

# A New Look at Space

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## **Abstract**

Among all the fundamental categories of physics, space is the dominant place, for everything that exists as a physical reality. Until the end of the 19<sup>th</sup> century the prevailing consensus was that there was a continuous “environment” called “ether” that fills all space, but completely intangible for humans. After the experiments of Michelson and Morley and describing the principles of Einstein’s Special Theory of Relativity, the concept of “ether” was completely discarded from science. It was recognized, that electromagnetic waves propagate in an absolute vacuum. With the advent of the General Theory of Relativity and quantum mechanics, the need to recognize the presence of a certain "medium" filling space reappeared. Such concepts as “physical field”, “physical vacuum”, scalar field (Higgs field) and others were proposed. The author in this article proposes the concept according to which space-time is considered as the physical system that consists of physical substrate and presents itself as an “absolute physical reality”.

**Key words:** *space, space-time continuum, physical system, physical reality, preferred motion direction*

The question of physical nature of space remains to be one of the most complex and controversial issues in philosophy and physics. Since all physical reality, all physical systems exist in space, this is no coincidence. For a long time, scientists and philosophers have argued about whether space is a void, "nothing", or whether it is "something", consisting of some kind of physical substrate. It is well known that until the end of the 19th century, for more than three millennia in science, the prevailing

opinion was a certain continuous medium called “ether” that fills all space and permeates all objects, but at the same time remains absolutely intangible for humans.

However, by the beginning of the twentieth century, the situation in physics had changed. After the well-known experiments of Michelson and Morley, in view of “unprovability”, and subsequently “unnecessary” to describe the principles and provisions of A. Einstein’s “special theory of relativity” (STR), the concept of “ether” was completely discarded from science. It was accepted that electromagnetic waves propagate in an absolute void - a vacuum, and do not need a "medium".

Meanwhile, this situation in science did not last long. With the advent of the “general theory of relativity” (GTR) and “quantum mechanics”, the need to recognize the presence of a certain “medium” filling space has reappeared. The concept of “physical field”, “physical vacuum” is proposed, which means a substance that fills all space and is filled with “virtual particles”. The latter, as a result of “fluctuations”, can turn into real “particles” and “antiparticles” [1, 2].

It should be noted that the past twentieth century in the history of the development of science has not brought anything significant for solving this problem. The repeated efforts of the supporters of the "ether theory" to prove the existence of a certain substance or "universal medium", the filling space, have proved futile. Official science has declared all such theories and hypotheses a priori “pseudoscience” [3, 4]. Obviously, the reason for the current situation was not only the “unwillingness” of the pillars of modern science to accept the concept of “ether”, but also the absence of such a theory of “ether” that would not only fit into the well-known laws and principles of modern physics, but also would give them a logical explanation [5].

In this article, we offer our concept of space. First of all, we believe that space is not an abstract or purely mathematical concept. As physical reality, it is a physical system that has a physical substrate, that is, consisting of constituent particles – elements [6, 7].

What is the name of this substance? Undoubtedly, it would be fair to call it historically - “ether”. However, since this term would have caused a majority of modern physicists to not perceive and does not reflect the essence of the space

structure that we are proposing, we decided to call it the “space-time continuum” (STC). It is known that a similar term - “space-time” was first used by Minkowski and Einstein in the description of general relativity. However, it had a purely mathematical, more precisely, geometric meaning and does not imply the presence of “physical substance”.

According to the concept that we are proposing, STC is a certain physical substance, or physical reality, which fills, or rather, makes up our three-dimensional space. It permeates all parts of space, the atoms themselves and elementary particles. The physical substrate, or constituent particles (elements) of this substance are the smallest particles, practically without size and mass in its usual sense. In their physical parameters, they are identical to the concept of “material point”, known in classical mechanics. We present them in the form of the smallest spheres, indivisible and having absolute hardness. These particles exist in a state of constant chaotic motion, continuously colliding with each other. We think that in a certain sense these particles themselves are particles of “motion” or “momentum”. With the latter in mind, we decided to call them "graviton-momenta."

It should be noted that the STC is very reminiscent of the “ideal gas” well known in physics. This is a mathematical model of gas, where "the potential energy of interaction of molecules can be neglected in comparison with their kinetic energy." The collision of particles with each other is absolutely elastic, and during the interaction between them during a collision is negligible compared to the average time between collisions. Particles of the “ideal gas” have the shape of an absolutely elastic sphere and the collision between them can be of a “central” and “off-center” nature.

However, in addition to the similarities listed above, there is a very significant difference between the “ideal gas” and STC. In contrast to the constituent particles of the “ideal gas”, which have a very small but real mass and, therefore, kinetic energy, the separately taken “graviton-momentum” of the STC does not have mass and kinetic energy. They differ from each other only in the direction of movement and density in space.

It should be noted that a single graviton pulse cannot be visualized or registered. For it is not a physical system that has internal and external parameters, and can interact (collision) with only one graviton-momentum, in which only the directions of their motion change. It is known that all methods of registration (visualization) of physical interactions known in science are based on the reflection or emission of photons (electromagnetic waves), or other elementary particles. The latter, according to the author's concept, are a physical system formed by swirling graviton pulses.

As noted, STC, as a continuous medium, is a chaotic system. Moreover, the "degree of chaotic state" can range from "complete" (absolute) chaos ( $X=1$ ), to its absence ( $X=0$ ). "Complete chaos" means that in the considered volume of STC in all possible directions the number of gravitons is approximately the same. The phenomenon, when the number of moving graviton pulses increases in a certain direction, we call "preferred motion direction" (PMD). In essence, this is the "flow". In this case, the direction of motion (flow) can be straightforward, or rotational (turbulence). The degree (magnitude) of the PMD can also be from  $PMD=1$  (absolute flow), to  $PMD=0$  (absence of PMD). According to the author, PMD is the most important concept underlying all kinds of categories and processes of the universe. The author also considers it possible that in the same section (volume) of STCs at the same time there can be an almost unlimited number of PMD (flows) in different directions.

Another property of the space model (STC) proposed by the author is that it is a dynamic chaotic system. That is, it is continuously expanding, or, a centrifugal stream of graviton pulses flows in it in all possible directions.

Thus, according to the proposed concept, the basis of the universe is space (STC), which is a physical chaotic system. All other fundamental physical categories, such as momentum, energy, physical field, mass, are secondary (more precisely, derivatives) with respect to STC.

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