, therefore, over the time, it was called "Laplacian determinism". In his work "The Experience of the Philosophy of Probability," Laplace asserted that "we must consider the present state of the universe as a consequence of its previous state and as the cause of the subsequent state" (Laplas, P, 2011). That is for the supporters of Laplacian determinism, the Universe appears in the form of a huge mechanical system, each subsequent state of which is simply determined by its previous state, etc. In the framework of such representations, determinism stipulates a predictability on the basis of universal laws, which, naturally, are the laws of classical mechanics. However, such laws give accurate predictions only in those areas of research where one can abstract from the complexity of interaction between the elements of the system, not to take into account the role of chance and so on.

In the "Universe of Laplace" nothing fundamentally new can not arise: the world seemed existing, but not arising. "Since the time of Newton, the physics sees its task in achieving a timeless level of reality, at which real changes do not occur, but the initial state is evolving in a completely deterministic way," Ilya Prigozhin, the founder of the "emerging physics", pointed out. And further: "... a profound revolution in our thinking, caused by the theory of relativity and quantum mechanics, essentially did not affect the basic purpose of classical physics. In dynamics, whether classical, quantum or relativistic, time appears only as a certain external parameter. In dynamics there is nothing that would allow us to distinguish the past from the future" (Prigozhin, I, 1985). But if the first of the given fragments is indisputable, then the second causes certain objections. After all, it was quantum physics that led to the final rejection of Laplacian determinism, affirmed the fundamental nature of the probabilistic description of the objects of the atomic and subatomic world in terms of, in particular, wave function, and so on.

The value of the system approach in understanding the unity of the world was manifested in the generalization on its basis of extensive experimental material about the existence of various types of simple substances and the systematization of knowledge about properties, primarily, of inorganic nature.

In the middle of the twentieth century, the systemic approach was significantly developed thanks to the general theory of systems, the originator of which is Ludwig von Bertalanffy (Bertalanfi, Ludvig fon, 1969). Von Bertalanffy, in particular, drew attention to open systems capable of self-regulation on the basis of feedbacks and interacting with the environment in a significant way. This explains the possibility of the appearance in them of qualitatively new properties, that is, the capacity for real evolution. Today, the systemic approach has an interdisciplinary and transdisciplinary nature, including philosophy, physics, computer science, biology, sociology, political science, psychotherapy, technical sciences and technology, and so on and so forth. It thus serves as a fruitful "platform" for the integration of science and technology: «The problem of the unity of scientific knowledge is essentially a special case of the systemic problem as a whole» (Kuznetsov, A. V, 2008).

Like the systemic approach, the concept of global evolutionism has deep roots, within the framework of classical science, again going back to the quest for "subcritical" Kant.

"Give me the matter, and I will show you how the world should be formed from it. Because if there is matter that is essentially endowed with the power of attraction, then it is not difficult to determine those reasons that could contribute to

the organization of the world system, "Immanuel Kant proudly proclaimed in the middle of the 18th century in the abovementioned work" Universal Natural History and Theory of the Sky " [12, p. 127]. He put forward in this connection a cosmogonic hypothesis about the origin of the solar system from a gigantic gas nebula under the action of gravity and repulsion forces. This hypothesis was of a qualitative nature and for several decades did not attract serious attention. The idea of evolutionism quite triumphed in the nineteenth century. This manifested itself, first of all, in the rediscovery of the hypothesis of Kant by French scientist Pierre Simon Laplace. Then, thanks to Darwin, the idea of evolution was extended to living beings, including humans. Finally, it began to penetrate the foundations of physical science - through, first of all, research in the field of thermodynamics. Here a special role was played by the Austrian Ludwig Boltzmann, who not only called the 19th century "the century of Darwin", but also did a lot in the theoretical justification for such a name. "The idea of evolution possessed an irresistible attraction for Boltzmann, and his ambitious dream was to become a" Darwin "of the evolution of matter," - already at the end of the 20th century, Ilya Romanovich Prigozhin, a well-known Belgian of Russian origin, wrote (Prigozhin, I, 1985). Time as irreversibility no longer separates us from nature. On the contrary, the second origin of thermodynamics expresses our belonging to the constantly evolving Universe. "(Prigozhin, I, 1985).

Explication of global evolutionism and the system approach as the basis of nanotechnology is essential, but leaves room for further re-shaping taking into account the concept of modern holism.

Another of the seven Greek sages - Lin of Thebes - taught (Fragmentyi rannih grecheskih filosofov. (1989):
So, through dissension everything is always managed.
Of all, all [things], and of all [things] - Everything,
All [things] are one, each part of the Whole, all in one:
For all these [things] have arisen from the once unified Whole.

Thus, the idea of the world Whole, generating and embracing all the diversity of all "things", was expressed in the depths of time, hidden from us by a succession of centuries and events. Without a special strained interpretation in this and other similar statements of the ancient wise men, one can see the deepest sources of holism.
The features of the intuitive insights of the ancient sages about any particular unity and integrity of the world have been repeatedly investigated (Vindelband, V, 1995; Rozhanskiy, I. D, 1972; Komarova,V. Ya, 1975). Taking them into account, let us next consider the first known attempt to rationally substantiate the nature of being as one in the most general and absolute sense. This attempt, undertaken in the 6th century BC by Parmenides of Elea, subsequently had a significant influence on the formation of concepts of wholeness, and, in the end, on modern holism.

The starting point of the Ancient Greek thinker's arguments was the opposition of sensory perception and rational thinking. Having discovered their divergence and the irreducibility of one to the other, he brought this divergence to the extreme, to the complete mutual exclusion of the parties. This extreme opposition is reflected, first of all, in the dual construction of a large fragment of Parmenides's poem "On Nature" that has come down to us (Parmenid, 1989).

The original for Parmenides was the concept of being. It reflected not only the "thing" (that which is, the essence), but also the property and relation (to be; exists, etc.). Through the logical exclusion of alternative possibilities, the sage came to the fundamental statement: "Being in fact is, and nothing is not ." Developing the basis found, Eleat further concluded about such properties of being: it did not arise and is not subject to death, does not consist of many parts, solely , motionless, complete or perfect. These signs were synthesized in the concept of a single entity, which, according to Eleat, was completely different from the sensually present world, even incompatible with it.

A differentiated and diverse reality of this kind is grasped, according to Parmenides, on the "way of Opinion", which does not lead to "true truth". According to the thinker of Elea there are two absolutely unrelated worlds: an intelligible single being containing a "well rounded truth", and a sensible given much reflected in the opinion, which is detriment in its nature. This kind of opposition had some general epistemological basis, not connected with the problematic argument of Parmenides himself. The definition of a single as a not-a-lot with indication of specific features, to which the operation of negation

extends, is justified and relevant to this day. In particular, the definition of a single as a complete negation and exclusion of much, as not much (one), underlies the holistic position of I.Z. Tsekhmistro (Tsehmistro, I. Z, 1977). Parmenides' contribution to the "theme of the Mono" is sometimes not separated from the conclusions of his literary counterpart - the main character of the same name of Plato's dialogue. But is such an identification justifiable?

The result of Eleat's poem can be briefly summarized as follows: being is, therefore, it is unity. The logical subject here is the concept of being, and the unified unity is its essential predicate. In Parmenides of Plato, on the contrary, a pair of categories "unity (single) - many (other)" is taken as the basic one. In this case, it is not the single that is predicated on being, but being, which is supposed to be absolute or relative, is attributed to the single. Therefore, the totality of the fundamental concepts, their correlation with the historical Parmenides and its counterpart differ significantly.

Constructed by Plato, the dialectics of a single - many things in detail - are clarified, for example, by A.F. Losev (Losev A. F, 1970). Now it is appropriate only to briefly summarize some of the results of the famous dialogue.

Conclusions

First, if there is only single and there is nothing else, then in this case the single does not exist. "And it turns out," Platonov Parmenides concludes a sucssesion of reasoning of this kind, "the single does not exist as one, and does not exist at all ... Therefore," he adds, "one can neither call it nor speak about it, nor form opinions about it , nor cognize it, and nothing existing can perceive it sensitively. " (Losev A. F, 1970). In other words, an absolutely unified the single turns out to be so alien to a person that he can not even judge of its existence.

Secondly, if the unified exists, it means the existence of everything, including many things. That is, the relative position of the single implicates the recognition of many things: "Thus, the very single, fragmented by being, is a huge and boundless multitude ..." (Losev A. F, 1970). So if being is unified then it is multiple. If, however, being is only single , it does not exist and is not intelligible. In this sense, the hero of Plato's dialogue leading to the logical conclusion of the foundings of Eleat, reveals the danger of his self-denial and unacceptability, at least for rational thinking.

The Parmenides' united and multitude were absolutely divided, and Platon tried to overcome this kind of dualism. He sought to solve the problem by affirming the idea as, in terms of A.F. Losev, generating a model of things. At the same time, the category of the single was considered as the most general expression of the origin of the idea, whereas matter was also taken in its most generalized comprehension and was called a different one (Losev A. F, 1970). The constitutive sign in the content of the categories of the part and the whole is the irreducibility of the properties of their denotata to the properties of the corresponding initial set of ingredients. In other words, between the whole and part, on the one hand, and on the other hand - the initial set of ingredients for them there is the ratio of not the quantities of one quality, but the ratio of different qualities.

Although the origins of analytical methodology go as far back as to the disciple of Plato - Aristotle, but developed forms of experimental and abstract and logical analysis were worked out and consciously had introduced into practice only by the end of the 16th century. Classical analytical thinking is not satisfied with the statement of the qualitative heterogeneity and diversity of reality. It is aimed at an absolutely precise identification of the components and their connections. Any experimental setup, as early as the middle of the twentieth century, indicated Niels Bohr, which would allow us to control the life events with the same degree of accuracy required for a clear description of them in the language of physics, will impede the free flow of life (Bor, N, 1971). Consequently, the concept of "element-structure-system", typical of analytical thinking, denying in the dialectical sense the "part -whole" pair, then they themselves assume negation.

Modern holism synthesizes evolutionism, brought to the idea of self-development, with a systemic approach, in which ”zone of responsibility” not only isolated but open complex systems fall into. Therefore, it is appropriate to include it in the process of re-shaping the ontological foundations of nanotechnology and, apparently, in the whole of techno-science. Nanotechnology is a specific type of systemic activity and the interaction between nanotechnologies and information

technologies has a two-sided synergetic, recursively mutually reinforcing character. On the one hand, information technologies are used for computer simulation of nanodevices. On the other hand, even today there is an active use of nanotechnology to create more powerful computing and communication devices, "- explained the synergy of the NBIC-tetrahedron by V. Pride and Dmitry Medvedev on concrete egxample (Prayd ,V., Medvedev, D. A, 2008).

The diverse support of nanotechnology and the NBIC tetrahedron as a whole, that is, the NBIC-initiative, is also a complex of self-organizing and self-developing system. It carries with it the principle of openness and irreversibility of processes, so it is natural to expect that its development will be carried out through special points of bifurcation, once weak, including random, the impacts can lead to the emergence of new structures, new types and levels of organization - and new risks .

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