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About The Properties Of A Hidden Matter

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Annotation: *A new approach to the study of the properties of the hidden mass of the universe is proposed, based on the modification of the law of universal gravitation with respect to continuous media. According to him, gravity is a consequence of the inhomogeneous distribution of the density of matter in the universe. This law reveals the presence of "strong" gravity in hidden matter, which exceeds the Newtonian potential on the surface of the Sun by five orders of magnitude, as well as the existence of gravitational equilibrium and gravitational repulsive forces that make "dark energy" an unnecessary entity. The possibility of separating the "free" (workable) part in the gravitational energy and its division into "gravistatic" and "gravikinetic" components is revealed. It is shown that this part of the gravitational energy makes the hidden matter the true "fuel" of the stars and the cause of many phenomena that seem to contradict the laws of physics. At the same time, it is shown that self-oscillations of density inevitably arise in hidden matter, transforming part of its gravitational energy into other forms and making it the "first principle" of all forms of baryonic (visible) matter and a self-sufficient carrier of light. Along with the justification of these properties of hidden matter and their experimental confirmation, an explanation is given of a number of observable cosmological phenomena.*
Key words*: hidden mass; dark matter; gravity and antigravitation; gravistatic and gravikinetic energy; force of attraction and repulsion; wave-particle; torsional (swirling) waves; angular momentum; unknown phenomena.*

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I. Introduction

The development of observational astronomy led to the discovery of the fact that at least 95% of the mass of the universe is "hidden" (unobservable) matter that does not participate in the electromagnetic interaction and manifests itself as its gravity [1]; that the universe is expanding not slowly, but accelerated [2]; that the distribution of galaxies on the three-dimensional map of the starry sky is by no means erratic [3], but resembles in the section concentric circles with the predominant arrangement of stars at its center and on the periphery [4] that gravitational waves exist in the universe [4], etc. These discoveries compel us to reconsider the role of the hidden mass in the universe, which according to modern concepts consists of 26.8% of the "dark" matter, which manifests itself mainly in its influence on the character of the mentioned rotation curves, and 68.3% of the "dark" energy , responsible for the accelerated expansion of the universe [5]. It is believed that both of these hypothetical components of hidden matter are "dark" not only because they do not participate in electromagnetic radiation, but also because of the lack of knowledge of their properties.

The purpose of this article is to show that "hidden matter" is not so "dark" if it is studied by the methods of energodynamics [6], which treats hidden matter as the successor of the ether, i.e. A continuous medium is the carrier of gravitational energy, from which all forms of the visible (baryonic) matter of the Universe were formed during the process of structuring. This theory generalized the methods of nonequilibrium thermodynamics of irreversible (dissipative) processes[7, 8] to the processes of the useful transformation of internal energy, not only in nonthermal and noncyclic machines, but also in natural processes of energy conversion. This makes it a unified theory of the processes of transfer and transformation of any forms of energy.

To eliminate the existing uncertainty of the concept of energy caused by the introduction of the concept of internal energy U as a degraded part of the total energy that has lost its efficiency, energy dynamics considers isolated systems as the initial object of research, including the entire set of interacting (mutually moving) objects. For such a system, all of its energy is internal (intrinsic), independent of the state of any external bodies and frames of reference. This is the universe as a whole, which includes "everything that exists."

In particular, this approach allowed us to give a theoretical derivation of the law of gravitation, starting from the nonuniform distribution of the gravitational potential ψg (ρ) as a function of the local density ρ in the volume of the system [9]:

$$\psi_g = GM(1/R_c - 1/R). \quad (R \geq R_c). \qquad (1)$$

where G is the gravitational constant; R is the distance between the centers of the "field-forming" M and the "trial" m mass; R_c is the minimum distance to which they can be approximated.
It is easy to see that Newton's law of gravitation

$$F_g = GMm/R^2 \quad (2)$$

directly follows from this expression as the derivative $F_g = (\partial U/\partial R)$, since the gravitational potential ψ_g is the specific energy of the test body U/m.

Characteristically, with such an approach, the state of these bodies at $R = R_c$ is taken as the origin of the gravitational energy U, conditionally attributed to the test body in the "field" of the more massive body M. This calibration eliminates the negative values of the gravitational potential $\psi_g = -GM/R$and the energy $U = -GMm/R$in Newton's law, devoid of physical meaning. In addition, expression (1) eliminates the divergence caused by the inversion of the energy U, the potential ψ_g and the gravitational force F_g to infinity as $R \to 0$ in it. According to expression (1), the force $F_g$reaches its maximum at $R = R_c$, i.e. on the surface of the "field-forming" body, while the potential ψ_g then vanishes. This is natural, since for solid bodies of finite dimensions, with which Cavendish experimented, further rapprochement is impossible. Thus, the region of validity of Newton's law is bounded by the region $R \geq R_c$, and its divergence is due to neglect of the spatial extent of real bodies.

However, the advantages of energy dynamics do not end there. It is important that the methods of energy dynamics, like thermodynamics, do not rely on model concepts of the structure of matter and proceed from the possibility of describing both continuous and discrete media by the macroscopic parameters of the system as a whole or by their density. In addition, her method belongs to the category of deductive (from general to particular), which allows us to consider the universe as a whole as an object of research and to reveal the most common properties of hidden matter. All this makes energy dynamics the most adequate to the task posed by the research tool, all the more so since all the known conservation laws (energy U, mass M, charge Q, pulse $\mathbf{P}$ and its moment $\mathbf{L}$) were formulated precisely for isolated systems.

II. Law of gravitation in hidden matter

One of the main features of gravity in hidden matter is the absence in it of "field-forming" and "trial" bodies with masses M and m, appearing in the law of gravitation of Newton (2). Therefore, for it the gravitational potential ψ_g should be represented as a function $\psi_g(\rho)$ of the matter density $\rho = (\partial M/\partial V)$ in a given region of space, rather than its mass M. The shortest way to this is the principle of equivalence of the mass M and energy $U = Mc^2$, according to which $\psi_g = c^2$, and $\rho\mathbf{g} = (\partial \mathbf{F}_g/\partial V)$. The force $\mathbf{F}_g$ can be expressed in terms of the product F_g by the unit vector $\mathbf{e}$ in the direction of its action, so that in accordance with the expression $F_g = (\partial U/\partial R)$, the acceleration of the gravitational field $\mathbf{g}$ can be expressed by the relation:

$$\mathbf{g} = \rho^{-1}(\partial \mathbf{F}_g/\partial V) = \rho^{-1}\mathbf{e}(\partial^2 U/\partial V \partial R) = \rho^{-1}c^2(\partial^2 M/\partial V \partial \mathbf{R}) = \rho^{-1}c^2(\partial\rho/\partial \mathbf{R}), \quad (3)$$

or finally

$$\mathbf{g} = c^2\nabla\rho/\rho, \quad (4)$$

where $\nabla\rho = \mathbf{e}(\partial\rho/\partial R)$is the density gradient in the acceleration direction $\mathbf{g}$.

This expression differs from the sign of the right-hand side obtained earlier [10, 13], which is due to the choice here of a more convenient reference system related to the direction of the action of the force[1)].

The law of gravitation modified in this way differs from Newton's law of gravitation in several respects. First of all, he points out that the gravitational forces arise only for an inhomogeneous distribution of the density of matter in space (when $\nabla\rho \neq 0$). Consequently, according to him, the cause of gravity is not the curvature of space [11], but the *non-uniform distribution of matter in it*.

Secondly, the law (4) reveals the existence in the universe of states of gravitational equilibrium ($\nabla\rho = 0$), which in no way follows from Newton's law. An experimental confirmation of the existence of such an equilibrium is the presence in the system of three bodies of so-called "libration points" in which "test bodies" (for example, the Moon located between the Earth and the Sun) experience oscillations (rocking) [12].

Thirdly, according to (4), outside the equilibrium zone there can exist both gravitational forces ($\mathbf{F}_g > 0$ for $\nabla\rho > 0$) and repulsive forces ($\mathbf{F}_g < 0$ for $\nabla\rho < 0$). This indicates the existence in the same hidden matter of both gravitation and antigravity, which contrasts sharply with existing ideas based on the absence of repulsive forces in Newton's law of gravitation. The presence of such forces means that the accelerated expansion of the visible (observed) part of the universe is due not to the existence of a hypothetical "dark energy" as a medium with a negative pressure compensating for gravitational forces, but more prosaic causes - the presence of regions of the universe, where $\nabla\rho < 0$, repulsive forces prevail. This makes "dark energy" an unnecessary entity and frees us from the unsuccessful search for a candidate for her role. The division of hidden matter into "dark matter" and "dark energy" also becomes unnecessary, which makes "hidden" and "dark" matter synonymous. This allows us

[1)]Before, reference system was chosen, connected with the center of the "field-forming" mass, for example, a cluster of stars, so that $\nabla\rho = (\partial\rho/\partial \mathbf{r})$ was directed from its center to the periphery ($d\mathbf{r} = -d\mathbf{R}$).

to consider the universe as a binary system consisting of non-baryon (unstructured) and baryonic (structured) matter [13].

Fourthly, it follows from the modified law of gravitation that the acceleration of gravity g can be different in different regions of the universe due to the heterogeneity of the intergalactic medium. This explains the anomalous acceleration of the space probes "Pioneer" and "Voyager" during their movement in outer space. Fifth, from the principle of equivalence of mass and energy, as well as the law of gravitation (4), it follows that gravitation is by no means the weakest of all interactions, as is commonly assumed. On the contrary, in a continuous medium, gravitation is much "stronger" than the pair interaction of bodies described by Newton's law. It is easy to verify this by comparing the gravitational potential of the hidden matter $\psi_g=c^2 \approx 9\cdot10^{16}$J/kg with the Newtonian gravitational potential ψ_c on the surface of the Sun with a mass $M= 1{,}989\cdot10^{30}$ kg and radius $R_c = 6{,}9599\cdot10^8$ m where it is maximum. Assuming in accordance with (1) that the potential is strictly positive, we find for $G= 6{,}672\cdot10^{-11}$H·m^2·kg^2, that is $\psi_c = 1.906\cdot10^{11}$ J/kg, which is less than the potential of hidden matter ψ_g in $4.7\cdot10^5$ time. This circumstance confirms the existence of the so-called "strong gravity" [14] and fundamentally changes our ideas about the nature of gravity and its role in the processes of the universe.

III. The internal gravistatic energy of hidden matter

Gravitational energy is considered to be external, i.e. dependent solely on the position of the system with respect to external bodies. However, for the universe as a whole, which includes "everything that exists," the concept of external energy loses its meaning. Consequently, in isolated systems, gravitational energy should be considered as part of its internal energy *U*. In a baryonic substance possessing several types of energy (nuclear, atomic, chemical, thermal, electric, magnetic, etc.), this fraction is noticeably less than in areas of the universe, free of it. However, in it, this fraction is different from zero, since there is no isolation from gravitational interaction. This circumstance once again emphasizes the expediency of considering the universe as a binary system, and the process of formation of a baryonic substance as a process of "condensation" of non-baryonic matter. This makes it possible to apply the same methods of energy dynamic study to non-baryonic matter as to any other multivariant system.

An energodynamic study of such systems begins with the elucidation of the number of independent processes taking place in them. For this purpose, we draw attention to another feature of the law of gravitation (4), according to which the acceleration of gravitation is always directed in the same direction as $\nabla\rho$. This means that if in any area of the universe spontaneously a density gradient of matter $\nabla\rho$ appeared, then the gravitational forces lead to its further increase, strengthening the heterogeneous state of hidden matter. Such instability of a homogeneous state is an earlier unknown feature of the gravitational field, which is completely uncharacteristic of the fields of any parameters of the observed (baryonic) matter. This instability leads to the spontaneous appearance in the hidden matter of areas of increased density and the subsequent formation in these "centers of condensation" of all known forms of celestial bodies [10]. It is easy to show that such processes are accompanied by the formation of density waves $\rho(\mathbf{r},t)$, the characteristic feature of which is its deviation in both directions from their mean value $\bar{\rho} = V^{-1}\int\rho dV = \Theta/V$. For this it is sufficient to have the obvious equality $M = \int\rho dV = \int\bar{\rho}\, dV$, from which it follows:

$$\int(\rho - \bar{\rho})dV = 0. \quad (5)$$

According to this expression, the excess density of matter in any region of the universe ($\rho - \bar{\rho} > 0$) is always accompanied by its opposite change in the other ($\rho - \bar{\rho} < 0$). Examples of such processes are the flow of matter from one galaxy to another in close systems of binary stars. This type of oscillation is expediently called "gravitational waves" in order to distinguish them from waves of "space-time curvature" predicted by general relativity.

This process of wave formation is illustrated in Fig. 1, from which it follows that it is accompanied by the transfer of some mass ($\Theta' \equiv M$) from the position $\mathbf{R}'$ to the position $\mathbf{R}''$, ie its displacement by a distance $\Delta\mathbf{R}$ equal to half the wavelength $\lambda/2$. The position of the centers of gravity $\mathbf{R}'$ and $\mathbf{R}''$ can be found in a known way:

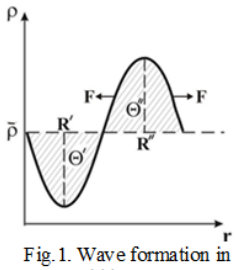

Fig. 1. Wave formation in gidden matter

$$\mathbf{R}' = M^{-1}\int\bar{\rho}\,\mathbf{r}dV;\quad \mathbf{R}'' = M^{-1}\int\rho\mathbf{r}dV, \quad (6)$$

where $\mathbf{r}$ is the "traveling" (Euler) coordinate of the point of the field $\rho(\mathbf{r}, t)$.

It follows that in the process of wave formation a certain moment of mass distribution arises:

$$\mathbf{Z}_m = M\Delta\mathbf{R}_m = \int(\rho - \bar{\rho})\mathbf{r}dV, \quad (7)$$

Here $\Delta\mathbf{R}_m = \mathbf{R}'' - \mathbf{R}'$ is the arm of the moment $\mathbf{Z}_m$, which we called the" displacement vector ".

If we set $\mathbf{R}' = 0$, then the change in this moment can be decomposed into three components [6]:

$$d\mathbf{Z}_m = \mathbf{r}_m dM + M d\mathbf{r}_m + d\boldsymbol{\varphi}\times\mathbf{Z}_m. \quad (8)$$

where $\mathbf{r}_m \equiv \mathbf{e}|\mathbf{R}_m|$- the vector of the transfer of the center of mass M; $\mathbf{e}$ is the unit vector in the direction of this transfer; φ is the spatial orientation angle of the vector $\Delta\mathbf{R}_m$ in space.

Thus, in the hidden matter there can be three independent processes, the coordinates of which are the parameters M, rm and φ. In the particular case of the halo surrounding the galaxy, the first term (8) corresponds to the process of transformation of the hidden matter into the baryonic substance of the galaxy, the second is the displacement of the center of the halo mass $\mathbf{r}_m$ toward the center of the galaxy as it thickens, and the third - the rotation of the halo along with the galaxy.

According to the theorem proved in energy dynamics [6], the number of independent energy arguments of any system is equal to the number of independent processes occurring in it. In this case, this means that the energy of the hidden matter as a function of its state has the form $U = U(M, \mathbf{r}_m, \boldsymbol{\varphi})$, and its total differential can be represented in the form of the identity:

$$dU \equiv \psi_g dM - \mathbf{F}\cdot d\mathbf{r}_m - \mathbf{M}\cdot d\boldsymbol{\varphi}, \quad (9)$$

where $\psi_g \equiv (\partial U/\partial M)$ is the gravitational potential of the hidden matter; $\mathbf{F} \equiv -(\partial U/\partial \mathbf{r}_m)$ - internal gravitational force (gravitational field strength); $\mathbf{M} \equiv -(\partial U/\partial \boldsymbol{\varphi})$ is the torque of these forces.

A similar (9) identity can also be written for the baryonic matter of the universe, which has the same processes (accretion of matter, its flow from the galaxy to the galaxy, and their rotation). It can be generalized to other forms of energy (thermal, elastic deformation, chemical, electric, magnetic, kinetic energy of the relative motion of system components, etc.) that the baryonic substance acquires during its structuring. For such an isolated polyvariant system, the identity (9) takes the most general form of the energy conservation law of the universe [10]:

$$dU/dt \equiv \Sigma_i \psi_i d\Theta_i/dt - \Sigma_i \mathbf{F}_i\cdot\boldsymbol{\upsilon}_i - \Sigma_i \mathbf{M}_i\cdot\boldsymbol{\omega}_i = 0, \quad (10)$$

where Θi are any extensive parameters of the system (mass M, moles of k-th substances N_k, entropy S, charge Θ_e, pulse$\mathbf{P}$, its moment $\mathbf{L}$, etc.); $\psi_i \equiv (\partial U_i/\partial\Theta_i)$ are the generalized potentials corresponding to them (absolute temperature T and pressure p, chemical μ_k, electric φ, gravitational ψ_g, etc. potentials); $\mathbf{F}_i \equiv -(\partial U/\partial \mathbf{R}_i)$ - forces in their general physical understanding (external and internal, mechanical and non-mechanical, useful and dissipative); $\mathbf{M}_i \equiv -(\partial U/\partial \boldsymbol{\varphi}_i)$ - the moments of these forces; $\boldsymbol{\upsilon}_i = d\mathbf{R}_i/dt$, $\boldsymbol{\omega}_i = d\boldsymbol{\varphi}_i/dt$- speed of relative translational and rotational motion of energy carriers $_{\Theta i;}$ t is the time; i = 1,2, ..., n is the number of energy forms in the system.

In homogeneous systems, the second and third sums of identity (10) vanish, and it goes over to the generalized equation of nonequilibrium thermodynamics [6], which describes the processes of heat exchange, mass transfer, diffusion, volume strain, and so on. In isolated conservative systems (where by virtue of the laws of conservation of mass, charge, momentum, and its moment there is no first sum), identity (10) becomes a generalized equation of the dynamics of mechanical and nonmechanical systems. Thanks to this synthesis, the basic laws and equations of mechanics, thermodynamics, hydrodynamics, electrodynamics, the theory of heat and mass transfer, and so on. follow from energy dynamics as its consequences [16].

IV. The gravikinetic energy of hidden matter

The processes of redistribution of the mass of hidden matter in the scale of the universe are extremely slow. Meanwhile, a number of processes observed in it occur in real time. In order to discover the cause of this, let us pay attention to one more feature of the waves of hidden matter, consisting in the fact that, in accordance with Fig. 1, the maximum density at the antinode of the wave can not exceed twice the value of its mean value. According to modern data, this density does not exceed 10-27 g / cm3, so that the formation of stellar matter becomes most probable in those regions of the Universe that have reached a certain density and become the "condensation centers" discussed above.

As the density increases, the number of such "condensation centers" increases, so that they begin to flow in real time. This leads to the appearance in the hidden matter of the kinetic energy of the vibrational motion, which is expediently called the "gravicinetic" $U(\mathbf{P})$, in order to distinguish it from its potential ("gravitational") energy $U(\mathbf{R}_m)$, depending on the moment of mass distribution in space.

In order to estimate its magnitude, we take into account that the displacement of the mass in the wave by the amount $|\Delta\mathbf{R}|$ equal to half the wavelength λ/2 in Fig. 1 is carried out for the period of vibration τ, inverse to its frequency ν, so that the modulus υ in its average velocity $\boldsymbol{\upsilon}_в$ for $\lambda\nu = c$ is equal to

$$\upsilon_в = |\Delta\mathbf{R}|/\tau = \lambda\nu/2 = c/2. \quad (11)$$

If we assume that the entire mass of hidden matter is involved in the vibrational motion, then the density ρ_k of the "gravistatic" energy $U(\mathbf{P})$as a function of the momentum of the waves $\mathbf{P} = M\boldsymbol{\upsilon}_в$will be equal to

$$\rho_k \equiv \rho\upsilon_в^2/2 = \rho c^2/8 \ (\mathrm{J/m^3}). \quad (12)$$

It is easy to show the correspondence (12) to the expression known for the oscillation theory for the energy density of the traveling wave [17], taking the displacement $|\Delta\mathbf{R}|$for the amplitude A of the resulting longitudinal wave of non-baryonic matter:

$$\rho_{\text{в}} = \rho A^2 \nu^2/2, ((\text{J/m}^3), \tag{13}$$

Thus, the instability of the homogeneous state of the universe leads to the spontaneous occurrence in it of oscillations of the density of hidden matter and the appearance of the kinetic energy of the vibrational motion. Unlike the other part of the gravitational energy $U(\mathbf{R}_m)$, this part of $U(\mathbf{P})$is able to perform work and with the same position of celestial bodies. This fundamentally new position indicates that only part of the gravitational energy $U = Mc^2$, is workable. This part includes the potential $U(\mathbf{R}_m)$, and the kinetic $U(\mathbf{P})$component and is often named after Helmholtz "free" energy, in contrast to the remainder, which he called "bound energy". However, in thermally inhomogeneous media, this "bound" (with heat) energy itself becomes operational. Therefore, in energy dynamics, as a non-equilibrium thermodynamics of energy-transforming systems, the energy is divided not into a free and bound energy, but into an ordered $U(\mathbf{R}_m) + U(\mathbf{P})$and an unordered $U - U(\mathbf{R}_m) - U(\mathbf{P})$, called for brevity, "*inergy*" and "*anergy*"[1)].

The division of energy into *inergy* and *anergy* as a workable and inefficient part of the energy is possible, generally speaking, for any form of internal energy, and not just the gravitational energy of hidden matter [6]. Recognition that in the modern understanding, energy as a general measure of all forms of the motion of matter is by no means a measure of the system's efficiency, has the very estimates of the fluctuation energy a direct relation not only to hidden matter, but also to physical vacuum. The energy of its fluctuations from the standpoint of thermodynamics is anergy. Therefore, it is not by chance that the fact that so far this "boundless ocean of energy" managed to get a job comparable only to "with the wings of the butterfly wing" [18].It only confirms the correctness of R. Feynman, who admitted that "today's physics do not know what energy is" [19].

The presence of a part of gravitational energy capable of taking part in all real processes in any celestial bodies of the Universe raises the question of the speed of its transfer in space. To this end, we show that this transfer is realized in the form of traveling (longitudinal) waves. We represent the total derivative $d\rho/dt$ as usual, in the form of the sum of its local $(\partial\rho/\partial t)$and spatial component $(\boldsymbol{\upsilon}_{\text{в}}\cdot\nabla)\rho$, and give this expression the form of the wave equation in its so-called "one-wave" approximation [17]:

$$\partial\rho/\partial t + \boldsymbol{\upsilon}\cdot(\partial\rho/\partial\mathbf{r}) - f(\rho) = 0, \tag{14}$$

where $\boldsymbol{\upsilon}$ expresses the phase velocity of the wave, and $d\rho/dt$ is the function of its damping $f(\rho)$.

This equation is sometimes called "kinematic" (in contrast to the "dynamic" second-order equation), which is a solution, in particular, of Maxwell's equations. It describes a wave of perturbation of the medium running in one direction (from the source). Such waves emanate from baryonic matter, which differs from latent (non-baryonic) matter not only by a density increased by tens of orders, but also by the formation of structural elements of the "wave-particle" type [15]. The oscillations of such "wave-particles" differ in their wave characteristics from oscillations of hidden matter, which leads to modulation of the latter by frequencies that it did not have. The latter makes the baryonic substance visible. This makes the hidden matter a self-sufficient carrier of the wave form of energy, which does not require the existence in the cosmic space of either electromagnetic fields or a photon "gas" [20]. This is all the more important because in areas of the universe where there is no baryon (observable) matter, and the fraction of hidden matter approaches 100%, there simply does not remain a place not only for the electromagnetic field (EMF), but for any other fields that claim to be materiality [21].

The non-electromagnetic nature of light is also evidenced by a large number of so-called anomalous radiations that easily penetrate electromagnetic screens [22], including the presence of a non-electromagnetic component of laser radiation [23,24]. At the same time, radiation does not appear as a material entity, but as a process of converting the internal energy of baryonic matter into the energy of waves running in hidden matter, with subsequent partial or complete restoration of its original form in the radiation receiver. This is clearly indicated by the different forms of perception of the same radiation by different bodies: in some, it causes only heating, in others - ionization, dissociation, photosynthesis, photoelectric effect, photoluminescence, photochemical and photonuclear transformations. We are not talking about the numerous internal contradictions of the electromagnetic theory of light [21], including its conflict with the law of conservation of energy, when the electromagnetic field is represented by an environment that "transfers energy after it left one body and has not yet reached the other" [25]. This is what N. Tesla meant when he wrote that "it would be a big mistake to consider that light is propagated in the form of electromagnetic waves" [26].

All this convinces us that the so-called electromagnetic radiation is only a part of the spectrum of oscillations of a baryonic substance that is transported in space by hidden matter and is weakened by

[1)]This term was proposed by Z. Rant in 1955

electromagnetic screens. It is no accident that even precision measurements could not detect in the physical vacuum not only the electric and magnetic fields equivalent in power, but even the traces of the latter, which would appreciably exceed the background ones [27]. In other words, the hidden matter is the only material carrier of any radiation, which was previously called ether.

According to experience, the wavelength of its waves λ can be the most diverse - from microwavesleaving a point trace in a Wilson chamber or on a photoemulsion, to concentric waves with a diameter of 500 million light-years, detected in the compilation of a map of the starry sky (Fig. 2) [28]. The concentric nature of stellar clusters resembling scattered waves in stagnant water, as well as their approximately equal diameter within the visible part of the universe, clearly indicates the wave nature and in-phase of these structures, in which galaxies are located in the zones of antinode waves that NASA researchers called "Baryonic acoustic oscillations of the primary plasma of the universe" [29].

The natural question arises: why, then, does hidden matter remain invisible? The answer is so natural: because the oscillations of non-baryonic matter as an all-pervasive medium are also present in the detectors, forming a "background" that makes visible only the largest external disturbances. This is confirmed by the detectors of gravitational waves such as the LIGO and VIRGO [7]. As for baryonic (structured) matter, due to the presence of thermal, electrical, magnetic, nuclear, etc. in it. forms of energy, the spectrum of its oscillations is different from the "background", which makes it visible (observable).

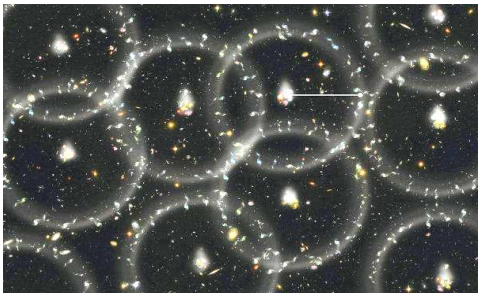

Fig.2. Map of the Universe
(Source: Berkeley National Labor.)

V. Hidden matter as a "fuel" of stars and the cause of a number of unknown phenomena

The presence in the hidden matter of "free" energy (inertia) makes it a true source of energy for the stars. In fact, the emergence of any elements that later took part in spontaneous reactions of thermonuclear fusion or the decay of heavy elements was not a spontaneous process and required the cost of free energy of some external source of energy. N. Tesla expressed this idea with the words "There is no energy in matter other than that which it received from the environment" [26]. This environment for a baryonic substance could only be a hidden matter. The specific value of its energy exceeds by many orders of magnitude the energy of thermonuclear fusion, which is limited by the relative magnitude of the defect of the baryon mass $\Delta M/M$, much smaller than unity. On the contrary, the relative value of the mass of hidden matter $\Delta M_h/M$, both converted into a baryonic substance, and entering the body in the process of accretion of baryonic matter, is not limited by anything.This confirms the role of the non-baryonic substance as the "first matter" and successor to the ether, or the even older concept of prana, which was key in a number of oriental philosophical teachings.

We can not exclude the participation of gravitational energy in any processes occurring on Earth, since there is no isolation from gravitational forces. At the same time, in the processes taking place in real time, the gravitic energy of the region of the Universe in which our planet is located at the given moment takes part. Without its participation, it seems that not only natural disasters like tornadoes and tsunamis, but also the reactions of the so-called "cold nuclear fusion", taking place in the absence of gamma-radiation inevitable for nuclear transformations [30], and the emergence and "burning "Ball lightning, which lasts quite a long time. A vivid evidence of its participation was the fact that the calculated thermonuclear reaction exceeded by 10^5 times the thermonuclear reaction recorded during the tests of the hydrogen "king-bomb" over the New Earth in 1961, when the explosion cloud rose to the stratosphere and continued to "burn" within 30 minutes after the explosion [31]. Her invisible involvement explains the operation of numerous "superunit" devices (with efficiency exceeding one), starting from the "amplifying transmitter" N.Tesla to the generators T. Kapanadze [32].

The existence of the gravitational energy in addition to the potential component of the kinetic form of the vibrational motion, which does not depend on the position of the celestial, removes the centuries-old ban on the creation of cyclic devices using gravitational energy. This prohibition stems from the equality of the circular integral of any potential function to zero, including, which excludes the possibility of accomplishing work from the gravitational field with the unchanged position of the celestial bodies. The latter gave rise to a persistent rejection of any projects of so-called "perpetuum mobile", although the Universe itself demonstrated an example of perpetual motion. This affected not only the "wheel of Orferius", which he demonstrated in the eighteenth century in many European countries, or the modern 18-meter wheel built by A. Costa, but also a number of so-called "superunit" devices, including vortex generators of excess heat and apparatuses V. Schauberger and J. Searl, whose work without the recognition of an invisible source of energy remained

inexplicable. With the recognition of the existence of the kinetic energy of hidden matter, the question is translated into a practical channel for finding conditions under which the use of this energy becomes possible. This also applies to antigravity, for which, according to (4), it is sufficient to create very low negative density gradients of non-baryonic matter, so that at a density of the order of ~ 10-29 g / cm3, we can compensate the gravitational forces in the atmosphere with a density of ~ 10-3 g / cm3, proportional to $\nabla\rho / \rho$. All this forces us to reconsider the conclusions of a number of fundamental disciplines confining ourselves to studying baryonic matter and not recognizing the existence of ether as a precursor of hidden matter.

VI. Hidden matter and the evolution of the universe

Recognition of the existence in the Universe of the structured and unstructured phases of matter and the presence of correlations between them makes it possible to analyze the behavior of the invisible (unobservable) part of it, starting from observations of the visible (baryonic) matter. If, for example, the density of a non-baryonic substance increases in any direction, then the probability of formation of a baryonic substance increases in the same direction, since the number of "condensation centers" of non-baryonic matter increases. From this standpoint, the presence in the center of a number of galaxies of the so-called "black hole" indicates rather the incompleteness of the process of filling its non-baryonic core with stars, rather than the cessation of radiation by its gravity forces. This indicates the existence of two types of black holes: some that do not study due to unstructured (non-nuclear "black holes") and others that delay radiation due to super-strong gravity (baryon "black holes"). The first of these are inherent in the early stage of the formation of galaxies, the latter are preceded by a "supernova explosion" [10]. In this "order of things" the appearance of rotating bright jets in the center of the galaxy is a natural consequence of the inequality of zero for the radial component of the velocity of stars during their accretion and their "collision".

Further, if the density of stars in the cluster of galaxies falls to its periphery ($\nabla\rho<0$), then this indicates the presence in it of forces leading to its further condensation ($g <0$). If, however, the galaxies are distributed in the form of spheres that form concentric circles in the section around their central cluster (as follows from Fig. 2, then the practical absence of galaxies in the interval between them indicates a more or less uniform distribution of hidden matter in this zone, ie, the absence of condensation centers in it.In this case, an increase in the density of clusters of stars at the periphery of this zone indicates the action of repulsive forces on them, which are responsible for the expansion of this region of the universe [10].

The explanation is obtained and the practically unchanged position of the nuclei of galaxies during the "flow" of matter from one of them to another. Indeed, according to the law of gravitation (4), the acceleration g is inversely proportional to the local density of the substance ρ, so that even with the same value of $\nabla\rho$, it affects the less dense sleeves rather than the nuclei. Finds an explanation and rotation of asymmetric galaxies, caused by the anisotropy of the gravitational forces acting on it and the appearance of their moment M. All this opens up new opportunities for observational astronomy.

VII. Conclusion

1. The predominance in the Universe of a "hidden" (invisible) mass that makes up at least 95% of its matter and does not participate in electromagnetic radiation indicates that it is the carrier of gravity and the basis of all forms of its baryonic (visible, structured) matter;
2. The application of the principle of the equivalence of mass and energy to hidden matter allows us to modify the law of universal gravitation with respect to continuous media and establish the true origin of gravity as a consequence of the inhomogeneous distribution of matter in the universe. This forces gravitational energy to be recognized as the initial form of all forms of energy of baryonic matter;
3. The modified law of universal gravitation reveals the existence of "strong" gravity in hidden matter with the magnitude of the gravitational potential exceeding the Newtonian gravitational potential on the surface of the Sun by five orders of magnitude. This makes it the true "fuel" of the stars and forces us to reconsider the role of hidden matter in the universe as a "first matter" and successor to the ether;
4. The dependence of the gravitational force on the density gradient of gravity emerging from the modified law of gravity reveals the existence of gravitational equilibrium and repulsive forces in the hidden matter, which makes the introduction of hypothetical "dark energy" superfluous, and the hidden mass synonymous with dark matter;
5. The increase in gravitational forces as the density of matter increases reveals the instability of the homogeneous state of hidden matter and predicts the spontaneous emergence of self-oscillations in it, accompanied by the transformation of a part of its gravitational energy into a gravimetric one, capable of performing work with the unchanged position of celestial bodies;
6. The self-induced vibrations of the gravity of the gravitational nature arising in the latent matter form the traveling waves, modulated by the vibrations of baryonic matter, which makes the hidden matter a self-sufficient carrier of light;

7. The presence in the baryonic matter of particles with a spectrum of oscillations that is different from the background spectrum of hidden matter, leads to its modulation by new frequencies, which makes the baryonic matter visible (observable);
8. The division of gravitational energy into "bound" (anergy) and "free" (inertia), and the selection in the latter of the "gravitational" and "gravicinetic" component eliminates the uncertainty of its magnitude and makes it a true "fuel" of stars and a source of energy for the processes of cold nuclear fusion, ball lightning and numerous "superunit" devices;
9. The ability of hidden matter to condense into baryon (visible) matter opens the possibility of judging the processes in it by the behavior of baryonic matter, which greatly expands the possibilities of observational astronomy;
10. Absence of isolation from gravitational forces makes it necessary to treat hidden matter as an indispensable component of any material system and to take into account the possible participation of its energy in all processes taking place on our planet, including not only natural disasters, but also many unknown phenomena that seem to contradict the laws of nature.
11. The properties of hidden matter, which follow from the modified law of gravitation, allow us to clarify a number of ideas about the nature and sequence of the evolutionary processes of the universe and its role in them.

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