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THE INITIAL PERIOD IN THE UNIVERSE CREATION

Kondratenko Petro O.

Doctor of Science, professor, National Aviation University, Kyiv, Ukraine.

Abstract

The article analyzes the initial period of the Universe creation, proceeding from the Standard Model, as well as from the Model of creating the Universe with the minimum initial entropy. It is shown that the Standard Model and its development in the form of the theory of the Universe's inflation are based on ideas that contradict the laws of physics and do not explain the reasons for the rotation of matter at every hierarchical level of the Universe. As for the Model of the Universe's creation with the initial minimum entropy, this Model takes into account all the laws of physics, introducing a layered space consisting of four layers with different dimensions: zero-dimensional space, one-dimensional space, two-dimensional space, and three-dimensional space. All these spaces are combined into a single Super-Universe, where there is an information connection through a delocalized point between the individual spaces. In addition, all these spaces are united by common time. All these spaces are branes of spaces of higher dimension, the radius of which increases with time with the speed of light. Through the zero-dimensional space, which has 12 minimized spatial coordinates (fundamental space), the Scalar Field enters, carrying with itself a program (fundamental code) of the evolution of the Universe. This Field alternately fills all subsequent spaces of the Super-Universe, generating the corresponding particles in each of them: magnetic monopoles in one-dimensional space, quarks in two-dimensional space and particles in three-dimensional space. The Scalar Field is responsible for the rotation of matter at every hierarchical level of the Universe, for the annihilation processes, for the presence of mass of all created particles, and also for the visible radiation of stars.

Keywords: Models of the Universe creation; layered space; Scalar Field; mass of particles; rotation of matter; radiation of stars.

The discovery of galaxy recession made by E. Hubble in 1929, as well as the theoretical studies of A. Friedman, which showed that the Universe filled with gravity of matter cannot be stationary, led to the understanding that in the distant past our Universe was very small, that is, there was a moment of birth of the universe. In this regard, studies of the expansion of the Universe and determination of age by the duration of this expansion come to the fore. Many theories of the birth of the universe arose. The modern theories of the emergence and evolution of the Universe are based on the works of G. Gamov, in which the physical processes that occur at various stages of the expansion of the Universe are studied.

Based on the model of G. Gamow, scientists believe that at first the Universe was in conditions characterized by the presence of high temperature and pressure in the singularity, that is, at the point at which all matter was concentrated. This model is called Standard. It is believed that this model is confirmed by the presence of relict radiation [1-5].

The expansion of matter from a singularity is called the Big Bang.

Of course, there are alternative theories of the birth and evolution of the universe. In this article we will consider for comparison only the model of the birth of the Universe with a minimum initial entropy [6,7].

Standard Model of the Birth of the Universe

So, the Standard Model for the Creation of the Universe declares that the beginning of the creation of the Universe was a singularity in which the energy equivalent to the modern mass of the Universe was placed. Moreover, the temperature of the Universe at this point was very large. If the diameter of the singularity point is zero, then the temperature will be equal to infinity. If, nevertheless, it is recognized that the initial diameter must be finite (use the Planck length in this case), then the initial temperature will have a finite value (~ 10^{28} K [8]). The initial entropy of such a universe will also be extremely large.

The Planck length is a fundamental quantity at which the gravitational radius of the Planck particle is equal to the Compton length. For elementary particles, the Compton length is significantly greater than the Planck length, and the value of the gravitational radius is much less than the Planck length. If we calculate the Compton length for the Universe, which is singularly similar to a small particle with a complex internal structure, then we get the value $\lambda_c \sim 5 \bullet 10\text{-}93$ m, which is 58 orders less than the Planck length. At the same time, the magnitude of the gravitational radius of the Universe is rg $\sim 7 \cdot 10^9$ Light years. Consequently, the Universe at birth appears inside a black hole [6,7]. Supporters of the Standard Model do not take this fact into account. Despite this fact, theoretical studies were conducted [9], which showed that at the birth of the Universe as a result of fluctuations in the distribution of matter small black holes should have been created. So, according to the accepted model, a large black hole is not created, but small ones can be created! Paradox. And there could be so many (millions) of such small black holes in every galaxy. To detect such small black holes, special astronomical studies were conducted [10], which showed that such holes are absent in the Universe. This fact is a serious blow to the theory of the hot start of the universe.

On the other hand, the unlimited or very large initial entropy of the Universe ($S_0 = 10^{88}$ [11]) will stand in the way of creating galaxies, stars and planetary systems.

Regarding the fundamental nature of the Planck length, there is a point of view [12-15], according to which additional spatial measurements should appear at small distances, as a result of which the Planck length will not have a clear fundamental physical meaning.

Despite such comments, it is believed that after such a start, the size of the Universe is rapidly increasing, that is, the Big Bang is taking place.

Since the space in which it occurs is also being born at the same time as the Big Bang, it is important to answer the question: why do we see this space flat and why is matter and energy in this space evenly distributed? To answer these questions, an inflationary model of the universe was created. According to this model, the Universe was originally created in an unstable state (false vacuum), which in search of the true vacuum state caused its rapid expansion. As a result, the Universe turned out to be much larger than its part filled with matter.

The beginning of the theory of inflation was laid by Alan H. Guth in 1980 [16]. However, it followed from his model that the distribution of matter in the Universe can be heterogeneous. Immediately after this, Andrei Linde, as well as Andreas Albrecht and Paul Steinhardt supplemented the theory of A. Gut, so that it ensured uniformity in the distribution of matter in the Universe [17]. The model developed by A. Gut claims that the size of the Universe due to the scalar field doubled every 10^{-35} s and so lasted at least 10^{-32} s (sometimes called 10^{-34} s). So, doubling the size of the universe was at least 103 times! If the expansion rate of the Universe in the first 10^{-35} s was equal to the speed of light, then at the moment $t = 10^{-32}$ s it reached $2^{1000} = 10^{301}$ speeds of light. In the second case, the expansion rate of the Universe reached $2^{10} = 1024$ light speeds. Even if at the birth of the Universe there was some curvature in it, then with such a powerful expansion, the curvature will disappear.

The size of the universe will be much larger than the diameter of the Metagalaxy. With an increase in the volume of space, the magnitude of the scalar field should decrease, as a result of which the ultrafast expansion of space will cease. So, nothing will interfere with the expansion of the Metagalaxy after the Big Bang.

In this case, the distance between the galaxies will increase due to the expansion of galaxies as a result of the explosion, and due to the expansion of space. In this case, the effect due to the expansion of galaxies should decrease with time due to the gravitational interaction between galaxies, and the effect due to the expansion of space should increase exponentially within the limits of inflation.

As a physical reason for such a rapid expansion of space, the concept of an inflate field and its carrier particle, inflate, are introduced. So, this particle must move faster than the speed of light, that is, be a tachyon. However, it has been proved that the space of tachyons cannot be combined with the space of tardions, that is, particles that move slower than the speed of light. Otherwise, the causality principle will be violated [18].

In addition, it is believed that the inflation field should be scalar. Therefore, it is worth stopping at this moment. On the one hand, it is assumed that this field is identical to the Higgs field. On the other hand, it is indicated that the scalar field should be the same throughout the Universe, since it ensures the presence of mass for elementary particles. Astronomical observations confirm that the masses of atoms and their components are really the same in the universe. If a scalar field has caused inflation of space, then it should fill the entire space. Therefore, the question arises: why do we need a field where there is no substance?

In addition, the presence of a carrier particle of the field indicates that this field is responsible for the interaction. In this case, let us consider a scalar field, as it was introduced in the works of T.F.E. Kaluza. Moreover, as for four-dimensional space-time, it was believed that one coordinate is temporary, and four are spatial [19,20].

For the five-dimensional interval, we write:

$$dI^2 = G_{AB} dx^A dx^B,$$

where the indices A and B are 0, 1, 2, 3, 5 (the four are purposely omitted). We write the components of the tensor G in the form of a matrix

$$G = \left(\begin{array}{cccc:c} G_{00} & G_{01} & G_{02} & G_{03} & G_{05} \\ G_{10} & G_{11} & G_{12} & G_{13} & G_{15} \\ G_{20} & G_{21} & G_{22} & G_{23} & G_{25} \\ G_{30} & G_{31} & G_{32} & G_{33} & G_{35} \\ \hdashline G_{50} & G_{51} & G_{52} & G_{53} & G_{55} \end{array} \right)$$

The tensor G is symmetric, so there are only 15 different components in it. Moreover, 10 components correspond to the Einstein general theory of relativity tensor, four components correspond to the components of the electromagnetic vector potential A_α ($G_{5\alpha} = \frac{2\sqrt{\gamma}}{c^2} A_\alpha$, where γ is the gravitational constant in Newton’s formula, $\alpha = 0, 1, 2, 3$), and the additional component G_{55} is unknown. It follows from the structure of the matrix G that the component G_{55} corresponds to an unknown scalar field.

We draw attention to the fact that the electrostatic field is characterized by a scalar potential. But this field causes a force interaction, which is determined by the gradient of this field. Consequently, the field turns out to be vector, which is a component of the electromagnetic interaction vector, which is reflected in the Kaluza matrix. At the same time, the scalar field is characterized by a single component G55. This field is not a force! It has completely different properties [21]. And he does not need to have a particle carrier field. For an unknown reason, physicists do not pay attention to this fact.

The scalar field was introduced phenomenologically without justification and description of its properties. In theory, its value can take on different meanings in different areas of the universe. An increase in the magnitude of the scalar field in individual parts of the Universe should lead to the creation of the Multiverse, that is, universes with narrow corridors between them. You need to have great imagination to think of such a structure of the Universe. There are no physical mechanisms that would cause the formation of such a structure and support it.

All three types of fields are involved in our universe. It is only necessary to understand where the scalar field appears.

Thus, it can be argued that the expansion of space with superluminal speed in our Universe is impossible. The scalar field, which is responsible for the ultrafast expansion of space, does not have this property.

Another surprise is the hypothesis of the expansion of space, leaving it flat. Such a hypothesis can only be understood as a convenient moment for conducting theoretical research.

For unknown reasons, in the presence of a very large entropy of the Universe, it is structured into galaxies, star clusters, planetary systems. All these processes occur with a decrease in entropy. The standard model does not answer the question: where does the excess entropy go? It is only believed that the grouping of matter into galaxies, stars and planets occurs due to quantum fluctuations, the scales of which are infinitely smaller than the sizes of galaxies.

So, according to the theory of inflation, space can exist without matter and time. Of course, such a result contradicts the Einstein's triunity law[1], according to which space, time and energy (matter) must coexist inseparably.

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[1] The triunitylaw, discovered by A. Einstein, is formulated as a formula $R_{ik} - \frac{1}{2} g_{ik} (R - 2\Lambda) = \frac{8\pi G}{c^4} T_{ik}$.

In such a space, light quanta that separated from matter after the Big Bang have the ability to propagate beyond the Metagalaxy. The expansion of space, as well as the adiabatic expansion of the region of existence of this light should lead to its cooling and manifest itself as relic radiation. Experimental confirmation of the existence of microwave radiation, which is characterized by a temperature of -270.425 ° C = 2.725 K, is considered confirmation of the Standard Model for the Birth and Evolution of the Universe.

Paying attention to the development of the theory of T.F.E. Kaluza, we can conclude that all coordinates must be folded onto themselves, which to some extent contradicts the theory of inflation.

In the Standard Model, a substance is not born immediately after the Big Bang, but only after some time, in the era of nucleosynthesis. In the theory of inflation, the birth of matter also occurs at the end of the inflationary stage of the expansion of space over a period of 10^{-10} s, until the temperature drops to 1016 GeV. This period is called the period of the Great Unification. In this case, all known elementary particles are created, but without mass (?). This point is also surprising, because according to the inflation model, the scalar field causes both inflation and the presence of mass in the particles.

A further decrease in temperature to 10^{15} GeV leads to the replacement of the era of the Great Unification with the era of electroweak unification. At the moment when the temperature drops to 100 GeV, the era of electroweak unification ends, and quarks, leptons, and intermediate bosons are created. The hadron era begins when quarks merge into hadrons. Confinement of quarks arises. Moreover, the time from the birth of the Universe is 10^{-6} s.

Here again misunderstanding arises. The fact is that both the Kaluza theory and the Dirac theory prove that the charge of elementary particles is quantized, and the minimum charge is the charge of a proton and an electron. At the same time, the charge of quarks is 3 times less!

In the singularity there was only energy, which, according to the authors, could create only a particle-antiparticle pair. And from here an unresolved problem arises: why are only particles observed in the Universe?

As follows from the above information, there was a period after the Big Bang, when there were no baryons. And in our time, based on a consideration of nuclear reactions, experts argue that there is a law of conservation of the number of baryons, forgetting about the existence of a nucleosynthesis period. It would be necessary to clarify this point in the scientific and educational literature.

Various theories of the Great Unification allow the birth of a large number of magnetic monopoles in the early Universe. However, so far they have not been found.

And finally, existing theories do not explain why everything in the universe rotates.

Model of the birth of the universe with a minimum initial entropy

The model of the birth of the Universe with a minimum initial entropy is created on the basis of the Laws of similarity and unity in the Universe.

It is known that the Universe has a hierarchical structure, which determines the fulfillment of the Law of Similarity [22]. Moreover, in [22] the principle of hierarchical similarity was considered as a new fundamental law of physics. In addition, the Law of similarity is uniquely described using the Tree of Life, which allowed the author of the monograph [22] to create a theory of hierarchical systems and to create numerous schemes of free electron lasers. We use this information in modeling the processes of birth and evolution of the Universe.

In this model, the beginning is marked by the creation of the embryo of the Super-Universe, represented by a layered space that consists of four layers [6,7].

In the created Super-Universe, the first layer is depicted as a zero-dimensional space (World-1). The second layer is one-dimensional space, the third is two-dimensional and the fourth is our three-dimensional space.

Between adjacent layers there is information interaction through one delocalized point.

At the beginning of the creation of the Super-Universe, each layer is represented by a space with folded coordinates of fundamental dimensions.

The first layer has 12 minimized spatial coordinates, as well as temporal and informational coordinates. The second layer has three folded spatial coordinates, one of which with time reveals itself as a brane of two-dimensional space (a circle whose radius increases with the speed of light). The third layer has three convoluted spatial coordinates, two of which eventually open up as branes of three-dimensional space (a sphere whose radius increases with the speed of light). The fourth layer has 6 spatial coordinates, three of which are revealed as branes of four-dimensional space. In this case, the radius of the four-dimensional sphere increases with the speed of light. The time and information coordinates are characteristic for all layers of the layered space.

12 coiled spatial coordinates of zero-dimensional space cover all spatial coordinates of the stratified space, which makes it possible to interact between processes occurring in zero-dimensional space with processes that occur in other spaces.

Thus, the individual layers of the stratified space are closed spaces. The length of the shown coordinate of one-dimensional space is $V1 = 2\pi R$, the area of two-dimensional space is $V2 = 4\pi R2$, and the volume of three-dimensional space is $V3 = 2\pi 2R3$ [18]. In all cases, the value of R increases with the speed of light ($R = cTU$, where TU is the time of existence of the Super-Universe from the beginning of filling of zero-dimensional space). Only zero-dimensional space has constant dimensions and represents a fundamental multidimensional sphere.

Through the zero-dimensional space, the Scalar Field enters at a constant speed. The Scalar Field carries with it a program (universal code) for creating the Super-Universe. This Field first fills the one-dimensional space until a constant density of matter in this space is reached. The application rate of the Scalar Field should be 3 times higher than that required to maintain a constant density of matter in a one-dimensional space, which is constantly expanding. This ratio is due to the fact that the rate of filling with energy of one-dimensional, two-dimensional and three-dimensional spaces is the same and amounts to 1 • 1034 kg / s [6,7]. The process of stabilizing the density of a substance in one-dimensional space can last for a time T_1, which is much shorter than Planck's time. Most likely, the value of T1 will be equal to the period of oscillation of the Scalar Field generating the Super-Universe. As follows from the article [21], the value of the oscillation period of the Scalar Field is $T_1 = 2.45 \cdot 10^{-85}$ s. Based on the structure of World-1, it is clear that the Scalar Field can be in World-1 only during the time T_1. So, the energy of the Scalar Field, which is in a multidimensional sphere, is equivalent to a mass of $7.35 \cdot 10^{-51}$ kg, which is much less than the mass of a Planck particle. And from this it follows that our Universe cannot be inside a black hole.

On the other hand, we can conclude that the Scalar field can be in World-1 for a time $\tau \gg T_1$, forming all the properties necessary to create a Super-Universe. In addition, since all the coordinates of World-1 are folded into circles of small radius, the Scalar Field wave must be circularly polarized. And this, in turn, will lead to the fact that in the Universe all the created substance must have a torque. From an atom to a galaxy, everything revolves. Moreover, astronomical observations confirm that galaxies rotate mainly in the same direction [23]. Since there is no apparent reason for such a rotation of galaxies, the author of [23] concludes that the rotation appeared at the birth of the Universe and was transmitted to galaxies.

After stabilization of the density of the substance in one-dimensional space is completed, the energy of the Scalar Field is poured into two-dimensional space. Therefore, this space begins to fill up with a delay over time τ.

Since the “volume” of two-dimensional space ($V_2 = 4\pi c^2 T_U^2$) is proportional to the square of the time of existence of the Super-Universe, and the amount of energy supplied is proportional to time, the density of matter in two-dimensional space will decrease inversely with time.

As calculations showed, the delay time of the start of filling with energy of three-dimensional space is $3 \cdot 10^{-5}$ s [6,7]. During this time, the radius of the brane will reach 9 km. A newborn three-dimensional space will initially be filled only with vacuum particles [18] and zero oscillations of physical fields. The entry of a large energy flux of the Scalar Field will lead to the excitation of vacuum particles and the creation of material particles, which can only be bineutrons or complexes of bineutrons [24].

It was indicated above that the properties of the Scalar Field are significantly different from the properties of the electromagnetic field. While the electromagnetic field is capable of creating a particle-antiparticle pair under certain conditions, the Scalar Field creates a material object devoid of all quantum numbers except the mass, for example, a bineutron or a complex of bineutrons. Such particles are born in three-dimensional space. The Scalar Field is also responsible for the existence of mass of particles, and therefore there cannot be a period of existence of massless particles. There is no antimatter in the universe. Since the Scalar Field is not a charge carrier, the matter generated by it must be electrically neutral. Therefore, in all spaces there is a law of conservation of the total charge.

The mass of elementary particles is formed due to the fact that in the vicinity of each particle of the corresponding substance there is a Scalar Field. Only the presence of a Scalar Field is responsible for the processes of annihilation of a particle with an antiparticle. In this case, a vacuum particle is created [18], the main characteristic of which is the absence of mass and the equality of all quantum numbers to zero. The polarization of such a particle in the field of an atomic nucleus allows the excitation of this particle by an electromagnetic wave with the formation of a particle-antiparticle pair. Excitation of a vacuum particle to a virtual state is possible due to the Scalar Field.

The informational connection between three-dimensional and two-dimensional spaces leads to the fact that particles appear in a two-dimensional space that are rigidly connected with the baryons of three-dimensional space. The dimension of space determines the minimum electric charge of a particle. Therefore, quarks, being localized in two-dimensional space, have a charge $q_2 = \pm e/3$ and $\pm 2e/3$, and particles of one-dimensional space have a charge $q_1 = \pm q2/2 = \pm e/6$. Moreover, it turned out that particles of one-dimensional space are diones, that is, carriers of electric and magnetic charges. In other words, they turned out to be magnetic monopoles, the mass of which is equal to the mass of Planck particles. The existence of diones in one-dimensional space is facilitated by the fact that magnetic monopoles have a one-dimensional topological charge [25–28].

The initial temperature of vacuum particles, and then of bineutrons in three-dimensional space will be equal to 0 K. In the future, new particles will be born mainly in the vicinity of existing particles (nucleons), increasing the mass of newly created nuclei. In this case, the mass of newly created nuclei will increase with acceleration, reaching values that can significantly exceed the mass of uranium nuclei. There will be reactions of fission of nuclei, causing the birth of protons and electrons, which will entail heating of the substance. This explains why heavy chemical elements are present on Earth, including uranium and plutonium, and also why the central regions of all planets and stars have a high temperature.

Since the Scalar Field enters at a constant speed, the average particle density in three-dimensional space will decrease inversely with the square of the lifetime of the Super-Universe. The entire volume of space will be filled with particles. Consequently, the Einstein's trinity law holds.

In everyday life, we are used to perceiving the Earth's surface as flat, although we know that it has a shape close to a ball. Therefore, it is not surprising that we see the Universe flat, since the radius of the four-dimensional sphere, the three-dimensional surface of which is our Universe, exceeds $13 \cdot 10^9$ light years [6,7,29,30].

Conclusion

Based on the analysis of the initial period of the creation of the Universe in the Standard Model and in the model with the initial minimum entropy, the following conclusions are drawn:

1. The standard model of the birth of the Universe and its development in the form of a theory of inflation of the Universe are based on ideas that contradict the laws of physics. In particular, it follows from the Standard Model that the Universe at birth should be inside a black hole. And the theory of inflation of the Universe requires the intervention of the tachyon field, the existence of which is possible only in parallel

worlds. In addition, the considered models unconvincingly explain the structuring of matter in the Universe in the form of galaxies, stars and planets, and also do not explain the reasons for the rotation of matter at all hierarchical levels of the Universe. An important drawback of the Standard Model for the Creation of the Universe is its image in the form of a single three-dimensional sphere, partially filled with matter and fields.

2. To explain all the properties of the Universe, the model of its birth and evolution with minimum initial entropy uses a layered space consisting of four worlds with different spatial dimensions: zero-dimensional space, one-dimensional space, two-dimensional space and three-dimensional space. All these spaces are combined into a single Super Universe, in which between the individual spaces there is an information connection through a delocalized point. In addition, all these spaces are united by a single time.

3. The beginning of the creation of the universe is the simultaneous creation of layers of layered space. Moreover, in each separate layer of the stratified space, the beginning is a multidimensional space of fundamental dimensions. All spaces simultaneously begin their expansion as branes of spaces of higher dimensions. In one-dimensional space, only one of the three collapsed coordinates is revealed. In two-dimensional space, two of the three collapsed coordinates are revealed. In three-dimensional space, three of the six collapsed coordinates are revealed. Zero-dimensional Space remains unchanged and forms the properties of the Scalar Field, which enters through it into the Super-Universe.

4. The Scalar Field has the ability to create particles or ensembles of particles in each space, all of whose total quantum numbers are equal to zero. In one-dimensional space, these are ensembles of dyons, which are Planck particles, magnetic monopoles. In two-dimensional space, these are ensembles of famous quarks. In three-dimensional space, these are bineutrons or complexes of bineutrons, the grouping and decay of which causes the creation of all known particles, atoms and massive bodies in the Universe.

5. The energy filling of the Scalar Field of the Super-Universe begins with a zero-dimensional space having 12 minimized spatial coordinates, as well as time and

information coordinates. Then, with a certain delay, the Scalar Field fills the one-dimensional space, creating diones in it. After reaching a stationary concentration of particles in this space, the Scalar Field begins filling two-dimensional space, and then three-dimensional space. In the latter case, the delay with filling reaches $3\cdot10^{-5}$ s.

6. Scalar Field has the ability to cause rotation of matter at all hierarchical levels of the Universe.

7. The mass of all massive objects in the Universe increases in proportion to time due to the Scalar Field, which gives rise to bineutrons in the vicinity of existing atomic nuclei. As a result, the mass of atomic nuclei increases, nuclear reactions of decay and heating of the inner regions of stars and planets arise. These reactions cause the visible emission of stars.

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