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On the Importance of the Constructive Role of Contradiction in the System of Scientific Research

Abstract

In philosophical literature there is a statement that knowledge is a purely logical process. Researchers argue that elements of formal logic such as induction, deduction, analogy, formalization, mathematization, etc., are sufficient for the process of knowledge. Categories play a major role in the productive activity of thinking. At one time, philosophers put forward the idea of another logic - transcendental, dialectical, in this regard, representatives of

empiricism and rationalism, F. Bacon, R. Descart, G. Leibniz, I. Kant, G. Hegel made efforts to create universal methods and logical methods of knowledge. These methods were presented in the form of certain algorithms, as well as organized procedures for discovering truths, moving from truths of a lower order to truths of a higher order. In this regard, research and Western philosophers, with their obviousness, show that the illusory nature of ideas about the nature of knowledge as purely logical. This article attempts to show the fallacy of this fact.

Keywords: *Science, Search, System, Logic, Contradiction, Cognition, Process, Development, Knowledge*

Bilimsel Araştırma Sisteminde Çelişkinin Yapıcı Rolünün Önemi Üzerine

Öz

Felsefi literatürde bilginin tamamen mantıksal bir süreç olduğuna dair bir ifade vardır. Araştırmacılar, tümevarım, tümdengelim, analoji, biçimselleştirme, matematikselleştirme gibi biçimsel mantık unsurlarının bilgi süreci için yeterli olduğunu savunurlar. Kategoriler, düşünme faaliyetinin üretkenliğinde önemli bir rol oynar. Bir zamanlar filozoflar başka bir mantık fikrini ortaya attılar - transandantal, diyalektik, bu bağlamda ampirizm ve rasyonalizmin temsilcileri, F. Bacon, R. Descart, G. Leibniz, I. Kant, G. Hegel evrensel yöntemler ve mantıksal bilgi yöntemleri oluşturmak için çaba sarf ettiler. Bu yöntemler belirli algoritmalar biçiminde sunulmuş, hakikatleri keşfetmek, daha düşük mertebedeki hakikatlerden daha yüksek mertebedeki hakikatlere geçmek için organize prosedürler olarak ortaya çıkmıştır. Bu bağlamda, araştırmalar ve Batılı filozoflar, bilginin doğası hakkındaki fikirlerin yanıltıcı doğasının tamamen mantıksal olduğunu açık bir şekilde göstermektedir. Bu makale, bu gerçeğin yanlışlığını göstermeye çalışmaktadır.

Anahtar Kelimeler: *Bilim, Araştırma, Sistem, Mantık, Çelişki, Biliş, Süreç, Gelişim, Bilgi*

Introduction

The necessary prerequisites for the process of cognition are also practice, particularly experimentation, the creation and use of various material tools. Formal logic, mathematics, and experimentation each perform specific functions in the formation of knowledge. It should be noted that the process of cognition, in its essence, is a process of development, an evolution of science as a specific, complexly organized system. This does not exclude the use of theories and their systematization of substantive principles. It is worth noting that some scientific theories, regardless of our concept, are in a state of development. For example, classical and non-classical physics. What has been said about cognition allows us to clarify the nature of the determination of its development. In this sense, the nature of the determination of its development is most generally reflected in dialectics. The indicated mechanisms of interaction

and interconnection, each of which performs a specific constructive role in relation to the development of cognition and its results, are important.

1. Main part

In other words, we can assert that in the development of cognition, there are no definite logical determinants or logical forms of determination. The development of cognition and its components is an actual process of development, not a logical consequence, inference, or their system. It should be noted that the sources of motivating motives, the driving forces of cognition are its contradictions. These contradictions, like all other contradictions of reality, are specific. We can firmly state that none of them possesses certain logical properties. These properties, it should be noted, can belong to the images of contradictions in the process of cognition, but not to the contradictions themselves. It is also worth noting that different interpretations of contradictions are possible. For instance, T. Kuhn believes that the causes for the transition from one paradigm to another lie in the crisis situation of science, which is characterized by a significant number and sharp contradictions (Alekseyev & Panin, 2010). It can be confidently stated that contradiction not only encourages the scientist to research and search but also stimulates their activity in proposing new hypotheses, theories, and methods in science, as well as new ways of thinking. Furthermore, contradiction stimulates the discovery of new facts, or in other words, contradictions in cognition are constructive. They also determine the quantitative and qualitative characteristics of cognition. Contradictions are found in interactions and interconnections (Barashenkov, 1992). What has been said allows us to assert that dialectics of determination consists in the fact that in cognition, the resolution of contradictions is a regular movement towards deeper truths. It should be noted that any level of cognition of the studied reality is expressed in specific truths. Based on this reasoning, it follows that the determination by contradictions, the transition from one level to another, a deeper level of reality, plays a role in determining the content of knowledge. Therefore, we can assert that the determination of cognition is related to the constructive role of its contradictions (Borotkin, 1985). The constructive role of contradictions can be demonstrated through specific cognitive situations (for example, the creation of Mendeleev's periodic table of elements, which raised the question of the cause of the periodicity of chemical elements). The creation of the periodic table of elements by Mendeleev resolved existing contradictions, although it also gave rise to new contradictions. In particular, the question of the cause of the periodicity of the properties of chemical elements emerged. It is worth noting that the truth of the assumption that the properties of chemical elements depend on their atomic weights became the basis for the discovery of periodicity (Gernek, 1984). It is known that since the time of Newton and Leibniz,

classical physics was based on the concept of continuity in all dynamic processes. According to this, contradictions arose within this physics. Although they were resolved based on the preservation of the fundamental idea of continuity. Later, it was proven that light waves are transverse. By the beginning of the 20th century, theoretical and experimental research in physics demonstrated the transition to the opposite view – that of discontinuity, or, in other words, the interruption of dynamic processes. It was also proven that matter has a discrete structure. Thus, the constructive resolution of contradictions formed the basis for the new physics of quantum theory. The accepted hypothesis that energy can only take discrete values, multiples of a certain minimal amount of energy called a quantum of energy, became the foundation for quantum theory.

The idea that bodies can absorb and emit light not in arbitrary amounts but in definite portions – this was the first step towards the emergence of non-classical, quantum theory in physics. The recognition of the new contradictory idea also contributed to its fruitful development within the context of contradictory views on the photon. The contradictory idea that light is not only emitted and absorbed but also propagates as a stream of certain particles – photons – became evident. It became clear that all attempts to extend the principles of classical physics to the new domain only led to complicating existing theories, with artificial assumptions, and conversely, the radical acceptance of the single quantum hypothesis (radical in its extension to light) provided the new theory with fruitfulness.

It can be asserted that all components of cognitive situations play a constructive role in scientific search. But only contradictions are the sources, the main driving forces, the motives for development. It should be noted that these contradictions are not "pure relations." The identification of the constructive role of contradictions is, in fact, a deeper, more specific level of cognition – a logical-methodological requirement for understanding the constructive side of facts, methods, theories. Contradictions appear as cognitive processes, as relatively independent mechanisms of determination in scientific search. What has been said confirms the constructive role of contradictions, considering their place, function, and significance in the overall cognitive process (Ptashne et al., 2006). For understanding the constructive role of contradictions in cognition, their place in the process of developing a new fact must be considered. Regarding the mechanisms of determination in the development of scientific reality, certain fragments of it appear as a whole inherent in its contradictions. The diversity of evaluations in the process of cognition, their contradictions, which aim at their resolution, all testify to the complex nature of contradictions and, at the same time, the probabilistic process of cognition, as well as the

actions of its contradictions and their dynamics. It is also worth noting that the creation of new representations about the studied reality, new models, happens when the impossibility of developing contradictions based on the old ones is forecast or revealed (Ismayilov, Islamov & Yusifova, 2024). According to Rutherford, the atom consists of a nucleus, which contains the main part of the atom and its entire positive charge. Around the nucleus, electrons move on specific circular orbits. It is also worth noting that in each atom, their total negative charge equals the positive charge of the nucleus. Therefore, the atom is considered neutral. According to calculations, the diameter of the nucleus is approximately one hundred thousand times smaller than the size of the atomic nucleus (Ismayilov & Efendiyev, 2023). One important circumstance should be noted: in its time, even such an advanced theory of Rutherford did not go beyond classical physics. The development of physics showed that precisely because of this, it could not explain many phenomena, mainly the stability of atoms, their spectra, and the return of atoms to their initial state after interactions with other atoms. This contradiction was explained by N. Bohr. To do this, he had to develop Rutherford's model and create a new model. It is important to note that this novelty lay in the use of quantum concepts regarding the movement of electrons around the nucleus of the atom. *"Bohr creatively combined the ideas of Rutherford, Planck, and Einstein, spectroscopy, and quantum theory"* (Mamchur, 1975). As a result of scientific search, hypotheses are created that play a constructive role, at least at certain stages of it. This position is related to the fact that their creation and functioning already represents a system of contradictory requirements, such as logical-methodological, empirical, theoretical, and others.

One important circumstance should be noted: these hypotheses may sometimes not correspond to reality and not resolve contradictions. The main thing is that they serve as the most important stages of scientific search in the movement towards truth. What has been said can also be applied to the process of creating the systematization of elementary particles. A contradiction arose between the systematics of elementary particles. As a result of the systematization of elementary particles, the contradiction between the discovery of a large number and variety of these particles and the need to understand their laws and connections was resolved. In this regard, they are clearly divided into three stages. The last one is related to the development of a new idea – the bootstrap, multiplets, and quarks. Regarding this, V. S. Barashenkov once noted that each of these stages was a real history of the search for truth, associated with the discovery of contradictions in cognitive situations for each idea. Importantly, the development of these ideas, the discovery of the patterns inherent in them and the contradictions created certain prerequisites, in particular ideologically-theoretical, and the

means to transition to the next stage of scientific research (Barashenkov, 1992). It should also be noted that some physicists currently believe that the idea of quarks and its development primarily solved the problem of the systematics of elementary particles.

Conclusion

Now it can be confidently stated that cognition is not a purely logical process. The application of formal logic, dialectics, mathematics, and experimental research in the process of cognition allows solving certain classes of problems. It should be noted that the global, general structures of cognition are expressed by the laws of dialectics. It should also be noted that complex, contradictory, probabilistic, and relatively independent mechanisms of determination of the process of development, diversity, and uniqueness of its qualitative and quantitative characteristics are mainly driven by contradictions (Landau & Lifshits, 1963). The constructive role of contradictions in the development of knowledge consists in determining certain ideas, hypotheses, theories, and models. The most significant constructive role of contradictions in the development of knowledge occurs when contradictions are resolved, and the results obtained in the process of creativity function normally in the acquired knowledge and practice. It is also worth noting that when revealing the constructive role of contradictions, it is important to consider the place of this situation of cognition and the contradictions inherent in it. In scientific cognition, the dialectics of determination is such that the resolution of contradictions becomes a movement towards deeper truths of knowledge, as well as the process of creating more and more new means of comprehending them. The complexity, contradiction, probability of actions, and the dynamics of contradictions in cognition are not bypassed by the law of mutual transition of quantitative and qualitative changes. The character of their actions and the nature of the cause-and-effect structure of the development process are expressed in this process. In conclusion, it should be noted that the trends, patterns of the dynamics of contradictions in the development of cognition, arising from their replacement with historically specific characteristics, cannot be deeply understood without researching the development of science and its relatively independent fragments. Sometimes contradictions in cognition are resolved to the extent that the prerequisites, conditions, and means for their resolution created by development allow. Therefore, the creation of new theories and their sequences may not resolve the contradictions that give them life.

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