COSMOS' STRUCTURE AND ELECTRIC CHARGE' NATURE

Bondarev V.G., Migal L.V.

Summary
This paper presents the new approach to the description of the nature and essence of electric charge, formulated within the framework of a unified concept of the formation of the structure of the cosmos. A computer model of the cosmos based on elements in the form of primary space quanta and energy quanta is proposed. We conducted a detailed study and visualization of the process of formation of the structure of the primary space.
The essence of electric charge is defined as transformation of smooth continuous two-dimensional primary space by its deformation leading to formation of a set of spacestrons of different levels. The reason of origin and equality of negative and positive charges is explained in the given work. The process of spacestrons formation is investigated in details. It is shown that the electric field arises at distortion of 4-dimensional space-time, similarly to gravitational field, but under the influence of open quanta of space and antispace. In our paper a new interpretation of the possible appearance of the Universe from the point of view of submicroscopic approach to nature is proposed. Hypotheses about the role of primary space, the origin and form of the Big Bang, the asymmetry of baryonic matter, as well as such concepts as dark energy, dark matter and their possible correlation in the cosmos are considered.
Key words: modelling, cosmos, universe, electric charge, primary space, space quantum, energy quantum, spacestron, loveton, dark energy, dark matter.

INTRODUCTION

Electric charge is one of the fundamental concepts, serving as a cornerstone for understanding the processes occurring in the surrounding world. The understanding of the nature and basic laws of electricity, the processes of interaction of elementary particles and, practically, the whole picture of the world depends on its representation.

Electric charge is commonly understood as a characteristic of an elementary particle that determines its electromagnetic interactions [1]. At present, it is one of the basic physical constants possessing such properties as additivity, conservation and quantisation [2]. Charges are additive in nature. This means that they behave as scalars. The principle of conservation of electric charge is a fundamental property of nature. It states that in a closed system, the total charge does not change with time. However, equal amounts of positive and negative charges can be created or annihilated simultaneously without disturbing the overall balance of electrical charge. The quantisation of charge points to the fact that charge is an integer quantity, i.e. it is possible to express it as integer multiples of the elementary electric charge. Note also that in physics, the concept of charge is not defined as a substance and is not considered as a natural phenomenon [3]. However, modern science does not explain the nature of charge, considering this property as an "innate" property of material objects [4].

It is well known that an electrostatic field appears around any stationary unbound charge, which does not change its properties with time. This field will act on any other electric charge, which will also act on the first charge. According to the experimental data of M. Faraday, it is assumed that the charges are surrounded by an electric field by means of which the interaction is carried out [5]. That is, Faraday's works and Maxwell's theoretical reasoning indicate that charges interact with each other only by means of their fields. However, the nature of the force lines of the electric field remains undiscovered. In addition, the force lines of opposite charges at contact should annihilate, which in reality does not happen under stationary conditions, in the bound state and at equality of charges, and the electric field is not manifested in the system [6].

Several centuries have already passed since the discovery of electromagnetic interaction, during which enormous progress has been made in the details and applications of electronic theories [7]. At the same time, the nature and essence of the electric charge remained a problem that has not yet been completely solved [8-11].

To solve this problem, numerous attempts have been made to clarify the nature and physical essence of the electric charge. There are different hypotheses about the origin of electric charge. Thus, G. Shpenkov and L. Kreidik [12] proposed a hypothesis based on a new definition of elementary particles and their exchange in matter - the space-time field. Their hypothesis is that electric charge is determined by the rate of change of mass. The concept of spin was also considered as a possible explanation for the nature of electric charge. Thus, S. Tiwari [13] suggested the origin of electric charge in terms of fractional spin, D. Cacco [14] proposed a hypothesis based on the relationship between electric charge and spin. A mechanism has also been proposed to explain the nature of electric charge, based on some specific assumptions related to additional dimensions of space-time [15]. It is argued that the existence and compactification of additional dimensions are the source of the creation of electromagnetic interaction in ordinary four-dimensional space-time. H. Nguyen [16] discussed the change in electron charge in an external magnetic field. He noted that "the variability (or constancy) of the mass and electric charge of the electron is still a fundamental problem in modern physics awaiting solution."

A somewhat different approach to determine the nature of electric charge was proposed by S. Barak [17], who considers the charge as a deformation of space. Barak [17], who considers the charge as a deformation of space. The positive charge in his case represents a narrowed zone of space, and the negative charge - an expanded zone. In this case, the electric charge field is a smooth continuation from one of the zones to infinity of the decreasing contraction or expansion of space. This consideration allows us to derive Maxwell's theory of electrostatics theoretically, without any phenomenology. The proposed geometry of deformed zones of space allows us to attribute positive curvature to the compressed zone of space, i.e. to the positive charge, and negative curvature to the negative charge.

A. Zakazchikov [18] believed that electric charge as an object of a special form of matter or some entity does not exist, but there are unknown processes that cause in the surrounding space what we call an electric field. According to V. Dmitriev's hypothesis, the concept of charge should, first of all, be sought in the non-zero property of rotating around its own axis inherent in any particles with a rest mass [19]. In other words, the direction of rotation determines the properties of the particle, which are called electrical: attraction and repulsion. A number of other researchers also share a similar opinion [20, 21]. The sign of the charge as the direction of rotation of the particle in space physically explains the processes of attraction and repulsion of unlike and like charges [22].

According to Yu. Yampolsky [23], "the presence of charges is determined by the fact that there is a duality caused by the development process, in which case opposite charges arise. It follows that the sign of the charge that was given to the particles is a characteristic of the relative position of the rotating particles in space. That is, the charge and the sign of the charge are a characteristic of the rotation of elementary particles in a spatial environment." However, calculations have shown that the rotation of the mass is not the source of what is commonly referred to as electric charge.

It should be noted that none of these works reveals the essence and understanding of the nature of electric charge, based on proven facts. It can be argued while analyzing the concept of electric charge that at present, there is no specific understanding of its nature and in some cases, an explanation is used by the phenomena of the electromagnetic field or it is attributed to the primary property of matter. It is evident that the essence of any material object is characterized and identified by its properties. Thus, ambiguous definitions of the essence of electric charge, in our opinion, are caused by the conditions of the study, which should consider the object under study based on its associated or individual states in the system. This study proposes a new approach to this problem and to explaining the nature of electric charge. This approach has great generality and physical simplicity. Therefore, the goal of this study is to consider a new physical concept for constructing the structure of the cosmos, which allows us to give a possible explanation of the nature and essence of the electric charge. In this article, we will consider a new representation of electric charge, which will significantly clarify the picture of electromagnetic interaction.

1. RESEARCH OBJECTIVE

When putting the research objective, it is necessary to take into account the known conditions for the existence of an electric charge, such as additivity, conservation and quantization, as well as its independence from the speed of the object [6]. The above, as well as other conditions for the existence of an electric charge can be resolved without contradictions with the law of conservation of energy under the assumption that, unlike mass, the electric charge is not an energy characteristic. To do this, you will first need to understand the mechanism for dividing primary space into spacetrons. We have already tried to consider the connection between space and matter through their unification through the hypothesis of the existence of spacetrons of different levels [24]. However, when considering the structure of spacetrons, one important stage was missed concerning the process of formation of such objects. When considering this process, it is also possible to resolve the main problem associated with the nature of the electric charge. To do this, we propose to associate an electric charge with a specific object. In our case, we will choose the primary space as such an object.

We will solve the problem within two stages. At the first stage, we will understand the general structure of the cosmos and only then consider the reasons for the occurrence of an electric charge. We propose a mechanism to explain the nature of charge creation based on some specific assumptions related to the structure of primordial space. We assert that the source of the creation of electromagnetic interaction in ordinary 4-dimensional space-time is the primary space.

2. MODELING

2.1 ELEMENTS OF THE COSMOS

The cosmos cannot be understood in the same way as we understand macroobjects, however, in the proposed model, let us consider its visualisation in a general form. For this purpose, let us first understand how the structure of the cosmos can look like in the presented model under this approach. From our point of view the cosmos is an energy medium consisting of energy quanta, in which a two-dimensional primary space is located. Here under primary space, in its turn, we will understand a real physical immaterial object with the property of extension in two dimensions, consisting of quanta of space and antispace. In other words, the cosmos will be based on three basic elements - quanta of space and antispace, constituting the primary space, as well as quanta of energy. The proposed elements are grouped into several separate components, and energy quanta are represented in the form of independent layers, each of which borders with the primary space, on one side with the space layer, and on the other side with the layer of antispace quanta (Fig.1).

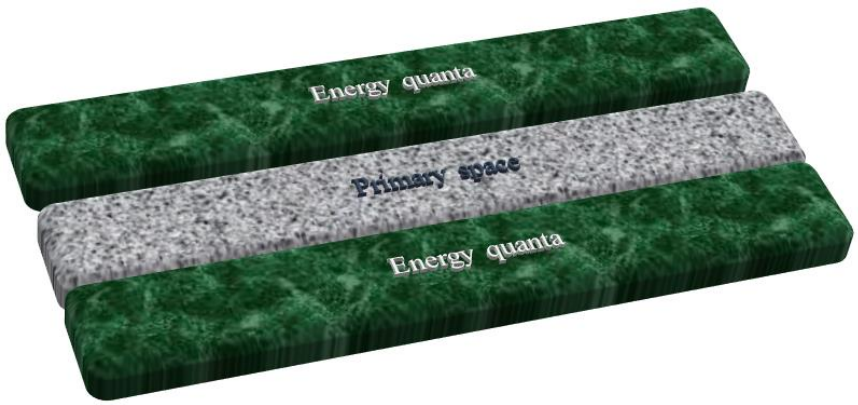

Fig. 1 – Layout of the structure of the cosmos

Let's show that in the presented model energy quanta can be responsible for gravitational interaction, and primary space quanta - for electromagnetic interaction. Moreover, the quanta of

energy, connected with quanta of primary space, represent already objects, which are called by the concept "matter". We also note that in the initial state of the cosmos, there were no open electric charges and, accordingly, there was no electromagnetic field. The general electrical neutrality of the primary space allows us to suppose that it is a set of electric dipoles consisting of quanta of space and antispace.

2.2 FORMATION OF THE COSMOS STRUCTURE

Let us try to construct a qualitative model of elementary charge by means of detailed investigation of the structure of the cosmos. Below, based on the proposed elements of the cosmos and their properties, let us consider the model of electric charge, which allows us to understand the physical essence of this phenomenon. Let us put forward a hypothesis about possible identification of quanta of space and antispace with the cause of electric charge.

Initially we will take into account that quanta of space can partially penetrate into the layer consisting of quanta of antispace, and it is possible to consider penetration of quanta of antispace into the layer containing quanta of space. To simplify the analysis of such a mixed layer, we will consider the primary space divided not into two but into four layers (Fig. 2). In this case, the upper and lower layers will allow to form the upper-level spacetrons, and the inner layers will be responsible for the formation of the first-level spacetrons.

Fig. 2 – Layout of the primary space structure

If we consider primary space as a kind of liquid [25], then between the space quanta there will be surface tension forces directed horizontally to the surface of the layer of space quanta, which leads to the contraction of space quanta into a common group, thus separating them from antispace quanta. The shifting quanta of space break ties with the quanta of anti-space. Because of this process, open quanta of both space and antispace arise. This process leads to the curvature of space-time itself, interpreted as the appearance of an electric field. Consequently, in this region, open space quanta and antispace quanta of equal quantitative magnitude appear, that is, not compensated for charge. Similar processes will occur during de-formation of the lower layer, consisting of antispace quanta.

The effect of concentration in a certain region of quanta of space together with quanta of the lower layer of antispace, created by deformation of a smooth surface of primary space under the influence of surface tension forces, leads to the appearance of upper-level spacetrons. Let us note, that the region freed from quanta of space remains filled by the open quanta of antispace. In turn, the open space quanta of the inner layer are also grouped in a similar way, jointly forming the first level spacetrons (Fig. 3).

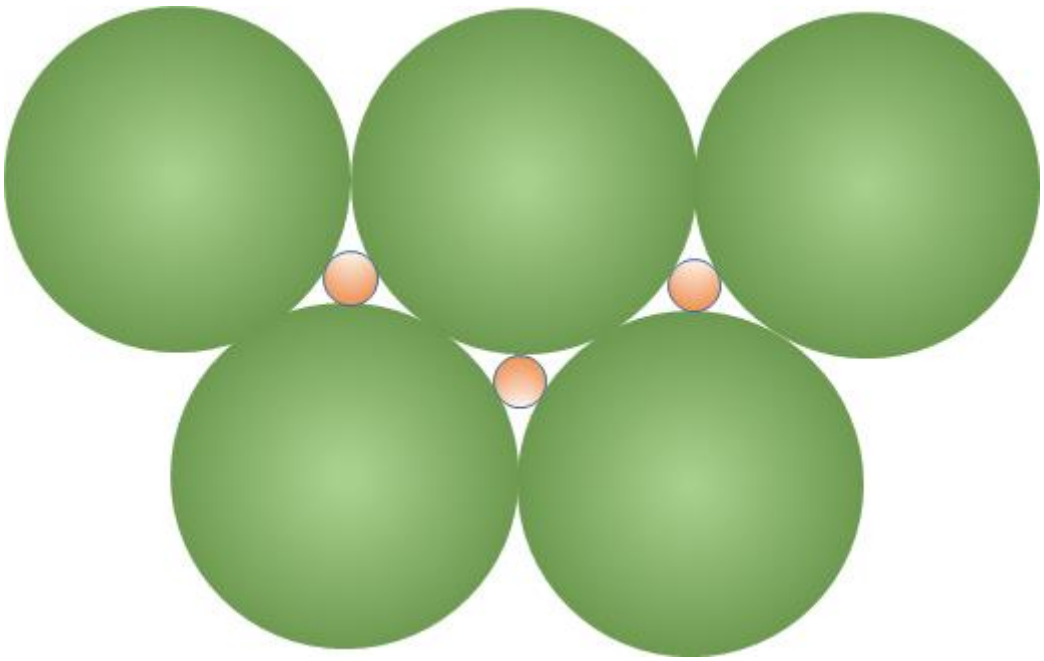

Fig. 3 Spacetrons of the upper and first levels

Each spacetron of the upper level consists of two particles: a loveton and an antiloveton [24], and the spacetrons of the first level form electron-positron pairs.

3. RESULTS AND DISCUSSION

3.1 NATURE OF ELECTRIC CHARGE

Summing up the results of the modelling of electric charge, the following results of the study can be described. Firstly, electric charge can be defined as an immaterial object representing a set of open quanta of space or antispace. This object has all the properties described above: the ability to be a source of electromagnetic fields, additivity, co-preservation and quantisation. When the velocity of a body possessing a charge changes, the number of open quanta of space does not change. The totality of open quanta of space or antispace contained in a loveton or an electron can be taken as the value of elementary charge.

In the presented model of the cosmos, the consideration of laws of gravitational and electromagnetic interaction can be interpreted because of curvature of space-time under the action of space and energy quanta. In this case, in one case there is a set of energy quanta connected with quanta of primary space, responsible for the formation of mass of material objects, and in another case - for the interaction of open space and antispace quanta, determining the nature of electromagnetic interaction.

3.2 ORIGIN OF THE UNIVERSE

The current state of scientific understanding of the origin and development of the Universe is currently based on the physical concept of the Big Bang with the subsequent inflationary expansion of the Universe formed because of this explosion [26]. Based on this concept, the Lambda CDM model was also developed, which is a cosmological model describing the evolution of the Universe. At the same time, most researchers interpret the moment of the Universe origin as a global fluctuation of the physical vacuum at a single point [27]. It is more pragmatic to consider that before the Big Bang the Universe was an infinite area of super-hot dense material, which remained in a stable state until for some reason the Big Bang occurred [28]. Such an approach can be realised also within the framework of our model. There are at least three different scenarios.

Firstly, it is the superposition of two separate primary spaces, secondly, the emergence of a fold beyond the two-dimensional space, and thirdly, the interaction of the boundaries of the primary space within the four-dimensional space. In addition, all three possible variants can lead to practically the same result.

Provided that the primary space has no boundaries, let us choose the second of the presented scenarios as a basis. The primary two-dimensional space, in the process of elimination of the fold (Fig. 4), striving to restore the state of two-dimensionality leads to the destruction of a part of the superimposed space and antispace, and to the symmetric ejection of matter and antimatter in the directions corresponding to the sides of space and antispace. Consideration of the moment of appearance of the Universe, based on the proposed hypothesis, indicates linearity, or even planarity of the area of the Big Bang origin.

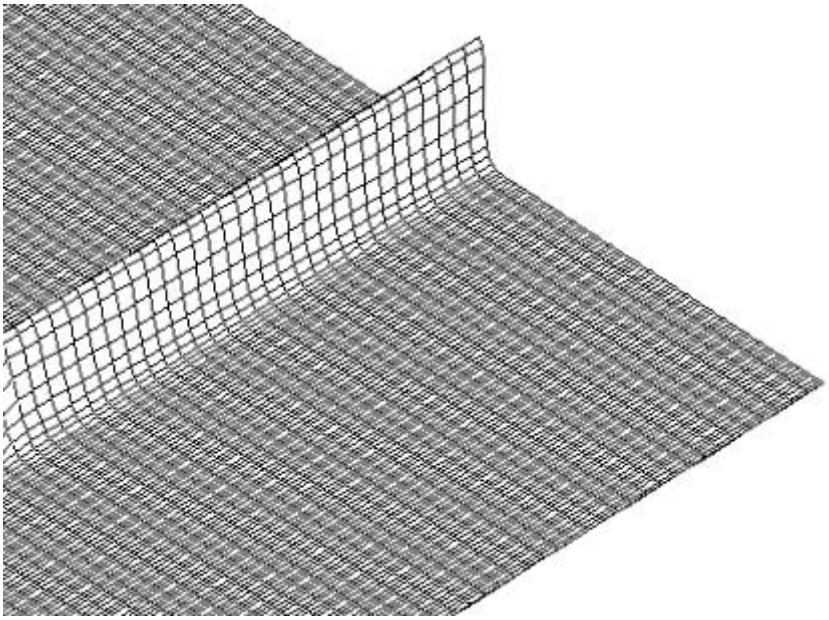

Fig. 4 - Representation of a spatial fold extending beyond two-dimensional space

Let us consider the problem of the appearance of complete dominance of matter over antimatter. To solve this problem we postulate that initially, matter and antimatter were in equal proportions. According to the presented concept, the appearance of the Universe is connected with the emergence of the primary space fold. The process of straightening of the fold of the primary space led to an increase of tension in the region near the fold with the subsequent transformation of a part of the upper and first level spacestrons to the breaking of bonds and ejection of free lovetons and electrons into space, and anti-lovetons and positrons into antispace. In other words, there was a splitting of the primary space in the plane separating lovetons and antilovetons with the subsequent symmetric ejection of matter and antimatter. We conclude that electrons and lovetons appeared because of elimination of the fold that appeared in the primary space of the cosmos, which led to the appearance of the Universe.

Finally, Neil Turok and Latham Boyle believe that the Big Bang generated not only our Universe, but also the Anti-universe consisting of antimatter [29], which is consistent with the above hypothesis. Their proposed model of the Universe can explain all observed phenomena based only on known particles and fields. One can accept their view that the apparent asymmetry is probably due to the simultaneous appearance of the Anti-universe together with our Universe. Although now there is no observational confirmation of this hypothesis, it has a full right to exist and is quite close to the model of the appearance of the Universe considered by us.

3.3 DARK ENERGY AND MATTER

Dark energy is a substance that is uniformly distributed in the entire cosmos [30]. The main contender for the role of dark energy is the physical vacuum. This approach is proposed within the framework of Einstein's theory of gravitation, more precisely from the fact that space can have its own energy, which is taken into account by applying the so-called cosmological constant [31]. The vacuum energy density does not change at expansion of the Universe, and this means the negative vacuum pressure. Besides physical vacuum, there is also another view on dark energy, in which it is stated that in the Universe prevails a certain dynamic field represented as an "energy fluid", for which the term quintessence is applied [32]. In principle, the energy quanta proposed in this paper can also be identified with elements of the physical vacuum; therefore, we will consider these objects as dark energy.

Quanta of energy also can be in the bound state, forming together with quanta of primary space what is called matter, realised in the form of energy of connection between spacetrons and their components [33]. Hence, under matter we will understand a set of energy quanta rigidly connected with quanta of space or antispace. The mass of matter particles is numerically estimated according to their size in 4-dimensional space [24]. The presence of energy quanta in the composition of visible matter determines its dependence on the velocity of body movement in space. Let us consider that at increase of speed of a body in space additional quanta of energy are added to quanta of space.

In the early 1980s, it was suggested that in addition to visible matter in the Universe, there should exist hidden dark matter, which accounts for about 28% of the Universe's matter [34]. At the same time, at the moment there are no specific objects that can be associated with dark matter. There are hypotheses and assumptions, but no reliable and experimentally obtained data revealing the true nature of these objects have been found so far.

The quanta of space and antispace, and also the spacetrons formed on their basis, responsible for formation of lovetons, antilovetons and electron-positron pairs, are massless by themselves. At the same time, connections of lovetons and antilovetons among themselves and with electron-positron pairs, which also have certain connections among themselves, are carried out with the help of energy quanta connected with quanta of space, that allows them to fulfil the role of dark matter.

So if we take into account that the binding energies between bound lovetons and electron-positron pairs determine dark matter, as well as the absence of limitations in the size of primary space, we can assume that the number of energy quanta in the energy layers and energy quanta responsible for dark matter in the space layer relate to each other approximately as two to one (Fig. 1). In other words, in percentage terms we can consider that energy quanta (dark energy) can be defined as 67%, and, consequently, matter - 33%. Real, visible matter, according to known facts, approximates approximately about 5%, and then finally we have ratios of these entities in percentage relation as 67%, 28% and 5%, that is close enough to known data. According to the results obtained with the help of the Planck space telescope [34] the share of dark matter in the Universe is 26.8%, the rest falls on "ordinary" matter (4.9%) and dark energy (68.3%).

4. CONCLUSION

The article presents a new approach to the description of the nature and essence of electric charge, formulated within the framework of a unified concept of the formation of the structure of the cosmos. The model of the cosmos based on elements in the form of primary space quanta and energy quanta is proposed. A detailed study of the process of formation of the primary space structure is carried out.

The essence of electric charge is defined because of transformation of smooth continuous two-dimensional primary space by its deformation leading to formation of a set of spacetrons of different levels. The reason of origin and equality of negative and positive charges is explained. The process of formation of spacetrons is investigated in detail. It is shown that the electric field arises at distortion of 4-dimensional space-time, similarly to the gravitational field, but under the

influence of open quanta of space and antispace. Besides, the hypothesis in which the appearance of the Universe can be considered not through its emergence from singularity of physical vacuum by fluctuations, but from planar region at smoothing of the fold of primary space is proposed.

The curvature of spacetime is not only a fundamental concept, but also represents a new view of physical reality when explaining the electromagnetic interaction as a result of curvature at transformation of 4-dimensional spacetime under the influence of a set of open quanta of both space and antispace. Hence, the electric charge should be considered as the basic internal property of the primary space, unlike mass, the reason of which origin is simultaneously quanta of both energy and primary space.

The paper also considers hypotheses about the role of primary space, the origin and form of the Big Bang, and the asymmetry of baryonic matter. The paper offers a new interpretation of such concepts as dark energy, dark and visible matter and their possible correlation in the cosmos.

Conflict of interest

The authors did not declare any conflict of interest.

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