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"Eternal Motion" as a "Form of Movement of a Special Nature" and the Main Condition for the Creation of the Universe

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Abstract

The article hypothesizes that DE and DM (UCM) are a "Form of Motion of a Special Nature", where "Form of Motion" means "Eternal Motion" as the power of dynamics of different levels and varying degrees of self-sufficiency, and by "Special Nature", gravitational and two other properties of matter, "tied" to the "Eternal Movement" and completely dependent on it. Carriers of key properties of a "Special Nature" have been established: "0"-DE particles and "3"-DM particles (UDM). The unity of their inherent "motionally-gravitational" properties and the peculiarity of the relationship between "motion" and "gravity" are revealed: the higher the intensity of "Eternal Motion", the stronger the gravitational properties of matter are manifested (and vice versa). The relationship of "time" with the "vibration frequency" and the "mass" of photons with the "degree of bonding and deformation properties of the field" is shown. The maximum level of gravity has been determined, which allows Nature to successfully create the Universe: such a landmark is the proximity to the property of the Primary Source—the "pure graviton" of the O_{SP} space, the most powerful "motionally-gravitational" particle of the Universe. The reasons for the emergence of such an identity of the gravitational properties of particles with the indicators of a "pure graviton" are established: for "0"-DE particles, this is the acquisition of the function of "freedom of movement"; for "3"-DM particles (UDM), the creation of a special structure—a "double field" ("Main" and "Small"). The presence in the "double field" of specific "tools" for the creation of the worlds of the Universe—gravitational "waves" gives rise to impulses (shocks) of varying intensity and shape. A list of functions performed by "waves" in the "Main" and "Small" fields has been compiled. The specific conditions for the formation of "UDM Streams", their transformation into a "Vortex" and, under the influence of a powerful Initial Impulse (push), sending them to the "place" of the creation

of galaxies, are shown. It is suggested that there is a "Cycle of Matter in Nature" in the closed structure of our Universe due to the "work" of "waves" and the functioning of special "factories" in the form of exotic space objects—Black holes.

Keywords

DE, DM (UCM), Graviton, Eternal motion, Double Field of the Universe, Motionally-Gravitational Particles, Degree of Self-Sufficiency, Main Field, Small Field, Gravitational Waves, Primary Impulse, Flows UDM, Vortex, Time, Massive Photons, Clumps of DM, Movement of Galaxies, Factories of Black Holes, Circulation of Matter in Nature

1. Introduction

According to our concept presented in previous articles [1]-[6], the Universe is built by two types of Universal Cosmic Matter (UCM):

- dark energy (DE), consisting of a double Shell of the Universe with a Field of "0-strings" ("+", "0", "−"); ("−", "0", "+") and the three spheres of the Relic ("0"), ("+"), ("−");
- dark matter (DM), which includes matter of 6 types, but 3 different levels: matter of the Higher World—Integration (Unified) Dark Matter/UDM 3(1,2), 3(2,1)/; The Middle World—Creative Dark Matter/CDM 1(3,2), 1(2,3)/; and the Lower World—Intelligent Dark Matter/IDM 2(3,1), 2(1,3)/[1].

Now, continuing to study the processes of creation of the Universe within the framework of this Concept, we have tried to deal with individual (key) parts of this whole even more biased. We are talking about the following problems:

- we talked about the Ethers of the 1st and 2nd types [6], which arose as a result of the transformation of Chaos into Order [2] after 2 different events: the functioning of the Black–and-White Hole (B-WH) of the O_{SP} space (with the formation of the substance "0", "+", "−"), and the Big Bang (BB) 30% of the same substance (but with the formation of "seeds of creation" "3", "2", "1") [3] [4]. At the same time, restoring Order meant sending to special "places"—3 Spheres Relict [2] [3] separate groups of particles of the Substance, and, thereby, their transformation into Ethers of the 1st or 2nd type [6], and subsequently into triads of 2 types of UCM—DE and DM [1]. But how did this process happen? What served as a smart, viable "tool" to achieve these goals? After all, if we imagine the vastness of the Universe, an unimaginable number of invisible, chaotically and rapidly moving particles of the first three types—"0", "+", "−", and then joining them immediately after the BB (Big Bang) particles "3", "2", and "1", it is difficult even to imagine a "tool" that could accomplish such a difficult task;

[1]DE (Dark Energy); DM (Dark Matter); UCM (Universal Cosmic Matter); ITM satisfies to UDM (Unifying Dark Matter); TTM satisfies to CDM (Creative Dark Matter); RTM satisfies to IDM (Intelligent Dark Matter).

- how did the early Universe solve issues related to Primary (and not only) impulses (shocks) [2] [3] [6], without which it is impossible to imagine the processes of transformation of energies (and hence the creation of matter) of different worlds? In which places of the universe did such Impulses originate, of what matter did they consist, what shape could they have, how did they function?
- our previous studies have revealed the crucial role of participation in the construction of the worlds of the Universe of the "gluing-deformation" properties inherent in the "0" particles of DE and "3" particles of DM, and were, respectively, the 2nd and 3rd generations of the First of the three "rings" of Borromeo O_{SP} space (according to our terminology—"Graviton") [3] [4] [5] [6]. However, it remained unclear exactly how the gravity inherent in the "Graviton" could be repeated with the same power in the Particles of the Lower Worlds? After all, this categorically contradicts both the principle of the hierarchy of worlds postulated by us, and the condition of reducing the properties of matter in each subsequent world compared to the previous one [2]. At the same time, it seems obvious that, without such an exception to the general rule, the creation of the Universe would be impossible, which means that it is necessary to find a reasonable explanation for the existence of a "Phenomenon" actually operating in its vastness—a powerful gravitational super force thanks of whom the "atoms"—the "bricks" of the "building" itself, are firmly glued together "The Universe and "atoms"—the "bricks" of stars, planets and other space objects;
- it was not completely clear why the practically stationary "Graviton" of the O_{SP} space [3] [4], having turned into a "0"-a particle of the DE of the neighboring, but located below, world, suddenly acquired fantastic speeds—"Eternal Motion"? Even more surprising and inexplicable was the preservation of the same highest level of "Eternal Motion" in DM (UDM), which, according to our concept [1]-[6], has already built a visible world. It was important to figure out in which "additional functions" or in which "special structures" of the early Universe there could be "sources of power" that created the prerequisites for the irreversible growth of the dynamics of DE and DM (UDM), which we called "Eternal Motion". And how could maintaining the highest level of dynamics affect other properties of DE and DM matter, especially the "gluing-deformation" properties?
- science has established that photons (in the narrow sense—light) they have no mass (weight). We tried to show that in the Universe the overwhelming number of photons has mass (weight) if they create gravitational fields from DE and DM;[2]
- if we assume that our hypothesis about the structure of the "building" of the Universe is correct and it really consists of two structures—the Upper sphere

[2]In this case, we are not talking about Maxwell's electrodynamics, but about a more general theory, in the spirit of the Proca equations, which are invariant with respect to a more general group than the Lorentz or Poincare group.

of "0" particles and the Field of the Universe of "0" strings [5] [6], the question arises: why a structure where both fields are superimposed on each other (interact with each other, which means they form a kind of double force), did the Universe need it?

- earlier [2] [3] [6] we expressed the idea that the flow of UDM, with the monstrous effect of spin, twisting, forming a single powerful structure—an unimaginably huge, long, bizarrely curved, shining "vortex rod", following the information recorded in its Code, stops at a certain "place" of the Universe and creates the galaxy. At the same time, we emphasized that due to the "Eternal Motion" and the incomprehensible rotation speed of the end of the "Vortex", it is compacted to unimaginable limits, creating the "core" of the future galaxy. But one day there comes a moment when the matter of the Stream, constantly and under tremendous pressure, enters the very center ("core"). The Ray of Creation suddenly begins to scatter in all directions, thinning to a diffuse concentration. This is how the stage of Star Creation begins, first in circles close to the galactic center (large, massive, voluminous), and then in its outer regions, where younger, less voluminous and massive objects are created. After performing a number of calculations, we tried to test the viability of this hypothesis;
- putting forward, within the framework of our concept, a hypothesis about the functioning of BH, Einstein-Rosen transitions and other exotic objects [3] [4] [5] [6], we could not help but wonder: how does the closed system of our Universe, which has existed for the 2nd dozen billion years and at the same time constantly creating new objects, solve the problem of providing primary construction "raw materials"-"elementary particles"? In our opinion, the solution to this problem could be implemented only with the participation of B-WH, as specific "factories", the main structures in the system of the "cycle" of cosmic matter in the nature of the Universe.

The article is organized as follows: After a brief introduction, in the second section of the article we consider the features of the concept of "Eternal motion" introduced by us and its physical consequences. In addition, we investigate the influence of DE on the formation of localized bound states of matter and the formation of its breathing modes.

In the third section of the article, we consider the "Main" and "Small" fields and gravitation "waves" of DE introduced by us as the main "Tools" for the creation of large-scale structures in the Universe and in addition we discuss the mechanism of the circulation of matter in it. We have investigated inhomogeneous cosmological models in the ultrarelativistic limit, constructed using a complete set of invariants of the Riemann tensor. We also investigated the influence of DE in these inhomogeneous cosmological models, expressing the spatial scale factor through the matter heterogeneity parameter forming these models.

At the end of the article, we discuss obtained results and formulate final conclusions.

2. "Eternal Motion" as Key Property of the DE and DM and Unity of "Eternal Motion" with "Gravity"

If we take as a basis the indisputable fact of the existence of visible and invisible worlds of the Universe, it is important to understand why, first of all, the property of "invisibility" of cosmic matter turned out to be in demand for their construction. After all, 5% of baryonic matter against the background of 95% of the rest, that is, invisible matter, cannot but suggest the idea of the tip of the "iceberg", somehow closely related to its invisible, "underwater" part. According to our concept, DE and DM are not a substance, not a chemical substance, but a "form of motion of a special nature" ("Eternal Motion") that makes cosmic matter invisible.

Why do we consider "Eternal Motion" to be the main property of DE and DM? We know that in order for an event (phenomenon) to occur at point "B" of outer space, energy with certain properties must be directed from point "A" to point "B" with the help of an Impulse ("push"). Only in this case, at point "B", under the influence of new environmental conditions that differ from the environmental conditions at point "A", a process of energy transformation can occur, leading to the birth of matter of a new quality with new energy properties [6]. Therefore, it can be assumed that the most important condition for the successful functioning of cosmic matter is its ability to generate Primary impulses ("shocks") of such intensity that could create vibrations of the required frequency in the space of the Universe for a long period of time. In short, we can say: "There are sources of the most powerful impulses ("shocks"), there are processes of creation of the Universe. If there were no such a Primordial Mover, it would be impossible to create a Universe."

But what if "space" is a completely vast, incomprehensible expanse? If any impulse ("push"), even monstrously powerful, taking into account cosmic distance, should one day certainly close both its strength and its direction? [2] [3] This is especially true for Descending vibrations [2], in which the manifestations of events change from more intentional and flexible to more mechanical and frozen. But then the question arises, thanks to what the universe has been for 13.8 billion years. How long has it been possible to maintain its fantastic speeds, which we have called "Eternal Motion", at the proper level? In our concept [1]-[6] we tried to answer these questions as follows.

Firstly, the very Nature of cosmic matter ("0"-the DE particle and "3"-the DM particle) has a special force, a special form of "form of motion", that is, "Eternal Motion", responsible for the guaranteed movement and delivery of matter from point "A" to point "B" in within one world or another. Without "Eternal Motion", and properties (forces) inherent in DE and DM would be helpless and useless. The personification of "Eternal Motion" in UCM is the "Spin" of the highest degree.

Secondly, the Universe has special cosmic structures [6] responsible for creating additional shocks—"Transitions" that allow to overcome the Intervals [2] of

the decaying Primary impulse, and therefore maintain a state of "Eternal Motion".

But is it only "Eternal Motion" that should be considered a key function of DE and DM? The last two words ("Of a Special Nature") in the above-mentioned phrase—"The Form of Motion of a Special Nature"—suggests the presence of a "0" particle and a "3" particle (in addition to the function of "Eternal Motion"), the second most important property—"Gravity". The power of the properties of Gravity DE and DM increases many times when it works in tandem with "Eternal Motion", merging together with its "Spin". And the higher the level of "Eternal Motion", the stronger the manifestation of the properties of gluing and deformation of the UCM.

It is also important to note that it is these 2 key properties ("Eternal Motion" and "Gravity") that allow two other properties of a "Special Nature" accompanying the key ones to manifest themselves in "0"-DE particles and "3"-DM particles. This is a skill:

- to create (establish) "time" as one of the properties of the "motion" function; time is a different frequency of vibration of matter of different levels and different properties. This is a Rhythm, this is the interval between waves formed by vibration; the rarer the Rhythm (the wider the Interval between waves), the longer the time embedded in this matter. The complete absence of an Interval, due to the highest frequency of vibration, indicates timelessness;
- to create powerful gravitational fields emitting photons of bright, all-pervading, eternally existing, indestructible "light". It is the photons emitted by the gravitational fields of the UCM (DE and DM) that have mass, weight (unlike photons residing in electromagnetic fields). They need mass to perform the functions of a "particle" and a "wave", that is, to perform "work".
- In order to prevent the use of inaccurate terms from further leading us to a wrong perception of the essence of phenomena occurring in the Universe, we consider it important at this stage to fix the correct (from our point of view) emphasis in the nature of cosmic matter, grouping and formulating its properties as follows.

1) Particles "0" DE and "3" DM are the personification of the "motionally-gravitational" ability, where: the "motor" ability, thanks to the all-powerful "Spin", generates the function of "Eternal Motion" and unhindered delivery to all corners of the Universe of 3 properties of matter, and, above all, gluing-deformation; the "frequency of vibration" inherent in this "motor" ability gives rise to the function of "time", which ensures the timely (certain rhythmicity) delivery of matter to the point of its transformation into another type of energy and matter; gravity is accompanied by the appearance of gravitational fields and the formation of photons with a certain mass (weight).

2) The "+" particles in DE and DM contain the ability to create life, create new space objects or worlds, evolutionarily developing them or, conversely, destroying them and thereby creating prerequisites for a new round of creation.

3) The particles "–" in DE and DM are designed to introduce omnipresent the Mind and Consciousness into invisible space objects.

These 3 properties, 3 Beginnings [1], fixed in the information codes of elementary particles of Ether of the 1st and 2nd type [3] [6], subsequently allowed to create a totally self-sufficient (transcendent) materiality of visible and invisible worlds.

And yet, speaking about DE and DM, it is important to emphasize the following: when an equal sign is placed at the level of "Eternal Motion" of "3"-DM particles and "0"-DE particles, this does not mean at all that all 6 types of DM are identical to the properties of DE. Only 2 types of DM-UDM correspond to this condition 3(1,2), 3(2,1), that is, the matter of the Higher Visible World, where the "3" particle is the leader in the triads. In other types of DM-CDM 1(3,2), 1(2,3) and IDM 2(3,1), 2(1,3) after BB, a number of important features appeared that significantly reduced[3] the intensity of the "Eternal Motion", which, in turn, allowed 5% of DM to become visible, baryonic. These include:

- increased versatility, formed during the period when in the "seeds of creation" ("+", "0" and "–") elementary particles exchanged with each other not only their unimaginable dynamics, but also other qualities that turned them into elementary particles "3", "2", "1" [1] [3]. "The Big Bang" (BB), having secured all newly acquired properties (powers) for them, filled the vastness of the Universe with an amazing variety of Creation.
- different dimensions of the worlds of the Universe. The most powerful dynamism turned out to be inherent in the matter of the world of "Shining Streams of UDM" [2] [3] [4] [5] [6], currently observed in the form of luminous electromagnetic fields of the Rays of Creation in astronomical images. In two other worlds: the Middle one—CDM, that is, the world of Giant stars of the Universe, and the Lower One—IDM, that is, the world of Yellow Dwarfs, gaseous, rocky planets and their satellites, the level of "Eternal Motion" decreased, following the cosmic rule: the lower the world, the lower the level of "Eternal Motion". And this is not accidental. After all, the worlds of the Universe are built by different rhythms of energies and different measures of matter.

But where is the Source located, which is a reference point for maintaining that norm of "motionally-gravitational" manifestation of "0"-DE particles and "3"-DM particles, which we call the highest level of "Eternal Motion"? And what special structures and "tools" in the invisible world create the necessary prerequisites for its maintenance?

In addition we have, that the need for a connection between motion and the gravitational properties of matter is due to the fact that with slow movements, the contribution of motion energy to gravitational properties is negligible, but

[3]When talking about UCM energies, we often use words and comparisons such as "reduced", "decreasing", "less", "weaker", etc., however, the feeling of their incredible, fantastic superiority should never leave us, residents of the Lower three-dimensional World. Otherwise, we will not be able to properly understand how our universe works.

this is not the case with high speeds of motion of gravity sources. This follows directly from Einstein's classical theory. The right part of his equations defines the sources of the gravitational field, which are described by the energy-momentum tensor, which takes into account the motion of gravity sources. The problem of accounting for movement is mathematically much more complicated. This difference follows from a comparison of the analytical solutions of Schwarzschild and Kerr. The observation of the acceleration of the Universe during expansion suggests the influence of a new type of motion on the gravitational properties of the Universe, which has not been previously considered. We associate this motion with the properties of the existence of Spin at the quantum level of matter and interpret it in terms of "Eternal Motion", associating it with an unusual form of motion caused by movement in a higher dimensional space in which a lower spatial dimension space is immersed.

3. On the Influence of DE on the Formation of Bound States of Matter

Breathing modes of matter

In this section, we will show what effect DE has on the formation of bound states at the microscopic level, emphasizing its "bonding" properties, which we mentioned in the previous section and its role in the formation of "breathing" modes of matter. Thus, DE form matter, linking is individual parts into structural formation of a particular world, forming bound states. On macroscopic scales and more, we will show how the dynamics of the Universe itself changes, determined by the scale factor $a(t)$ that determines the formation of structures such as stars and galaxies.

We begin our presentation with the methodological part, in which we deduce, following [7] all the formulas necessary for understanding. Indeed, let us consider a generalization of the Einstein vacuum equation, with the inclusion of a Λ-term, which we will interpret as the contribution of DE, and we will interpret it as a homogeneous field generated by DE:

$$R_{\mu\nu} = 0 \to \Lambda \neq 0 \Rightarrow R_{\mu\nu} + \Lambda g_{\mu\nu} = 0, \tag{1}$$

Here, $R_{\mu\nu}$ is the Ricci tensor and $g_{\mu\nu}$ is a metric tensor. At the same time, the origin of the term is interpreted by us as a term in the Einstein equation generated by DE. We will talk about the nature of DE below, based on the concept we are developing. Next, we mathematically strictly obtain the solution of the metric by following [7] in detail. Indeed, if we express the components of the Ricci tensor in terms of the Christoffel symbols:

$$R_{\mu\nu} = R^{\alpha}_{\mu\nu\alpha} = -\Gamma^{\alpha}_{\mu\nu,\alpha} + \Gamma^{\alpha}_{\mu\alpha,\nu} - \Gamma^{\beta}_{\mu\nu}\Gamma^{\alpha}_{\beta\alpha} + \Gamma^{\beta}_{\mu\alpha}\Gamma^{\alpha}_{\beta\nu}, \tag{2}$$

in a metric with a signature $(+,-,-,-)$ given by the expression:

$$\mathrm{d}s^2 = \mathrm{e}^{2\nu}\mathrm{d}t^2 - \mathrm{e}^{2\lambda}\mathrm{d}r^2 - r^2\mathrm{d}\vartheta^2 - r^2\sin^2\vartheta\cdot\mathrm{d}\phi^2, \tag{3}$$

Then, for the Christoffel symbols:

$$\Gamma^{\sigma}_{\mu\nu} = \frac{1}{2} g^{\sigma\tau} \Gamma_{\tau\mu\nu} = \frac{1}{2} g^{\sigma\tau} \left(g_{\tau\mu,\nu} + g_{\tau\nu,\mu} - g_{\mu\nu,\tau} \right), \tag{4}$$

after simple calculations, taking into account (3), we obtain:

$$\Gamma^{0}_{10} = \nu'; \ \Gamma^{1}_{00} = \nu' \mathrm{e}^{2(\mu-\lambda)}; \ \Gamma^{1}_{11} = \lambda'; \ \Gamma^{1}_{22} = -r\mathrm{e}^{-2\lambda}; \ \Gamma^{1}_{33} = -r\sin^2\vartheta \mathrm{e}^{-2\lambda} \tag{5}$$

Then the components of R_{00}, R_{11}, R_{22} and R_{33}, of the Ricci tensor will be written as:

$$R_{00} = \mathrm{e}^{2(\nu-\lambda)} \left(\nu'' + \nu'^2 - \nu'\lambda' + \frac{2\nu'}{r} \right) \tag{6}$$

$$R_{11} = \nu'' + \nu'^2 - \nu'\lambda' - \frac{2\lambda'}{r} \tag{7}$$

$$R_{22} = \mathrm{e}^{-2\lambda} \left(1 + r\left(\nu' - \lambda' \right) \right) - 1 \tag{8}$$

$$R_{33} = R_{22} \sin^2\vartheta \tag{9}$$

Taking into account the chosen metric, we obtain that Equation (1) reduces to the following form:

$$R_{\mu\nu} = -\Lambda g_{\mu\nu} \tag{10}$$

Using expressions for the components of the Ricci tensor it can be written in an equivalent form:

$$\begin{aligned} &R_{00} = -\Lambda g_{00} = -\Lambda \mathrm{e}^{2\nu} = \mathrm{e}^{2(\nu-\lambda)} \left(\nu'' + \nu'^2 - \nu'\lambda' + \frac{2\nu'}{r} \right) \\ &\to \mathrm{e}^{-2\lambda} \left(\nu'' + \nu'^2 - \nu'\lambda' + \frac{2\nu'}{r} \right) = -\Lambda \end{aligned} \tag{11}$$

$$\begin{aligned} &R_{11} = -\Lambda g_{11} = \Lambda \mathrm{e}^{-2\lambda} = \mathrm{e}^{-2\lambda} \left(\nu'' + \nu'^2 - \nu'\lambda' - \frac{2\lambda'}{r} \right) \\ &\to \mathrm{e}^{-2\lambda} \left(\nu'' + \nu'^2 - \nu'\lambda' - \frac{2\lambda'}{r} \right) = \Lambda \end{aligned} \tag{12}$$

From the relations (11)-(12), it follows that: $\lambda + \nu = const \equiv \alpha \to \lambda = \alpha - \nu$ and then we write:

$$R_{22} = -\Lambda g_{22} \to \mathrm{e}^{-2\lambda} \left(1 + r\left(\nu' - \lambda' \right) \right) = 1 - \Lambda r^2 \to \left(r\mathrm{e}^{2\nu} \right)_{,r} = \mathrm{e}^{2\alpha} \left(1 - \Lambda r^2 \right), \tag{13}$$

from where, integrating the last expression, we get that:

$$r\mathrm{e}^{2\nu} = \mathrm{e}^{2\alpha} \left(r - \frac{\Lambda}{3} r^3 + const \right), \tag{14}$$

but due to the fact that $\Lambda = 0$, for an external Schwarzschild vacuum solution, we get at $r \to \infty$ a flat solution, then we necessarily get that the desired solution will look like:

$$\begin{aligned} \mathrm{d}s^2 = &\left(1 - \frac{2\gamma M}{c^2 r} \pm \frac{|\Lambda|}{3} r^2 \right) \mathrm{d}t^2 - \left(1 - \frac{2\gamma M}{c^2 r} \pm \frac{|\Lambda|}{3} r^2 \right)^{-1} \mathrm{d}r^2 \\ &- r^2 \mathrm{d}\vartheta^2 - r^2 \sin^2\vartheta \cdot \mathrm{d}\phi^2 \end{aligned} \tag{15}$$

We will consider the anti-de-Sitter space and, by introducing a notation for

convenience $|\Lambda| = \Lambda > 0$, we will write the resulting solution as:

$$ds^2 = \left(1 - \frac{2\gamma M}{c^2 r} - \frac{1}{3}\Lambda r^2\right)dt^2 - \left(1 - \frac{2\gamma M}{c^2 r} - \frac{1}{3}\Lambda r^2\right)^{-1} dr^2 - r^2 d\vartheta^2 - r^2 \sin^2 \vartheta \cdot d\phi^2 \tag{16}$$

Analysis of the singularity solution.

This solution is of interest because the nature of the resulting singularity, unlike the coordinate singularity in the case of the Schwarzschild solution, is structurally more complicated for an arbitrary body with mass M "immersed" in a space filled with DE. The event horizon for BH, taking into account the influence of DE looks like:

$$g_{00}(r) = 1 - \frac{2\gamma M}{c^2 r} - \frac{1}{3}\Lambda r^2 = 0 \tag{17}$$

From the last ratio, then we get that it is more convenient to represent it in the form:

$$\left(r^2 + \frac{3}{\Lambda}\right) r = \frac{6\gamma M}{\Lambda c^2} \tag{18}$$

Let's analyze the ratio (18) (see Figure 1), for $\Lambda \to 0$, then it is easy to get:

$$r^2 \ll \frac{3}{\Lambda} \to \left(r^2 + \frac{3}{\Lambda}\right) r \to \frac{3}{\Lambda} r = \frac{6\gamma M}{\Lambda c^2} \Rightarrow r = \frac{2\gamma M}{c^2}, \tag{19}$$

that is, we have obtained that in this case, the radius of the event horizon for a body with mass M coincides with the Schwarzschild radius, which is quite expected. Let us consider another limiting case, when, then, from the relation (18) we get that:

$$r^2 \gg \frac{3}{\Lambda} \to \left(r^2 + \frac{3}{\Lambda}\right) r \to r^3 = \frac{6\gamma M}{\Lambda c^2} \Rightarrow r = \sqrt[3]{\frac{2\gamma M}{\Lambda c^2}} \tag{20}$$

The latter result is of interest because, in fact, it means that at large magnitude parameters Λ, matter condenses into microscopic BH, the radius of which tends, at finite mass values M (as if "embedded" in the medium of DE), to a negligibly small value determined by the ratio (20), which are droplets of matter from BH, "splashed" in the DE environment, the volume of which is equal to:

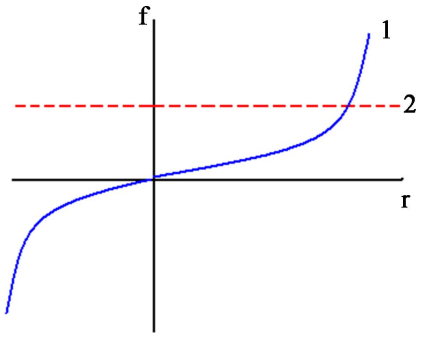

Figure 1. To the calculation of the event horizon of the BH caused by DE.

$$V_{BH} = \frac{4}{3}\pi \cdot r^3 = \frac{8\pi\gamma M}{3\Lambda c^2} \tag{21}$$

It follows from (21) that the average density of such a BH is a constant value, regardless of its mass, since:

$$\rho_{BH} = \frac{M_{BH}}{V_{BH}} = \frac{3\Lambda c^2}{8\pi\gamma} \tag{22}$$

Further, assuming that the process of formation of BH caused by the DE medium can occur at critical values Λ_{Cr} that correspond to the Planck density of matter, we obtain:

$$\rho_{BH} \approx \rho_{Pl} = \frac{M_{Pl}}{l_{Pl}^3} = \left(\frac{\hbar c}{\gamma}\right)^{\frac{1}{2}} \left(\frac{\hbar\gamma}{c^3}\right)^{-\frac{3}{2}} = \frac{c^5}{\hbar\gamma^2} \to \Lambda_{Cr} \sim \frac{c^3}{\hbar\gamma} \tag{23}$$

We will return to the analysis of these results later, and now consider the issue of the formation of bound states for matter in the early stages of the evolution of the Universe, taking into account DE. And, since the spectrum of bound states is determined from the stitching of the external solution of the Schrödinger equation with its internal solution, which is determined by the interaction potential, consider the model problem of changing the spectrum of bound states depending on from the value Λ. This problem is due to the fact that if we write down the metric (16) for the anti-de-Sitter case:

$$\mathrm{d}s^2 = \left(1 - \frac{1}{3}\Lambda r^2\right)\mathrm{d}t^2 - \left(1 - \frac{1}{3}\Lambda r^2\right)^{-1} \mathrm{d}r^2 - r^2\mathrm{d}\vartheta^2 - r^2\sin^2\vartheta \cdot \mathrm{d}\phi^2, \tag{24}$$

that is the Schrödinger equation, for a flat space:

$$\Delta\Psi + \frac{2m}{\hbar^2}\left(E - U(r)\right)\Psi = 0, \tag{25}$$

in a curved space, it will be possible to write in a generalized form as:

$$g^{ij}\left[\Psi_{,ij} - \Gamma_{ij}^k \Psi_{,k}\right] + \frac{2m}{\hbar^2}\left(E - U(r)\right)\Psi = 0, \tag{26}$$

where the indices i, j, k run through the values 1, 2 and 3. Taking into account the metric (24), we get:

$$\begin{aligned} &g_{11} = -\left(1 - \frac{1}{3}\Lambda r^2\right)^{-1}, \; g^{11} = -\left(1 - \frac{1}{3}\Lambda r^2\right), \; g_{22} = -r^2, \\ &g_{33} = -r^2\sin^2\vartheta, \; g^{33} = -r^{-2}\sin^{-2}\vartheta \end{aligned} \tag{27}$$

Then, taking into account the fact that we consider a spherically symmetric case when all components are $\Psi_{,\vartheta} \equiv \frac{\partial\Psi}{\partial\vartheta} = 0$ $\Psi_{,\phi} \equiv \frac{\partial\Psi}{\partial\phi} = 0$ and $\Psi_{,r} \equiv \frac{\partial\Psi}{\partial r} \neq 0$, then we write:

$$g^{ij}\Psi_{,ij} = g^{11}\Psi_{,11} = -\left(1 - \frac{1}{3}\Lambda r^2\right)\Psi_{,rr}, \tag{28}$$

while the expression $-g^{ij}\Gamma_{ij}^k\Psi_{,k}$: requires more careful consideration:

$$-g^{ij}\Gamma_{ij}^{k}\Psi_{,k}=-g^{ij}g^{k\tau}\Gamma_{\tau ij}\Psi_{,k}\equiv-g^{ij}g^{k\tau}\frac{1}{2}\left(g_{\tau i,j}+g_{\tau j,i}-g_{ij,\tau}\right)\Psi_{,k} \tag{29}$$

The latter ratio, taking into account that only $\Psi_{,r}\equiv\frac{\partial\Psi}{\partial r}\neq 0$, is converted to the form

$$-g^{ij}\Gamma_{ij}^{k}\Psi_{,k}=-g^{ij}g^{1\tau}\frac{1}{2}\left(g_{\tau i,j}+g_{\tau j,i}-g_{ij,\tau}\right)\Psi_{,1}=-\frac{1}{2}g^{11}g^{ij}\left(g_{1i,j}+g_{1j,i}-g_{ij,1}\right)\Psi_{,1} \tag{30}$$

and dividing it into two multipliers $-\frac{1}{2}g^{11}\Psi_{,1}$ and $g^{ij}\left(g_{1i,j}+g_{1j,i}-g_{ij,1}\right)$, taking into account that $\tau=1$, we write that:

$$g^{ij}\left(g_{1i,j}+g_{1j,i}-g_{ij,1}\right)=g^{11}g_{11,r}-g^{22}g_{22,r}-g^{33}g_{33,r} \tag{31}$$

$$g^{11}g_{11,r}=-\left(1-\frac{1}{3}\Lambda r^{2}\right)\cdot-\left(1-\frac{1}{3}\Lambda r^{2}\right)_{,r}^{-1}=\left(1-\frac{1}{3}\Lambda r^{2}\right)^{-1}\left(-\frac{2}{3}\Lambda r\right)=\frac{\frac{2}{3}\Lambda r}{1-\frac{1}{3}\Lambda r^{2}} \tag{32}$$

$$g^{22}g_{22,r}=-r^{-2}\left(-r^{2}\right)_{,r}=\frac{2}{r} \tag{33}$$

$$g^{33}g_{33,r}=-r^{-2}\sin^{-2}\vartheta\left(-r^{2}\sin^{2}\vartheta\right)_{,r}=\frac{2}{r} \tag{34}$$

Substituting (32)-(34) into the ratio (31), we get:

$$\begin{aligned}&g^{11}g_{11,r}-g^{22}g_{22,r}-g^{33}g_{33,r}\\&=\frac{\frac{2}{3}\Lambda r}{1-\frac{1}{3}\Lambda r^{2}}-\frac{4}{r}=\frac{\frac{2}{3}\Lambda r^{2}-4\left(1-\frac{1}{3}\Lambda r^{2}\right)}{1-\frac{1}{3}\Lambda r^{2}}=\frac{-4+2\Lambda r^{2}}{\left(1-\frac{1}{3}\Lambda r^{2}\right)r}\end{aligned} \tag{35}$$

And then, the final expression for the expression $-g^{ij}\Gamma_{ij}^{k}\Psi_{,k}$, will take the form:

$$\begin{aligned}-g^{ij}\Gamma_{ij}^{k}\Psi_{,k}&=-\frac{1}{2}\left(1-\frac{1}{3}\Lambda r^{2}\right)\cdot\left(\frac{-4+2\Lambda r^{2}}{\left(1-\frac{1}{3}\Lambda r^{2}\right)r}\right)\Psi_{,r}\\&=\frac{-2+\Lambda r^{2}}{r}\Psi_{,r}=-\frac{2-\Lambda r^{2}}{r}\Psi_{,r}\end{aligned} \tag{36}$$

Taking into account the ratios (28) and (36), the Schrödinger equation can be written as:

$$\left(1-\frac{1}{3}\Lambda r^{2}\right)\Psi_{,rr}+\frac{2-\Lambda r^{2}}{r}\Psi_{,r}+\frac{2m}{\hbar^{2}}\left(U\left(r\right)-E\right)\Psi=0, \tag{37}$$

or in a more convenient way to solve it:

$$\left(1-\frac{1}{3}\Lambda r^{2}\right)\cdot r\Psi_{,rr}+\left(2-\Lambda r^{2}\right)\Psi_{,r}+\frac{2m}{\hbar^{2}}\left(U\left(r\right)-E\right)\cdot r\Psi=0, \tag{38}$$

Let's introduce an auxiliary function: $\Psi=\frac{f}{r}$ and write (38), taking into ac-

count the function f, we have:

$$\Psi_{,r}=\left(\frac{f}{r}\right)_{,r}=\frac{f_{,r}}{r}-\frac{f}{r^2}\quad\text{and}\quad r\Psi_{,rr}=\left(\frac{f}{r}\right)_{,rr}=f_{,rr}-\frac{2f_{,r}}{r}+\frac{2f}{r^2}\tag{39}$$

Substituting the obtained ratios in (38), we write:

$$\left(1-\frac{1}{3}\Lambda r^2\right)\cdot f_{,rr}-\frac{1}{3}\Lambda r f_{,r}+\left[\frac{2m}{\hbar^2}\left(U(r)-E\right)-\frac{1}{3}\Lambda\right]f=0\tag{40}$$

Let's introduce the interaction potential (see Figure 2), in the following form:

$$U(r)=\begin{cases}-U_0, & r\in[0,a]\\ 0, & r\notin[0,a]\end{cases}\tag{41}$$

Then equation (40) can be presented in two forms:

$$\left(1-\frac{1}{3}\Lambda r^2\right)\cdot f_{1,rr}-\frac{1}{3}\Lambda r f_{1,r}-\left[\frac{2m}{\hbar^2}\left(U_0+E\right)+\frac{1}{3}\Lambda\right]f_1=0\quad\text{at}\quad r\in[0,a]\tag{42}$$

$$\left(1-\frac{1}{3}\Lambda r^2\right)\cdot f_{2,rr}-\frac{1}{3}\Lambda r f_{2,r}-\left[\frac{2m}{\hbar^2}E+\frac{1}{3}\Lambda\right]f_2=0,\ \text{at}\quad r\notin[0,a]\tag{43}$$

Since $\Lambda<0\to\alpha^2=-\frac{1}{3}\Lambda\equiv\frac{1}{3}|\Lambda|>0$, let's imagine Equations ((42), (43)) as:

$$\left(1+\alpha^2r^2\right)\cdot f_{1,rr}+\alpha^2 r f_{1,r}-\left[\frac{2m}{\hbar^2}\left(U_0+E\right)+\frac{1}{3}\Lambda\right]f_1=0\tag{44}$$

$$\left(1+\alpha^2r^2\right)\cdot f_{2,rr}+\alpha^2 r f_{2,r}-\left[\frac{2m}{\hbar^2}E+\frac{1}{3}\Lambda\right]f_2=0\tag{45}$$

Solve Equations ((44), (45)) using the substitution [8]:

$$\alpha\cdot r=sh\left(\alpha\cdot\xi\right)\to\xi=\frac{1}{\alpha}\ln\left[\alpha\cdot r+\sqrt{1+\alpha^2\cdot r^2}\right]\tag{46}$$

Taking into account (46), we get:

$$f_{,r}=f_{,\xi}\xi_{,r}=f_{,\xi}\left(1+\alpha^2r^2\right)^{-\frac{1}{2}},$$

$$f_{,rr}=f_{,\xi\xi}\left(\xi_{,r}\right)^2+f_{,\xi}\left(\xi_{,r}\right)_{,r}=f_{,\xi\xi}\left(1+\alpha^2r^2\right)^{-1}-\frac{\alpha^2 r}{\left(1+\alpha^2r^2\right)^{\frac{3}{2}}}f_{,\xi}\tag{47}$$

From where, using $\frac{1}{3}\Lambda\equiv-\frac{1}{3}|\Lambda|<0$:

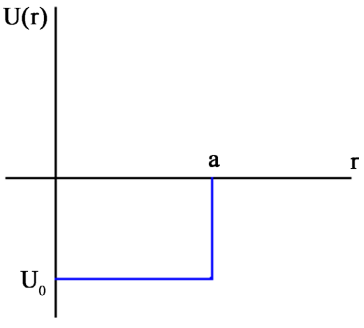

Figure 2. Potential of local interaction.

$$f_{1,\xi\xi} - \left[\frac{2m}{\hbar^2}(U_0 + E) - \frac{1}{3}|\Lambda|\right] f_1 = 0 \tag{48}$$

$$f_{2,\xi\xi} - \left[\frac{2m}{\hbar^2}E - \frac{1}{3}|\Lambda|\right] f_2 = 0 \tag{49}$$

Solution and analysis of equations ((48), (49))

(Breathing modes of matter)

Let's introduce a parameter $\beta_1 = \frac{2m}{\hbar^2}(|U_0| + E) - \frac{1}{3}|\Lambda|$ in equation (48), then the solution splits into two cases: $\beta_1 < 0$ and $\beta_1 > 0$.

1. The case $\beta_1 = -|\beta_1| < 0$

In this case, Equation (48) will take the form:

$$f_{1,\xi\xi} + |\beta_1| f_1 = 0, \tag{50}$$

is the equation of harmonic oscillations, the solution of which is represented as:

$$f_1(\xi) = C_1 \sin\left(\sqrt{|\beta_1|}\xi\right) + C_2 \cos\left(\sqrt{|\beta_1|}\xi\right), \tag{51}$$

where C_1 and C_2 are the integration constants determined from the boundary conditions of the matching of the internal solution, at $r \in [0, a]$ and the external solution at $r \notin [0, a]$. However, for an external solution, the equation for the function f_2 is written as:

$$f_{2,\xi\xi} + \gamma_1 f_2 = 0, \tag{52}$$

where $\gamma_1 = -\left[\frac{2m}{\hbar^2}E - \frac{1}{3}|\Lambda|\right] = \frac{1}{3}|\Lambda| - \frac{2m}{\hbar^2}E$. For further analysis, it is convenient to introduce some effective interaction potential (see **Figure 3**) induced by DE, which we will define as:

$$U_{\Lambda\pm} = \pm\frac{\hbar^2}{6m}|\Lambda|, \tag{53}$$

where, the sign is determined by the sign of the magnitude Λ itself. Then there is the potential for interaction. Taking into account DE, in contrast to (41), it will look like:

$$U_{eff}(r) = \begin{cases} -U_0 \pm \frac{\hbar^2}{6m}|\Lambda| = -U_0 + U_{\Lambda\pm}, & r \in [0, a] \\ \pm\frac{\hbar^2}{6m}|\Lambda| = U_{\Lambda\pm}, & r \notin [0, a] \end{cases}, \tag{54}$$

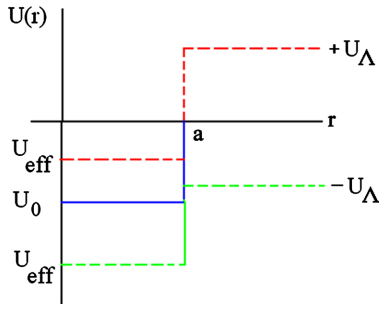

Figure 3. Effective interaction potential $U_{eff}(r)$ induced by DE.

Thus, we see that the solution for the case $\beta_1 = -|\beta_1| < 0$ splits into two more possible solutions, depending on, outside the potential pit, which external potential is induced by DE, i.e. $U_{\Lambda\pm} = \pm\frac{\hbar^2}{6m}|\Lambda|$? Indeed, let us consider the case when we have: $U_{\Lambda+} = \frac{\hbar^2}{6m}|\Lambda|$ (see **Figure 4**) and accordingly:

$$\gamma_1 = -\left[\frac{2m}{\hbar^2}E - \frac{1}{3}|\Lambda|\right] = \frac{2m}{\hbar^2}\left(U_{\Lambda+} - E\right) \to \gamma_1 < -\frac{2m}{\hbar^2}|U_0| \tag{55}$$

Taking into account (55), Equation (52) is written as:

$$f_{2,\xi\xi} - |\gamma_1| f_2 = 0 \tag{56}$$

And then it is easy to see that the solution of Equation (56) will be written as:

$$f_2(\xi) = C_3 e^{\sqrt{|\gamma_1|}\xi} + C_4 e^{-\sqrt{|\gamma_1|}\xi}, \tag{57}$$

where C_3 and C_4 are the integration constants. From the definition of the variable ξ and quantity α introduced by us, according to the ratio (46), we obtain:

$$f_2(r) = C_3\left(\alpha\cdot r + \sqrt{1+\alpha^2\cdot r^2}\right)^{-\sqrt{3\left|\frac{\gamma_1}{\Lambda}\right|}} + C_4\left(\alpha\cdot r + \sqrt{1+\alpha^2\cdot r^2}\right)^{\sqrt{3\left|\frac{\gamma_1}{\Lambda}\right|}} \tag{58}$$

Further, since the desired wave functions are equal $\Psi = \frac{f}{r}$, we have:

$$\begin{aligned}\Psi_1(r) = \frac{1}{r}\Bigg[&C_1\sin\left(\frac{\sqrt{|\beta_1|}}{\alpha}\ln\left[\alpha\cdot r + \sqrt{1+\alpha^2\cdot r^2}\right]\right)\\ &+ C_2\cos\left(\frac{\sqrt{|\beta_1|}}{\alpha}\ln\left[\alpha\cdot r + \sqrt{1+\alpha^2\cdot r^2}\right]\right)\Bigg]\end{aligned} \tag{59}$$

$$\Psi_2(r) = \frac{1}{r}\left[C_3\left(\alpha\cdot r + \sqrt{1+\alpha^2\cdot r^2}\right)^{-\sqrt{3\left|\frac{\gamma_1}{\Lambda}\right|}} + C_4\left(\alpha\cdot r + \sqrt{1+\alpha^2\cdot r^2}\right)^{\sqrt{3\left|\frac{\gamma_1}{\Lambda}\right|}}\right] \tag{60}$$

Let's analyze the solutions obtained at the boundary points: $r = 0; r = a; r \to \infty$.

The analysis shows that if $\sqrt{3\left|\frac{\gamma_1}{\Lambda}\right|} > 1$, for $r \to \infty$, then the second term in (60) diverges and therefore, we get $C_4 = 0$. Analyzing the behavior of the solution at a

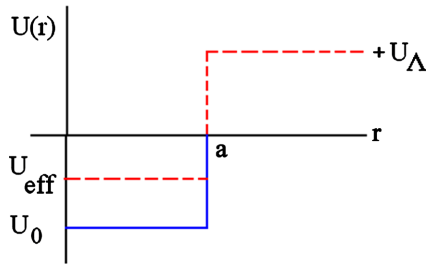

Figure 4. The effective potential $U_{eff}(r)$, at $U_{\Lambda+} = \frac{\hbar^2}{6m}|\Lambda|$ when induced by DE.

point $r=0$, we get that in this case the second term in (59) also diverges, due to the fact that we get the ratio of the finite cosine function to zero, from which we get that $C_2=0$, while the behavior of the first term is regular at zero. Indeed, we get that:

$$\lim_{r\to 0}\left[\frac{\sqrt{|\beta_1|}}{\alpha}\ln\left[\alpha\cdot r+\sqrt{1+\alpha^2\cdot r^2}\right]\right]\to 0, \tag{61}$$

and thus, we get that at the point $r=0$, the first term in (59) takes a regular value, since we have uncertainty at the zero point, of the type from which we get v, carefully moving to the limit in the denominator, taking into account that

$$\begin{aligned}&\lim_{r\to 0}\left[\ln\left(\alpha\cdot r+\sqrt{1+\alpha^2\cdot r^2}\right)\right]\\&=\lim_{r\to 0}\left[\ln\left[1+\alpha\cdot r+\frac{1}{2}\alpha^2\cdot r^2+\cdots\right]\right]=\alpha\cdot r+\frac{1}{2}\alpha^2\cdot r^2+\cdots\end{aligned} \tag{62}$$

From the last relation, we obtain that at the zero point, the function $\Psi_1(r)$, for $r\to 0$, takes a regular solution equal to:

$$\begin{aligned}&\lim_{r\to 0}\left[\sin\left(\frac{\sqrt{|\beta_1|}}{\alpha}\left[\alpha\cdot r+\frac{1}{2}\alpha^2\cdot r^2+\cdots\right]\right)\right]\\&\to\lim_{r\to 0}\left[\sin\left(\sqrt{|\beta_1|}\left[r+\frac{1}{2}\alpha\cdot r^2+\cdots\right]\right)\right]=\sqrt{|\beta_1|}\left[r+\frac{1}{2}\alpha\cdot r^2+\cdots\right]\end{aligned}$$

Where do we come to the ratio that:

$$\begin{aligned}&\lim_{r\to 0}\frac{1}{r}\left[\sin\left(\frac{\sqrt{|\beta_1|}}{\alpha}\left[\alpha\cdot r+\frac{1}{2}\alpha^2\cdot r^2+\cdots\right]\right)\right]\\&=\lim_{r\to 0}\left(\sqrt{|\beta_1|}\left[1+\frac{1}{2}\alpha\cdot r+\cdots\right]\right)=\sqrt{|\beta_1|}\end{aligned} \tag{63}$$

Taking into account the regularity at zero, we obtain that the desired integration constants are only C_1 and C_3, which we can determine from matching condition at the boundary point $r=a$. The result obtained allows us to write the solution in the form:

$$\Psi_1(r)=C_1\frac{1}{r}\sin\left(\frac{\sqrt{|\beta_1|}}{\alpha}\ln\left[\alpha\cdot r+\sqrt{1+\alpha^2\cdot r^2}\right]\right),\ \text{at}\ \ r\in[0,a] \tag{64}$$

$$\Psi_2(r)=C_3\frac{1}{r}\left(\alpha\cdot r+\sqrt{1+\alpha^2\cdot r^2}\right)^{-\sqrt{3\left|\frac{\gamma_1}{\Lambda}\right|}},\ \text{at}\ \ r\notin[0,a] \tag{65}$$

Then, the spectrum of states, wave functions, and respiratory modes generated by THOSE are determined from the solutions of a system of transcendental equations represented as:

$$\Psi_1(r)\big|_{r=a}=\Psi_2(r)\big|_{r=a} \tag{66}$$

$$\left.\frac{\mathrm{d}\Psi_1(r)}{\mathrm{d}r}\right|_{r=a}=\left.\frac{\mathrm{d}\Psi_2(r)}{\mathrm{d}r}\right|_{r=a} \tag{67}$$

Equations ((66), (67)), in expanded form, is written as:

$$C_1 \sin\left(\frac{\sqrt{|\beta_1|}}{\alpha}\ln\left[\alpha\cdot a+\sqrt{1+\alpha^2\cdot a^2}\right]\right)=C_3\left(\alpha\cdot a+\sqrt{1+\alpha^2\cdot a^2}\right)^{-\sqrt{3\left|\frac{\gamma_1}{\Lambda}\right|}} \tag{68}$$

$$\begin{aligned}&C_1\left\{-a^{-2}\left[\sin\left(\frac{\sqrt{|\beta_1|}}{\alpha}\ln\left[\alpha\cdot a+\sqrt{1+\alpha^2\cdot a^2}\right]\right)\right]\right.\\&\left.+a^{-1}\sqrt{\frac{\alpha|\beta_1|}{1+\alpha^2\cdot a^2}}\cos\left(\frac{\sqrt{|\beta_1|}}{\alpha}\ln\left[\alpha\cdot a+\sqrt{1+\alpha^2\cdot a^2}\right]\right)\right\}\end{aligned} \tag{69}$$

$$=-C_3a^{-2}\left(\alpha\cdot a+\sqrt{1+\alpha^2\cdot a^2}\right)^{-\sqrt{3\left|\frac{\gamma_1}{\Lambda}\right|}}\left[1+\frac{a\sqrt{3\left|\frac{\gamma_1}{\Lambda}\right|}}{\sqrt{1+\alpha^2\cdot a^2}\left(\alpha\cdot a+\sqrt{1+\alpha^2\cdot a^2}\right)}\right]$$

To determine the spectrum of states induced by DE, we obtain the equation:

$$\tan\left(\frac{\sqrt{|\beta_1|}}{\alpha}\ln\left[\alpha\cdot a+\sqrt{1+\alpha^2\cdot a^2}\right]\right)=-\sqrt{\frac{\alpha|\beta_1|}{3|\gamma_1|}|\Lambda|}\left(\alpha\cdot a+\sqrt{1+\alpha^2\cdot a^2}\right) \tag{70}$$

In the last expression, simplifying the parameters included in it, we get:

$$\frac{\sqrt{|\beta_1|}}{\alpha}=\sqrt{\frac{|\beta_1|}{\alpha^2}}=\sqrt{\frac{6m}{\hbar^2}\frac{|U_0|+E}{|\Lambda|}-1}\,,\quad \sqrt{\frac{\alpha|\beta_1|}{3|\gamma_1|}}=\sqrt{\frac{\sqrt{\frac{|\Lambda|}{3}}\left|\frac{6m}{\hbar^2}\frac{|U_0|+E}{|\Lambda|}-1\right|}{3\cdot\left|1-\frac{6m}{\hbar^2|\Lambda|}E\right|}} \tag{71}$$

assuming that $\alpha=\sqrt{\frac{1}{3}|\Lambda|}$ and $\gamma_2=\frac{6m}{\hbar^2|\Lambda|}$, we finally write down:

$$\frac{\sqrt{|\beta_1|}}{\alpha}=\sqrt{\gamma_2\left(|U_0|+E\right)-1}\,,\quad \sqrt{\frac{\alpha|\beta_1|}{3|\gamma_1|}}=\sqrt{\frac{\sqrt{|\Lambda|}\cdot\left|\gamma_2\left(|U_0|+E\right)-1\right|}{3\cdot|1-\gamma_2E|}} \tag{72}$$

Then, the ratio (70) will be written as:

$$\begin{aligned}&\tan\left(\sqrt{\gamma_2\left(|U_0|+E\right)-1}\cdot\ln\left[\sqrt{|\Lambda|/3}\cdot a+\sqrt{1+a^2|\Lambda|/3}\right]\right)\\&=-\sqrt{\frac{\sqrt{|\Lambda|}\gamma_2\left|\left(|U_0|+E\right)-1\right|}{3\cdot|1-\gamma_2E|}|\Lambda|}\left(\sqrt{|\Lambda|/3}\cdot a+\sqrt{1+a^2|\Lambda|/3}\right)\end{aligned} \tag{73}$$

For the solution, it is more convenient to represent this transcendental equation as:

$$\begin{aligned}&\cos\left(\sqrt{\gamma_2\left(|U_0|+E\right)-1}\cdot\ln\left[\sqrt{|\Lambda|/3}\cdot a+\sqrt{1+a^2|\Lambda|/3}\right]\right)\\&=\left(\frac{\sqrt{|\Lambda|}\gamma_2\left|\left(|U_0|+E\right)-1\right|}{3\cdot|1-\gamma_2E|}|\Lambda|\left(\sqrt{|\Lambda|/3}\cdot a+\sqrt{1+a^2|\Lambda|/3}\right)^2\right)^{-1}\end{aligned} \tag{74}$$

From this relation, it is possible to obtain a condition for the existence of

bound states:

$$\left(\frac{\sqrt{|\Lambda|}\gamma_2\left|\left(|U_0|+E\right)-1\right|}{3\cdot\left|1-\gamma_2 E\right|}|\Lambda|\left(\sqrt{|\Lambda|/3}\cdot a+\sqrt{1+a^2|\Lambda|/3}\right)^2\right)^{-1}\le 1 \tag{75}$$

The potential $U_{\Lambda-}=-\frac{\hbar^2}{6m}|\Lambda|$ case is considered similarly; however, the spectrum of states, as well as the "breathing modes" of matter, will change due to the fact that the depth of the potential pit will become deeper. At the same time, it is interesting that, assuming the interaction potential $U_0\to 0$, we will get that the module $U_V=|U_{\Lambda-}|=\frac{\hbar^2}{6m}|\Lambda|$ will characterize the depth of the "sea" which form the spectrum of states of all possible particles, which form the "vacuum" of the DE.

4. "Main" and "Small" Fields and Gravitation "Waves" of DE, as the Main "Tool" of the Creation

1) In the early Universe, at the very beginning of its creation, two fundamental structures were created, in which the "Motionally-Gravitational" properties of DE were especially clearly manifested. The first Field of the Universe was built from "0-strings" ("+", "0", "−"), ("−", "0", "+"), and immediately after it—the Upper Sphere ("0") as part of the Relic ("0"), ("+"), ("−") [3] [4] [5] [6]. For convenience, let's call them the "Main" and "Small" fields. Both Fields consisted of the same elementary "0" particles responsible for the same "Motionally-Gravitational" properties, but, as we will see later, depending on the condition of the "place" [1] [2] [6], they achieved completely different final goals.

We asked ourselves: why does the Universe need two Fields of the same properties in space located one in the other? What functions could the Field perform in the creation of the Universe ("+", "0", "−"); ("−", "0", "+"), and what tasks could be assigned to the Upper Sphere of the Relic of ("0") particles? Indeed, by the fact of its existence in the Upper (and not in the Middle or Lower) Sphere, this "Small" field of ("0") particles already, like DE matter, had numerous advantages. And, nevertheless, why did the Universe need its multiple amplification with similar properties of the "0" strings of the "Main" Field, which is present everywhere in the Universe? What kind of cosmic phenomena required the presence of an environment with such monstrous dynamics and gravity, which was formed within the framework of a Double Field—the Upper Sphere of a Relic of "0" particles, as if "superimposed" on the Field of the Universe of "0" strings? The correct answers to these questions could be the key to unraveling the way the baryonic matter of the Universe was created, the formation of BH and other exotic space objects.

First, let's try to answer the following questions:

a) how do we see the structure of matter in the "Main" field of the early Universe;

b) what functions did it perform (and is performing) The field of the Universe

("+", "0","-"); ("−", "0", "+");

c) what were the features of the manifestation of the energy of the Field from the "0-strings" ("+", "0", "−"); ("−", "0", "+");

d) and what specific tasks did the Universe try to solve thanks to the ability to glue, deform and rapidly move the "Main" Field?

According to our concept, the "Main" Field is a complex, highly organized, self-sufficient (transcendent) cosmic matter consisting of alternately alternating "Motionally-Gravitational" "0" strings of 2 different qualities obtained as a result of transformational interaction with either a "−" particle or a "+" particle DE. The cosmic process of energy transformation has created conditions under which:

- one part (50%) of the "0" Field strings, becoming the leader (anabolic transformation) in the Triads of the first type of DE—"0" ("+", "−"), She also gained the Omnipresent Mind of the "−" particles of the Shell of the Universe (catabolic transformation);
- the other part (50%) of the "0" is the strings of the Field, also becoming the leader (anabolic transformation) in the Triads of the second type of DE—"0" ("−", "+"), in addition to her natural qualities, she added the ability to Create, which passed to "zeroes" from "+" particles Shells of the Universe (catabolic transformation).

The resulting complex universality of triad matter raised the local properties of the particles that were part of them to a new level of energy interaction with each other to the level of self-sufficiency (transcendence): for example, if a field of "0" strings had only an incomprehensible ability to mindlessly glue and deform everything in its path, it would play the role of an "elephant in a china shop" in the fate of the Universe. But the "0" strings of the Field, having become intelligent and creative particles as part of the DE triads, turned not just into the "foundation" of the "building" of the Universe [6], but into a universal "Tool" for its further construction.

Gravitational "waves" became such a "Tool" in the vastness of the Universe, which turned into a new, specific, incredibly powerful material force of "Eternal Motion". "0"-the strings of the Field, having an amazing adhesive - deformation ability to compress, expand and change the configuration of matter, turned "waves":

a) into a source of powerful pulses (shocks) for the formation of type 1 Ether used in the construction of 3 Relic Spheres, including the Upper Sphere of "0" particles [6];

b) into a tool for restoring Order in the environment of a substance randomly moving in the space of the Universe from "3", "2 and "1". The elementary particles of Ether of the 2nd type formed from it subsequently became the "raw material" for creation using the "waves" of the DM—UDM, CDM and IDM triads [3] [4] [6];

c) into a "Tool" for the formation and regulation of "Flows" of UDM and

"clumps" of CDM and IDM, as well as into a super dynamic, intelligent force capable of accelerating even galaxies with already functioning or ready to become actively active B-WH for the creation of new worlds in the "empty" spaces of the Universe [2] [3] [4] [6].

Here it is appropriate to recall the cosmology phrase on duty that "the DM of the Universe, under the influence of gravity, gets knocked into clumps." Does it follow that for science, "gravity" exists separately, and "dark matter" separately? But according to our hypothesis, "Gravity" is a property of the UCM, and therefore "DM"! And it is she who, as an inherently natural property, being in every elementary particle that makes up the DM triads, allows (one might even say: compels) DM "to get into clumps". We call such an influence the action of the cosmic law "like is attracted by like", where the role of "like", for obvious reasons, is assigned to Gravity, which is present to varying degrees in any of the types of cosmic matter.

2) It is an indisputable fact for cosmology that unimaginable dynamics prevail in Space. But why did Nature make "gravity" "born together" with "Eternal Motion", and therefore directly dependent on its fantastic speeds? We explain it this way: "Graviton", as one of the 3 "rings" of Borromeo, in potency possessed the highest of all possible "motionally" and "Gluing - Deforming" properties of the Universe. And in the O_{SP} space, where, due to its unique significance, the properties that allow Borromeo's "rings" to be a Single Whole were in demand, the importance of the monstrous force of gravity in each triad of "rings" is easily explained. But, as we showed earlier [3] [4], having descended into the next, Lower in comparison with the O_{SP} space, the world of B-WH, turning first into a chaotic substance of three types, and then into a "0" particle as part of the TE triads (in the form of a "0"-the strings of the field of the Universe and ("0")-particles of the Upper Sphere of the Relic), "Graviton", in accordance with the cosmic law of observing the hierarchy of worlds, partially lost its inherent super-powerful gravitational properties. However, the former power of the gluing-deformation properties of the "Graviton" was vital for the upcoming creation of the worlds of the Universe, and then the Cosmos had to return to the "0" particles "in full" Something" capable of restoring the required (initial, existing in O_{SP} space) gravity level. This "Something" has become the function of "Eternal Motion": so "Graviton", having separated from the other two "rings" of Borromeo, and becoming a free "0" particle, was able to regulate 2 key qualities in itself at once—dynamics and gravity. Albert Einstein drew attention to this "Something" in his law ("inert mass is equal to gravitational mass"), which, if paraphrased, can be formulated as follows: "the faster the movement, the more powerful the properties of gravity manifest themselves and vice versa".

Interestingly, the Universe uses this technique more than once to solve many problems, and the closest of them, within the framework of the sequence of creation of the structures of the Universe, is associated with the reason for the creation of a "Small" field—the Upper Sphere of a Relic of ("0") particles.

3) Why were three Relict spheres formed at the dawn of the Universe, imme-

diately after the "Main" Field with "0" strings ("0"), ("+"), ("−") (we talked about their creation and tasks in [5] [6], and, especially its Upper sphere ("0"). As we have already emphasized, the superimposition of a sphere of ("0") particles on the Field of the Universe of "0" strings has greatly increased the power of the dynamics of this space, and therefore the gluing—deformation power of its characteristic "waves". Our calculations also showed this [5]—The upper Sphere of the Relict of "0" particles not only turned out to be "mobile", its matter can actively move within the Upper Sphere, creating gluing—deformation "waves".

But why did the Universe need to create such specific conditions precisely "above", precisely in the Upper Sphere of the Relic? We know that the Upper Sphere of the Relic ("0") in the process of creation of the Universe became the "place" of the accumulation of Ether of the 2nd type, from which the integration (gluing and deforming) DM was created 3(1,2), 3(2,1), that is, the ITM of the Universe. According to our concept [1]-[6], it was supposed to become the basis from which the baryonic matter of the Middle and Lower Worlds of the Universe, composed of "brick atoms" of different properties, could subsequently be formed. But in order to begin construction, Type 2 Ether first had to be grouped into triads, turning UDM into matter, where the fastest, most gravitationally saturated particles "3" became the leaders. Then the created matter had to be divided into separate huge "clumps" - future "Shining Streams" - "Rays of Creation" [2]. But that's not all: it was necessary to give these Flows a tremendous acceleration to overcome the spaces of 3 worlds, as well as to ensure that the gluing-deforming matter gathered together on the way to the goal did not dissipate in the space of the Universe and ended up at the "destination" in a timely manner. To do this, even at the stage of formation of "stream clusters", they had to be twisted into a "Vortex" and surrounded on all sides by a huge field of shining gravitational photons.

This is what the stages of creation of the Universe with the participation of the "Main" and "Small" fields look like at the moment, if they are stated very briefly:

a) since the construction process has not stopped for a minute since the creation of the Universe, the "waves" of the "Main" Field of the Universe from the "0" strings constantly deliver all new substances "3", "2" and "1" to the Upper Sphere of the Relic ("Small" Field) to form the Ether of the 2nd type, and therefore triads of UDM 3(1,2); 3(2,1); now this substance is "collected" by the "waves" of the "Main" Field in the territories of White Holes (as a continuation of Black Holes), functioning in the centers of many galaxies (after all, even in cases when BH do not seem aggressive, they are still active, processing the matter of UDM Streams invisibly entering them). But in the early Universe, when almost the entire volume of Type 2 Ether formed after BB was used to create its worlds, it became obvious that the substance "3", "2" and "1" needed to be constantly replenished. And such sources of "raw materials" could only be the first and all subsequent galaxies with their Black holes that appeared relatively early in the Universe.

b) "waves" of the "Small" field (enhanced by the power of the dynamics of the "Main" field), forming triads of UDM 3(1,2); 3(2,1)—the main building matter of the worlds of the Universe is divided into this total mass of triads into "clumps" - future "Streams" - Rays of Creation;

c) the "waves" of the Upper Sphere (enhanced by the power of the dynamics of the "Main" Field) twist the "Flows" of UDM, gluing, deforming and accelerating their dynamics to unimaginable magnitudes, turning the "Flows" into a "Vortex" state. And this "Vortex" begins already at the place of creation of UDM, that is, in the "Small" field;

d) the "waves" of the Upper Sphere (enhanced by the power of the dynamics of the "Main" Field), with a gigantic impulse (push), direct this UDM stream, rapidly spinning around the center, shining in photons of light of its own gravitational field (which is greatly facilitated by the "all-powerful" spins of the Integration DM), for the formation of a new galaxy;

e) but, as we wrote earlier [2] [6], the creation of baryonic matter of galaxy objects goes not only through the stage of "twisting", but also through the stage of "splashing", which occurs at the moment when, rotating at fantastic speeds, the "clot" of UDM in the "place" of its formation, overflows and matter, thinned to a diffuse concentration, begins to fly away from its "core" in different directions. Subsequently, luminaries and other visible space objects are formed from this matter.

Of course, the property of "Eternal motion" transferred to "3" particles from their Ancestors "0" particles, and the quality of their matter containing "omnipotent spin", and the presence of a CODE that preserves all the necessary information about the "place" and "purpose" of the upcoming flow movement, allowed us to hope for the successful dynamics of the Rays of Creation and achievement of desired goals. But without the main condition of Creation—the creation of a powerful primary impulse—nothing could happen. This, as with all other tasks, had to be handled by the transcendent energy of the "0" particles of the double field—the Field of the "0-strings" ("+", "0", "−"); ("−", "0", "+") and the Upper Sphere ("0"). And according to our concept, she successfully coped with them.

4) We have already mentioned in this section that the global field that determines the dynamics of the Universe is characterized by interactions superimposed by the "Main" and "Small Fields" formed by the spheres of the Relic and "0"-strings, which perform two main functions necessary for the creation of new structures in the Universe. This is what we call the "motionally-gluing" function of these fields, where the gluing function determines the gravitational (attractive) properties, and the motional function performs the function of delivering energy to the places of formation of new structures.

In the article [3], we follow to the excellent work of [9], in which the action for the equations of the gravitational field, unlike Einstein, is based not on the invariant of the Ricci tensor $R^{\mu}{}_{\nu} \to R = R^{\alpha}{}_{\alpha}$, but on the invariants of the Riemann

tensor $R^{\mu}{}_{\nu\sigma\tau} \to R, R^{\alpha}{}_{\beta}R^{\alpha}{}_{\beta}, R_{\alpha\beta\gamma\delta}R^{\alpha\beta\gamma\delta}$, which led to the equation for the scale factor $a(\eta)$, determined through a parameter η, according to the ratio $c\mathrm{d}t = a(\eta)\mathrm{d}\eta$, in the following form:

$$a''a + ka^2 - \frac{2\alpha}{\sqrt{3}}\sqrt{\left(a''a - (a')^2\right)^2 + \left((a')^2 + ka^2\right)^2} = \frac{a^4}{6c^2}\left(\varepsilon^* - 3p^*\right), \tag{76}$$

and taking into account the notation adopted in [3] [9] and assuming that $\varepsilon - 3p = -\frac{\Lambda c^4}{2\pi\gamma}$, $c = 1$, Equation (76), for $k = 0, \pm 1$, is written as:

$$\left(a''a + ka^2\right)^2 = \frac{4\alpha^2}{3}\left[\left(a''a + ka^2\right)^2 + \left((a')^2 + ka^2\right)^2\right], \tag{77}$$

from which it follows:

$$\begin{aligned}&\left(1 - \frac{4\alpha^2}{3}\right)(a''a)^2 + 2ka''a^3 + \left(1 - \frac{4\alpha^2}{3}\right)k^2a^4\\ &= \frac{8\alpha^2}{3}\left[-a''a(a')^2 + (a')^4 + ka^2(a')^2\right]\end{aligned} \tag{78}$$

here, for $k = \pm 1 \to k^2 = 1$. Let's consider different cases, taking into account $k = 0, \pm 1$.

I. (a) The case $k = 0$

Then equation (78) will be written as:

$$\left(1 - \frac{4\alpha^2}{3}\right)(a''a)^2 = \frac{8\alpha^2}{3}\left[-a''a(a')^2 + (a')^4\right], \tag{79}$$

and multiplying it by a^{-4}, it can be represented in a form convenient for solving:

$$\left(1 - \frac{4\alpha^2}{3}\right)\left(\frac{a''}{a}\right)^2 + \frac{8\alpha^2}{3}\left(\frac{a'}{a}\right)^2\left(\left(\frac{a''}{a}\right) - \left(\frac{a'}{a}\right)^2\right) = 0 \tag{80}$$

By introducing, for convenience, the notation:

$A = 1 - \frac{4\alpha^2}{3}$ and $B = \frac{8\alpha^2}{3} \to 2A + B = 2$, we obtain:

$$A\left(\frac{a''}{a}\right)^2 + B\left(\frac{a'}{a}\right)^2\left(\frac{a''}{a} - \left(\frac{a'}{a}\right)^2\right) = 0 \tag{81}$$

By introducing a new function defined as $y = \frac{a'}{a}$, $\frac{a''}{a} = y' + y^2$ we have:

$$A(y')^2 + 2y^2y' + Ay^4 = 0, \tag{82}$$

which is easily integrated and, taking into account the introduction of new notation, leads to the following expression:

$$a(\eta) = (A_0\eta + \eta_0)^{\frac{1}{A_0}}, \quad A_0 = \frac{1 \mp \frac{4\alpha^2}{3}\sqrt{3\left(2\alpha^2\right)^{-1} - 1}}{1 - \frac{4\alpha^2}{3}}, \tag{83}$$

where η_0, is the integration constant. The dependence $a(t)$ can be easily ob-

tained using the ratio $c\mathrm{d}t = a(\eta)\mathrm{d}\eta$ and as a result:

$$ct = \frac{\left(A_0\eta + \eta_0\right)^{\frac{A_0+1}{A_0}}}{A_0+1}, \quad \eta = \frac{\left(c\left(A_0+1\right)\right)^{\frac{A_0}{A_0+1}}}{A_0} t^{\frac{A_0}{A_0+1}} - \frac{\eta_0}{A_0} \tag{84}$$

Acting in the same way as for the case $k=0$, we bring this equation, taking into account the previously introduced designations and conditions $k=\pm 1$, to the following form:

$$A\left(\frac{a''}{a}\right)^2 + 2k\frac{a''}{a} + A = B\left[-\left(\frac{a''}{a}\right)\left(\frac{a'}{a}\right)^2 + \left(\frac{a'}{a}\right)^4 + k\left(\frac{a'}{a}\right)^2\right] \tag{85}$$

$$A\left(y'\right)^2 + 2\left(y^2+k\right)y' + A\left(y^4 + 2ky^4 + 1\right) = 0 \tag{86}$$

$$A\left(y'\right)^2 + 2\left(y^2 \pm 1\right)y' + A\left(y^2 \pm 1\right)^2 = 0 \tag{87}$$

I. (b) The case, $k=+1$

$$A\left(y'\right)^2 + 2\left(y^2+1\right)y' + A\left(y^2+1\right)^2 = 0 \tag{88}$$

$$y'_{1,2} = \frac{-1 \pm \sqrt{1-A^2}}{A}\left(y^2+1\right) \to \int \frac{\mathrm{d}y}{y^2+1} = A_+\eta + \eta_0 \tag{89}$$

$$y = tg\left[A_\pm\eta + \eta_0\right] \text{ where } A_\pm = \frac{-1 \pm \sqrt{1-A^2}}{A},$$

$$a_\pm(\eta) = C_+ \cdot \cos^{\frac{1}{A_\pm}}\left[A_+\eta + \pi/2\right], \tag{90}$$

for simplicity, we have chosen $\eta_0 = \pi/2$, C_+ is the integration constant, for $k=+1$.

I. (c) The case $k=-1$

$$A\left(y'\right)^2 + 2\left(y^2-1\right)y' + A\left(y^2-1\right)^2 = 0 \tag{91}$$

$$y'_{1,2} = \frac{-1 \pm \sqrt{1-A^2}}{A}\left(y^2-1\right) \to \int \frac{\mathrm{d}y}{y^2-1} = A_\pm\eta + \eta_0 \tag{92}$$

$$\frac{1}{2}\ln\left|\frac{y-1}{y+1}\right| = A_\pm\eta + \eta_0, \quad a_\pm(\eta) = C_-\mathrm{e}^{\eta}\left(1 - \mathrm{e}^{\pi}\mathrm{e}^{2A_\pm\eta}\right)^{-\frac{1}{A_\pm}} \tag{93}$$

and C_- is the integration constant, for $k=-1$.

In principle, taking into account the ratio $c\mathrm{d}t = a(\eta)\mathrm{d}\eta$, from ratios (83), (90) and (93), it is possible to obtain values for the scale factor $a(t)$ in all these cases. Since the inhomogeneity parameter $\alpha = \frac{L}{R}$ is the ratio of the scale of inhomogeneity to the radius of the "world" under consideration, in which this inhomogeneity develops, we can investigate the dynamics of the development of inhomogeneity over time of our own observer in the "world" under consideration, depending on the magnitude of the DE parameter Λ. Thus, we have shown the "motionally-gravitational" role of DE both on small scales, on which bound states of matter are formed, and on large scales comparable to cosmological

scales, since we can make the inhomogeneity parameter $\alpha = \frac{L}{R} \sim 1$. Assuming that the physical dimension $[\Lambda] = L^{-2}$, we can assume that the intensity of DE also changes at small values of the size of the Universe, it grows.

5. Conclusions, Results and Discussion

The development of modern physics has been divided into two branches: one is related to the study of local properties of matter. Another branch is related to attempts to understand the behavior of matter on cosmic scales. These two methods of research consider the local and global properties of matter and space-time separately. But such a consideration is impossible when studying matter at the beginning of the origin of the Universe, when these properties are intertwined with each other and it is not so easy to separate the global and local properties of matter and space-time. In this case, we cannot consider space-time and matter without mutual influence on each other. In our article, we tried to find a way to understand the nature of the world using the unifying concept of Three Principles, which allows us to explore the Nature of the formation of the Universe from a Unified perspective. The reality of today, associated with the new observations of the Webb Observatory, shows that the modern understanding of the Universe has a conceptual crisis of ideas, which means the need to find alternative ways to understand nature in the light of new observations.

In addition we want add, that a new mechanism formation of the galaxies partially reflected in [2] [3] [6]. In a more detail, it is described at the description of the 4-th transition [6] which is associated with the rapid movement of matter flows ITM (UDM) down the Ray of Creation, culminating of which is self-limitation of space and the creation of special "clumps"—the "cores" of future galaxies which becomes a BH in the centre. The compaction and subsequent overflow of the "cores" by triads of matter ITM (UDM) led to powerful explosions and splashing in the space of the Universe. In this period, the matter of the ITM (UDM) Streams, combining with the TTM (CDM) triads of the Middle World, creates "atoms"—"bricks of 3 ITM (UDM)+ 3 TTM (CDM)", and from them—the materiality of the Middle World—the Stellar world similar to Milky Way.

The formation of UDM flows in this interpretation means the formation of vortex forces that can form rotating streams of matter. The mechanism of galaxy formation in this case resembles a funnel formed by a rotating stream, which during its rotation involves new matter in this movement and forms the critical mass of the future galaxy. The formation process ends when the rotational energy runs out and there is not enough force to attract new matter into this vortex. This mechanism differs from Jeans theory, where the formation of galaxies occurs due to density perturbations and due to the growth of these perturbations over time. Webb's latest observations, during which galaxies were discovered, that, according to modern theories of galaxy formation, should not exist, force us to look for other ways and mechanisms of galaxy formation.

1) According to our concept, the Universe is built by 2 types of UCM—DE and DM. DE and DM are not a "substance", not a "chemical substance", but a "form of motion of a special nature", where "form of motion" means "Eternal Motion" of unimaginably thin, extremely rarefied cosmic matter, and by "special nature"—three other properties of UCM (the ability to "glue and deform matter", "to create Life in visible and invisible worlds", "to embed the Mind"). These properties of a "special nature" (especially gravity), being "tied" to "Eternal Motion" and dependent on it, make cosmic matter universal and self-sufficient (transcendent).

2) It is shown that DE and DM performed earlier and are currently performing different tasks in the process of creation of the Universe: DE was used to build the "building" of the early Universe and maintain all creation processes in the invisible world at the proper level. DM, being also multifunctional, was involved in the construction of 3 visible worlds.

3) It is suggested that the function of "Eternal Motion", which generates the invisibility of the UCM, has become vital—not by chance:

a) "Eternal Motion" creates prerequisites for the unhindered delivery of 3 properties of matter, and, above all, gravity, to all corners of the Universe;

b) the different "frequency of vibration" inherent in the "motionally" ability gives rise to a function of different "time", ensuring the timely delivery of matter to the point of its transformation into another type of energy, and therefore into a new type of matter;

c) without "Eternal Motion", the "Eternal Cycle" of matter in the Nature of the Universe and much more would be absolutely impossible.

4) "Eternal Motion" is a power of different levels and degrees of self-sufficiency (transcendence). It is carried out thanks to:

a) "0"-DE particles, which created a Double Shell of the Universe with a Field of "0-strings" ("+", "0", "−"); ("−", "0", "+") and the three spheres of the Relic ("0"), ("+"), ("−");

b) "3"-particles of DM, which gave rise to 6 types of DM: UDM 3(1,2), 3(2,1); CDM 1(3,2), 1(2,3); IDM 2(3,1), 2(1,3). We called them "motionally-gravitational" particles, since "Eternal Motion", together with their inherent "gluing-deformation property", forms integrity and Unity in these particles.

5) The presence of a strong relationship between these 2 key properties of the UCM, which most accurately characterize the "feature of the nature" of cosmic matter, has been revealed: the higher the intensity of the "Eternal Motion", the more powerful and self-sufficient the gravitational properties of matter are manifested (and vice versa). It is suggested that there are two types of photons in the Universe: with the presence of mass (weight)—as a creation of the gravitational fields DE and DM; with a mass equal to 0—as a creation of the electromagnetic fields of matter of the Lower Worlds.

6) It is established that the properties of DE and DM vary depending on the proximity to the property of the Primary Source—the "Graviton" of the O_{SP} space, the most powerful "motionally—gravitational" particle of the Universe.

Such an identity of properties was obtained by the "0" DE particles along with the acquisition of a new function—"freedom of movement", which arose at the dawn of the creation of the Universe in the space of a Black-and-White Hole. To achieve the "3" DM (UDM) particles of the same, unusual in force, "gluing—deformation" properties of the "Graviton", it took the creation of a special structure—a "double field". We called these fields "Main" and "Small".

7) Cosmic structures capable of generating impulses ("shocks") of various intensity have been identified. They create the main prerequisites for the creation of the worlds of the Universe and it is for them that there are no impossible tasks. We called them gravitational "waves". The difference between the functions performed by "waves" in the "Main" and "Small" fields is shown.

8) "Waves" of the "Main" Field of the Universe, consisting of two types of "0-strings" ("+", "0", "−"); ("−", "0", "+"), have shown the ability to be:

- a source of Pulses (shocks) for the formation of type 1 Ether (used in the construction of 3 Relic Spheres, including a "Small" field of "0" particles);
- a means of bringing order out of the Chaos after the Big Bang;
- a tool for creating Ether of the 2nd type and 6 types of DM;
- a tool for regulating the direction of movement of UDM flows, arising from the "Small" field;
- the force that forms and moves huge "clumps" of DM (CDM and IDM), and accelerates transporting galaxies in the space of the Universe in order to build new worlds.

9) The vibrations of the "Small" field of the Universe, consisting of "0" particles of the Upper Sphere of the Relic, superimposed on the vibrations of the "Main" field of "0" strings, form a monstrous force of gravitational "waves", which:

- two types of Integration DM are formed from Ether of the 2nd type—3(1,2), 3(2,1);
- divide the formed mass of matter into separate huge "clumps";
- they twist "clumps"-future "streams", giving them the shape and unimaginable impetuosity of a "Vortex";
- with the help of a powerful Primary Pulse (push), "Streams" are sent, emitting photons of Light in their own electromagnetic field, down into the Middle and Lower Worlds of the Universe, to the place of creation of visible space objects.

10) "Eternal Motion" inevitably implies the presence of a "Cycle of Matter in Nature" in the closed structure of our Universe. This process is carried out due to the constant functioning of a special mechanism—"factories" in the form of exotic "B-WH":

a) "BH" crushes in their "millstones" the remnants of UDM flows (if BH is not aggressive) or slowly "devours" the matter of the galaxies themselves (if BH is aggressive);

b) in the "WH", the "waves" of the "Main" Field of the Universe continuously collect and distribute the "raw materials" of the "B-WH" (that is, the substance)

into the Spheres of the Relic "3", "2", "1"), turning it into Type 2 Ether, sending the required amount to the Upper A ("Small") Relict field for creating triads of UDM, and so on, in an "eternally repeating circle". So, in our opinion, UCM, with the help of a "Form of Motion of a Special Nature" - "Eternal Motion", solved (and continues to solve) numerous problems of creation of the Universe.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Khugaev, A.V. (2021) Concept of "Nested Russian Doll" Concept of 3-Principles and the Nature of the Dark Matter. *Sciences of Europe,* **1**, 34-40.

[2] Khugaev, A.V. and Bibaeva, E.A. (2021) Concept of Vibration in the Real World. Mechanism of the Universe. *Sciences of Europe,* No. 74, 47-57.

[3] Khugaev, A. and Bibaeva, E. (2023) The Worlds on the Other Side of the Big Bang. *Journal of Applied Mathematics and Physics*, **11**, 276-302. https://doi.org/10.4236/jamp.2023.111016

[4] Khugaev, A. and Bibaeva, E. (2023) To the Self-Deployment of Worlds on the Other Side of the Big Bang. *Journal of Applied Mathematics and Physics*, **11**, 1498-1524. https://doi.org/10.4236/jamp.2023.116099

[5] Khugaev, A. and Bibaeva, E. (2023) About Worlds inside a Black Hole and Peculiarities of the Formation of Exotic Space Objects. *Journal of Applied Mathematics and Physics,* **11**, 3009-3029. https://doi.org/10.4236/jamp.2023.1110199

[6] Khugaev, A. and Bibaeva, E. (2023) Ether as the Fundamental Substance of the Creation of the Universe. *Journal of Applied Mathematics and Physics,* **11**, 3800-3825. https://doi.org/10.4236/jamp.2023.1112241

[7] Dirac, P.A.M. (1975) General Theory of Relativity. John Wiley & Sons Inc.

[8] Kamke, E. (1971) Handbook on Ordinary Differential Equations. 4th Edition, Science Publisher.

[9] Khiet, V.T. (1984) About Inhomogeneous Cosmological Model. *Ukrainian Physical Journal*, **29**, 969-977.