GRAVITATIONAL REPULSIVE FORCES AND EVOLUTION OF THE UNIVERSE

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Abstract. Based on the principle of mass-energy equivalence established a new law of gravitational interaction, which is a special case of Newton's law of gravitation. In conjunction with the modern thermodynamics, the law predicts existence of gravitational forces of attraction and repulsion, the strong and weak gravity, stable and unstable gravitational equilibrium, as well as the presence of huge reserves of usable gravitational energy. He explains the phenomenon of libration, flow of material from the galaxy to galaxy, their rotation, the accelerated expansion of the galaxies peripheral regions, collapse and the subsequent outbreak of "supernova", the anomalies in the behavior of space probes and the emergence of capable radiation baryonic matter as a result of condensation of non-baryonic matter with followed self-organizing it into ordered structures such as galaxies. Conclusion is drawn on non-baryonic matter as a "fuel" stars, and it was unnecessary to conduct a hypothetical dark energy environment, causing the accelerated expansion of the universe. It is shown that the theoretical predictions are confirmed by astronomical observations in recent years.

Key words: Universe, baryonic and non-baryonic matter, theory and consequences, attraction and repulsive force, gravitational equilibrium, strong and weak gravity, data of observations.

1. Introduction.

One of the most significant discoveries in astrophysics of the XX century was the experimental discovery of the presence in the universe is "dark" matter [1,2] and the "dark" energy [3]. According to the observations "Plank" Space Observatory, the total mass of the observable universe consists 4.9% of the ordinary (baryonic) matter, 26.8% of dark matter and 68.3% of dark energy [4]. Thus, the universe at 95.1% consists of non-baryonic matter, which does not participate in electromagnetic interactions, and therefore invisible. This circumstance forces consider it as some "protomatter" from which were formed during the evolution of all known forms of matter of the universe, and to reconsider the role of gravitational energy in the process of its evolution.

The most direct route to this would be the application of the mass and energy conservation law in isolated system and the principle of its equivalence. Then it would immediately become clear that the "dark" areas of the universe where the mass of non-baryonic matter reaches 100%, the gravitational energy is the only form of it. However, for this it is necessary to consider the universe as a whole isolated system that is not shared by all. In addition, the study of the processes occurring in isolated systems, requires the use of a theory that does not resort to the determination of any parameters as the partial derivatives of the system energy and is capable of systematic consideration of the universe "from the whole to part", not dividing it into conditional equilibrium region, and phase components. Such a theory is suitable to study the non-equilibrium (non-static) processes of the transport and the transformation of all forms of energy, has appeared recently and has been named by us for the sake of brevity, "energodynamics" [5].

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This theory has carried out the synthesis of equilibrium [6] methods and non-equilibrium [7,8] thermodynamics, followed by a generalization of them to non-thermal form of energy. She considers the most general case of open polyvariant and multicomponent systems, which are able to carry out any works (external and internal, technical and non-technical, mechanical and non-mechanical, utility and dissipative). This makes it the most acceptable theory for the study of energy and matter conversion in the universe.

Approach with a common position allows to prove the existence in the universe the gravitational forces as of attraction and repulsion that makes unnecessary the introduction of hypothetical dark energy as a homogeneous medium with a negative absolute pressure responsible for the accelerated expansion of the universe. Along with this the energodynamics predicts existence of strong and weak gravity, stable and unstable gravitational equilibrium, as well as the presence of huge reserves of ready to use (free) gravitational energy. Thanks to all this the energodynamics gives a new explanation of observed phenomena in the universe is connected with the evolution and involution of some of its other areas.

2. Features of energodynamics in the annex to the isolated systems

Like the classical thermodynamics [6], energodynamic method of investigation is based on the properties of the total differential of the system energy $\mathcal{E}$ as most common features of its state. Wherein it takes into account that the concept of external kinetic energy E^{k}, the outer potential $E^{\text{п}}$, external forces and external energy in isolated systems lose their meaning, and the law of the total energy conservation degenerates therein to the law of internal energy U conservation. In this case, the internal energy becomes a total energy of an isolated system, which includes the kinetic energy of the relative motion of macroscopic parts $U_{\text{к}}$ system and the potential energy of their interaction $U_{\text{п}}$, but in general – the energy U_i all its i-th form $U = \Sigma_i U_i$ [5]. Since the insulation from the gravitational interaction does not exist, energodynamics considers non-baryonic matter as an indispensable component of any astrophysical systems, and the formation of its normal (baryonic) matter, which has many degrees of freedom – as a phase transition process characterized by an unusually high degree of sealing material [1)].

Further, in contrast to the classical thermodynamics, energodynamics study the non-equilibrium processes in which intensive local system parameters differ from their state averages. The specifics of these processes is the opposite in character (sign) changing the extensive parameters Θ (mass M, entropy S, charge Θ_{e}, number moles of k^{th} substances N_k, the pulse $\mathbf{P}$, its torque $\mathbf{L}$, etc.) in different parts (areas, phases, components) of the system. To prove this, simply select in the volume V of the research object a subsystems with volumes V' and V'', within which the density $\rho(\mathbf{r},t) = d\Theta/dV$ any extensive system parameter Θ more or less of the average magnitude $\bar{\rho} = \Theta/V$.

Then, by the obvious equality $\Theta = \int\rho dV = \int\bar{\rho}\, dV$, we have:

$$\int(\rho' - \bar{\rho})dV' + \int(\rho'' - \bar{\rho})dV'' = 0. \tag{1}$$

[1)] Non-baryonic matter density is currently estimated 10^{-27} g/cm^3, and the density of stars reaches the value of 10^{18} g/cm^3).

It follows that a deviation $\rho' - \bar{\rho}$ and $\rho'' - \bar{\rho}$ of a subsystem (areas, phases, components) in a heterogeneous system always has the opposite sign, as well as their rate of change. This provision, called [5] "principle of processes counterdirectivity ", determines the evolution of the universe, not only in general, but any part of it. Examples of such processes is the flow of material from one galaxy to another in close binary star systems. Examples of such processes is the flow of material from one galaxy to another in close binary star systems. They lead to the formation of longitudinal gravitational waves by spontaneous seal (thickening) and some decompression other parts of space filled with non-baryonic matter. This oscillatory process is illustrated in Fig.1, which shows that any wave of arbitrary magnitude Θ (in this case the mass M) is formed by displacement of a number of its Θ′ from the position with the radius-vector **r′** to 'position **r″**.

Such waves are formed between the irregularities of the non-baryonic matter and are standing. They do not transfer energy through their sites, and that is the reason they are not observable. However, the internal transport of material in them is accompanied by the formation of a dipole "moment distribution" mass Z, which determine the expression:

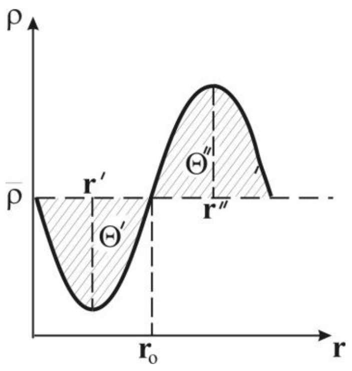

Fig.1. Billowing in the baryonic matter

$$\mathbf{Z} = M\mathbf{\Delta r} = \int(\rho - \bar{\rho})\mathbf{r}dV, \tag{2}$$

where $\Delta\mathbf{r} = \mathbf{r}'' - \mathbf{r}'$ – the arm of moment **Z**, hereinafter "the vector displacement»; r - running (Euler's) coordinate. Such moments occur when redistributing any extensive parameters Θ. Therefore, the introduction of such "parameters of non-uniformity" to evaluate the deviation of the system as a whole from the equilibrium of any kind (thermal, mechanical, material, etc.), avoiding the use of local equilibrium hypothesis [6].

The total differential of the time can be decomposed into three independent components:

$$d\mathbf{Z} = \mathbf{\Delta r}dM + Md\mathbf{R} + d\boldsymbol{\varphi}\times\mathbf{Z}, \tag{3}$$

where $\mathbf{\Delta R} \equiv |\mathbf{\Delta r}|$ – the magnitude of the displacement.

In accordance with the methodology of the energodynamics [5], this means that to describe the state of spatially inhomogeneous system with <u>only</u> (gravitational) degree of freedom ($U = U_g$) is necessary and sufficient three arguments, one of which represents the change in its mass M_g example during accretion; the other – the position $\mathbf{R}_g$ center of mass, changing in the process of redistribution (eg, in mass transfer from one galaxy to another with the speed $\boldsymbol{\upsilon}_g = d\mathbf{R}_g/dt$), and the third – the process of reorientation, coupled with the change in the spatial angles $\boldsymbol{\varphi}_g$ orientation vector $\mathbf{\Delta R}$ (for example, by the rotation of the galaxy with angular velocity $\boldsymbol{\omega}_g = d\boldsymbol{\varphi}_g/dt$). In other words, the gravitational energy U_g as a state function has the form $U_g = U_g(M_g, \mathbf{R}_g, \boldsymbol{\varphi}_g)$, and its total differential can be represented in the form of identity:

$$dU_g \equiv \psi_g dM_g - \mathbf{F}_g \cdot d\mathbf{R}_g - \mathbf{M}_g \cdot d\boldsymbol{\varphi}_g, \tag{4}$$

where $\psi_g \equiv (\partial U_g/\partial M_g)$ – gravitational potential; $\mathbf{F}_g \equiv -(\partial U_g/\partial \mathbf{R}_g)$ – the gravitational force; $\mathbf{M}_g \equiv -(\partial U_g/\partial \boldsymbol{\varphi}_g)$ - its torque. It does not matter whether we consider non-baryonic substance as a continuous or a discrete medium, since the state of its description by means of these parameters it is possible in this, and in the other case.

The process of wave formation in the non-baryonic matter (Figure 1) is the first step towards its transformation into baryonic matter. This process is accompanied by the appearance of his kinetic energy of the relative motion $U_к = M_g \upsilon_g^2/2$. This gives rise to a pair of forces $\mathbf{F}_g$ proportional "steepness" wave, which seeks to "flatten" the wave and fill all the space provided to her. These repulsive forces explain the "pervasive" nature of gravitational waves and give rise their compression to a condition sufficient to form one of baryonic matter. They also explain the ability of non-baryonic matter to do work "against equilibrium" in the baryonic matter, which is accompanied by the appearance in it of new degrees of freedom with opposite charges, spins, and pulses etc. . All new i^{th} forms of baryonic matter energy U_i, including kinetic energy of the relative translational, rotational and vibrational motion of its parts, of their potential energy of interaction (gravitational, electrical, magnetic, chemical, nuclear, etc.) as well as the thermal energy arise in the process of structuring the baryonic matter, of course, due to the decrease of the gravitational energy of non-baryonic matter. With the advent of new degrees of freedom arises ability of baryonic matter to the thermal and nonthermal radiation, which makes it "visible".

Since there are distribution points Zi in general and new forms of energy, the identity (4) complicated and takes into account not static processes to form:

$$\Sigma_i dU_i/dt \equiv \Sigma_i \psi_i d\Theta_i/dt - \Sigma_i \mathbf{F}_i \cdot \boldsymbol{\upsilon}_i - \Sigma_i \mathbf{M}_i \cdot \boldsymbol{\omega}_i, \qquad (5)$$

There Θ_i – extensive system parameters (mass M, the number of moles of k^{th} substances N_k, the entropy S, the charge Θ_e, pulse **P,** its momentum **L** etc.); $\psi_i \equiv (\partial U_i/\partial \Theta_i)$ – generalized potentials system (its absolute temperature T and pressure p, chemical μ_k, electrical φ, gravitational ψ_g etc. potentials); $\mathbf{F}_i \equiv -(\partial U_i/\partial \mathbf{R}_i)$ – forces in their general physical sense (both external and internal, mechanical and non-mechanical, utility and dissipation); $\mathbf{M}_i \equiv -(\partial U_i/\partial \boldsymbol{\varphi}_i)$ – the moments of these forces; $\boldsymbol{\upsilon}_i = d\mathbf{R}_i/dt$, $\boldsymbol{\omega}_i = d\boldsymbol{\varphi}_i/dt$ – rate of relative translational and rotational movement of parameters Θ_i as energy carriers; t - time; i = 1,2, ..., n - number of energy forms in the system.

With the advent of new degrees of freedom arises ability of baryonic matter to the thermal and nonthermal radiation, which makes it "visible". In homogeneous systems of the 2nd and 3rd sums of the identity (5) vanish, and it turns into a generalized equation of nonequilibrium thermodynamics [6], which describes the non-static processes of heat transfer, mass transfer, diffusion, volumetric strain, etc. If, however, considered isolated systems in which these processes are not available, it will change to a generalized equation of dynamics isolated systems in which the internal processes proceed simultaneously mechanical and non-mechanical nature. Through this synthesis the energodynamics allowed to receive not only basic laws and equations of mechanics and thermodynamics, hydrodynamics and electrodynamics as her consequences, but also a number of other non-trivial consequences [9]

The members of his 2nd and 3rd sums characterize the internal work done by non-baryonic matter during its transformation into baryonic matter. It was this work leads to the appearance in the condensed-matter particles with spin and charge of different sign, with opposite direction of the pulse of translational, rotational and vibrational motion, etc. Such work "against equilibrium" accompanied by the appearance in the baryonic matter in addition to thermal (chaotic) motion of the orderly movement of the particles, accelerate their relative translational and rotational motion, etc.

Due to the emergence of new degrees of freedom baryonic matter acquires the ability to thermal and non-thermal radiation, which makes it "visible".

For solving specific problems basic identity the energodynamics (5) should be supplemented by so-called "conditions of uniqueness," including the physical properties of the object being studied, and the equation of its state and transfer, boundary conditions, etc. When their adequacy the energodynamics retains inherent thermodynamics infallible justice of its consequences. This allows you to rely on the fruitfulness of its application to astrophysical processes.

3. The energy and gravitational potential of non-baryonic matter

According to identity (5), in the "dark" areas of the universe, where the share of non-baryonic matter is 100%, $M = M_т$ и $U = U_т$. Then from (4) that at rest (when there is no flow of mass and its rotation) $dU_т = \psi_т dM_т$ or

$$U_т = \psi_т M_т\,. \tag{6}$$

Earlier this expression, stating the proportionality of the mass *M* and energy *U*, attributed to the ether as a light-carrying medium capable of conversion to ordinary matter (N.Umov, 1873. J. Thomson, 1881; O. Heaviside, 1990, Poincaré, 1900; F . Hazenorl 1904 et al.). Wherein the proportionality coefficient taken depending on the model, the value from $(1/2)c^2$ to $(4/3)c^2$, where c – the speed of light [10]. A. Einstein in 1905 is summarized in the expression of all kinds of substances and forms of energy, putting the proportionality factor equal to c^2 [11]. Since this position is called the principle of mass-energy equivalence. According to this principle, the gravitational potential in the expression (4) is equal to the square of the speed of light:

$$\psi_т = (\partial U_т/\partial M_т) = c^2, \text{ Дж/кг}. \tag{7}$$

It is interesting to compare this value with the Newtonian gravitational potential.

$$\psi_с = GM_с/R_с, \tag{8}$$

on the surface of the sun (mass $M_с = 1{,}989 \cdot 10^{30}$ kg, radius $R = 6{,}9599 \cdot 10^8$ m), assuming $\psi_с$ as the energy value of a purely positive. For him $\psi_с = 1{,}906 \cdot 10^{11}$ J/ kg, that for $G = 6{,}672 \cdot 10^{-11}$ N·m^2·kg^{-2} and $c = 2{,}99792458 \cdot 10^8$ m·s^{-2} is less than the capacity of the dark matter in $4{,}7 \cdot 10^5$ time. Even weaker gravitational potential at the surface of the Earth ($M_з = 5{,}976 \cdot 10^{24}$ kg; $R = 6{,}36 \cdot 10^6$ m), for which $\psi_с = 6{,}27 \cdot 10^7$ J/kg, ie, $\psi_с$ less than 9 orders of magnitude! This fact justifies the presentation of the question about the existence of "strong gravity" [12], bringing us to the understanding that all the forces acting in the ordinary matter, are ultimately the common nature and are clearly distinguishable only after the occurrence in the gravitational interaction of new energy carrier.

This also implies that the gravitational energy is almost the only source of energy of stars. This statement is based on the fact that the entire stock of energy expended by them in the process of nuclear fusion, it was acquired by the condensation of non-baryonic matter. In addition, if the energy released in thermonuclear reactions is limited to the relative size of the mass defect $\Delta M_с/M_с$, is much less than unity, then the relative value of the mass of non-baryonic matter

$\Delta M_т/M_т$ coming from the environment in the process of its transformation into the baryonic matter is not limited.

The fact that such a transformation is carried out not only in space but also on Earth, show the results of tests of the hydrogen "king - bomb" on the New Earth in 1961, when calculated energy of thermonuclear reaction has been exceeded by 10^5 times [13]. This is also evidenced by the existence of ball lightning, which emit energy for a long time (15 minutes), as well as numerous "over-unity" of the device, known since the time of Tesla. The latter often exceeds the output power consumption by several times due to "recharge" their energy environment, not measurable. Chances are good, and that is the condensation of non-baryonic matter causes excess heat in the reactions of the so-called "cold fusion", as they are accompanied by the emergence of new chemical elements in the absence of binding of fusion reactions gamma radiation [14]. These circumstances encouraged to rethink the role of gravitational energy in the process of its evolution.

4. Existence of gravitational repulsion forces in the dark matter

From the principle of mass-energy equivalence, it follows that

$$u_g = c^2\rho, \text{ Дж/м}^3, \tag{9}$$

where ρ, u_g – density non-baryonic substance and its energy.

Applying to both sides of the expression (8), the operator ∇, we have:

$$\nabla u_g = c^2\nabla\rho. \tag{10}$$

Since the gravitational acceleration **g** connected with the density gradient ∇u_g known relation $\rho\mathbf{g} = -\nabla u_g$, from (9) in view $\psi_g = c^2$ directly follow an alternative to Newton's law of gravity [15]:

$$\mathbf{g} = -\psi_g \nabla\rho/\rho. \tag{11}$$

According to this expression, the value of the gravitational acceleration is proportional to the gradient of the relative ∇ρ/ρ density of the material forming the gravitational field. Thus gravitational force is always directed against the density gradient material ∇ρ and therefore can be different magnitude and sign in different regions of the universe. In other words, the gravitational force can be both forces of attraction and repulsion forces depending upon the mass distribution in space.

The presence of gravitational forces of the two signs does not follow from Newton's law of gravitation. Nevertheless, the expression (11) does not contradict the law (8). As is known, Newton's law is obtained on the assumption of a homogeneous distribution of the density ρ and determine gravitational potential ψ_c at point **r** out of this body in its function of mass $M_c = \rho V_c$, ie $\psi_c = \psi_c(M_c, \mathbf{r})$. Let us now problem differently: to find potential ψ_c on the surface of a sphere of unit volume V (with a radius R_c) in function of the density of matter ρ, ie, $\psi_c = \psi_c(\rho, R_c)$, as in the expression (11). According to (8), this potential is

$$\psi_c = (GV_c/R_c)\rho. \qquad (12)$$

It follows that

$$\mathbf{g}_c = -\nabla\psi_c = -(GV_c/R_c)\nabla\rho = -\psi_c\nabla\rho/\rho, \qquad (13)$$

those $\mathbf{g}_c$ acceleration barionic matter related to density gradient the same equation (11), wherein the proportionality coefficient ψ_T is replaced by ψ_c. Apparently, it is the difference of potentials ψ_g and ψ_c as a function of density perturbations in the propagation velocity of baryonic and non-baryonic matter is the cause of differences «strong» and 'weak' gravity. In this case, Newton's law can be seen as a different formulation of the law of mass interaction for the case of the pair interaction of bodies.

It is characteristic that not only the identity (5), but also the laws of gravity in the form of (11) and (13) emphasize that any force fields are generated not the masses, charges and currents in themselves, and their uneven distribution in space. Award-common law (11) and (13) allows him to predict the behavior of objects in the Universe by measuring the relative value $\nabla\rho/\rho$ gradient density of visible matter. If, for example, star galaxy density decreases toward the periphery thereof, according to (11) and (13) therein acceleration acts toward the center. If, for example, galaxy density decreases toward the periphery thereof, according to them therein acceleration acts toward the center. This indicates the occurrence of the compression process therein. Conversely, if two galaxies having density maximums at their center, spaced apart by a gap, devoid of baryonic matter, it indicates an action between the repulsive forces (at least in the past).

The law of gravity (11) and (13) explains the phenomenon of the "overflow" of matter from one galaxy to another in the absence of a convergence of their nuclei. Indeed, according to (11), g the acceleration is inversely proportional to the density of matter and therefore largely affects the peripheral rather than the central regions of galaxies. This explains the lagging envelope (coat) of moving (colliding) galaxies from its nucleus. No less important is that the law (11) and (13) helps to explain the emergence of a number of rotation of galaxies. If, for example, binary stars are of different density, and then acting on them by the force of gravity will also be different, thus creating torque. The same will happen with the galaxy having a sleeve, ie asymmetrically exchanging matter with the neighboring galaxies. Such a moment will be absent only with the full symmetry of the object (when offset vector $\Delta R = 0$) of gravitational forces throughout its evolution, since the rotation, once it has arisen, is retained in the future for a long time, and in the absence of torque due to the virtual absence among non-baryonic viscosity material. All this allows us to explain and predict the nature of the motion of the objects of the universe on the basis of measurements "in real time", when long observation excluded. Thanks to this new law of gravity opens up new possibilities of observational astronomy.

5. The existence of gravitational equilibrium

A special the heuristic value of the new law of gravity is in the prediction of the existence of gravitational equilibrium, characterized by the absence of the resultant force $\mathbf{F}_g$. This provision also does not follow from Newton's law of gravity (12), according to which these forces reach zero only at an infinite distance gravitating bodies. From the law of the (11) it follows directly that the gravitational force $\mathbf{F}_g = M\mathbf{g}$ vanish at $\nabla\rho = 0$ regardless of the value of the most density ρ. This state is in the common thermodynamic equilibrium criteria [6], the host, in this case the form:

$$\mathbf{g} = -\nabla\psi = 0. \tag{14}$$

It is characteristic that even Newton himself gave an elegant proof of the absence of gravity inside the sphere with a uniform density distribution at the surface [16]. This equilibrium is stable, if the displacement $d\mathbf{r} = d\mathbf{R}_g > 0$ from ro equilibrium position causes a "restoring" force, ie acceleration directed against bias

$$-\nabla\mathbf{g} = \nabla^2\psi_g > 0, \tag{15}$$

and, conversely, unstable, if the offset $d\mathbf{r} = d\mathbf{R}_g$ causes further acceleration of the body in the same direction:

$$-\nabla\mathbf{g} = \nabla^2\psi_g < 0, \tag{16}$$

The presence of such zones of stable equilibrium demonstrates the phenomenon of libration (periodic oscillations position or trajectory of the motion of celestial bodies relative to the middle position). In accordance with the expressions (11) and (13), this phenomenon is observed when the outer body is rejecting his position or trajectory of the equilibrium state falls in the region with increasing gravitational potential ($\nabla\psi_g > 0$). According to (11) and (13), the "width" of stable equilibrium zone depends on the $\nabla\rho$ ρ. Where the relative heterogeneity $\nabla\rho/\rho$ is small, libration zone, like lowland rivers may hold a significant portion of the space of the universe. However, with the increasing heterogeneity of these areas are narrowed and may disappear altogether, as it was in Newton's law of gravitation (12) where ($\partial\psi_c/\partial R_c$) is always less than zero. This is easy to check by placing «trial» body between two gravitating masses. A similar situation is observed in the so-called "close system" paired stars or galaxies, where the equilibrium instability manifests itself in the mass transfer from one celestial body to another.

Approaching the libration zone and may explain the anomalous deceleration of space probes such as "Pioneer" and "Voyager 1 and 2" of the transition to the universe with a more uniform distribution of matter.

Thus, according to (11,13) , on the nature, magnitude and sign of the relative density gradient star clusters $\nabla\rho/\rho$ can be judged not only on the direction of the evolution of this or that region of the universe, but also on the relative rates of these processes.

The existence of gravitational equilibrium and the presence of vast libration zones explains why observable universe astronomers for a long time seemed stationary, and ultrafast processes in it - random. A fine balance between attractive and repulsive forces is broken only with the release of the libration zone. In accordance with expression (15) it occurs with increasing displacement $\Delta\mathbf{R}_g$ from equilibrium area, i.e. with increasing repulsion forces, which are proportional to the gradient of the gravitational potential. This causes preferential recession of distant galaxies that are closer to the borders of the libration zone (where the gradients $\nabla\rho$ greater). Note that the explanation of the accelerated expansion of "peripheral" regions of the observable universe was beyond the power of any of the existing theories of gravity.

The presence of the repulsive forces at the very baryonic matter makes unnecessary involvement hypothetical "dark energy" – unchanged in time environment with negative pressure, designed to compensate for the force of gravity to explain the observed accelerated expansion of distant galaxies. It becomes unnecessary and hopeless search for candidates for the role of carriers of this energy, which would be able to maintain such a fine balance between the forces of gravity and repulsion, not to exceed it, like the physical vacuum on the order of 123 [17]. This makes the terms "non-baryonic" and "dark" matter is essentially synonymous.

6. Discussion of results and experimental verification of the theory

Strong evidence of the consequences of the concept developed here can be found from the Lawrence recently obtained in the laboratory in Berkeley (USA) data on the distribution of galaxies in the visible universe [18]. The main goal of this laboratory, the project Digital Sky Survey (the SDSS) was most accurate (reached today 1%) calculation of coordinates and a half million star clusters and drawing three-dimensional maps of the sky. Analyzing the distribution of celestial bodies at a fixed distance from the observer, the scientists found that the galaxies are concentrated mainly either in the center or on the surface areas at a distance from their center at a distance of about half a billion light-years [15]. At a fixed distance from the observer such clusters of galaxies appear as circular structures resembling ripple in still water when falling in these large drops of rain (Figure 2). Researchers have interpreted them as baryon acoustic oscillations of the primordial plasma of the universe. [16] However, they are rather gigantic length gravitational waves as acoustic waves or other starting material in the universe can not arise. The illustrated character of the distribution of baryonic matter in the universe is consistent with the law of gravity (11). According to him, the gravitational force $\mathbf{F}_c$ always directed to the side opposite to the density gradient $\nabla\rho_c$. This is what we are seeing in each of the ring structures, where the density of star clusters in the central portion thereof decreases as the distance from its center. In this case, gravity forces are directed into the cluster, accelerating its compression. The same is observed in the peripheral part of the ring, where the density of star clusters decreases with deviation from the center line on both sides like a half-wave "elevation". The fact that between them there is a vast space, practically free of galaxies, evidence of the existence of gravitational equilibrium ($\nabla\rho_c = 0$), when there are no conditions for thickening mass of dark matter with its subsequent conversion into baryonic matter. The evolution of this metagalaxy depends on expanding or narrowing the zone.

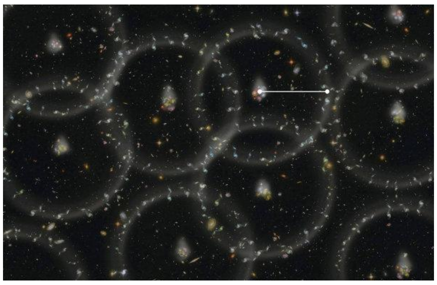

Fig.2. Map of the Universe Showing Circular Structures (Source: Berkeley National Laboratory)

Clearly visible in Figure 1 fractal nature of ring structures in the entire observable universe and its about the same diameter (the size of an eye-lo half a billion light-years) is fairly considered in [16] as the applicability of a certificate to the universe Euclidean geometry. The proximity of the universe to its "flat" model (with general relativity position) confirms the validity it study from the standpoint of classical physics.

It is interesting to describe briefly to the conclusion from the standpoint of energodynamics evolution and involution of the individual regions of the universe. According to her, in the non-baryonic matter local "thickening" are caused by density fluctuations. Having arisen, they have the force of law of gravitation (11) generate a couple of forces, causing a further seal of high density area. As the seals (condensation) of dark matter are born structural elements of baryonic matter, which generate oscillations of radiation. This process is terminated only with the advent of "collapse" when the state of the star becomes close to homogeneous ($\nabla\rho_c \rightarrow 0$), and compression forces are beginning to concede the forces of the internal pressure generated in the material flowing exothermic processes. Then collapsing star begins relatively quickly "reset" the outer shell. This process is accompanied by a sharp burst of luminosity (flash "supernova") and can be repeated as long as the substance is not a star will be scattered in space. Such cycles of evolution and involution are observed in all areas of the visible universe, confirming its unsteadiness and existence of its unlimited in time and space.

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