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The Evolution of the Universe in a Model with Minimal Initial Entropy

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Abstract: *Based on the model of the Universe with initial minimum entropy, the article considers the evolution of the Universe as brane of four-dimensional space. Taking into account that the radius of the four-dimensional sphere increases with the speed of light, it is shown that the possibility of observing galaxies is limited to a four-dimensional space-time cone with a forming angle of 1 radian, which is about 5% of all galaxies. The dependence of the mass and position of galaxies in space-time since the moment of radiation has been found. This dependence explains the reason for the reduced mass of matter in the Universe, found from astronomical studies. It is shown that in astronomical studies can be found no more than 8% of the real density of matter. It was also shown that gravity takes main role in the redshift of the emission spectra of galaxies localized in clusters at a distance of more than 4 billion light years. This fact explains the presence of a cluster of quasars in the absence of quasars in other large parts of the sky. In this case, the distance to quasars may turn out to be significantly less than that given in the scientific literature.*

Keywords: *Model of the Universe evolution, brane of four-dimensional space, influence of gravitation on red shift, cosmological constant.*

1. INTRODUCTION

In the article [1] the author proposed the model of the process of the origin of our Universe with minimal initial entropy (UMIE). According to this model, our Universe is a component of the Super-Universe. In turn, the Super-Universe is represented by a layered-space. In this case, the neighboring layers differ in the dimensionality of the space on the one-sided. Usual for us three-dimensional space (four-dimensional (3 + 1) Universe) borders on two-dimensional space. Similarly, two-dimensional space borders on one-dimensional space. Finally, one-dimensional space is bounded by zero-dimensional space. Between adjacent prospectors there is information interaction between each other through one delocalized point. The complete structure of the Super-Universe is set immediately, while energy flows through a zero-dimensional space, gradually filling the spaces of higher dimensions. The substance created in these spaces has an initial zero temperature.

Zero-dimensional space (World-1) is the bearer of the Scalar Field-time. It has the ability to interact with other spaces, create elemental particles of these spaces, and set the program for the evolution of the Universe. In the World-4, the Scalar Field has the ability to create a bineutron in a singlet state.

In the World-1, all measurements are locked into a circle of small radius (Planck radius). Since all dimensions of this World are the same, it can be considered a multidimensional **sphere of fundamental dimensions**.

One-dimensional space (World-2) is inhabited by Planck particles, which are the carriers of electric and magnetic charges, diones. In the two-dimensional space (World-3) there are well-known quark sciences. Only three-dimensional space (World-4) contains not only elementary particles of this World, but also atoms, molecules, planets, stars, galaxies, Metagalaxy. Information from World-2 on magnetic charges is transferred to World-3 and World-4 in the form of spin particles.

All mentioned Worlds are the branes of higher dimensional spaces. Consequently, all the Worlds are locked and have finite "volumes". World-2 is represented by a circle, World-3 is the surface of a three-dimensional volume, and World-4 is a three-dimensional surface of four-dimensional volume. The radiuses of all promoters of higher dimensions increase in proportion to time with the speed of light.

In addition, in all the worlds the mass of matter fills the entire space and increases with the same velocity, the same for all the Worlds:

$$\upsilon_m = \eta c^3/G = 1\cdot 10^{34}\text{kg/s}, \quad M_U = \frac{\eta c^3 T_U}{G}, \tag{1}$$

where $\eta = r_g/R_U = 0{,}0244$ – the parameter of the dilution of a substance that determines the ratio of the gravitational radius to the real radius of the Universe. In this case, the density of matter remains constant only in the World-2. In World-3, it depends inversely on time, and in the World-4 is inversely proportional to the square of time. The beginning of filling the World-4 occurs through $T_{Uo} = 3\cdot 10^{-5}$seconds. The initial density of matter does not exceed the density of the nuclear material. The substance produced was cold.

Unlike the model of the UMIE model described in [1], the standard model states that the Universe was created in the process of the Big Bang from a singular point, where the initial values of density, temperature and entropy were extremely high. In this case, the mass of matter in such a Universe is unchanged and does not fill the entire space, which in an implicit form has infinite dimensions. With a great initial velocity, the substance in such an entire world continues to run around. At some point in time after the Big Bang, the density of the plasma was so diminished that the light could dissipate from the plasma and adiabatically expand in the formed space. At this time, the remnants of this light are observed in the form of relic radiation.

In the initial moments after the Big Bang, the density of matter was large; therefore, an opportunity was created for the creation of black holes, the mass of which grew over time to accelerate the adsorption of matter (gas, dust, stars, and planets) from space. Continuing to adsorb substance effectively, such black holes have turned out to be quasars.

Since the new model of UMIE arose in connection with the large inappropriateness in the old model (the justification is given in [1]), in this article we discuss from the new positions known from astronomical studies facts about evolution, structure and properties of the Universe.

2. Part of the Universe Available for Study

Let's consider the problem for one-dimensional, two-dimensional and three-dimensional spaces in which the substance is formed. At the same time, let's take into account that one-dimensional space is represented by a brane of two-dimensional space. Accordingly, the two-dimensional space is a brane of three-dimensional space, and the three-dimensional space is a brane of a four-dimensional space (Fig. 1). In each case, the radius of brane expands with the speed of light.

In the case of one-dimensional space, a substance located at a distance S> R (angle α> 1 radian) will be invisible to the observer. The point for which S = R will move away from the observer at the speed of light. Consequently, an observer localized in this space will be able to see some of the substance

$\frac{2S}{2\pi R} = \frac{1}{\pi} = 0{,}3183,$ (31.83%).

Similarly, considering a brane of three-dimensional space (surface of a sphere), we find that an observer localized in this space will be able to see part of the substance of this space:

$$\frac{2\pi R^2(1 - cos\alpha)}{4\pi R^2} = 0.0731, (7.31\%).$$

In the case of a four-dimensional space, the volume of a three-dimensional surface can be found by the formula [2]:

$$V_3 = 2\pi^2 r_4^3 \tag{2}$$

By dividing the visible part of the volume of a three-dimensional surface into a full value of this volume, we find the value 0.0528, that is, 5.28%.

Let's take into account that one-dimensional space is represented by a closed line - a circle. The diameter of this line does not exceed Planck's length. The two-dimensional space is represented by a two-dimensional surface of a three-dimensional sphere (the surface thickness does not exceed Planck's length), and the three-dimensional space is a three-dimensional surface of a four-dimensional sphere.

Based on Fig. 1 it is possible to understand what part of matter in the relevant World can be studied by an observer. The radius of brane R increases with the speed of light. So the Universe is being developed. The distance between material particles (atoms, planets, stars, galaxies) collapses as a result of space expansion. However, there is an interaction between the material particles, which leads to the displacement of these particles in space, giving a small contribution to increasing the distances between the galaxies.

The observer moves from the center of the birth of the World (point O) along the radius R to point A. The arc, which is based on the angle α = 1 radian, increases its length, too, from the speed of light. Consequently, OB and OC radiuses of the brane determine the most distant areas that can be observed. In this case, the passage of light from the beginning of the radius OB to the end of the radius OA equals the lifetime of the Universe. If the brane is the surface of a three-dimensional sphere, then the radius OB describes the conical surface around the radius of the OA.

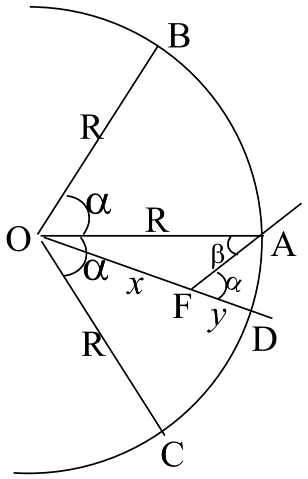

Fig1. *Influenced space model*

If the brane is a three-dimensional surface of a four-dimensional sphere, then the radius of the OD describes a four-dimensional conical surface around the radius of the OA.

Let's consider how the beam of light will pass from a source located at an arbitrary point F. This point moves along the radius OD. Exiting this point at an angle α = 1 radian to the radius of OD, the light will reach the observer, which is at point A. In this case

$$OF = x = R \cdot \frac{\sin\beta}{\sin\alpha} = cT_1,$$

and $0 \le \beta \le \alpha$; T_1 is the time from the creation of a light source to the moment of photon emission.

Distance FA, which passed the ray in space time

$$L_x = FA = R \cdot \frac{\sin(\alpha-\beta)}{\sin\alpha}.$$

The ratio of this distance to the arc S_x from point F to radius OA

$$\frac{L_x}{S_x} = \frac{FA}{x\cdot(\alpha-\beta)} = \frac{\sin(\alpha-\beta)}{(\alpha-\beta)\cdot\sin\alpha}. \quad (3)$$

The dependence of this relation on the magnitude of the angle β is given in Fig. 2.

By varying the magnitude of the angle β from 0 to α, we cover the entire array of galaxies available for observation. As follows from Fig. 2, the ratio of the path that passes through the photon in space-time to the distance it would have had in the event that the Universe was not inflated essentially depends on the magnitude of the β angle, that is, from the moment of illumination by the galaxy of the quantum of light. And only for relatively small distances this relation is close to unity.

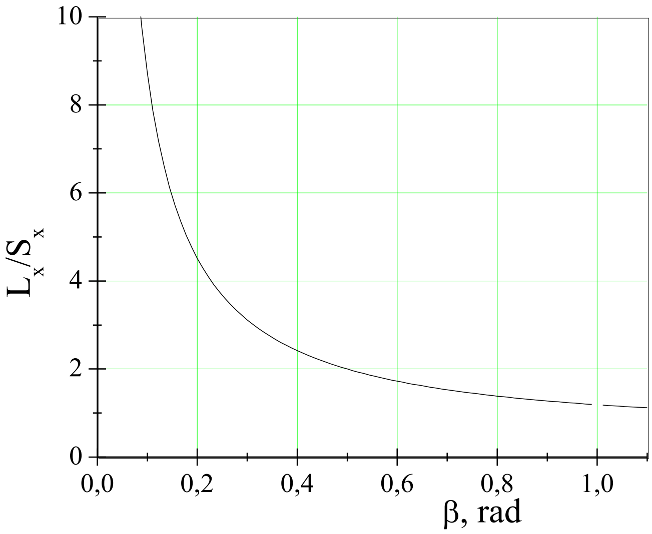

Fig2. *The ratio of the distance that the photon passes to the observer in space-time, to the distance along the arc of radius x*

Using the above calculations, we can find the position of galaxies in space-time, depending on the moment of radiation $t = x/c$. To do this, we set the perpendicular from point F (Fig. 1) to the vector OA and find the projection of X of the vector OF on OA and the distance Y from point F to OA:

$$X = x \cdot cos(\alpha - \beta) = R\frac{\sin\beta}{\sin\alpha}cos(\alpha - \beta)$$

$$Y = x \cdot sin(\alpha - \beta) = R\frac{\sin\beta}{\sin\alpha}sin(\alpha - \beta) \quad (4)$$

Figure 3 illustrates the dependence of Y on X, and hence the position of galaxies in space-time, depending on the moment of radiation.

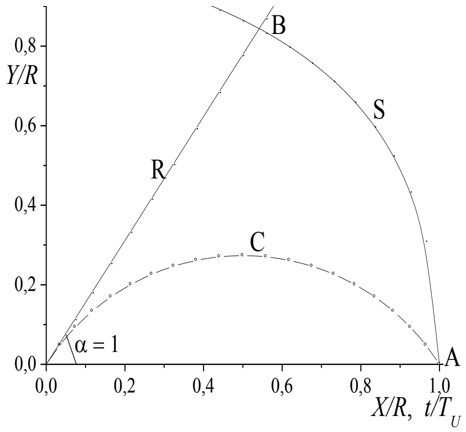

Fig3. *The position of galaxies in time-space (curve C), which are observed in astronomic studies*

In this case, it is necessary to take into account the known dependence: the flow of radiation energy of the star is proportional to the cube of its mass. And since the mass of the star increases in proportion to the time of its existence, it is clear that in the first billion years after the birth of the Universe, the luminosity of the stars was more than 1000 times smaller than in our time. Consequently, this period is not available for observation. A major problem is the observation of the stars, even after 2 billion years after birth.

It is clear that the curve C, rotating around the radius of the OA, in the World-3 and World-4 forms the surface of the galactic localization in time-space at the moment of light emission, which we can register today.

3. AVERAGE DENSITY OF MATTER IN THE UNIVERSE

In the Standard Model for Creating the Universe, the galaxies have virtually unchanged masses. In addition, although they say about the bloating of the Universe, it is often understood not as an increase in the radius of brane, but as the spread of matter after the Big Bang. In the new model we will consider as an increase in the mass of matter in proportion to the time and existence, and extending the radius of the brane in proportion to time [1].

Since astronomical studies capture the radiation of galaxies in the distant past, when their mass was significantly less than modern, the averaged density of the matter will be significantly lowered compared to the real size that exists at the present time. The part of the mass that can be seen in the Worlds of varying dimensions can be found using the formula:

$$\frac{M_a}{M_U} = \frac{1}{T_U^n}\int_0^{T_U}(T_U - t)^{n-2}t dt\,, \tag{5}$$

where $M_a = \sum m_a$ – is the mass observed in the studies, n is the dimension of the space whose brane is World-n. For one-dimensional World-2, half the mass will be observed within the angle ±1 radian. For the two-dimensional World-3, this value will be 1/6, and for our three-dimensional World-4 - 1/12.

We obtain this result for a strictly homogeneous distribution of matter in the corresponding spaces. Apparently, such a division is typical for World-2 and World-3. In our same space, where conditions for the formation of planets, stars, galaxies and Metagalaxy are created, the homogeneity of the distribution of matter is not possible. Therefore, the value found 1/12, that is, 8.33%, can only be approximated. However, this magnitude is quite close to that found in astronomical studies of the density of matter in the Universe, which is approximately 5% of the critical.

Consequently, we can assume that the resulted calculation explains the cause of what will be found experimentally, the average density of matter in the Universe is significantly less critical. Thus, the conclusion drawn by V. Kulish on the basis of the consideration of the Universe as a hierarchical structure [3] and that our Universe is closed is confirmed. And since the results presented simultaneously confirm that our Universe is a brane of four-dimensional space, and then automatically follows the conclusion of its closeness.

4. Accelerating expansion of the Universe

Using Standard Model principles, and taking into account the acceleration of the dispersal of galaxies, astrophysicists decided that there is an unknown dark matter and dark energy that fill space and accelerate its infiltration. The author of this article is surprised that physicists, with the available knowledge of material objects, have such a superstition. On the basis of this, for them became the usual false view of matter in the Universe and they have come to such an absurd in their reflections.

However, there is an idea in the scientific circles that acceleration of the expansion of the Universe may be due to the nonzero magnitude of the cosmological constant Λ [4] introduced by A. Einstein in the general theory of relativity (GTR). In the GTR for the years of its existence, the physical content of this constant has remained unclear to the end and therefore in most calculationsit is taken to be zero. And all this despite the fact that in the monograph Gerlovin [2] describes in detail the theory that exhaustively reveals the physical nature of the Λ-member. In this connection, we will have to briefly discuss the theory of the fundamental field (TFF) of Gerlovin.

The fundamentals of mathematical formulation of the law of trinity (LT) are discovered by A. Einstein and are the basis of the general theory of relativity (GTR). In formulating GTR A. Einstein recorded the basic equation of the theory as follows:

$$R_{\mu\nu} - \frac{1}{2}g_{\mu\nu}(R - 2\Lambda) = \frac{8\pi G}{c^4}T_{\mu\nu}. \tag{6}$$

Subsequently, they began to treat GTR as a theory of gravity, and this equation as a gravitational field equation. However, there were also vivid exceptions to this rule. In particular, in [5-10], the question was seriously debated whether the Einstein equation is an equation of a gravitational field in general. All this suggests that Einstein's equations are neither an equation of the field of gravitation nor a physical field equation in general. Therefore, in the TFF, it is assumed that the following sum of the known theoretical and experimental data corresponds to the following interpretation of the law by A. Einstein: This is only the law of trinity (LT) of space-time-substance. This law is obligatory for all types of physical fields, including, of course, and for the gravitational field, but the field equation is not this law. This law also asserts that there can be no space without time and matter.

Gerlovin applied this equation to all layers of the multi-fiberspace and showed that with its use it is possible to describe all the known properties of elementary particles without introducing the parameters of the theory and additional postulates and to predict the existence of not yet covered particles.

In carrying out researches of the fundamental field Gerlovin considered the mapping of points in two adjacent subspaces of the layered space (spatial meta-morphosis). At the same time, when solving the equation LT through the Λ-member, the mass or charge of the particles was not localized in the finite, and even less in the small volume.

When the solution of the equation is made for the case $\Lambda = 0$, Gerlovin found that the charges and masses had point (singular) form, and the space around them had zero values of the density of charge and mass. Hence, the Λ-member characterizes the distribution of mass and charge throughout the space. Such a division does not allow them to be localized in a finite volume, beyond which there is no charge or mass.

It turned out that the value of the Λ-term is different in different layers of the layered space. In particular, in our Universe its value is $2.7958473 \cdot 10^{-56}$cm^{-2}.

If $\Lambda \neq 0$, then for a closed Universe with radius r_U (we use the notation from work [2]) we obtain:

$$r_U = \Lambda^{-1/2} \tag{7}$$

and

$$\Lambda = \frac{4\pi\gamma\rho}{c^2}, \tag{8}$$

where ρ is the density of matter of the Universe.

For the mass of a closed Universe (the brane of a four-dimensional space) we have

$$m = \frac{\sqrt{\pi}c^3}{4\sqrt{\gamma^3\rho}} \tag{9}$$

In addition, for the mean value of the density of a closed Universe equals to

$$\rho = \frac{m}{2\pi^2 r_{\mathrm{U}}^3} \tag{10}$$

It is interesting that from the last two formulas it follows that the mass of matter in the Universe is proportional to the radius of a four-dimensional space. This result corresponds to the data of work [1]. Since the magnitude of the radius of the Universe increases with time, then the value of the Λ-term for the Universe should decrease.

Thus, the Λ - member characterizes the distribution of mass and charge of particles throughout the space. In particular, for the distribution of potential found

$$\varphi = \frac{q}{r} \cdot \exp\left(-\frac{R}{r}\right), \tag{11}$$

where

$$R = \frac{\hbar}{mc}. \tag{12}$$

Dependence (11) shows that it does not allow infinity for $r \to 0$. A similar result is obtained for the spatial dependence of the electric field intensity and the distribution of the electric charge density.

The information provided here gives rise to the researchers of the accelerated expansion of the Universe to continue their research provided $\Lambda \neq 0$.

5. INFLUENCE OF GRAVITATION ON THE REDSHIFT IN THE GALACTIC RADIATION SPECTRUM

The expansion of the Universe is a phenomenon that consists of an almost homogeneous and isotropic expansion of outer space on the scale of the entire Universe. Experimentally, the expansion of the Universe is observed in the form of the implementation of the law of Hubble. Theoretically, the phenomenon was predicted and substantiated by A. Friedman at an early stage in the development of a general theory of relativity from general philosophical considerations about the homogeneity and isotropy of the Universe.

In 1929, based on the observations of the redshift in the spectra of the emission of galaxies, the American astronomer Edwin Hubble formulated the law: the velocities of the collisional distance of the galaxies increase in proportion to the distance between them: $\upsilon = H\cdot r$. This law is called the law of Hubble. Permanent Hubble is now taken equal to H = 73.8 km/s/Mpc [11]. Close results are obtained with the help of WMAP and Plank devices.

The value of the redshift is characterized by the z parameter

$$z = \frac{\lambda - \lambda_0}{\lambda_0} = \frac{\nu_0 - \nu}{\nu} = \sqrt{\frac{1+\upsilon/\tilde{n}}{1-\upsilon/\tilde{n}}} - 1. \tag{13}$$

where the magnitudes λ_o and ν_o are the wavelengths and the radiation frequency of atoms (for example, hydrogen) in the laboratory on Earth.

If the velocity of the galaxy rotation is non-relativistic, then the formula is simplified

$$z = \upsilon/c \tag{14}$$

or

$$\upsilon = cz = H\cdot r \tag{15}$$

It should be mentionedin mind that the relative velocity makes sense and can be found only in the plane space-time, or in a sufficiently small area of distorted space-time. Therefore, for large z no longer says the distance to the galaxy, but is limited to z. These quantities for quasars reach several units (there are reports of quasars UDFy-38135539 with z = 8.5549 and UDFj-39546284 for which z = 11.8 ± 0.3 [12]).

The evolution of the views of humanity at the center of the Universe was the stage of geocentrism and heliocentrism. Finally, the discovery of galaxies and their dispersal led to an understanding that the center of the Universe does not exist. This is understandable if we consider the Universe to be a three-dimensional surface of four-dimensional volume. An analog is the two-dimensional surface of the Earth around its three-dimensional volume. In this case, no point on the Earth's surface can be considered its center. However, when considering the tasks in the coordinate system of the experimenter, its position can be considered as the origin of the coordinates, that is, the chosen center. Similarly, in the Universe, the chosen center can be considered a galaxy that emits a quantum of light that reaches the earth's observer. In this case, Hubble's law on the speed of receding galaxies can be interpreted as an extension of space. It is now believed that the speed of receding galaxies is a consequence of the Big Bang.

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:

$$\rho_{cr} = \frac{3H^2}{8\pi G} \tag{16}$$

Substituting the value of H = 73.8 km/s/Mpc = $0.755\cdot10^{-10}$ years^{-1} = $2.392\cdot10^{-18}$ s^{-1} [11] we find: ρ_{cr} = $1\cdot10^{-26}$ kg/m^3 = $1\cdot10^{-29}$ g/cm^3.

In formula (16) all parameters are known. Therefore, the density of matter should be equal to ρ_{cr}. Probably, the experts who develop the Standard Model do not trust the formula (16), but because they discuss different variants of the behavior of the Universe related to its density. The non-observance of the values ρ and ρ_{cr} was supposed to force the specialists to change the model of the creation of the Universe.

According to the Standard Model, if the real density is $\rho < \rho_{cr}$, then the total energy (the sum of the potential energy of the interaction of a particle with mass m contained inside a surface with radius *r* and the kinetic energy of this particle) will be greater than zero. Such a Universe must-infinitely expand. In the case where $\rho > \rho_{cr}$ is the total energy $E < 0$, the galactic system is connected. In this case, the extension should be replaced at a time with compression.

It should be noted at the same time that such a discussion shows that the Universe must have a much larger volume than the substance occupies. It is clear that this view contradicts Einstein's Law of Trinity.

It is clear that in the model, where the Universe is a brane of four-dimensional space, it is always closed.

In all theories of the speed of receding galaxies it is assumed that the influence of gravity on this process is minor [13]. We will try to analyze this influence and make proper conclusions.

Consequently, we will consider the point of radiation of the quantum of light by the center for the calculations and see how the frequency of this quantum will change with the distance.

As the distance from the radiation point increases, gravitational interaction with the quantum of light includes new areas of space. If the distance from the point of radiation is denoted by *r*, then the mass of the substance will be in the volume:

$$M(r)=\frac{4}{3}\pi\rho\, r^{3} \tag{17}$$

The density of matter from the moment of radiation T_1 from the birth of the Universe decreases with time

$$\rho=\frac{3M_U}{4\pi R_U^3}=\frac{3\eta}{4\pi G(T_1+t)^2}=\frac{3\cdot 0{,}0244}{4\pi G(T_1+t)^2}\ , \tag{18}$$

where t - time deducted from the moment of light emission T_1. In formula (17) $r = ct$.

Changing the potential energy of a photon by increasing the distance to $dr = cdt$ will be:

$$dU=\frac{GmM(r)}{r^2}dr=\frac{h\nu}{(T_1+t)^2}\cdot\eta\cdot tdt=-d(h\nu) \tag{19}$$

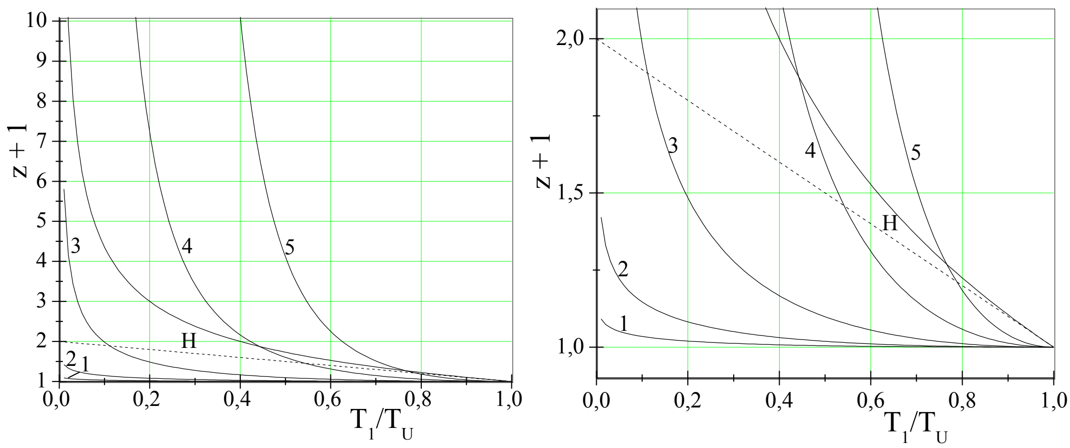

Fig4. *The dependence of the magnitude of the redshift from the moment of galactic radiation due to the Hubble's law (H, the solid curve according to formula (13), the dotted line with formula (14)) and the influence of gravity, depending on the average density of matter in the Universe (1 - $\rho = 0.05\,\rho_{cr}$, 2 - $\rho = 0.2\,\rho_{cr}$, 3 - $\rho = \rho_{cr}$, 4 - $\rho = 5\,\rho_{cr}$, 5 - $15\,\rho_{cr}$).*

We integrate this expression:

$$\int_0^{T_U-T_1}\frac{\eta}{(T_1+t)^2}\cdot tdt=-\int_{\nu_0}^{\nu}\frac{d\nu}{\nu} \tag{20}$$

We'll get it:

$$\ln\left(\frac{\nu_0}{\nu}\right) = \eta \cdot [-\ln(x) + x - 1], \quad x = \frac{T_1}{T_U}. \tag{21}$$

So,

$$z + 1 = \frac{\nu_0}{\nu} = \left(\frac{\mathrm{T_U}}{\mathrm{T_1}}\right)^{\eta} \exp\left(-\eta \cdot \left(1 - \frac{\mathrm{T_1}}{\mathrm{T_U}}\right)\right). \tag{22}$$

Let's estimate the value of the right-hand side for 1 Mpc, assuming that $\rho = \rho_{cr} = 1\cdot10^{-26}$ kg/m^3. Since 1 Mpc = $3.0857\cdot10^{22}$ m, then the time for which the photon will overcome this distance is 3259400 years. From here

$$x = \mathrm{T_1}/\mathrm{T_U} = 1 - \frac{3.2594 \cdot 10^6}{12.25 \cdot 10^9} = 1 - 2.66 \cdot 10^{-4} = 0.999734$$

$$z = 8.63\cdot10^{-10}. \tag{23}$$

It is clear that such a z-value will be invisible in the Hubble's law. However, at distances exceeding $cT_U/2$ (or even closer), the effect of gravitational interaction on the redshift will prevail.

It is necessary from the outset to draw attention to the fact that astrophysicists adopted the beliefs of Friedman's postulates, according to which 1) the Universe is isotropic in three-dimensional space; 2) The Universe is homogeneous in a three-dimensional space. In this case, the second postulate is considered to be fulfilled, since it is considered the exact law of Hubble, expressed by the formula: $\upsilon = Hr$, for which H = const. In fact, the Hubble's formula is approximate, which is logical, given the non-homogeneity of the Universe over long distances.

Therefore, there may arise areas of the Universe, where a large cluster of galactic with a large average density of a localized. The heterogeneity of the distribution of the temperature of residual radiation at angular coordinates has been experimentally found due to the heterogeneous distribution of matter on a large scale of the Universe (see the results of WMAP [14]).

And now the question arises: what is the average density of the Universe? From the above calculations, we can conclude that it provides only a partial openness of the Universe, which follows from the hierarchical structure of the Universe [3].

Let's take into account the fact that galaxies in the Universe are heterogeneous. If in some region of the Universe the value is $\rho = 5\cdot\rho_{cr}$, then the gravitational displacement at a distance of order 3 Gpc will significantly exceed the displacement due to the Hubble's effect. We have this effect when observing the spectral displacement of quasar radiation. Consequently, they are much closer than the estimates made in the literature.

Here we have suggested the essential heterogeneity of the mass distribution in the Universe. The results of astronomical observations really confirm that this is the case.

Thus, we have seen that there is no reason to ignore the effect of the gravitational field on the effect of galaxies receding. On the one hand, such an effect must necessarily exist for remote galaxies, since, at small values of T_U, the density of matter in the Universe was significantly higher than in our time.

Scientific literature has a lot of information about the cellular structure of the Universe, which can be found in scientific articles and even on Wikipedia. This structure appears on scales less than 100 Mpc. Therefore, it is believed that on a large scale the Universe is in the middle of it a homogeneous, that is, a cube with a side of more than 100 Mpc in an arbitrary place of the Universe, mixes approximately the same number of galaxies and the same mass. However, it turned out that in the Universe there are void with dimensions of more than 1 Gpc [15,16], that is, the homogeneity of the Universe on a large scale is absent. And from here it follows that there are areas of the Universe with a significantly increased density of matter, where quasars can exist. This existence is facilitated by the high density of matter in the vicinity of quasars.

6. QUASARS

Assuming that the space is uniformly filled with galaxies, as it is stated in the Standard Model, we must see black holes in the center of the galaxies visible to the Earth's observer, regardless of the distance to them. However, no black holes within 3 Gpc reveal the properties attributed to the quasars.

Paying attention to the magnitude z, which characterizes the redshift of the spectrum of galactic radiation, astronomers have decided that it is an active black hole that appeared more than 12 billion years ago, that is, when the Universe was created [17,18]. According to modern notions of quasars, it is probably the result of substance accretion on supermassive black holes in the nuclei of distant galaxies. At the same time, scientists assume that supermassive black holes are present in all massive galaxies, but only a small amount absorbs large volumes of matter and, as a consequence, are quasars. When the whole substance (gas and dust) around the black hole is absorbed, then the quasar stops radiation and turns into a normal galaxy.

Such a mechanism for the emergence of quasars was proposed to explain the presence of quasars only in the distant past, despite the fact that large thick clouds of space gas and dust are observed in our time.

The described mechanism of the existence of quasars and an explanation of their radiation raises a number of objections. In particular, what causes large volumes of space gas and dust to fall for a long time into a black hole? The absorption of dust and stars by black holes exists in our time, however, at this moment the black hole does not become a quasar.

Proceeding from the mechanism of the birth and evolution of the Universe with minimal initial entropy [1], we can conclude that in the early days of the Universe (more than 12 billion years ago) black holes could not exist. What caused a large cosmological displacement of the spectrum of quasar radiation? And finally, why are large compact groups of quasars [19], whose existence violates the well-known cosmological principle according to which the Universe is on a large scale homogeneous, so that an observer should see on average one and the same picture in an arbitrary area of space?

One can answer all these questions: quasars are active galaxies, located in the region of a significantly increased galaxy density. As follows from Fig. 4, quasars can exist in real-time moments of time-space $T_1 \sim 0.4 \cdot T_U$. In this case, enough time has taken for the formation of massive and active galaxies that have pulled off other galaxies, significantly increasing the heterogeneity of their placement in space. Assuming that $T_U = 13.25 \cdot 10^9$ years [1], we find $T_1 \sim 5.3 \cdot 10^9$ years. Consequently, quasars are distant from us for about 8 billion years, and given the significant heterogeneity in the distribution of galaxies in the Universe, this distance can be $(4 \div 6) \cdot 10^9$ years. It follows that the true intensity of quasar radiation is significantly less than researchers believe in our time.

7. RELIC RADIATION

The interpretation of electromagnetic radiation, which corresponds to the radiation of an absolutely black body, with a temperature of -270,425 °C (2,725 K), is based on the Standard Model of the Universe's Birth. According to this model, the hot plasma at the first moments after the birth of the Universe was very dense, so that electromagnetic radiation could not go beyond its limits. In the process of expanding the Universe, the photons were able to dissipate from the plasma and expand adiabatically in space. In this case, the radiation continued to be characterized by the temperature of an absolutely black body and evenly fill the space. Since the appearance of this radiation is associated with the Big Bang, its temperature should not depend on the direction of propagation. However, the WMAP study showed that radiations with a slightly higher temperature range from the galactic cluster, and from an empty space - with a lowered temperature. That is, radiation is in some way related to the distribution of matter in space.

Another point of view on relic radiation is the vision of Gerlovin [2], who believed that it was associated with the radiation of the excited neutrino vacuum. However, in this case, the radiation spectrum and its temperature should be constant in all directions.

Based on the model of the UMIE, it is clear that the initial stage, which led to the separation of electromagnetic radiation from the dense plasma and the creation of relic radiation, could never appear due to several reasons. First, there was no hot plasma. Consequently, radiation could not be formed. Secondly, the three-dimensional volume of the four-dimensional brane has finite dimensions. Therefore, the electromagnetic radiation is not possible to expand indefinitely.

The author in his article [20], based on the law of similarity in the Universe, set out his point of view on relic radiation. The calculation of the energy that stars could excite during the existence of the Universe has shown that it is equivalent to the radiation of an absolutely black body, the temperature of which equals 22 K. Therefore, there must be an excess of energy in the Universe. In addition, a source of energy is needed, which would provide a constant radiation emitting power of the stars. It is clear that the burning mass of stars can not ensure the sustainability of their radiation. In particular, the Sun could have lasted only a few tens of millions of years, contrary to the geological data of the Earth, which require that the radiating power of the Sun be kept almost constant for billions of years. Therefore, it is concluded in [21] that any star emits as much energy as it enters from outside, performing only the role of a machine for converting energy. Moreover, it follows from the work [21] that the problem of the glow of stars is a partial case of a general problem - why in the Universe there are no equilibrium states?

Many cyclical processes are taken place in nature. For example, the water cycle on Earth. Consequently, we have a permanent source of water in the upper reaches of the rivers, which supplies rivers that carry water to the seas. Similarly, the cycle of energy flows during excitation and radiation of molecular systems [20, 22].

Similarly, there should be in the Universe, where stars emit energy, filling it with space. There must be an interaction that translates this energy to a higher level, from where it passes into massive bodies (stars, planets). So the complete cycle is closed. Consequently, the lifetime of a photon in the Universe should be limited. Since the volume occupied by massive bodies is very small, there must be a significant surplus of energy at the highest level to provide the stars with sufficient energy. As a result, the energy in our space is significantly lowered, which corresponds to the registered radiation. An important detail of the radiation described by the Universe is that it should correlate with the density of matter in the Universe.

8. Conclusions

On the basis of theoretical studies of the evolution of the Universe in the model of the Universe with minimal initial entropy, the following is shown:

1. Our Universe is part of the Super-Universe represented by a layered (multi-fiber) space. All layers of the multi-fiber space are the brane of spaces of higher dimensions.
2. The radiuses of spaces of higher dimensions increase with the speed of light. This fact makes it possible to observe galaxies localized within the space-time cone with an inverted angle of 1 radian. In one-dimensional space, this will only allow observation of particles in the range of 31.83%. In the case of a two-dimensional space, this part will be 7.31% and in our three-dimensional space 5.28%.
3. The dependence of the mass and position of galaxies in space-time from the moment of radiation was found. This dependence explains the cause of the underestimated mass of matter in the Universe, found in astronomical studies.
4. It is shown that from the astronomical studies of the Universe one can find the magnitude of the density of matter in the Universe, which does not exceed 1/12 of the real density.
5. The results of the above studies show that our Universe is closed because there is a brane of four-dimensional space.
6. The article contains information on the physical content of the cosmological constant Λ discovered by Gerlovin.
7. Under the condition of homogeneous placement of matter in the Universe at a distance ~8billionlight years, the gravitational component of the Hubble'slaw exceeds the effect of the expansion of the Universe.
8. The real heterogeneity in the placement of matter in the Universe will substantially increase the contribution of gravity to the effect of Hubble. The redshift in the spectrum of quasar radiation is due to the influence of gravity in regions of high density of matter. The distance to them may be several times smaller ($4 \div 6$ billion light years) than in the literature.

9. In the first few billion light years black holes could not be. The increase in mass of stars and their accumulation provided the creation of black holes. This fact explains the presence of a cluster of quasars and the absence of quasars in other large areas of the sky.

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