

# REFLECTION ON PHYSICAL REALITY, PHYSICAL SYSTEMS AND SPACE

A.M. Khadjibaev

## ABSTRACT

In the article the author discusses fundamental definitions as “Physical reality”, “physical systems” and “space”.

The author offers own parameters, original definition of physical system and describes the parameters that characterizes it. Describing the space, the author 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”. For the first time the author suggests a concept of “differentiating physical reality” as a physical system that differs from its “super system”

The definition and concept of physical reality (PR) has always been a subject of debate among philosophers and physicists. Often it was associated with the concept of “truth” or “objective reality”. The term “physical reality” was first introduced into the methodology of physics by Albert Einstein. This concept is associated with the content of the category “objective reality” and on the one hand with the content of the categories of the object and subject of cognition. In his article, Einstein stated: 'our notions of physical reality can never be final' [1].

Thinking about the essence of PR, it can be considered that Nature itself, including everything that exists and is happening in it, is PR. It must be recognized that for all its infinite variety of existence and manifestation, PR must necessarily possess the following two attributes (properties): be an objective reality, i.e. not to depend on existence (presence) on our consciousness and perception (according to E. Kant, these are “things in themselves”); to have the ability to respond (to react) to external influences and to exert influence on the surrounding PR itself.

All other attributes (properties) of things and phenomena may or may not be present and differ from each other in different level but we consider two attributes mentioned above to be mandatory for any PR. If one of them is absent, we cannot consider this thing or phenomenon as physical reality.

A concept very close in nature to the PR is the “physical system” (PS). The Greek word "system" literally means "a whole made up of parts". There are different definitions of the concept of PS. According to Weinik (1968), PS is a system that represents a certain amount of matter, which is imaginary separated from the environment by a control surface [2].

According to Kosharsky (2006), PS is a set of interrelated and mutually influencing elements, arranged in specific patterns in space and time, and working together towards a common goal [3].

Kogan (2006), summarizing the literature, gives the following definition: “the physical system is the imaginary allocated part of the material world” [4].

The literature analysis shows that one of the main features of PS is its “integrity”. According to Bakhmutsky (2007), system integrity is “the principal irreducibility of system properties to the sum of properties of its components and the non-derivability of system properties from properties of components” [5]. Moreover, Agoshkova and Akhlibinsky (1998) noted that PS includes a set of elements and the relationships between them [6].

It can be assumed that any PS includes two mandatory components: a. component parts, or elements of the system; b. internal communication (binding agent) between the elements. The fact is that the presence (aggregate) of multiple elements (constituent parts) is not enough to be considered as PS. There must be a constant internal connection between its elements, i.e. exchange or transfer of information. We believe that the internal communication makes up the essence of the PS, determines its “integrity” and all other properties and parameters. Without an internal connection between elements (constituent parts) there is no “integrity” and they will remain as a cluster (aggregate) and cannot be considered PS.

We suggest the following definition: PS - is the set of the constituent parts (elements) with a continuous internal connection (information exchange) between these parts. We believe that this definition most fully and laconically reflects the main principles of PS structure. It can be noted that if the first component, i.e. elements (component parts) determines the form of the PS, the second component of its (internal communication) - describes the essence of PS.

It should be noted, that the constituent parts of the PS could be any material bodies: from fundamental elementary particles to cosmic bodies and systems. Depending on the nature of the constituent elements, the PS can be “homogeneous” (all elements are identical), or “heterogeneous” (elements differ from each other in parameters). Closely related to this property of PS is its characteristic “isotropy”. However, even in a “heterogeneous” PS, the nature of the internal connection between the elements must be the same (common).

As for the mechanism or nature of the internal connection between the elements of the PS, a simple logical analysis suggests that although there are innumerable forms of communication in Nature, they are based on only one thing - action, or impulse. It is the impulse, which is transmitted only in one way - by

collision, that makes up the physical essence of any form of information, or communication.

It can also be mentioned that one and the same PS can be in relation to another PS (located in the same space) as a "super-system" and at the same time be a constituent element of another - a higher "super-system"! In other words, two different PSs can simultaneously occupy the same zone of space and not mix. As noted above, PS consists of two components: constituent parts and internal communication. If two PSs differ from each other by at least one of these components, then they are already different PSs. For example, "Brownian motion" of the smallest particles (plant pollen) on the surface of the water. The combination of these particles (having a certain mass) in a state of continuous chaotic motion and having momentum and kinetic energy is PS. However, this PS itself is located inside (on the surface) of another chaotic PS (medium), whose elements (water molecules) are also in a state of continuous chaotic motion (in fact, it is the latter that drive the elements - the plant pollens of the first PS i.e. creates its "internal connection").

We believe that another fundamentally important attribute of PS is its "dimension". Any PS should have a "dimension", that is, have certain boundaries and occupy a certain piece of space, in other words it should have a "locality".

It should be noted that the size of the PS as an attribute of its form is not constant or unchanged. They may be stable or unstable i.e. a PS can change its size and form over time, but at the same time maintain an internal connection. It is the latter that determines the essence of the PS. To differ from another PS (e.g. its "super-system") it is not mandatory to consist of other elements. It can consist of the same elements as the "super-system", but have a different character (mechanism) of internal communication.

Depending on the presence of communication (information or impulse exchange) with its environment or "super-system", PSs can be "open" or "closed". The total number of elements and the sum of the internal impulses are constant in time in "closed" PSs. This would mean the complete absence of any external influences on the PS or their complete mutual equilibrium. It should be recognized that in Nature, there cannot be "absolutely closed" PSs because all of them exist in one single "super-system" - the Universe and at the same time, they are its constituent parts.

After thinking about physical reality and physical systems, let us move on to the concept of "space". It is known that the concept of "space", as well as "time", "energy" and "mass" belongs to the fundamental categories of physics, without which it is impossible to build any physical theory. Of course, that among all the

fundamental categories of physics, space is the dominant place, for everything that exists as a PR is in space.

It is well known that until the end of the 19th century, for more than two millennia in science, the prevailing consensus was that there was a continuous “environment” called “ether” that fills all space and permeates all objects, but at the same time remains completely intangible for humans. However, by the beginning of the 20th century, the situation in physics had radically changed. After the well-known experiments of Michelson and Morley, in view of the “unprovability” and, subsequently, the “uselessness” of describing the principles and provisions of Einstein’s special theory of relativity (STR), the concept of “ether” as PR was completely discarded from science. It was recognized, that electromagnetic waves propagate in an absolute vacuum.

Meanwhile, this situation 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 reappeared. Such concepts as “physical field”, “physical vacuum”, scalar field (Higgs field) and others were proposed.

It must be admitted, that the past 20th century in the history of the development of science has not brought anything significant in solving this problem. Despite the obviousness of the fact that there is a missing link in the structure of the Universe of a certain substance ("universal medium") that fills the whole space, the repeated efforts of the advocates of the "ether theory" have proved futile. Official science declared all such theories and hypotheses a priori “pseudoscience” and simply did not consider it [7, 8]. Obviously, the reason for this situation is not only a "reluctance" pillars of modern physics to take the concept of "ether" (a kind of environment , space-filling), but not least the absence of such an "ether" theory, which would not only be completely fit into the known laws and principles of modern physics, but would also give them a logical explanation [9].

The author of this article sets out his vision for the notion of "space", seeing it primarily as PR, with specific properties, in particular, mandatory for any form of s PR: to respond to the impact and have an impact on other PS. It is the concept of the structure of space that formed the basis of our proposed concept of the structure of the entire Universe [10].

First of all, about the very concept of “space”. Logically, in its pure form, without the presence of “something” in it, it is meaningless, since in this case it is equivalent to the concept of “distance” or “dimension”. But the concept of “distance” in itself is not material and does not constitute a PR, it is an abstract concept [4, 6].

In our firm conviction, the concept of “space” has a much broader meaning than just “distance” or “measurement” (dimension). Undoubtedly, it being a PR should represent a certain physical substance that fills the entire Universe. Moreover, it would be correct to say that this substance does not “fill” the space, but itself constitutes it.

How to call this substance is a rhetorical question. Undoubtedly, it would be fair to historically call it “ether,” as it has been called for over two thousand years. However, since this term would cause a sharp non-perception (and irritation) of most physicists and scientists and does not quite adequately reflect the essence of the physical substance that we are offering, the author decided to call it the well-known term - space-time continuum (STC).

And so, what is STC? According to the concept proposed by the author, STC, being a PR, is a kind of physical substance that fills, or rather, makes up our entire three-dimensional (time - fourth dimension) space. It not only fills the space between material objects (material bodies, molecules, atoms, elementary particles), but also permeates them themselves, because they themselves consist of the same elements as space itself! In this regard, it is very similar to the historical "ether". However, the similarity between them ends here.

The author believes that, as a PR and a PS, space (STC) consists of the smallest elements-constituent particles, which have practically no size, mass and energy in the usual, generally accepted sense. According to the author, having vanishingly small sizes (maybe equal to the Planck length), these “particles” have a spherical shape, indivisible, have absolute hardness and elasticity. Most importantly, they exist only in a state of motion, having a certain direction and speed, and the STC itself is chaos or a chaotic PS.

The question arises: what are these STC elements called? The question is difficult to answer with agreement in terms of conversation (dispute) with physicists. In his first publications [10, 11], we called them "graviton-pulses", as they are essentially the momentum vectors (it should be noted that they have nothing to do with the "gravitons" - carriers of gravity of the interaction according to the conventional standard models of interaction according to the known continuous chaotic motion and constant collision, they have the same (averaged) speed and as a result of collisions only the direction of their motion changes . It would be logical to consider them as the motion itself (particles of motion).

It can be noted that in the proposed by the author version of the PVK particularly resembles the “ideal gas” well known in science, considered as a mathematical model of gas with known parameters and properties. 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. The particle collision with each

other is absolutely elastic, and the exposure time is negligible compared to the average time between collisions.

However, in addition to the similarities listed above, there is one fundamental difference between the “ideal gas” and the STC model proposed by the author: the “ideal gas” known in physics consists of elements (constituent particles) having a certain mass, and therefore kinetic energy, which cannot be said about “graviton-impulses”.

Considering the STC as a PR, the author suggests calling it (perceiving) as "absolute physical reality", and as a PS - "absolute super-system"! For all other PSs are (exist) within (within) this super-system and the author suggests calling them “distinctive physical reality” (DPR). Moreover, according to the author’s concept, all fundamental elementary particles, representing themselves as PS or DPR, themselves consist of elements of "absolute physical reality" - STC.

Thus, according to the concept proposed by us, the basis of the Universe is space (STC) - which is a chaotic “super-system”. It is the “absolute physical reality” and all other PSs such as DPR are created from it and are secondary to it.

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