

On The Analogue of The Classical Ether And Its Physico-Philosophical Interpretation

Radzhabov Toir Makhsudovich

Research Institute, Tajik National University, 734025 Republic of Tajikistan

Correspondence

Radzhabov Toir Makhsudovich
Research Institute at Tajik National University
734025 Republic of Tajikistan, Dushanbe,
Rudaki ave., 17.
Tel: +992 93 9995602
E-mail: buny_r@mail.ru

Abstract

The paper deals with the question of the ether, the dispute about the existence of which has been going on for centuries. The version about the analogue of the classical ether, which is based on Dirac's ideas, is discussed. According to this version, the analogue of the classical ether is the own field of physical objects that meet all the requirements to be considered as ether: it is elastic, it is discrete, it is entrained. It is connected to the body and waves and disturbances can propagate in it. It is the only material substance connecting physical bodies with each other, providing interaction over a distance. A previously unknown property for light is justified: if there is no material body at a given point in space, then light will not come to this point. The consideration is given within the framework of the classical approach.

- Received Date: 21 Jul 2023
- Accepted Date: 27 Jul 2023
- Publication Date: 31 Jul 2023

Keywords

luminiferous ether, nature of light, analogue of classical ether, discreteness and continuity in physics, nature of inertia force, Mach principle.

Copyright

© 2023 Authors. This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International license.

Introduction

The question of the ether has a history of thousands of years, and it occupies a central place in the physical representation of the picture of the universe. However, by now there is no clear and generally accepted physical representation of it. The scientific view of the ether originates from the works of Descartes [1], where a version of the mechanism of interaction of bodies was proposed - a vortex picture of the Universe. Ether was considered as a thin, permeating medium providing physical interaction of bodies in the theory of Fatio-Lesage [2]. Further, the ether was considered in connection with the nature and propagation of light waves [3]. The experiment of Michelson and Morley [4] was an attempt to discover ether experimentally and study its properties, but no positive result was obtained about its existence. Theoretically, a special relativity theory (SRT) was constructed [5], which claimed that electromagnetic waves do not need a special medium for their propagation. Light was considered as a stream of corpuscles propagating rectilinearly from the source. However, the denial of the ether within the framework of SRT and the negative result of the Michelson-Morley experiment did not put an end to the question of its existence.

Historically, in the intuitive view of the classics of physical science, the picture of the Universe could not be imagined without the ether. I. Newton wrote about the inevitability

of the existence of the ether: "That gravity should be innate inherent & {essential} to matter so that one body may act upon another at a distance through a vacuum without the mediation of anything else by & through which their action or force {may} be conveyed from one to another is to me so great an absurdity that I believe no man who has in philosophical matters any competent faculty of thinking can ever fall into it" [6].

Currently, there are conflicting opinions regarding the existence of the ether. However, in general terms, one way or another, one has to admit its existence. Thus, within the framework of the general theory of relativity, it is recognized that without the ether, it is impossible to imagine a picture of interaction at a distance. So, the creator of the general theory of relativity states his opinion as follows: "We may say that according to the general theory of relativity space is ended with physical qualities; in this sense, therefore, there exists an ether. According to the general theory of relativity space without ether is unthinkable; for in such space there not only would be no propagation of light, but also no possibility of existence for standards of space and time (measuring-rods and clocks), nor therefore any space-time intervals in the physical sense. But this ether may not be thought of as endowed with the quality characteristic of ponderable media, as consisting of parts which may be tracked through time. The idea of motion may not be applied to it" [7].

Citation: Makhsudovich RT. On The Analogue of The Classical Ether And Its Physico-Philosophical Interpretation. Japan J Res. 2023;4(5):1-4

In the question of the ether, two main questions need to be answered. The first question is whether ether exists as a material substance in nature? The second question is, if it exists, what is the physical form of its existence?

All the issues that are the object of research, including physical phenomena, have interpretation from two positions: from the position of private sciences and from a philosophical point of view. Einstein, in the framework of SRT, as a physicist – representative of private science, concludes that there is no ether, but in the framework of General Relativity Theory he adheres to the philosophical idea that interaction at a distance requires a common medium - ether. Thus, the question of the ether does not have an unambiguous conclusion even in the views of those whose conclusions are accepted within the framework of official physics. This situation requires further reflection and research about the ether. The negative result of the Michelson-Morley experiment also requires its interpretation. From a philosophical point of view, a negative result regarding the existence of the ether cannot be considered as a final conclusion until there is an answer to the second question – what can the ether be?

An analysis of the history of the development of physical representations and the lack of satisfactory solutions to the fundamental issues of physical theory led one of the major physicists of the 20th century, P. Dirac, to the conclusion that the basic arguments of physical representation should be revised. In his review article [8], he expressed his ideas for the further development of physical theory. One of his ideas is to return to the analogue of the classical ether.

In the general historical physical concept, the question of the ether should be considered in connection with its two functions: in describing the mechanism of interaction at a distance and as a medium for the propagation of waves and disturbances. In whatever form the ether is considered, it may be in demand primarily in connection with these functions. Clarity in the question of the ether can also clarify many other fundamental issues, such as the unified field theory, the mechanism of gravity and gravitational shielding, the question of mass, the question of the nature of the force of inertia and other related issues.

About the analogue of the classical ether

The phrase "analogue of the classical ether" belongs to P. Dirac [8]. The analogue of the classical ether implies that it must differ from the classical one – from the hypothetical stationary, thin, permeating matter everywhere, as the classics imagined. It must have a discrete - quantum property, meet the results of experience. Representations in matters of physical interaction and propagation of electromagnetic waves will depend on what the analogue of the ether is. A variant of the ether analogue and its structure is proposed in the work of Radzhabov [9]. In this work, it is shown that the proposed form of existence of the ether can meet all the requirements that the ether must meet as a medium of interaction and as a medium of propagation of electromagnetic waves.

We will briefly describe the proposed scheme of the analogue of the classical ether and consider the representations to which the proposed scheme of ether will lead in [9]. To distinguish the classical ether from the analogue of the classical ether, the latter can be called the analogue of ether.

In [9], the analogue of ether is presented as a material substance in the form of a limited number of force lines of the physical field, which begin in the physical body and go into the distance, decreasing in density in space according to the law $1/r^2$ (fig. 1b).

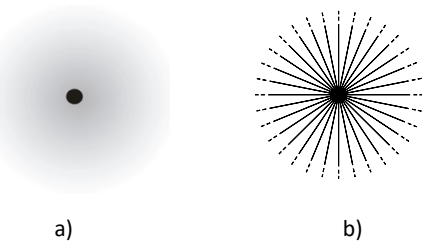


Figure 1. a) - a cloud-like scheme of the own field of physical objects; b) - the scheme of the own field of a physical body, as a finite number of lines of force.

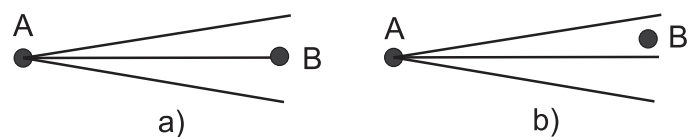


Figure 2. To the interaction of objects A and B: a) there is an interaction; b) there is no interaction.

This is the field of a physical object in a discrete representation. It is proposed instead of the existing representation of the field in the form of a cloud-like material substance (Figure 1a). According to this scheme, the ether analogue acquires discrete properties: it will become discrete in the tangential direction, and continuous, in the radial direction, along the lines of force. The lines of force, as channels of interaction, go into the distance and their intersection with another body will mean the presence of interaction with it. If there is no intersection with another body, then it is assumed that there is no interaction with this body, even if it is at an accessible distance (Figure 2). The discreteness of the ether analogue is derived from Dirac's idea and the principle of limitation: all material substances are limited in size, in properties and in possibilities. In this case, the own fields of physical objects can meet the requirements that the luminiferous ether must meet:

- ether is a material substance;
- ether is an elastic medium;
- ether is a entrained medium, since the corresponding field is organically connected with a material object and moves with it when it moves;
- ether is a medium that can connect a physical body with a remote light source. A wave from a remote source propagates using stretched strings in the form of lines of force.

The analogue of ether allows to create a causal and visual representation of physical phenomena and processes.

An analogue of ether as a medium of propagation of light waves

The analogue of ether is organically connected with the physical body, being its own field and an integral part of the unified system "body + field". When a body moves in space, the movement of its field, an analogue of the ether, also occurs with it. The unity and organic connection of the body with its field makes it possible to interpret the dynamic and kinematic state of the body. To do this, one can figuratively imagine a system consisting of a web with a spider in its center. The system of the

spider and its web is in a state of uniform rectilinear motion. The disturbance that occurs in the web propagates in it at a constant velocity relative to the spider. A similar picture can be presented for a light wave and the mechanism of its propagation. Light is a wave that arises in the own field of the physical body. A change in the environment in the form of the formation of waves and disturbances reaches the object through its field. And here we come to a qualitatively different idea of the properties of light - if there is no material body at a given point in space, then light does not reach this point in space, since light propagates only through the field of a physical object. If the object is the eyes, then such a representation resembles the mechanism of vision that existed in the ancient representation. In accordance with the images of ancient Egypt, there was a point of view according to which the eyes emit special rays that touch the surrounding world. The ancient Greek philosopher Empedocles expressed an opinion about the radiation of a special substance by the eye [10].

In matters of measurement, there is such a factor as the influence of the measuring device on the measurement result. This factor is directly related to the measurement of the velocity of light. As it was concluded above, light is a wave that propagates in the own field of a physical object. The measuring device is also a physical object, and light propagates in the measuring device's own field. If the measuring device is in an inertial reference frame, then the measurement of the velocity of light always gives the same value. This is the reason for the negative result in the Michelson-Morley experiment. Thus, the principle of the constancy of the velocity of light in inertial reference frames acquires a visual picture.

Within the framework of the proposed structure of the electric field in [9], the analytical formula of Balmer was obtained without accepting the postulates.

An analogue of ether as a medium of interaction of physical objects

Without an environment that can provide interaction at a distance, it is impossible to imagine a picture of physical interaction. In this regard, everyone holds the same opinion. From this point of view, physical interaction is realized with the participation of three material components: two bodies and a physical field between them. The physical field is an intermediate substance in the interaction between bodies: the first body affects the field of the second body, its field affects its own body. That is, there is a factor of interaction of the body with its field and vice versa. This factor allows us to consider the phenomenon of inertia from a new point of view, namely, inertia

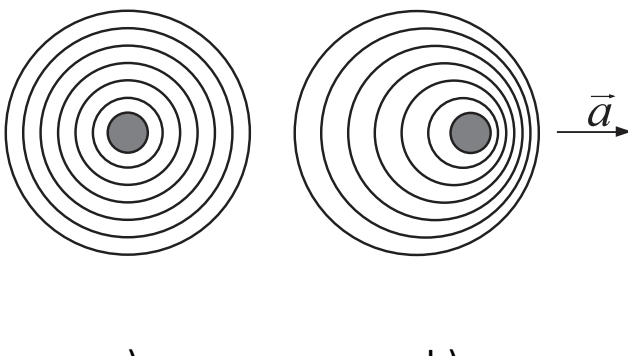


Figure 3. The shape of the own field of a physical body at: a) rest; b) motion with acceleration.

as the influence of its own physical field on the physical body. At the same time, the physical picture looks like this: when moving with acceleration, its own field is deformed (Figure 3b): in the direction of movement, its own field is compacted, which is the force of inertia. In an inertial reference frame, the own field is not deformed (Fig.3a). As for the nature of the inertia force, the hypothesis of E. Mach [11], according to which the cause of inertia is the presence of distant cosmic bodies. Although in the proposed work inertia is considered as a local phenomenon – as the interaction of a physical body with its physical field, however, the content of the field is determined by the influence of the environment, including distant celestial bodies on this body. In this regard, the Mach hypothesis does not lose its scientific significance within the framework of the work under consideration.

The nature of the inertia force is considered in [12], where the interpretation is given in abstract formulations. Our proposed option has a clear picture and meets the principle of causality.

It should be added that both optical phenomena and physical interaction are characterized by the same law of change of properties with a distance of $1/r^2$. That is, both in matters of interaction and in matters of wave propagation, the analogue of the ether is characterized by the same pattern.

Taking into account the proposed structure, Radzhabov [13] shows that the gravitational and nuclear interactions have a single mechanism and a common nature.

Discussion

The question of the ether occupies the most significant place in the physical representation of the picture of the universe. Depending on whether the ether exists as a material substance or not, the picture of the Universe takes completely opposite outlines. The assumption of its existence allows for the construction of a causal and visual picture, its absence, on the contrary, forces the creation of abstract representations that do not fit into the framework of physics, as a science dealing with concrete things. Logically, it is impossible to deny the existence of an environment that ensures the interaction of physical objects at a distance. On the other hand, it is also indisputable that there are their physical fields between physical objects, except for which there is no other material substance. The question will arise – whether the physical field, as a really existing material substance, can be considered as a physical medium in which waves and disturbances can propagate. Our research gives a positive answer to this question. The existence of such an environment is allowed by its specific structure, which is based on Dirac's ideas [8]. Dirac's ideas are the result of deep analysis and the product of the philosophical conclusion of a major physicist. We can briefly discuss and note the significance of Dirac's ideas.

Dirac's first idea is a return to the analogue of the classical ether. This joins Dirac the intuitive ideas of the classics of physical science, who did not doubt the existence of a specific environment through which physical interaction takes place and in which waves and disturbances can propagate. Currently, researchers, in principle, do not deny the existence of a specific environment that fills the entire space, calling it a physical vacuum. Dirac speaks of an analogue of the classical ether, but the essence of ether, both in classical and in other representations, remains unchanged - it is a materially existing substance.

Dirac's second idea is to introduce a limit on the number of Faraday lines of force. This is the product of P. Dirac's intuition,

and from a philosophical point of view, this idea brings specifics to the scheme of physical interaction. In terms of significance, this idea can be put on a par with Faraday's hypothesis about the introduction of force lines to characterize the physical field, which ensured the further development of physical concepts.

In the philosophical view, the introduction of a limit on the number of lines of force is connected with the question of finiteness and infinity, discreteness and continuity. The idea of the limitation of force lines allows us to transfer the consideration of phenomena and processes from the plane of continuity to the plane of discreteness. Continuity complicates the consideration of the issue and leaves it unresolved, creates paradoxes, like Zeno's paradox. On the contrary, the introduction of discreteness opens up new possibilities in solving problems. In the history of science, the transition to discreteness ensured the development of quantum physics and the creation of such branches of mathematics as differential and integral calculus.

Dirac's third idea is to take into account the size of microparticles, considering the electron as a sphere of finite size. In the framework of general physics, such a concept as a material point is used, when the size of objects can be neglected. This assumption simplifies the consideration of the issue and contributes to its solution in individual cases. However, in reality, any existing object has non-zero spatial dimensions. From a philosophical point of view, if the existence of an object is its first inherent quality, then its quantity and size are its second such quality. In some cases, neglecting the physical size does not affect the solution of problems and it is allowed to consider a physical object as a material point, in other cases this can lead to difficulties. For a more accurate description of the state of a real gas, the size of gas molecules was taken into account by the Van der Waals equation. In the physical representation, the realization of Dirac's idea should contribute to solving many other problems.

This work represents a further development of the principles of classical physics, to which the author's works are devoted [9,12-15].

Conclusions

1. The analogue of the classical ether is the own fields of physical objects, it is discrete in the tangential direction and continuous in the longitudinal direction, along the lines of force of the physical field.
2. The analogue of the classical ether as a medium of wave propagation, and as a medium providing physical

interaction, is characterized by the same regularity with distance – the inverse proportionality of the square of the distance.

3. Physical objects receive a light wave through their fields, the absence of a material object at a given point in space excludes light from entering at this point.
4. The idea of an analogue of the classical ether fits into the framework of classical concepts: it has a visual picture, meets the principle of causality.

References

1. Whiteside DT. The prehistory of the Principia. Notes Rec R Soc Lond. 1991;45/13.
2. Pushing Gravity. New perspectives on Le Sage's theory of gravitation. By Matthew R. Edwards (Editor). WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim; 2002.
3. Huygens, Ch. Treatise on light. University of Chicago Press; 2005.
4. Michelson AA, Morley EW. On the relative motion of the Earth and the luminiferous aether. UK: Taylor & Francis; 1887.
5. Einstein A. Zur Elektrodynamik bewegter Körper, Annalen der Physik. 1905;17:891-921.
6. Original letter from Isaac Newton to Richard Bentley. Source: 189.R.4.47, ff. 7-8, Trinity College Library, Cambridge, UK Published online: October 2007.
7. Einstein A. "Ether and the Theory of Relativity" (1920), republished in Sidelights on Relativity (Methuen, London, 1922).
8. Dirac PA. The Evolution of the Physicist's Picture of Nature. Scientific American. 1963; 208(5):45–53.
9. T.M. Radzhabov. On the missed opportunities of classical physics. Physics Essays. 2021; 34: 475-479.
10. Kingsley P. Ancient Philosophy, Mystery, and Magic: Empedocles and Pythagorean Tradition. — Oxford: Clarendon Press, 1995. ISBN 0-19-814988-3.
11. Butto N. Th Nature and Origin of Inertia. Physics Gravitation and Cosmology 07(02):761-772.
12. Radzhabov TM. Mass-area equivalence in classical physics and aspects of mutual shielding of objects. Physics Essays. 2022; 35(2):175-180.
13. Radzhabov TM. On the common nature and unified mechanism of gravitational and nuclear interactions. International Journal of Scientific Development & Research. 2022; 71(4):1078-10794.
14. Radzhabov TM. Consideration of the daily variation of gravity on the manifestation of gravitational shielding. Journal of Geoscience and Environment Protection. 2022;10(7): 31-47.
15. Radzhabov TM. On the gravitational shielding, gravitational permeability and hidden matter. International Journal of Geosciences. 2022;13:531-546. .