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Research Article

Comparison of the Universe Creation and Evolution Models

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Abstract

The article presents a comparative analysis of the Standard model and the model of the Universe with Minimum Initial Entropy (UMIE). This analysis allowed us to reveal all the possibilities of these models and draw certain conclusions. It is shown that the Standard model of the Universe uses approaches that contradict the laws of physics. It is unable to convincingly explain the structuring of matter in the form of galaxies, stars, and planets. An important drawback of the Standard Model of the Universe is its depiction as a three-dimensional sphere, partially filled with matter and fields. The interpretation of the nature of the cosmic microwave background radiation is unconvincing. On the other hand, the UMIE model uses a stratified space to explain all the properties of the Universe. This space consists of four Worlds: zero-dimensional space, one-dimensional space, two-dimensional space, and three-dimensional space. All of these spaces are closed, since they are branes of higher spaces. There is an information connection between them through a delocalized point. A single time unites these spaces. The Scalar Field (SF) enters through zero-dimensional space. It is the carrier of the universal code. In one-dimensional space, the SF creates dyons, which are Planck particles. In two-dimensional space, it creates quarks. In three-dimensional space, the SF gives rise to bineutrons in the vicinity of existing atomic nuclei, increasing their mass. This causes the creation of all known particles, atoms, and massive bodies in the Universe. The filling of the Universe with particles occurs at a constant rate. Nuclear decay reactions occur, which cause the heating of the inner regions of stars and planets. These reactions cause the visible radiation of stars. The total energy of the radiation of all stars during the existence of the Universe determines the presence of microwave radiation, called relic.

Keywords

Models of the Universe Creation, Standard Model, UMIE Model, Disadvantages of the Standard Model, Advantages of the UMIE Model, Need to Replace the Model

1. Introduction

For a comparative description of the models of the creation of the Universe, first of all, let us clarify how the models of the creation of the Universe arose. In this case, we will omit local models from consideration, that is, geocentric and heliocentric models.

First of all, astronomical observations revealed the existence of galaxies. In 1916, A. Einstein's General Theory of Relativity was created. Then, A. A. Friedman developed this theory, showing that the universe filled with gravitating matter cannot be stationary. This conclusion was confirmed after Hubble's discovery in 1929 of the red shifts, which were interpreted as the phenomenon of "scattering" of galaxies. It became clear that in retrospect, the distance between galaxies should decrease. This decrease was extrapolated to zero dimensions, that is, it was believed that the birth of the Universe occurred from a singularity. As a result of this

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development of understanding of the Universe, many models of the creation of the Universe appeared. Most of them accepted in faith the information about the creation of the Universe from a singularity.

For some unknown reason, all the authors of these models were satisfied that the original model did not consider the creation of a black hole during the compression of the Universe. In addition, they accepted without objection the appearance of a zero-dimensional singularity. Only attempts to develop the theory of quantum gravity required replacing the zero-dimensional singularity with a spatial quantum - the minimum possible size of space [1]. However, at the same time, the statement was taken for granted, according to which the total energy of the Universe is zero. Otherwise, it is impossible to reduce the size of the Universe to the size of a spatial quantum.

In connection with the above-stated state of the problem of the creation of the Universe, it became necessary to conduct a comparative analysis of these models to find out which model is best suited for describing the mechanisms of the creation and evolution of the Universe. For comparison, we use the Standard Model of the Creation of the Universe with all its modifications, as well as the UMIE model, which is being developed by the author of this article.

2. Standard Model of the Universe Creation

The author of the new model did not care how the Universe appeared. He simply considered the process of compressing matter to small sizes. This compression contributes to its heating. Therefore, in the works of G. A. Gamow, the idea of the Big Bang arose from a state characterized by high pressure, high density, and elevated temperature. Continuing the compression and heating of matter, the new model paid attention to its transition to the plasma state and the field state of matter. The mass of matter in this model remained constant during the expansion of the Universe.

Calculations of such a model showed that the singularity had an extremely hot temperature (~10^{28} K [2]) and a large entropy ($S_0 = 10^{88}$ J/K [3]). Numerous theoretical studies of the first second of the expansion of such a state of the Universe allowed theorists to find a lot of new effects related to the birth of matter and the development of the hierarchy of interactions at different hierarchical levels of the primary structure of the Universe. They noted that first of all quarks should be born, and then protons and electrons, hydrogen atoms, and possibly helium. Beautiful science, but it may turn out to be completely disconnected from the real history of the origin of the Universe. And this beautiful science is well funded by conducting research in the field of high-energy physics.

Developing his model, G. A. Gamow predicted in 1948 that the hot plasma created due to the Big Bang had a high density and therefore could not emit electromagnetic radiation from its volume. And only with the expansion of the Universe did the density of the plasma decrease sufficiently so that the radiation could separate from the plasma. Expanding in a flat space, this radiation cooled, resulting in its temperature dropping to 3 K. Therefore, microwave radiation with the corresponding temperature should exist in the Universe. Such radiation was confirmed in 1965 (A. A. Penzias and R. W. Wilson). It was interpreted as relic radiation.

Interestingly, astronomical observations show the formation of stars and galaxies even before the theoretically predicted separation of radiation from matter [4]. On the other hand, our Sun is also a dense plasma, but its surface emits a large flux of light and elementary particles. Astronomers should see not only the birth of the first stars and galaxies, but also the emission of dense plasma after the Big Bang. However, such observations have not been made.

In this regard, it is important to note that for the expansion of matter after the Big Bang and the propagation of radiation, there must be a space in which there was neither matter nor radiation. If radiation is separated from matter, which moves more slowly than radiation, then there should be no relic radiation within the existence of matter. This is easy to see as an example of a star explosion. Plasma and radiation are thrown into space, but radiation leaves the plasma quite quickly. This should also be the case with the Big Bang in flat space. For relic radiation within the reality of matter, a closed space is needed, which is constantly expanding.

Of course, microwave radiation is considered one of the main pieces of evidence of the validity of the Big Bang theory, as a *triumph* of this theory. Subsequently, the model of G. A. Gamow was called the Standard. Until now, none of the relevant specialists have thought about the possible role of the black hole state in the evolution of the Universe, which could radically change the view on the Standard Model. The second fact, as evidence of the triumph of the Big Bang theory, is that hydrogen (~70%) and helium (~25%) contribute to the radiation of all stars in the Universe. At the same time, it is believed that the entire volume of stars consists of a mixture of hydrogen and helium. And the illumination of stars is due to the thermonuclear reaction of the conversion of hydrogen nuclei into helium nuclei occurring in the star's center. This is even though heavier atoms (mainly up to iron atoms, and sometimes up to mercury [5]) are seen in the radiation spectra of stars.

Scientists believe that the nuclei of heavier atoms (up to the core of iron) are created in thermonuclear stars, and all other atoms, including uranium and plutonium, are born in supernova explosions. Of course, no proof exists of such mechanisms for creating heavy nuclei. It is worth noting that during supernova explosions, the upper part of the star is thrown into space, represented mostly by light nuclei, which cannot synthesize heavy nuclei when the star explodes. In addition, the ejected matter is clearly insufficient to create planets around all stars.

Recently, information has appeared that heavy chemical elements in the initial stages of the development of the Universe could be generated in magnetars [6]. This may be so, but the number of magnetars in the Universe is much smaller than the number of neutron stars. And neutron stars are generated as a result of the explosion of supernovae. In other words, there are so few magnetars that it is impossible to attribute to them a sufficient amount of heavy chemical elements to create many planets in the Universe. In addition, two points cast doubt on the possibility of magnetars ejecting heavy nuclei of chemical elements into space. First, a magnetar could eject only those nuclei born on its surface into space. Second, calculations show that a magnetar with a mass equal to the mass of the Sun has a second cosmic velocity of about 0.4 c. Usually, particles that are born in nuclear reactions have a lower velocity.

The Standard Model cannot explain why there is only matter and no antimatter in the Universe. The reason is that the model operates only with electromagnetic energy, which can only produce particle-antiparticle pairs.

The Standard Model studies a separate flat three-dimensional Universe. For such a Universe, the concept of critical matter density (ρ_{cr}) was introduced, which allows us to determine whether the Universe is open ($\rho < \rho_{cr}$), flat ($\rho = \rho_{cr}$) or closed ($\rho > \rho_{cr}$).

From the general theory of relativity, it is known that the value of the critical density ρ_{cr} is related to the Hubble constant by the formula:

$$\rho_{кр} = \frac{3H^2}{8\pi G} \tag{1}$$

Substituting the value H ≈ 73.4 km/(s·Mpc) = $0.75 \cdot 10^{-10}$ years^{-1} = $2.38 \cdot 10^{-18}$ s^{-1} [7, 8], we find: $\rho_{cr} \approx 10^{-26}$kg/m^3. Therefore, the density ρ_{cr} corresponds to the real density of matter in the Universe.

This is not about the black hole that our Universe was supposed to become.

Modern measurements using the WMAP and Planck telescopes have shown with great accuracy that the Universe is flat [9, 10], thereby confirming that matter in the Universe has a density of ρ_{cr}.

In this regard, it is important to note that in [10] it is shown that the measurement results given can correspond not only to Euclidean space, but also to a multidimensional structure with closed ends of space. This is a significant result that will contribute to changing the model of the creation of the Universe.

Let's see what characterizes a flat three-dimensional space with a critical density of matter. In this case, we will understand that all space is filled with matter. This requirement follows from the law of the trinity of space-time-matter [11], discovered by A. Einstein and laid by him as the basis of the general theory of relativity. A. Einstein wrote the main equation of the theory as follows:

$$R_{\mu\nu} - \frac{1}{2} g_{\mu\nu}(R - 2\Lambda) = \frac{8\pi G}{c^4} T_{\mu\nu} \tag{2}$$

Just as the invariant of relativistic kinematics connects time and space, so equation (2) connects time, space, and matter. That is, space must necessarily be filled with matters.

Let us assume that the radius of space expands at a rate $\upsilon \le c$. In this case, the mass of matter in the Universe.

$$M_U = \frac{4}{3}\pi R_U^3 \rho = \frac{4}{3}\pi \upsilon^3 T_U^3 \rho. \tag{3}$$

Gravitational radius

$$r_g = \frac{2M_U G}{c^2} = \frac{8}{3}\pi G \frac{\upsilon^3}{c^2} T_U^3 \rho \tag{4}$$

Assuming that $\upsilon = c$ and $T_U = 13.4 \cdot 10^9$ years, i.e., $4.23 \cdot 10^{17}$ s, we find $R_U \approx 1.3 \cdot 10^{26}$ m. Now we find the ratio of the gravitational radius to the radius of the Universe:

$$\frac{r_g}{R_U} = \frac{8}{3}\pi \frac{\upsilon^2}{c^2} G T_U^2 \rho \approx \rho \cdot \left(\frac{\upsilon}{c}\right)^2 \cdot 10^{26}. \tag{5}$$

So, if $\upsilon = c$ and $\rho = \rho_{cr}$, then $r_g = R_U$. In this case, the Universe is completely localized within the black hole, and therefore, matter must move only to its center. In the case when $\rho < \rho_{cr}$, we get $r_g < R_U$. In this case, space can continue to expand. If $\rho > \rho_{cr}$, then $r_g > R_U$ and space can only contract. However, the physics of space inside a black hole has not yet been studied. We can only assert that the laws of energy conservation, momentum, and angular momentum in the curved space inside a black hole cannot be fulfilled. And in our Euclidean space, these laws are fulfilled.

Since the expansion of space continues, within the Standard Model, we can conclude that only the condition $r_g < R_U$ is realized. This option is possible when $\rho = \rho_{cr}$, but $\upsilon < c$. Recognition of the fact of an accelerated expanding space simultaneously indicates that the relation $\upsilon < c$ can indeed take place.

Now let's return to the history of the creation of the Standard Model. Since it became known that the Universe is expanding, we can assume that, in retrospect, it was contracting. Forgetting that a barrier in the form of a surface of a sphere of gravitational radius will arise on this path, we can immediately move on to the small sizes of the Universe and investigate what can happen there.

It is important to consider how the Standard Model explains the creation of matter and the presence of interactions between its elements.

As a rule, the creation of matter is described as a sum of assumptions that, in the final version, do not explain the results of observations and often violate physical laws. It violates all possible laws, first of all, the singularity, as the starting point in creating the Universe. The next violation is the recognition of the presence in the Universe of quarks, i.e., particles that have an electric charge multiple of ⅓. And this is at a time when it has been proven that the minimum electrical charge can only be the charge of an electron and a proton, as quanta of electric charge.

It should be noted that the physical interaction between particles of matter requires the presence of a gauge field responsible for manifesting the interaction and interaction bosons controlled by the gauge field.

Considering the interaction between elements of matter, physicists have identified four types of interaction: weak, strong, electromagnetic, and gravitational. The first three types of interaction were described by the exchange of the corresponding bosons. In turn, the assumption was accepted that these bosons were created exclusively within the framework of the uncertainty relation. As a rule, they forgot to introduce the gauge field. It is difficult to imagine that such an approach to solving the problem will ensure a stable value of the interacting energy, since in all these cases, the reason for the directional transfer of the boson between the interacting particles has not been found. To describe the energy interaction between particles, empirically selected potentials are introduced that do not take into account the interaction models, which in fact do not allow us to understand the physics of physical interactions.

The Standard Model could not describe the gravitational field and explain why it is so weak. And finally, the Standard Model has no idea about the creation of life on Earth.

This way of understanding the process of creating the Universe does not correspond to the real process. Therefore, it was necessary to retreat from such a model and look for a real process, at each stage of which the laws of physics must be strictly observed. Instead, it was developed, supplemented, and new ways of creating matter and fields, as well as interactions between them, were introduced. Each time, they came across a dead end in their knowledge of various physical processes.

The most surprising thing in this regard is the creation of the theory of space inflation. The most surprising thing is that this model has been accepted by experts. Here, one can see the use of many violations of the laws of physics. On the one hand, it has been proven that in our space, nothing can move faster than the speed of light. Tachyons can move only at a speed exceeding the speed of light, but in a space of a different nature [11]. The particles introduced in the theory of inflation - inflatons - are tachyons. Therefore, they cannot exist in our space. On the other hand, space inflation is attributed to an unknown scalar field and its elementary particle. Again, this is a complete misunderstanding of the nature and properties of this scalar field.

Using a separate three-dimensional Universe as a model of its existence and applying the conclusions of this model to astronomical observations, experts were forced to consider another anti-scientific element: dark matter and dark energy. Again, the new model absorbs the creativity of experts.

In addition, the models under consideration do not convincingly 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 of creating the Universe is its depiction as a single three-dimensional sphere, partially filled with matter and fields.

Listing the shortcomings of the Standard Model of the Universe, it is worth pointing out the huge array of reliable results of observation of the Universe that require explanation within the framework of physical laws.

What conclusion can be drawn regarding using the Standard Model to describe physical processes? The only conclusion suggests itself: to reject it, replacing it with a model that does not contradict the laws of physics. Only then will it be possible to interpret the impressive research results on the Universe. As a result, dark matter, and energy, introduced to save the Standard Model, will disappear. The theory of inflation, which was not needed to save the Standard Model, will also disappear.

Science has had many cases in which abandoning the old model and introducing a new one was necessary. In particular, such cases also concern the view on the physics of the Universe. As a result, science has only won.

Numerous models of the creation of the Universe, based on the idea of the Big Bang, contradict the laws of physics. In such a situation, the author decided to propose his own model, which would not contradict the laws of physics and could unambiguously answer various questions of cosmology [12, 13].

3. UMIE Model

The model proposed by the author is based on the Laws of Similarity and Unity in the Universe. The hierarchical structure of the Universe determines the fulfillment of the Law of Similarity [14]. The principle of hierarchical similarity is considered in [14] as a new fundamental law of physics. Therefore, all processes in the Universe occur according to a single scenario, albeit at various levels and on different scales. This allows us to compare the stages of the Universe's birth and evolution with a child's intrauterine development.

In terms of the intrauterine development of the child, we will highlight the following points. First of all, the fertilization of the egg occurs, after which the relaxation process is observed until the creation of a full-fledged cell, ready for reproduction. After the receipt of the appropriate information, cell division begins. The construction of the organism occurs after the receipt of energy in accordance with the hierarchical law, that is, first one-dimensional objects (fibers) are formed, then two-dimensional objects (tissues), and three-dimensional objects. In turn, three-dimensional objects are created in the following sequence: a monofunctional organ (lobe), then the lobules are combined into multifunctional organs (liver, kidneys, etc.). In turn, multifunctional organs are combined into systems (nutrition, metabolism, circulatory, nervous, protective, immune, etc.). All systems form the organism.

When creating a model of the Universe as an organism, we will choose a layered space united into a Super-Universe, which consists of four layers: zero-dimensional space (World-1), one-dimensional space (World-2), two-dimensional space (World-3), and our three-dimensional space (World-4). Information interacts between the layers through a delocalized point. This is how the initial state is formed due to the information dimension.

The beginning of the creation of the Super-Universe is the formation of all four spaces, and all coordinates in these spaces have fundamental dimensions and are closed in on themselves in rings. World-1, through which the filling of other Worlds with matter and energy occurs, has 12 spatial coordinates of fundamental dimensions and one time and one information coordinate. All spatial coordinates of World-1 combine the spatial coordinates of the other three layers. The time coordinate is common to all spaces.

World-2 and World-3 have three collapsed spatial coordinates, and World-4 has six. With the beginning of the energy flow through World-1 in World-2, the radius of the ring of one spatial coordinate increases with the speed of light. Similarly, in World-3, the radii of two spatial coordinates increase, and in World-4, the radii of three spatial coordinates increase. Simultaneously with the expansion of spaces in all layers, elementary particles of vacuum (EPV) [11] and zero oscillations of physical fields are born. This is what the program, which is laid out by the information dimension, looks like.

Therefore, individual layers of the stratified space are closed spaces, branes of spaces per unit of higher dimension. The length of the manifested coordinate of one-dimensional space is $V_1 = 2\pi R$, the area of two-dimensional space is $V_2 = 4\pi R^2$, and the volume of three-dimensional space is $V_3 = 2\pi^2 R^3$ [11]. In all cases, the radius of space per unit of higher dimension is used, and $R = cT_U$, where the time T_U is measured from the beginning of the expansion of the radii of the manifested coordinates.

Through World-1, a multidimensional SF enters, which can create particles in all Worlds of the Super-Universe. This is how it differs from the scalar field introduced in the theory of the Universe's inflation.

Initially, the SF fills only World-2 particles until a steady-state particle concentration is reached. Then, continuing to fill World-2, the SF begins to fill World-3, and only later starts to fill World-4.

As calculations have shown, the delay time for the beginning of filling three-dimensional space with energy is $3 \cdot 10^{-5}$ s [12, 13]. During this time, the radius of the brane will reach 9 km. The entry of a large flow of energy from the SF will lead to the excitation of EPV and the creation of material particles near the newly created nucleons, which can only be bineutrons or bineutron complexes [15].

In World-2, dyons are created - particles endowed with electric and magnetic charges. In World-3, quarks known to us were created. Let us pay attention to the sizes of particles of World-2 and World-3. The axiom is that these particles have finite sizes in the manifested dimensions: in one and two dimensions, respectively. It could turn out that in other dimensions, particles are zero size, which would create difficulties for the description of such particles. However, we know that along with the manifested dimensions, there are additional collapsed dimensions [16, 17]. Moreover, the length of the collapsed dimension is only 1-2 orders of magnitude greater than the elementary length. The presence of such dimensions suggests that dyons have at least a three-dimensional structure, but they can move only in one dimension. Other dimensions are provided for the appearance of certain properties of particles, and not for movement. Therefore, mechanical motion of a particle is possible only along the manifested dimension.

Similarly, we can describe the structure of quarks-particles of World-3, where two dimensions are manifested and at least one dimension is closed. This situation only contributes to the presence of motion in the two manifested dimensions.

It is worth recalling that the described conditionally three-dimensional spaces of World-2 and World-3 do not intersect or have common dimensions with themselves and World-4. There is only an informational connection between them due to the multidimensional SF. Thus, we come to the need for at least (3+3+7) dimensions of the existing Super-Universe. Including the informational dimension, we have 14 dimensions. Most likely, these dimensions are enough to fully describe all the properties of the Super-Universe, and each World in particular. The number of manifested dimensions of the Universe is 4, and the number of hidden dimensions is 3, a total of 7. World-4 (3+1 dimensions) is much richer in particles and fields; therefore, it requires at least 7 dimensions.

Assuming that the critical value of the density of matter, which is equal to $\rho_{cr} = 10^{-26}$kg/m^3, characterizes all the mass in the Universe, we find the mass of matter:

$$M_U = 2\pi^2 R^3 \rho_{\rm cr} = 2\pi^2 c^3 T_U^3 \rho_{\rm cr} = 4.39 \cdot 10^{53}\ \mathrm{k}g \quad (6)$$

It is easy to understand that by astronomical observations we can cover the space within the distance R_U from the observer, which is no more than 20% of the total volume of the Universe. Therefore, no more than 8.8 10^{52} kg of matter is within reach. From here we can find the effective number of stars with the mass of the Sun (2 10^{30} kg) - 4.4 10^{22}. This number can be conditionally divided into 2 10^{11} galaxies and 2.2 10^{11} stars in the galaxy.

However, we will not be able to observe this matter visually. Only gravitational interaction can see it. And in the optical range, we can only see the past of all stars and galaxies, the mass of which is continuously increasing.

Since gravitational interaction exists within reach, only the matter in this part of the Universe can, under certain conditions, collapse into a black hole.

In this regard, it is necessary to decide what the gravitational radius of a black hole is, which corresponds to the data of astronomical observations. The generally accepted formula for determining the gravitational radius is built on the data of non-relativistic dynamics. At the same time, the real kinetic energy of a body is described by the relativistic formula $E_k = (m\text{-}m_0)\cdot c^2$. In this case, the kinetic energy will equal the potential energy at the particle velocity $\upsilon < c$. Therefore, I am inclined to consider the gravitational radius the distance at which the speed of motion in a circular orbit reaches the speed of light. As soon as a body in its orbit approaches r_g, it is immediately captured by the black hole. This is exactly what photographs of black holes look like. In this case, we will take the gravitational radius as

$$r_G = \frac{GM}{c^2} \approx \frac{6{,}67259\cdot 10^{-11}\cdot 8.8\cdot 10^{52}}{9\cdot 10^{16}} = 6{,}5\cdot 10^{25}\text{м} = 6{,}88\cdot 10^{9}\ light\ years. \quad (7)$$

However, in formula (7) the value of the gravitational constant G, known for the Solar System, is used. Analysis of the results of calculations given in [18, 19] shows that the value of G for the interaction between galaxies can be 13 times smaller, and between clusters of galaxies 30 times smaller. Therefore, in reality the value of r_G can be 20-30 times smaller. So, in reality

$$r_G = (2.3 \div 3.4)\cdot 10^{8}\ ly. \quad (8)$$

In order to prevent the Universe from falling into a black hole at all stages of its evolution, we will assume that there is a relationship between the gravitational radius and the real radius of the visible part of the Universe: $r_G = \eta R_U$, where $\eta \ll 1$. Since the born space increases its radius at the speed of light, then $R_U = cT_U$. Hence

$$r_G = \frac{GM_U}{c^2} = \eta R_U = \eta c T_U, \quad (9)$$

Formula (9) makes it possible to find the ratio η/G:

$$\frac{\eta}{G} = \frac{M_U}{c^3 T_U} = 7.7\cdot 10^{9} \quad (10)$$

$$\eta = \frac{r_G}{cT_U} = \frac{(2.3\div 3.4)\cdot 10^{8}}{13.4\cdot 10^{9}} = (0.017 \div 0.025) \quad (11)$$

From formula (9) it follows that the process of matter formation in our world proceeds constantly at a speed.

$$\upsilon_m = \frac{M_U}{T_U} = \frac{8.8\cdot 10^{52}}{4.23\cdot 10^{17}} \approx 2.08\cdot 10^{35} kg/s \quad (12)$$

So, the beginning of the creation of the Universe was characterized by the absence of matter in it, except for the EPV. And therefore, the entropy of the Universe at its birth is zero. And our Universe cannot be inside a black hole.

Dividing the found speed by the effective number of stars in the visible part of the Universe, we get the speed of filling the Sun with matter: $4.73 \cdot 10^{12}$ kg/s. During the existence of the Universe, the amount of matter entering the Sun will be $\approx 2\cdot 10^{30}$ kg.

Now let's return to describing the birth of particles and the interaction between them. A key role in this regard is assigned to the multidimensional SF - *the carrier of the universal code*, that is, the program for the creation of particles in all layers of the Super-Universe and the interaction between them. In the latter case, the SF acts as a gauge field that controls the transfer of interaction bosons at all hierarchical levels. In addition, the SF introduces the program for creating life in the Universe.

The properties of the SF in the UMIE model mustn't differ from the corresponding properties in the T. Kaluza model. The properties of the SF in the UMIE model are described in detail in [19-21]. Here we briefly list the important properties of the SF.

By the hierarchical structure of the Universe, the SF enters through World-1 at a constant speed. At the same time, due to a universal code, the SF creates matter and fields at each hierarchical level in particular. World-1 is the state of the Primary Vortices, the beginning of Vortex Movements, or the Main Driving Force. It follows that the SF sets the vortex structure of the Universe. From birth to completion, the Universe is fractal, and these fractals rotate. In other words, the SF in the Universe's initial space forms the Universe's structure, creating in strictly defined places the embryos of stars, galaxies, and clusters of galaxies. And all these embryos rotate. Substituting the above numbers, it is easy to calculate that at the birth of the embryos of galaxies, each had an average volume of 72m^3. Therefore, the diameter of this flat embryo did not exceed 10 m, with a distance between them of about 1 m. In this case, fluctuations in the position of galaxies occurred, which caused several galaxies to merge into a single galaxy with all the possible consequences.

The SF provides the processes of annihilation in a particle-antiparticle pair with the creation of the corresponding EPV and the excitation of the EPV to a virtual or real state. The SF can create matter devoid of charges and spins directly. This condition is satisfied by bineutrons or a group of bineutrons in a singlet state. As a rule, bineutrons are created near existing nucleons, increasing the mass of the corresponding atomic nucleus. Near each created particle remains the SF, which is responsible for the mass and properties of the particle. Being a gauge field, the SF creates bosons from the EPV and is accountable for particle interactions. It also creates conditions for the transfer of bosons between interacting particles.

Let's see how the SF realizes its functions in ensuring strong interaction. For further presentation of the material, we will consider the theoretical ideas in [11] about the nature and structure of the physical vacuum and EPV. All quantum numbers are zero in the unexcited state of an EPV in our laboratory space. Known physical interactions are incapable of creating an EPV, so they are absent from the Standard Model.

Since the SF provides all interactions between particles, it is multidimensional and synchronizes interquark and intranuclear interactions. For this reason, in three-dimensional space, we can see the quark structure of hadrons.

Quarks and gluons are in World-3, and nucleons and pions are in World-4. Both quarks and nucleons are simultaneously carriers of the SF. Therefore, the SF can control the interaction process.

The strong colorless interaction between nucleons occurs simultaneously in World-3 and World-4. In World-4, we have the standard Yukawa scheme of virtual pion transfer between nucleons. Virtual pions in World-3 are created by excitation of the quarks SF energy of polarized EPV $[^{1/2}d(\alpha)^{-1\bar{/}2}d(\bar{\alpha})]$ or $[^{1/2}u(\alpha)^{-1\bar{/}2}u(\bar{\alpha})]$, where $\alpha = r, g, b$.

Note that the quark composition of neutral pions is possible only in a high-symmetry field. In reality, all bosons are in a field of reduced symmetry in the interaction processes. Therefore, the energy of the SF quarks will be generated from EPV under conditions of reduced symmetry, and only a neutral quark-antiquark pair will be generated, corresponding to the neutral pion in World-4. If this pair is born in a triplet of quarks that are components of a neutron, then it should have the quark structure and the components of a proton. In this case, neutral pions in World-4 are born from polarized SF nucleons of the EPV of World-4 due to the energy of the same Field.

In all cases, the first thing that is formed from the EPV is colorless virtual pairs of quarks in World-3 and neutral pions (particles and antiparticles), which consist of a quark and an antiquark in a singlet state. In this case, the energy of the quarks that make up the nucleon decreases by the amount of excitation of the virtual neutral pion. This virtual pair can interact with the triplet of quarks that generated it (both in World-3 and in World-4) or return to the vacuum. In the latter case, the energy of the nucleon's SF is restored.

A virtual pair (pion π^o) can move to another nucleon, causing a strong colorless interaction between the nucleons. The movement of a virtual pion between nucleons causes the movement in the opposite direction of the SF energy that caused the birth of the virtual pair. The movement of a pion resembles the movement of a ship along a narrow channel between two small reservoirs. The ship displaces some of the water from the reservoir in which it is located. The ship's movement into the second reservoir causes water to flow from the second reservoir into the first.

After moving, the virtual pion will return to the vacuum. At the same time, the energy of the nucleon Field will increase to the standard state. The overlapping of the SF of the interacting nucleons and the decrease in the total SF energy will determine both the direction of movement of the virtual boson and the interaction between nucleons (Figure 1). Since the virtual states of bosons are generated exclusively by the action of the SF, the interaction between nucleons with the participation of pions is similar to the interaction between atoms in a molecule with the involvement of a pair of electrons in a singlet state.

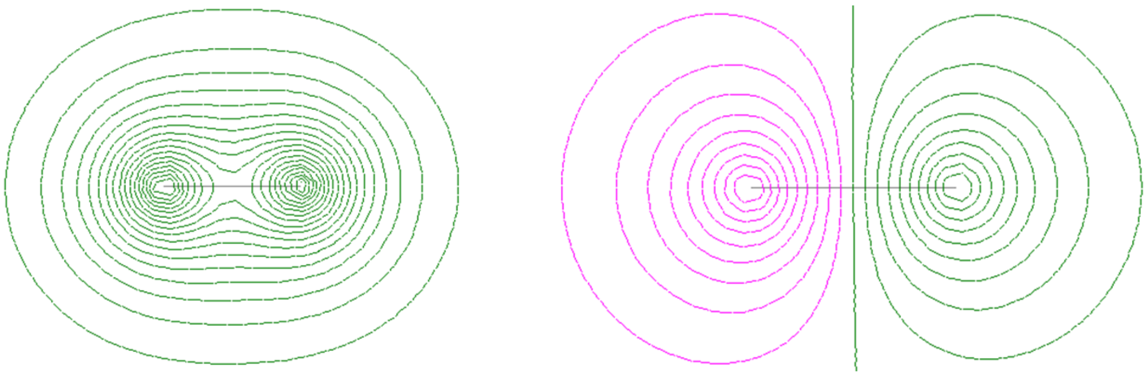

Figure 1. *Overlapping of the SF of interacting nucleons in the triplet state (left) and in the singlet state (right).*

After the birth of a virtual pion $\pi^0 = {}^{-1/2}u(\alpha)^{1/2}\bar{u}(\bar{\alpha})$ in the neutron Field, quark exchange is possible without changing colors.

$$^{-1/2}d(\alpha) + \pi^0 = {}^{-1/2}d(\alpha)^{1/2}\bar{u}(\bar{\alpha}) + {}^{-1/2}u(\alpha) = \pi^- + {}^{-1/2}u(\alpha). \quad (13)$$

In this case, π^- is emitted from the neutron, and the neutron turns into a proton.

The reaction in the proton's SF proceeds similarly. In this case, an exchange of quarks occurs.

$$^{-1/2}u(\alpha) + \pi^0 = {}^{-1/2}u(\alpha)^{1/2}d(\bar{\alpha}) + {}^{-1/2}d(\alpha) = \pi^+ + {}^{-1/2}d(\alpha) \quad (14)$$

So, π^+ is ejected from the proton, and the proton is transformed into a neutron. One would expect that the exchange of quarks with the virtual pair of quarks corresponding to the neutral pion would require additional energy from the SF quarks.

The movement of a charged pion to a partner nucleon requires the reverse reaction of the transformation of the charged pion into a neutral pion and the relaxation of the latter to the vacuum state. In all transformation processes, the antiquark included in the virtual particle remains part of the virtual particle.

The process of the birth of a virtual particle and its relaxation to the vacuum state resembles an oscillatory motion. Therefore, this process occurs continuously, ensuring a constant magnitude of the interaction between quarks and between nucleons.

There is an *additional possibility* for the manifestation of the strong interaction between nucleons. In World-4, the pion π^+ is the antiparticle to π^-. Therefore, the energy of the total SF of the neutron and proton is able to give birth to a virtual pair ($\pi^-\pi^+$). In the electrostatic field of the proton, this virtual pair is polarized, after which π^- interacts with the proton, and π^+ with the neutron:

$$\left.\begin{array}{l} p^+ + \pi^- \rightarrow n + \pi^o \\ n + \pi^+ \rightarrow p^+ + \pi^o \end{array}\right\} \quad (15)$$

The last process in reactions (15) is the return of neutral pions to the vacuum state.

In World-3, the formation of a virtual pair (π-π+) means the simultaneous formation of quark virtual pairs $^{-1/2}d(\alpha)^{1/2}\bar{d}(\bar{\alpha})$ and $^{-1/2}u(\alpha)^{1/2}\bar{u}(\bar{\alpha})$. In the SF of the group of quarks that make up the proton and neutron, polarization of these pairs and exchange of quarks in their structures occurs:

$$^{-1/2}d(\alpha)^{1/2}\bar{d}(\bar{\alpha}) + {}^{-1/2}u(\alpha)^{1/2}\bar{u}(\bar{\alpha}) \rightarrow {}^{-1/2}u(\alpha)^{1/2}\bar{d}(\bar{\alpha}) + {}^{-1/2}d(\alpha)^{1/2}\bar{u}(\bar{\alpha}), \quad (16)$$

what in World-4 corresponds to the formation of pions π^+ and π^-.

The first of the pairs formed has a "+" charge, and the second has a "-" charge. The group of quarks that makes up a neutron combines with the first pair, and the group of quarks that makes up a proton combines with the second pair.

It is important to note that when considering the interaction of two protons or two neutrons, reaction (16) is impossible. Therefore, interaction between identical nucleons is possible only due to the exchange of neutral pions. This, in turn, leads to the impossibility of a stable helium-2 nucleus, which would consist of only two protons (biproton).

According to the literature, the interaction energy between protons in a biproton is -0.5 MeV. Since the electrostatic repulsion energy is ≈1 MeV, the binding energy due to the transfer of a neutral pion accounts for 0.5 MeV [10, 14]. The same binding energy should exist in a bineutron. However, the bineutron is unstable due to the occurrence of a weak interaction reaction.

On the other hand, in the deuteron, the interaction energy is 2.22457 MeV [7] due to the transfer of a pair of charged pions (a much higher binding energy).

Let us note another important detail. In the ground state, the deuteron and the bineutron have spin 1. If the spin value is zero, then the binding energy between the nucleons will decrease by an order of magnitude. The reason for this result is easy to understand by considering Figure 1. A certain direction of the spin corresponds to a positive amplitude of the Field, and the opposite direction to a negative one. In this case, the amplitudes add up in the triplet state, creating a channel for the movement of the pion (Figure 1, left). In the singlet state, in a rough approximation, the channel is absent (Figure 1, right). However, from quantum chemistry we know that only in the triplet state can the system be in a state with a purely covalent bond, while in the singlet state an ionic bond is necessarily mixed [8]. Reasoning similarly, it can be understood that a weak communication channel should appear in the singlet state of a bineutron. In this case, there may be several mechanisms of such communication, among which it is worth highlighting the precession of spins in the magnetic field of another spin and the vibrational processes of quark movement within the bineutron. And indeed, there is data that the energy of such a connection in a bineutron is ≈70 keV [14]. And nevertheless, to create the Universe and atoms, the Field uses bineutrons in the singlet state.

Relaxation of virtual neutral pions formed during reactions (15) to the vacuum state contributes to the birth of the next pair of virtual pions. And so, the process proceeds to infinity in time. In the oscillatory process, the excited state of the virtual pair corresponds to potential energy, and the relaxation process to the vacuum state corresponds to kinetic energy. Such a scheme easily explains the appearance of charged pions during the interaction of cosmic rays with the Earth's atmosphere.

The interaction between quarks that are part of the structure of charged or neutral pions occurs only with the participation of gluons g_3 and g_8 (i.e., $r\bar{r}, g\bar{g}, b\bar{b}$), which do not change the color and flavor of quarks, but an exchange of spins occurs. In these pairs of quarks, the birth of a neutral pair of virtual quarks with the same color charges is also possible.

Since the neutral pion is itself an antiparticle, its lifetime is truly short (see above). A charged pion, which consists of a quark and an antiquark of assorted flavors, is another matter. Such a pair of quarks are unable to annihilate, and therefore their lifetime is increased by more than 8 orders of magnitude. This is because the charged pion must first exchange quarks with the surrounding quark environment to form a neutral pion, which then annihilates.

Thus, considering the strong interaction within the framework of the UMIE model, it looks simple and convincing. And at the same time, it is clear that there must be a purposeful transfer of a boson between quarks or between nucleons. And this direction provides the SF, which is endowed with all massive particles. The overlap between the distribution of the SF of two neighboring quarks or nucleons provides the formation of a bridge for the transfer of bosons responsible for the strong interaction.

It is important to understand that the excitation of virtual bosons from vacuum states is ensured exclusively by the presence of the SF near all massive particles. In this case, the birth of a virtual boson or a pair of virtual bosons is possible only within the limits of interacting quarks or nucleons.

Being multidimensional, the SF knows the coordinates of all massive objects at each hierarchical level, which ensures the targeted transfer of interaction bosons. This provides, in particular, gravitational interaction at each hierarchical level: 1) interaction between planets in a solar-type system, 2) interaction between stars in a galaxy, 3) interaction between galaxies in a galaxy cluster, and 4) interaction between galaxy clusters.

Since the Universe has a limited volume filled with matter and fields, the radiation of matter conducted during its existence will accumulate in space. The expansion of the Universe and the absorption of radiation lead to its cooling. As a result, this radiation is recorded as a relic [22]. Thus, a quasi-stationary state of the distribution of microwave radiation in directions is realized. This allows us to determine the speed of movement of the Galaxy relative to microwave radiation.

The most important fact is that the SF ensures the creation and functioning of life in the Universe. It controls the functioning of each living cell, carrying the corresponding program. It also provides the functioning of the entire living organism and the presence of consciousness in the organism. Human consciousness is localized not in the brain, but in the field, structure associated with the organism. This conclusion is confirmed by the information published by the Nobel Prize winner in Medicine J. Eccles, in the monograph [23, 24]. Thus, the program of the organism's activity is localized in the field structure, which is organically included in the organism's structure. If this program is destroyed or disappears, the organism becomes ill or dies. It is thanks to this program that the organism's functioning requires a minimum amount of energy. This is easy to see by considering the biochemical processes in each organism cell, in particular.

Only enzymatic reactions occur in a living organism (from a cell to a person). And each enzyme, a specific protein, is responsible for only one specific reaction. Several thousand different enzymes are needed to ensure life cycles in the organism. And these enzymes must be created! For this, there is a whole “factory” in the cell that works perfectly, according to the program laid down in it.

The functioning of a cell requires the cooperation of at least three types of complex molecules: DNA, RNA, and proteins. For the life of a cell, mechanisms are needed that conduct replication (copying DNA) and transcription (transferring information from a specific section of DNA, a gene, to RNA), targeted movement of RNA, and protein synthesis, etc.

Thanks to the participation of enzymes, various parts of the cell produce various products. When enzymes disappear in a certain part of the cell over time, information is sent to the center of the cell about the need to replenish the reserves of enzymes for this part of the cell. Immediately, in the center, thanks to the replication mechanism, a sufficient amount of enzymes is produced and sent to the desired part of the cell.

If there were no program for the functioning of the cell, the center would have to produce all possible enzymes simultaneously so that they would fill the entire cell volume by diffusion. In contrast, the need for enzymes arose only in a certain part of the cell. Therefore, it would be an irrational use of energy to produce the necessary amount of enzymes that could not actually be used in the processes of the cell's vital activity or even interfere with its vital activity.

All the mechanisms work with absolute precision, without failures. Thus, the cell resembles a huge factory, controlled by sophisticated computers with complex computer programs, which ensure the economical use of the cell's energy.

4. Conclusions

Comparative analysis of the Standard Model of the Universe and the UMIE model revealed all their possibilities and allowed us to draw the following conclusions.

The Standard Model of the Universe uses approaches that contradict the laws of physics. Analysis of the model shows that the Universe at birth should be inside a black hole. On the other hand, its development in the form of the theory of the inflation of the Universe requires the intervention of the field of tachyons, the existence of which is possible only in parallel Worlds. In addition, the model under consideration cannot convincingly explain the structuring of matter in the form of galaxies, stars, and planets. The model also does not explain the reasons for the rotation of matter at all hierarchical levels of the Universe. Finally, an important drawback of the Standard Model of the Universe is its depiction as a single three-dimensional sphere, partially filled with matter and fields. Therefore, the interpretation of the nature of the cosmic microwave background radiation is unconvincing. In addition, a consequence of such a depiction is the requirement that quarks could exist next to the electron and proton, which have quantum quantities of electric charge.

To explain all the properties of the Universe, the UMIE model uses a layered space, which consists 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 there is an information connection between individual spaces through a delocalized point. In addition, all these spaces are united by a single time.

The beginning of the creation of the Universe is the simultaneous creation of layers of stratified space. In this case, zero-dimensional space is represented by an unchanging 12-dimensional space of fundamental dimensions. The other three 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 forms the properties of the SF, which enters the Super-Universe through it.

The SF can create in every space particle or ensemble of particles, all total quantum numbers of which, except mass, 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 known 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.

The filling of the Super-Universe with energy begins with zero-dimensional space. Then, with a certain delay, the Scalar Field fills one-dimensional space, creating dyons. After reaching a stationary concentration of particles in this space, the Scalar Field begins to fill two-dimensional space, and then three-dimensional space. In the latter case, the filling delay reaches $3 \cdot 10^{-5}$ s. The Scalar Field carries with it the ability to cause the rotation of matter at all hierarchical levels of the Universe. The mass of all massive objects in the Universe increases proportionally to time due to the Scalar Field, which gives rise to bineutrons near existing atomic nucleus. As a result, the mass of atomic nuclei increases, nuclear decay reactions occur, and the heating of the internal regions of stars and planets occurs. These reactions cause the visible radiation of stars. The total radiation energy of all stars during the existence of the Universe causes the presence of microwave radiation, called relic radiation.

Abbreviations

The UMIE Model	The Model of the Universe Creation with Minimum Initial Entropy
World-1	Zero-dimensional Space
World-2	One-dimensional Space
World-3	Two-dimensional Space
World-4	Three-dimensional Space
SF	Scalar Field
EPV	Elementary Particle of the Vacuum

Author Contributions

Petro Olexiyovych Kondratenko is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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