WEB OF SCIENTIST: INTERNATIONAL SCIENTIFIC RESEARCH JOURNAL
ISSN: 2776-0979, Volume 3, Issue 4, April., 2022

DIALOGUE OF WORLD VIEWS OR SEQUENTIAL MONISM A. EINSTEIN

T. O. Ortiqov
Andizhan State University Department of Philosophy Doctor of Philosophy

В статье рассматривается вопрос диалога мировоззрений, основанный на учении последовательного монизма Эйнштейна.

In this article was given the problems of monosim education in dialogs of A. Einstein.

Abstract

More than a century has passed since the creation of the theory of relativity, which changed the scientific worldview of physicists and received high recognition of space science. The original premises and theoretical assumptions of this magnificent theory served in the technical calculations of space navigation of aircraft. General solutions of Einstein's equations allowed A.A. Fridman to apply them in describing the theories of the entire Universe. According to these solutions, the Universe must either expand or contract.

Introduction

In 1929, the American astronomer E. Hubble, with the help of astrophysical observations, discovered the expansion of the world of galaxies surrounding us, discovered the expansion of the Universe, confirming the correctness of the conclusions of A. A. Fridman. This fact laid the foundation for the further development of cosmology. For example, these models were essentially evolutionary, linking the current state of the universe to its previous history. At the end of the 1940s, G. Gamov put forward the so-called theory of the hot Universe, where nuclear reactions were considered that took place at the very beginning of the expansion of the Universe in a very dense substance. In this case, the temperature of the substance was high and fell with expansion. The theory predicted that the stars and galaxies formed during the expansion of the Universe are 75% hydrogen and 25% helium. The second conclusion of the theory says that in the current Universe there must be weak electromagnetic radiation left over from the explosive era of high density and temperature. The astrophysicist I.S. Shklovsky called this radiation relict radiation. Thanks to this theory, radio astronomy, X-ray and gamma-ray astronomy arose. In 1965, the Americans A. Penzias and R. Wilson experimentally discovered relic (residual) radiation, for which in 1978 they became Nobel laureates in physics. This

WEB OF SCIENTIST: INTERNATIONAL SCIENTIFIC RESEARCH JOURNAL
ISSN: 2776-0979, Volume 3, Issue 4, April., 2022

fact once again proved the validity of the hot Universe model. As can be seen from what was predicted, not only the scientific principles put forward by Einstein, but also the monistic position of the great scientist are heuristic. To appreciate the philosophical richness of the general theory of relativity (GR), one must distinguish between the philosophical premises associated with it, heuristic principles, and physical axioms.

Einstein and Mach. The formation of A. Einstein's worldview was significantly influenced by the views of his famous predecessors. The doctrine of space and time by Newton, Poincaré and Mach's epistemological method in the theory of knowledge always amazed A. Einstein. "... In my young years," he wrote, "I was also strongly impressed by Mach's epistemological attitude, which today seems to me untenable in essential points. Namely, he did not emphasize enough the constructive and speculative nature of all thinking, especially scientific thinking. As a result, he condemned the theory precisely in those places where its constructive speculative character comes out openly, for example, in the kinetic theory" [1.266].

Ernst Mach put forward the idea that science as a whole owes its existence to the principle of economy of thought, which is based on biological expediency. He believed that this principle frees the foundations of science from the influence of metaphysics. However, this position was once criticized by M. Planck, where the latter called the very principle of economy of thought metaphysical.

Mach denied the existence of atoms, absolute zero temperature and Boltzmann's kinetic theory. Concepts in science for Mach had meaning as symbols denoting a set of sensations, and science itself - as a set of hypotheses that should be verified by numerous experiments.

Some of his ideas influenced the formation of Einstein's views when creating the general theory of relativity. Mach at one time criticized the Newtonian concept of absolute rotation and absolute time. This criticism forced Einstein to abandon the basic principles of classical physics when creating the general theory of relativity. He attached great importance to physics based on the general principle of relativity: "... It would be in vain to look in classical mechanics (as well as in the special theory of relativity) for that real something to which the various behavior of bodies could be reduced concerning reference systems K and K. This objection was already foreseen by Newton, who vainly sought to weaken it. However, E. Mach understood it most clearly when he put forward the demand that mechanics be built on a new foundation. This objection can only be avoided by physics based on the general principle of relativity. The equations of such a theory are valid for any reference body, in whatever state of motion it is" [1.266].

WEB OF SCIENTIST: INTERNATIONAL SCIENTIFIC RESEARCH JOURNAL
ISSN: 2776-0979, Volume 3, Issue 4, April., 2022

There are works in the literature devoted to revealing the heuristic role of the Mach principle in the creation of the general theory of relativity. Ray Christopher of Oxford University, in his book The Evolution of Relativity, revisits the stages in the development of the theory of relativity, and also explores the role of conceptual simplicity in the process of developing views of space and time. The philosophical heritage of E. Mach and his influence on Einstein's views in literature, the author believes, are underestimated. Of course, Einstein himself, at one time, was skeptical of the positivist views of E. Mach, although he noted his positive influence on himself in his younger years.

The famous Mach criticism of Newton, according to R. Christopher, contains the following important principles:

- Space does not have an independent absolute existence;
- Only within the framework of physical theory does it make sense to talk about material objects in the universe, their properties and relationships;
- In relation to one object or system, any movement is relative;
- The forces of inertia observed by us can be explained by the fact of their occurrence only in accelerated or rotating objects, the movement of which occurs relative to a fixed celestial or material reference system;
- The possibility of inertial forces in an object or system accelerating or rotating relative to another system or object cannot be excluded, since the detection of such forces may be hindered by the lack of the necessary sensitivity of measuring instruments [3.211].

E. Mach's philosophy of science contains two different aspects: phenomenalism and the demand for economy or simplicity as the guiding principle of scientific thinking. Although the formulation of Mach's principle is not in his writings, however, it can be found in Mach's thinking. Einstein first formulated Mach's principle in his article "The Fundamental Content of the General Theory of Relativity":

“The inertial field is determined only by the distribution of mass - energy. Mass and energy, according to the consequences of special relativity, are one and the same; Formally, energy is described by a symmetric energy tensor, which means that the C-field is conditioned and determined by the energy tensor of matter” [2.613]. Although Mach's principle belonged to a relativistic context, his arguments were still in the context of Newtonian ideas. In the above quote, the C-field denotes the state of space, described by the tensor, which determines all the metric properties of space, the action of inertia and gravity in it. This tensor is what Einstein calls the symmetrical "fundamental tensor." According to R. Christopher, the general theory of relativity has a number of features associated with the principle of Mach's economy - equivalence, covalence and invariance. In the creation of general relativity, the most important moment was Einstein's realization of the indistinguishability of inertial and gravitational forces by an observer.

Consideration of recent studies devoted to general relativity leads to the idea that the theory is developing dynamically. It is worth trying to establish the boundaries of development beyond which general relativity does not work. The problem of infinite divisibility of space-time can also be solved in favor of the quantum approach. Perhaps discreteness and indivisibility have no empirical evidence, and, therefore, we can choose based on the principle of greatest simplicity. As R. Christopher notes, Mach's principle in general relativity is not positivist, it should be understood as a methodological prescription with a certain positivist tinge, established on the basis of ontological economy.

However, D.P. Gribanov, comparing the philosophical views of Mach and Einstein, expresses distrust of statements about the influence of Mach's ideas on Einstein's work when creating the theory of relativity: “If for Mach the subject of science is the analysis of the connections between our sensations, then for Einstein it is itself reality. If Mach denied objective laws and objective truth, then Einstein made truth dependent on objective reality. Thus, the content of Mach's philosophical ideas did not become for Einstein the basis on which his worldview took shape. Therefore, it did not enter the fabric of his physical ideas either. Mach's idealism rather influenced the "color of expression" in Einstein's work on certain problems of epistemology and physics" [4.48].

It seems to us that this is not entirely true. It is known that the classical interpretation of the principle of relativity, coming from Galileo and Newton, as the independence of the nature of the flow of phenomena (mechanical) from the uniform translational motion of the material system in which they occur, retained its inviolability throughout the 19th century. And only at the end of it, Henri Poincaré came to a different interpretation of the principle of relativity: “The principle of relativity, according to which the laws of physical phenomena must be the same for a stationary observer and for an observer making uniform translational motion, so that we have no way to determine whether we are whether we are in such a movement or not” [5.30].

Mach's principle asserts the equivalence of the field of forces of inertia to the gravitational field, and each field equally has a dependence on mass. As applied to the GR equations, this principle says that the curvature of space-time is entirely determined by the sum of the masses that make up the Universe. Mach believed that the concept of absolute space is philosophically unsuccessful, it cannot be perceived

WEB OF SCIENTIST: INTERNATIONAL SCIENTIFIC RESEARCH JOURNAL
ISSN: 2776-0979, Volume 3, Issue 4, April., 2022

by the senses and therefore unreal. Non-inertial motions (accelerated and rotating) are well explained by the masses of distant stars, and not by absolute space. Mach's criticism of Newton's concept of absolute space was the starting point of Mach's principle, which has not a philosophical, but a physical content.

Discussing the philosophical content of the Mach principle, V.S. Gott, V.S. Tyukhtin, E.M. Chudinov noted that “Einstein initially believed not only in the validity of the Mach principle, but also in its inseparable connection with the general theory of relativity. However, the development of general relativity has shown that its connection with the Mach principle is not so rigid... Einstein concludes that general relativity is only a satisfactory theory if the physical properties of space described by it are completely determined by one matter” [6.52-53].

From the time of Newton up to Mach, gravity was understood as a phenomenon representing the action of two or more masses. Then this concept was supplemented by the idea of Mach, who argued that the masses are responsible for the phenomena of inertia or are its cause. Giving due preference to Mach, Einstein noted: “... Mach clearly understood the weaknesses of classical mechanics and was not far from arriving at the general theory of relativity. And this is half a century before its creation! It is very likely that Mach would have been able to create a general theory of relativity if, at a time when he was still young in spirit, physicists were worried about how the constancy of the speed of light should be understood” [2.31].

General principle of relativity. Mach argued that accelerated motion is no more absolute than uniform motion, moreover, the relativity of motion requires equivalence of frames of reference. This is precisely what the general principle of relativity asserts - the laws of nature, if they are correctly formulated, retain their form in relation to an arbitrarily chosen frame of reference. The emphasis is on the fact that there are no adequate explanations for the reasons for the difference between inertial and non-inertial frames. Mach considered motion in relation to fixed stars, therefore Mach's principle is understood as the statement that all inertial effects arise due to the interaction of physical objects. Hence it follows that the equivalent class of inertial systems is determined by the actual configuration of matter in the Universe at a certain time.

The basis of the principle of equivalence is not only the equality of gravitational and inertial masses, but also their fundamental identity. However, from an ontological point of view, it is important that the equivalence is local, since gravity is radical and decreases with distance from the center of its source. It can be argued that general relativity is more of a field theory than a theory of remote interaction. The equivalence principle is also of great heuristic value, an example of this is Einstein's assumption about the deflection of light rays near large masses.

The principle of covariance is that the laws must be such that when converted to another coordinate system, their meaning would remain unchanged. Indeed, Einstein attached great importance to this principle in the context of general relativity, but it is completely unjustified that many authors identify general covariance with the general principle of relativity. Although everyone agrees that the general covariance plays the same essential role in general relativity as the Lorentzian covariance plays in the special theory of relativity (SRT), there is no unanimity in assessing the significance of this role. Einstein himself believed that the principle of general covariance has a factual content.

The famous Canadian philosopher Mario Bunge believes that the principles of covariance are devoid of factual content. He believes that the statement “classical mechanics is covariant with respect to Galilean transformations” is a statement not about the world, but about the structure of the theory. He calls the principles of covariance factually empty meta-theorems [7].

The most radical critic of Einstein's point of view on general covariance was the famous Russian theoretical physicist V.A. Fok [8.244-245]. He argued that there is no principle of general relativity, but only a general covariant theory of gravity. The close relationship between general relativity and general covariance is declared by him to be a delusion. The general principle of relativity is denied by him on the grounds that it has no empirical foundations, but is justified purely mathematically and a priori.

On the one hand, Fock recognizes the accepted interpretation of relativity that the laws of nature are identical in different frames of reference, on the other hand, he claims that the very existence of the principle of relativity is a manifestation of the homogeneity of space-time, and by homogeneity he understands the level of symmetry. So. a space is homogeneous if the interval or distance between two points is invariant with respect to a certain group of transformations. Space in physics is four-dimensional, and maximum uniformity requires a group of ten parameters. The homogeneity of space-time or the equivalence of all points or events requires four-parameter transformations. The isotropy or equivalence of directions requires a group of three parameters, the equivalence of inertial systems requires three more parameters in transformations, therefore, the Minkowski space-time has maximum homogeneity.

Fock argued that space-time in Einstein's theory of gravity is completely non-uniform, so there can be no principle of relativity associated with it. Thus, general relativity is not only far from the factual truth, but also contains a contradiction.

However, the principle of general covariance is neither necessary nor sufficient for the principle of general relativity. But the general covariance is still the basis of general relativity as the simplest and only practical way to move to laws that satisfy the general principle of relativity, as well as the simplest formal method for constructing laws that satisfy a stationary gravitational field and one point mass. This meant that Whitehead's theory could pass an empirical test such as measuring the precession of Mercury, or the deflection of light rays near the Sun.

In the 1920s, both theories were compared on the basis of conceptual analysis, since the same evidence was obtained for both. The problem was that confirming Whitehead's theory, which assumed Minkowski's global space, would mean denying the general principle of relativity.

Thus, Band criticized Whitehead, pointing out that a homogeneous or direct space leads to an incorrect statement of the standard of absolute uniform motion [9.434-440]. But the problem of finding exact solutions of both theories, except for the Schwarschild solution, is complicated, and the decisive experiment has not yet been carried out. The revival of interest in Whitehead's theory occurs in the 50s and is associated with the name of the Irish physicist Synge, who estimated its elegance and originality ^ 0.303-319].

Rayner created a cosmological model based on Whitehead's theory [11.509-526].

Will, noting the elegance of Whitehead's theory, claims that he was able to disprove it with the help of geophysical data. Many physicists have accepted his proof, but Fowler believes that if a different model of the Galaxy is used, Will's refutation is not so convincing [12.23-29].

“The real problem of Whitehead's and Einstein's theories is not of a physical but of a philosophical nature,” writes Fowler, “No empirical test can decide the question of the adequacy of the foundations of Whitehead's theory of relativity. The question should be put on another level” [13.288-290].

If we accept the idea of the topological primacy of events in relation to matter, then the degree of influence of the distribution of matter on the topology of space-time is thus limited. On the other hand, if we consider the structure of space-time to be completely dependent on the distribution of matter, then we find ourselves in the situation described by Godel: “For all possible definitions of world time, it is possible to travel to all regions of the universe that satisfy this definition.” Einstein then objected to Gödel that the topological structure of the Universe can be determined by matter in such a way that time world lines can be closed [14.447-450].

For the further development of Whitehead's theory, it would be desirable to accept the idea of the topological primacy of events in relation to matter instead of the postulate of homogeneity of the space-time metric.

Whitehead was critical of a number of aspects of Einstein's theory, especially the relationship between matter and space-time. He was also not satisfied with Einstein's point of view on matter, its independence and space-time from consciousness. He also did not agree with the idea of the primacy of matter in relation to space-time. In Whitehead's theory of gravity, light rays move along curved paths, while in Einstein's they move in a straight line in curved space. Moreover, Whitehead himself noted that flat space is not necessary in his theory, that is, the problem is not whether the space is Euclidean or not. Homogeneity of the metric structure of space-time is postulated, i.e. the same curvature at all points. The topological structure of space must be independent of matter, and thus relative to dimension.

So, the basic provisions of both theories are different, but in Einstein they are based on experimental facts. This corresponds to the ideas of Mach and the main idea of philosophical realism about the need to combine experimental data by means of a specific conceptual model. The elements of realism themselves must prove their truth by constructing a theory that satisfies observation. Einstein constructs realism as a program aimed at constructing realistic theories that ideally can be empirically adequate for all possible experiments. One of his programs was the postulation of the general principle of relativity and the creation of general relativity.

Literature

1. Einstein A. Sobr. scientific works. T. 4, - M., 1967
2. Einstein A. Sobr. scientific works. T.I.- M., 1966
3. Christopher R. The evolution of relativity. Bristol, Philadelphia: Hilger, 1987. 211 P
4. Gribanov D.P. Philosophical foundations of the theory of relativity. - M., 1982
5. Poincaré A. Present and Future of Mathematical Physics // Principle of Relativity: Sat. works on the special theory of relativity, - M., 1973
6. Gott V.S., Tyukhtin V.S., Chudinov E.M. Philosophical problems of modern natural science. - M., 1974
7. Bunge M. Laws of Physical Laws//Amer. J. Phys. 29.518.1961.
8. Fok V. A. Theory of space, time and gravity. - M., 1961-Band W. Dr. Whitehead theory of Absolute // Philosofical magazine. 7 1929. P. 434-440

ISSN: 2776-0979, Volume 3, Issue 4, April., 2022

9. Synge J. Z. Orbits and Rays in the gravitational Field of a Finite Sphene according to the theory of A.N. Whitehead // Proc. Ray. Soc. of London. S.A. 211. 1952. P. 303-319.
10. Ragner C. B. The Application of the Whitehead theory of Relativity to Nonstatus Spherically Symmetems // Proc. Roy. Soc. of London. A. 222. 1954. P509-526
11. Will C. M. Einstein on the firing Line // Phisics today. 25. 1972. P. 23-29
12. Fowler D. Disconfirmation of Whitehead Relativity theoru: A Critical Reply // Process Studies. 4. 1974. P. 288-290.
13. Godel k. An Example of a new cosmological solution of Einstein’s Field equations of gravitation // Reviews of Modiews of Modern Phisics. XXL 1949. P. 447-450; Einstein's Reply to criticism in Albert Einstein Philosopher // Scientist. Vol. 2. 1949. P. 687.