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# **A New Theory of Matter-Space-Time: Evidences in Support of An Advantage Over The Modern Theory Accepted in Physics and The Perspective To Be of Use**

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**Abstract.** Essential principles of a new theory of matter-space-time, Dialectical Physics, are considered in this report. The axioms of the Dialectical Model of the Universe and the Dynamic Model of Elementary Particles (DM), originated from the theory, are presented. The DM is the only theory existed today, which uncovers the nature of origination of mass and electric charge of elementary particles. A comparative analysis of the old (Standard, SM) and new (DM) models is presented in the form of a compact table without comments. The proofs of an advantage of the new theory, with respect to SM, are carried out with an example of an elucidation of the nature of (“relict”) cosmic microwave background radiation, the Lamb “shift”, and “anomaly” of the magnetic moment of an electron. Unknown earlier fundamental parameters of gravitational field, discovered in the framework of the DM, are briefly presented at the end of the report. It is stressed in conclusion that on the basis of the latter data, the control over the gravitational field of material objects is solved theoretically and, hence, can be realized in practice.

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## **1. Introduction**

Modern technologies are based mostly on a very primitive principle, namely on burning of mineral raw material such as mineral oil, gas, and coal and on use of radioactive materials. In this connection ecological situation in the World day by day changes for the worse. By this way humanity gradually rolls up to precipice.

Of course, such a fully formed adverse state cannot be lasted eternally, one needs to do something in order to change this tragic tend. In this situation we can count on natural sciences and first of all on physics. Indeed, physicists by vocation must solve this problem and propose new effective sources of energy friendly for environment, useful in practice. But why does physics cannot realize it now?

Physics, as the science about fundamental regularities in Nature, have made its first steps on the Earth; accordingly, modern physics is on a relatively low level. Mass media do not pay attention on the latter and, on the contrary, blow only about successes of physics. For example, quantum mechanics has been recognized by media at the turning point of centuries as the most outstanding physical theory of the passed 20<sup>th</sup> century. However, actually, quantum mechanics is the most primitive abstract-mathematical theory based on erroneous concepts, errors in principle and contradictions [1, 2].

It is no wonder; fundamentals of classical mechanics were generalized and formulated by Sir Isaac Newton in 1687. This year one can count conditionally as the year of the beginning of contemporary physics; the 319 years have passed only from that time. Essential principles of electricity as the science were established by Coulomb a hundred year later (1785-1789). Almost everybody knows the Coulomb law.

What does the period of time in the cosmic time scale take up 319 years? Another words, what are the 319 revolutions around the Sun in comparison with 10 billions revolutions of the Earth during approximately 10 billions years of its Existence? It is less than the twinkling of an eye in cosmic scale. And, really, nothing has changed from Newton and Coulomb's times in contemporary physics for understanding the nature of such fundamental notions as **mass** and **electric charge**. The latter holds the further development of physics and, consequently, technological progress.

Why do we speak about two aforementioned fundamental notions? First of all because of the resolution just of these questions, in our opinion, is the main clue for understanding other most important mysteries of Nature directly related with them. As a result a new way for development of ecologically clean technology will take its raise on the basis of new knowledge.

Of course, there are many attempts to build new theories to pull out physics from deadlock state in which it is at present. However, up to present, most works in this direction are directed to change or improve some fragments of the existed theories, to patch holes in old clothes, leaving the existed basis of physics untouched.

We intend to draw attention to new works in principle based on the new philosophical and theoretical basis, resulted at last in the discovery of the **nature of mass and electric charge**. These works were carried out in the course of the last decade and, therefore, they are not yet well known among scientists and public. The very short time has passed after the first publications in order to new knowledge has been noted and accepted by most physicists. The first information about the discovery was published in 1996 in the book „*Alternative Picture of the World*” (Vol. 1, 2, and 3) by L. G. Kreidik (1931-2002) and G. P. Shpenkov [3].

**Mass and electric charge** are primordial fundamental properties of matter (elementary particles). Unfortunately, contemporary physics is unable to explain what mass is, apart from that it is the measure of inertia of a body, i.e. its resistance to acceleration. And what is electric charge? Answers to these (and other not mentioned here) questions are impossible to find in principle in the framework of Standard Model (SM) of modern physics. Physicists-theorists very well know lacks of SM and, therefore, they continuously seek new solutions for its improvement.

Official physics prefers a renewal of SM keeping the conceptual basis of the model untouched. In particular, it rests hopes upon String Models of Elementary Particles. Principal difference of the latter with respect to SM is only in the fact that elementary particles in String Models are considered as dimension microobjects – very small strings (less in size than atomic nuclei) - but not as pointlike objects.

The total set of oscillatory modes of the strings must describe whole variety of elementary particles and their interactions, including gravitational. A complicated mathematical tool is used with this because the strings are 10- and 11-dimensional structures. Actually, String

Models, being yet more complicated than SM abstract-mathematical models, do not reflect the real image of elementary particles, tending to describe only their behavior. Physicists-theorists recognize this peculiarity of String Models, for example, David Jonathan Gross, 2004 Nobel Laureate in Physics.

A generalized String Model is very far from its final form, if only it will build ever completely. And what is the most important: String Models do not resolve the fundamental problem of physics, the problem of the mass and electric charge nature. Therefore, the choice of String Models is unsuccessful, rather erroneous; such models have no perspective. It is a pity of lost efforts and time on their development.

The nature of mass and electric charge originates in logical way from the Dynamic Model of Elementary Particles (DM). The model was developed by the authors of the aforementioned book „*Alternative Picture of the World*” and described for the first time (1996) there [3]. The first paper of the authors on this subject [4] entitled “*Dynamic Model of Elementary Particles and the Nature of Mass and ‘Electric’ Charge*” was published in the scientific journal

REVISTA CIENCIAS EXATAS E NATURAIS, Vol. 3, No 2, pp. 157-170, (2001). The PDF version of the paper can be found in Internet:

[www.unicentro.br/pesquisa/editora/revistas/exatas/v3n2/trc510final.pdf](http://www.unicentro.br/pesquisa/editora/revistas/exatas/v3n2/trc510final.pdf)

An unexpected and conceptually new way in resolution of the fundamental problem, simplicity and clearness of the work, have confused at the beginning the physicists who has read the paper.

The Dynamic Model cannot be regarded as one of many casual inventions or fruits of imagination. The basis of its creation is fundamental one and rests on new in principle approach based first of all on re-consideration and renovation of essential principles of physics. This approach takes into account thousand-year unquestioned achievements of the world philosophical thought [5].

By this reason let us consider first the basic concepts of new theory of matter-space-time, which are necessary for understanding the essence of DM.

## 2. Axioms of Dialectical Physics

At the base of classical and contemporary physics lies the model of the Universe, which can be called the model of one space, presented throughout the 19th century by the concept of “**world ether**”. The world ether was regarded as an initial level of the Universe. Today it is referred to as Dirac quantum vacuum, *etc.* Thus, in essence, the classical “ether” was transformed into the **quantum “vacuum”**. The latter is interpreted as some primordial quantum-mechanical chaos, in which not necessity and chance together, but only chance, in connection with the indeterminacy principle, is presented.

One can say now that this model does not respond to the needs of the present time. For this reason, we propose to turn to philosophy, as universal science, in particular to the **dialectical view** at the structure of the Universe [5].

The word **dialectics** (as “**dialectical philosophy and dialectical logic**”) means, on the one hand, the search of truth by conversations, which were carried out through the formulation of

questions and the methodical searching of answers to them. On the other hand, **dialectics** means the capability for vision and reflection by means of notions the opposite facets of nature.

In the wide sense of this word, **dialectics** is a skill of many-sided description of an object of thought and a logic formation of the prediction of necessary and possible events.

Thus, **dialectics is regarded as logic of philosophy and all sciences, i.e., as the logic of cognition on the whole.**

**Dialectics** represents a synthesis of the best achievements of both materialism and idealism and it is the ground for understanding of the material-ideal essence of the World. Physics based on axioms of dialectics is called **Dialectical Physics**.

The essence of the *dialectical model* of an arbitrary state or process is the fact that any property of the Universe, denoted by the limiting brief judgment **Yes**, always responds (without any exceptions) to the property **No**. This fundamental rule is the fundamental principle of the “dialectical model” that thus claims that any **Yes** has its own negation **No**. Moreover, there is not a clear boundary between **Yes** and **No**: many properties of **Yes** continuously and discontinuously turn into the opposite properties **No**.

Thus, the symmetry of a pair **Yes-No** is the foundation of the dialectical model of the Universe, resting upon the fundamental law of dialectical logic – the law of *affirmation-negation*.

Contemporary physics recognizes formal logic, the logic of either only **Yes** or only **No**. Therefore, it is unable to overcome its one-sided plane view at the World. At the same time contemporary physics of necessity operates with the dialectical law of affirmation-negation, but in the implicit, and the extremely cut off form. It mentions discontinuity (**Yes**) and continuity (**No**), particles (**Yes**) and antiparticles (**No**), symmetry (**Yes**) and asymmetry (**No**), rectilinear (**Yes**) and curvilinear (**No**), etc.

Following Einstein, contemporary physics states that only relative motion exists, but at the same time it operates with the absolute speed of electro-magnetic waves, the speed of light, which is the same “*for all observers in uniform relative motion, independently of the relative motions of sources and detectors*”. If we use the accurate language of logic, this assertion means that physics simultaneously implicitly operates with the absolute motion of electro-magnetic waves and with their absolute speed, since their absoluteness means their independence of a system of coordinates.

In the dialectical model, the aforementioned logical manipulations are not required, because the property of motion **Yes** = “**relative**” responds to its symmetrical property **No** = “**absolute**”. It means that any motion in the World is a complicated symmetrical complex of absolute-relative motion, i.e., of motion **Yes-No**, in which the law of conservation and transformation of absolute-relative motion is valid

One can present many other examples that justify limiting possibilities and unsuccessfulness of formal logic. Conceptual unfoundedness of an introduction in quantum mechanics the notion *hybridization of atomic orbitals* (the paper on this subject is in printing), which have led in particular to the development of quantum chemistry, is also a result of such formal logical one-sided view.

Atoms and „elementary” particles are regarded in Dialectical Physics as the structures of the distinct levels of the Universe, which has many such levels (e.g., molecular, atomic, subatomic, etc.). Therefore, it is clear; we should not consider atoms and elementary particles separately from the total structure of the Universe. This means that in a *consideration of the problem of structure of any material objects, one should begin from the precise definition of the principal axioms on the structure of the Universe on the whole.*

We present below axioms of the dialectical model of the Universe, taken from [5], which are necessary for understanding the conceptual basis of DM resulted in the discovery of the mass and electric charge nature.

**I.** The first system of 5 axioms of the dialectical model of the Universe relates to the **structure of the Universe**; we present these axioms completely:

**I.1.** The Universe is the Material-Ideal System with infinite series of levels of **embedded** potential-kinetic longitudinal-transversal **fields** of absolute-relative motion of matter-space-time, in which all processes occur simultaneously both at the same level (“horizontal” processes) and between levels (“vertical” processes).

**I.2.** Mutual transformations of fields with opposite properties (for example, the **potential field**  $\Leftrightarrow$  the **kinetic field**) cause the wave nature of the World. The wave process, appearing at some level, generates waves going deep into an infinite series of embedded fields-spaces, and vice versa, wave processes of the exchange of deeper levels, rising up, induce wave processes at the higher lying levels.

**I.3.** Any object of the Universe at a k-level simultaneously belongs to a lower situated infinite series of embedded fields-spaces; therefore, the structure of megaobjects of the Universe is defined by the structure of their microobjects (and the microfields related to them of an infinite series).

**I.4.** Between objects, objects and the ambient field of matter-space-time, there exists an **interchange** of matter-space-time occurring both in horizontal (within the same level) and vertical (between different levels) directions.

**I.5.** The longitudinal-transversal structure of the wave field of exchange of the Universe of an arbitrary level is presented by the spherical-cylindrical wave field of matter-space-time.

The next 3 systems of axioms (**II – IV**, we will not consider their here) relate to:

(**II**) dialectical elementary judgments,

(**III**) description of the physical objects and processes in space and time,

(**IV**) change of fields of matter-space-time in time.

**V.** The last axioms, **the axioms of wave equations of the field of matter-space-time**, state the following:

**V.1.** A complicated dialectical judgment  $\hat{\Psi}$ , describing properties of fields of matter-space-time, satisfies the wave equation

$$\frac{\partial^2 \hat{\Psi}}{\partial \rho_x^2} + \frac{\partial^2 \hat{\Psi}}{\partial \rho_y^2} + \frac{\partial^2 \hat{\Psi}}{\partial \rho_z^2} - \frac{\partial^2 \hat{\Psi}}{\partial \tau^2} = 0, \quad (2.1)$$

where  $\rho_x = kx$ ,  $\rho_y = ky$ ,  $\rho_z = kz$ ,  $\tau = \omega t$ , and  $k = \frac{2\pi}{\lambda} = \frac{\omega}{c}$  is the wave number.

The equation describes both the spherical and cylindrical components of the function-judgment about the spherical-cylindrical field of matter-space-time of a level.

The spherical (longitudinal, central) component of the judgment, we present in the form:

$$\hat{\Psi} = \hat{R}_l(kr)\Theta_{l,m}\hat{\Phi}_m(\varphi)\hat{T}(\omega t). \quad (2.2)$$

Analogously, we express the cylindrical (transversal, azimuth) component of the judgment

$$\hat{\Psi} = \hat{R}_m(k_r r)\hat{Z}(k_z z)\hat{\Phi}_m(\varphi)\hat{T}(\omega t). \quad (2.3)$$

**V.2. The longitudinal component** of the spherical-cylindrical field is described over a **spherical** realization of the wave equation (2.1), which comes to one time equation

$$\frac{d^2 \hat{T}}{d\tau^2} + \hat{T} = 0 \quad (2.4)$$

and three equations of the spherical space:

$$\rho^2 \frac{d^2 \hat{R}_l}{d\rho^2} + 2\rho \frac{d\hat{R}_l}{d\rho} + (\rho^2 - l(l+1))\hat{R}_l = 0, \quad (2.5)$$

$$\frac{d^2 \Theta_{l,m}}{d\theta^2} + ctg\theta \frac{d\Theta_{l,m}}{d\theta} + \left( l(l+1) - \frac{m^2}{\sin^2 \theta} \right) \Theta_{l,m} = 0, \quad (2.6)$$

$$\frac{d^2 \hat{\Phi}_m}{d\varphi^2} + m^2 \hat{\Phi}_m = 0, \quad (2.7)$$

where  $\rho = kr$ .

**V.3. The transversal component** of the spherical-cylindrical field is described over a **cylindrical** realization of the wave equation (2.1), which comes to one time equation in the form (2.4) and three spatial equations

$$\frac{d^2 \hat{R}}{d(k_r r)^2} + \frac{1}{k_r r} \frac{d\hat{R}}{d(k_r r)} + \left( 1 - \frac{m^2}{(k_r r)^2} \right) \hat{R} = 0, \quad (2.8)$$

$$\frac{d^2 \hat{Z}}{d(k_z z)^2} + \hat{Z} = 0, \quad \frac{d^2 \hat{\Phi}_m}{d\varphi^2} + m^2 \hat{\Phi}_m = 0. \quad (2.9)$$

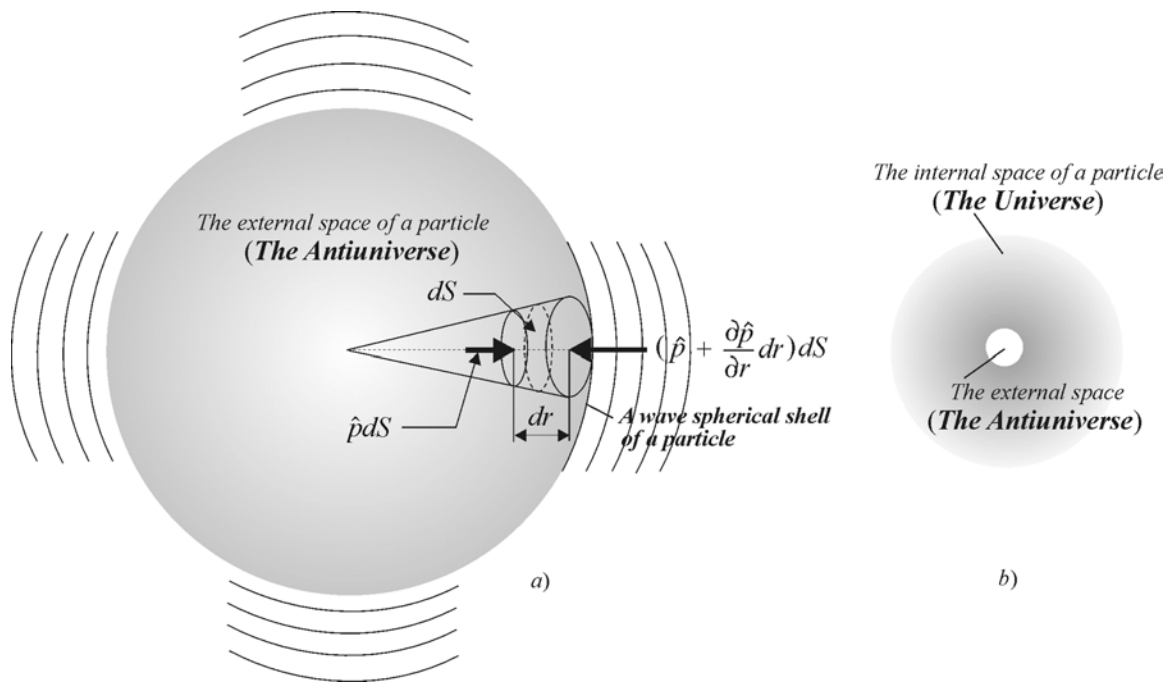
Aforementioned axioms of dialectical physics give us the possibility to describe objects and processes of nature by fully formed methods of wave physics, beyond quantum electrodynamics – the main theory of modern physics.

The wave nature of the Universe is reflected in the structure of elementary particles, which are dynamic, pulsing microobjects. We will proceed to describe them in the framework of the Dynamic Model of Elementary Particles and present unknown till now fundamental physical parameters originated from the model.

### 3. New - Dynamic Model of Elementary Particles

Let us imagine an elementary particle as a dynamic spherical formation of a complicated internal (not considered here) structure being in a dynamic equilibrium with environment through the wave process of the definite frequency  $\omega$  (Fig. 1a).

Such a spherical microobject can be considered as a specific physical point (for example, as a swirl or contraction, *etc.*) of many-dimensional wave space [4].



**Rys. 1.** An element of the volume (a) of the wave shell in a spherical field of exchange: a particle – ambient field of matter-space-time;  $\hat{p}dS$  and  $(\hat{p} + \frac{\partial \hat{p}}{\partial r} dr)dS$  are powers of exchange of the field with the element of shell  $dS$  of the particle,  $\hat{p}$  is the two-dimensional density of exchange, or the pressure of the field of exchange. The internal and external spaces of an elementary particle (b).

A spherical wave shell bounds the space of an elementary particle, separating it from the ambient wave field. We call this sphere the **characteristic sphere** of a micro-particle. The

characteristic sphere restricts the **main part** of the micro-particle from its **field part** merging gradually with the ambient field of matter-space-time.

The main part (core) is the **basis** of a micro-particle, whereas the field part represents its **superstructure**. Thus, the basis space of a micro-particle is restricted by the characteristic sphere, beyond which there is the space of its superstructure. Such a model interprets a micro-particle as a particular discrete physical point of an arbitrary level of matter-space-time, restricted by the characteristic sphere and being in rest in the field-space.

In the dynamical model presented, according to the definition [4], the **inner** geometrical space (spherical volume) of an elementary particle, restricted by its wave spherical shell, is the **external** world of the particle. As the external world of the Universe (Fig. 1b), this space (inside the spherical volume) naturally can be called the **Anti-Universe**. It means that the World (Being and Non-Being) is presented in DM through the Universe and Anti-Universe. Obviously, the spaces of the Universe and Anti-Universe are closed here on each other. Most probably, the main essence of life, its mystery, is hidden in the Anti-Universe.

Longitudinal oscillations of the wave shell in the radial direction provide an interaction of the particle with other objects and the ambient field of matter-space-time. In the approach presented, the logical triad: **matter-space-time** expresses an indissoluble bond of matter and space, being in uninterrupted motion, which is characterized by time. The logical pair: **motion-rest** presents indissoluble bond of motion and rest, *etc.*

The Universe is an infinite series of material and ideal spaces. Between objects of the spaces there take place the complicated interactions that represent the **exchange** of matter-space-motion-rest (**matter-space-time** for brevity). The exchange of matter-space-time occurs simultaneously in many levels, which are represented by corresponding subspaces of matter of the Universe. These subspaces should be regarded as **embedded** into each other; they form the space of the Universe. The **embedding** is one of the aspects of the physical multi-dimensionality of fields of matter-space-time of the Universe.

As a measure of **intensity of exchange** of matter-space-time, it is possible to take any parameter of exchange. If it is momentum, then we deal with the rate of exchange of momentum, *etc.* In such a broad sense of the word, the expression  $\mathbf{F} = d\mathbf{P} / dt$ , known as Newton's second law, is a simple writing of the formula of the vector power of exchange of momentum. By virtue of this, we will also call the vector  $\mathbf{F}$  the **power of exchange of momentum**. Of course, this power of exchange  $\mathbf{F}$  cannot be identified with the scalar power of exchange of energy  $W$ :  $N = dW / dt$ . However, in spite of their difference, both  $N$  and  $\mathbf{F}$  are powers of exchange, expressed by the language of the concrete measures of exchange, and nothing more. This is why the same term the **power of exchange** is the rightful one as the **measure of the rate of exchange**.

Thus, the existence and interactions of the particles are, in essence, a continuous process of wave exchange of matter-space and motion-rest, or, for brevity, **exchange of matter-space-time**. The wider (and, hence, truer) notion **exchange** is thus more correct because it reflects behavior of elementary particles in their dynamic equilibrium with the ambient field, at rest and motion, and interactions with other objects (and particles themselves).

In other words, the notion **exchange** is more appropriate from the point of view of the physics of the complex behavior of elementary particles viewed as dynamic microobjects belonging to one of the interrelated levels of the many-level Universe.



## The nature of mass

From the equation of exchange [4] it follows that **effective mass** of a microparticle has the wave **associated character**, is the **measure of exchange**, and is defined by the following formula:

$$m = \frac{4\pi r^3 \varepsilon_0 \varepsilon_r}{1 + k^2 r^2}, \quad (3.1)$$

where  $r$  is the **radius** of the **characteristic sphere** of the wave pulsing microparticle,

$$\varepsilon_0 = 1 \text{ g} \cdot \text{cm}^{-3} \quad (3.2)$$

is the **absolute unit density**,  $\varepsilon_r$  is the **relative density**,

$$k = \frac{2\pi}{\lambda} = \frac{\omega}{c} \quad (3.3)$$

is the **wave number** corresponding to the definite **fundamental frequency**  $\omega$  of the field of exchange,  $c$  is the **basis speed of exchange** of matter-space-time equal to the speed of propagation of electromagnetic waves, including waves of the narrow optical range (speed of light). The fundamental frequency of the value

$$\omega = \omega_e = 1.869162505 \cdot 10^{18} \text{ s}^{-1} \quad (3.4)$$

is characteristic for subatomic and atomic levels of the Universe. The fundamental wave radius of the field of exchange at the levels is equal to

$$\lambda = \lambda_e = \frac{\lambda_e}{2\pi} = \frac{c}{\omega_e} = 1.603886998 \cdot 10^{-8} \text{ cm}. \quad (3.5)$$

**It is no accident that the fundamental wave diameter  $D = 2\lambda_e \approx 0.32 \text{ nm}$  correlates with the average value of lattice parameters in crystals**, defining an average discreteness of space at the subatomic and atomic levels of exchange (interaction).

Mass (3.1) is, in its nature, **associated mass** in the central (longitudinal) exchange. It is called **associated** by analogy with **associated (added)** mass of liquid in hydrodynamics attributed to vibrations of an object in liquid, for example, a pulsing sphere or cylinder dipped under water.

Obviously, the so-called **rest mass** of the particle  $m_0$  is the **associated mass** with respect to the deeper level of the field of matter-space-time. Therefore, we can assert that all masses of micro-particles in the Universe have an **associated field character**, and that their **own (proper, rest) masses do not exist**.

**If situations are possible where exchanges of particles with the ambient field of matter-space-time of the subatomic level do not occur, then masses of particles with respect to this level are equal to zero, and no experiment will find such a world of micro-particles. Accordingly, this world will be unknowable to physics.**

## The nature of electric charge

We will call further **associated mass** also briefly **mass**. The comparative estimation of **change of mass** is defined by the ratio of the differential of the physical measure of matter (mass) to the differential of the absolute mathematical time:

$$q = \frac{dm}{dt}. \quad (3.6)$$

The ratio (3.6) defines the **speed of change** and the **rate of exchange** of the wave field of matter. We call it the **exchange charge**, or merely the **charge**. Strictly speaking, the

**exchange charge** is the **measure of the rate of exchange of matter-space-time**, or briefly the **power of mass exchange**.

As follows from the equation of exchange [4], the exchange charge has an active-reactive character:

$$\hat{q} = \frac{4\pi r^3 \varepsilon_0 \varepsilon_r}{1 + k^2 r^2} k r \omega + i \frac{4\pi r^3 \varepsilon_0 \varepsilon_r}{1 + k^2 r^2} \omega \quad (3.7)$$

where

$$\frac{4\pi r^3 \varepsilon_0 \varepsilon_r}{1 + k^2 r^2} k r \omega = q_a \quad (3.8)$$

is the **active charge**, and

$$\frac{4\pi r^3 \varepsilon_0 \varepsilon_r}{1 + k^2 r^2} \omega = q_r \quad (3.9)$$

is the **reactive charge**. The symbol „^” expresses the contradictory (or complex) potential-kinetic character of physical space-fields.

The **active** component  $q_a$  defines the dispersion during exchange, which in a steady-state process of exchange is compensated by the inflow of motion and matter from the deeper levels of space.

The **reactive** component of charge  $q_r$  (further for brevity, the **charge of exchange**  $q$ ) is called in modern physics the “electric” charge. It is connected with the associated mass  $m$  (3.1) by the relation:

$$q = m \omega. \quad (3.10)$$

The dimensionality of the exchange charge is

$$[q] = g \cdot s^{-1}. \quad (3.11)$$

Thus, DM for the first time uncovers the physical sense (the nature of origination) of both fundamental essences – mass and electric charge [6]. The charge of exchange (called the “electric” charge in modern physics) is the measure of the **rate of exchange of matter-space-time**, or briefly, the **power of mass exchange**. Its oscillating value is changed with the fundamental frequency  $\omega_e$ .

The dimension of the electric charge  $q_C$  in CGSE units of the charge,  $CGSE_{q_c}$ , is

$$[q_C] = g^{1/2} \cdot cm^{3/2} \cdot s^{-1}. \quad (3.12)$$

The dimension of the electric charge in SI units is expressed in coulombs:

$$[q_{SI}] = C. \quad (3.13)$$

In spite of the seeming difference of both dimensions, the electric charge in SI, in coulombs, presented through really basic units of matter ( $kg$ ) and space ( $m$ ), has as it turned out the same dimension as the charge in  $CGSE_q$  [7] (see (3.12)), because it is also expressed by fractional powers of the basic units:

$$[q_{SI}] = kg^{1/2} \cdot m^{3/2} \cdot s^{-1}. \quad (3.14)$$

The units of the electric charge in both systems, CGSE and SI, are as follows:

$$1 CGSE_q = 1 g^{1/2} \cdot cm^{3/2} \cdot s^{-1}, \quad (3.15)$$

$$1 C = \frac{c_r}{\sqrt{10^{11}}} kg^{1/2} \cdot m^{3/2} \cdot s^{-1}. \quad (3.16)$$

$$\text{where } c_r = \frac{c}{c_e} = \frac{2.99792458 \cdot 10^{10} \text{ cm} \cdot \text{s}^{-1}}{1 \text{ cm} \cdot \text{s}^{-1}} = 2.99792458 \cdot 10^{10}.$$

The quantities  $kg^{1/2}$  and  $m^{3/2}$  do have no physical sense, therefore, in our opinion, modern physics is unable to understand, resting on such nonsensical units, the nature of origination of the “electric” charge.

The DM gives the formula of correspondence between exchange charge  $q$  (3.11) and Coulomb charge  $q_c$  (3.12):

$$q = q_c \sqrt{4\pi\epsilon_0}, \quad (3.17)$$

where  $\epsilon_0 = 1 \text{ g} \cdot \text{cm}^{-3}$  is the **absolute unit density** (3.2).

Hence, the *exchange charge of an electron* at the level of the fundamental frequency  $\omega_e$  is

$$e = e_c \sqrt{4\pi\epsilon_0} = 1.702691627 \cdot 10^{-9} \text{ g} \cdot \text{s}^{-1}, \quad (3.16)$$

where  $e_c = 4.803204401 \cdot 10^{-10} \text{ g}^{1/2} \cdot \text{cm}^{3/2} \cdot \text{s}^{-1}$  is the experimental value of the (Coulomb) electron charge in CGSE<sub>q</sub>. Following DM, the quantity (3.16) is an **elementary quantum of the rate of mass exchange**.

**In conclusion** to this section let us recall the following fundamental features of DM. Atoms and elementary particles are regarded as the structures of the distinct levels of the Universe, which has many such levels (*e.g.*, molecular, atomic, subatomic, *etc.*). The perfect harmony and correlation inside and between all levels takes place in this Universe. From this viewpoint, the physical field-space of the Universe represents by itself an infinite series of spaces embedded in each other [recalling a set of nesting dolls, or an infinite functional series  $f(x) = \sum_{k=1}^{\infty} u_k(x)$ ]. This series of spaces expresses the fundamental concept of natural philosophy concerning the infinite divisibility of matter. Every level of space is the basis level for the nearest above-situated level and, simultaneously, it is the level of superstructure for the nearest below-situated level. This means that above-situated field-spaces are formed on the basis of below-lying fields-spaces. Accordingly, there is no meaning to the concept of ‘**very last elementary particle**’ in the common classical sense of this phrase.

#### 4. Comparison of the old and new models of elementary particles: Standard (SM) and Dynamic (DM)

The DM essentially differs from SM and surpasses String Models. During the last three decades physicists-theorists all over the world adamantly develops String Models to replace SM dominated currently in physics.

From the time of its first publishing (1996) the DM has turned out to be a clue of many mysteries of nature. This model gave already answers to many principal questions of modern physics exceeding all expectations. The list of advantages of DM (What does it follow from the DM?) and comments on capability of SM (based on Schrödinger’s quantum mechanics, Dirac’s quantum electrodynamics, and quantum chromodynamics) with respect to the enumerated points at issue is presented in Table 1 [8]. All details concerning a concrete issue one can find in References.

**Tablica 1.** A comparison of two models in physics: DM (new) and SM (used currently) [8]

	Advantages of the <b>Dynamic Model (DM)</b> based on solutions of the wave equation $\Delta\hat{\Psi} - \frac{1}{c^2} \frac{\partial^2 \hat{\Psi}}{\partial t^2} = 0$ What does it follow from the DM?	Comments on capability of the <b>Standard Model (SM)</b> based on: Schrödinger's QM, Dirac's QED, and QCD, with respect to enumerated points at issue
1	<b><i>The origin of mass.</i></b> The mass has the field associated character: $m = \frac{4\pi\varepsilon_0 r^3}{1 + k_e r^2};$ $\varepsilon_0 = 1 \text{ g} \cdot \text{cm}^{-3}$ , $k_e = \omega_e / c$ (see # 5). The rest mass does not exist.	<b>Unknown</b>
2	<b><i>The nature of electric charges.</i></b> The charge is <b><i>the rate of mass exchange</i></b> : $Q = \frac{dm}{dt}$	<b>Unknown</b>
3	<b><i>The relation between the mass and charge:</i></b> $Q = m\omega_e$	<b>Unknown</b>
4	The objective <b><i>central</i></b> (“electric”) <b><i>charge of an electron</i></b> : $e = 1.70269155 \cdot 10^{-9} \text{ g} \cdot \text{s}^{-1}$  The electron is an <b><i>elementary quantum of the rate of mass exchange</i></b> .	<b>Incorrect</b> dimension and, hence, value: $e = 1.602176462 \cdot 10^{-19} \text{ C (SI)}$ , where $1\text{C} = \frac{c_r}{10} \frac{1}{\sqrt{10^9}} \text{ kg}^{\frac{1}{2}} \text{ m}^{\frac{3}{2}} \text{ s}^{-1}$ , $c_r = 2.99792458 \cdot 10^{10}$ [14]; or in CGSE system $e = 4.803204197 \cdot 10^{-10} \text{ CGSE}_q$ ( $\text{g}^{\frac{1}{2}} \cdot \text{cm}^{\frac{3}{2}} \cdot \text{s}^{-1}$ )
5	<b><i>The fundamental frequency</i></b> of the subatomic and atomic levels: $\omega_e = e / m_e = 1.869162559 \cdot 10^{18} \text{ s}^{-1}$	<b>Unknown</b>
6	<b><i>Static fields do not exist in Nature.</i></b> “Electrostatic” fields are, actually, exofrequency fields of the fundamental frequency $\omega_e$ (see # 5)	<b>Unknown</b>
7	The objective <b><i>transversal</i></b> (“magnetic”) <b><i>charge of an electron</i></b> on the Bohr orbit: $e_H = \frac{v_0}{c} e$	<b>Unknown</b>

8	<b>The fundamental wave radius:</b> $\tilde{\lambda}_e = c / \omega_e = 1.603886492 \cdot 10^{-8} \text{ cm}$	<b>Unknown</b>
9	<b>The ratio of electron's orbital magnetic moment, to its orbital moment of momentum,</b> $\mu_{e,orb} = e v_0 r_0 / c,$ $\hbar = m_e v_0 r_0:$ $\frac{\mu_{e,orb}}{\hbar} = \frac{e}{m_e c} = \frac{1}{\tilde{\lambda}_e} = k_e$	<b>Incorrect value</b> $\frac{\mu_{e,orb}}{\hbar} = \frac{e}{2m_e c}$
10	<b>The magnetic moment of an electron:</b> $\mu_e = \frac{v_0}{c} e(r_0 + \delta r_0) = -1855.877359 \cdot 10^{-26} \text{ J} \cdot \text{T}^{-1};$ $v_0 = 2.187691263 \cdot 10^8 \text{ cm} \cdot \text{s}^{-1} \text{ is the Bohr speed}$	<b>Incorrect value</b> $\mu_e = (1 + \alpha_e) \frac{e\hbar}{2m_e c} =$ $= -928.476410(80) \cdot 10^{-26} \text{ J} \cdot \text{T}^{-1}$
11	The proper magnetic moment of momentum of an electron (" <i>spin</i> " magnetic moment): $\mu_s = \frac{r_e}{z_{p,q}} \sqrt{\frac{2Rh_e}{m_0 c}} = -5.50792 \cdot 10^{-29} \text{ J} \cdot \text{T}^{-1}$	<b>Incorrect value</b> $\mu_s = \mu_B = \frac{e\hbar}{2m_e c} =$ $= -927.400947(80) \cdot 10^{-26} \text{ J} \cdot \text{T}^{-1}$
12	The radius of an electron shell ( <i>electron's radius</i> ): $r_e = \sqrt{\frac{m_e}{4\pi\epsilon_0}} = 4.17052597 \cdot 10^{-10} \text{ cm};$ $\epsilon_0 = 1 \text{ g} \cdot \text{cm}^{-3}, m_e = 9.10938253 \cdot 10^{-28} \text{ g}$	<b>Unknown</b> Considered as a <b>point like</b> particle. Classical <b>electron radius</b> is $r_e = \left(\frac{v_0}{c}\right)^2 r_0 =$ $2.817940325 \cdot 10^{-13} \text{ cm}$
13	The radius of a proton shell ( <i>proton's radius</i> ): $r_p = 0.528421703 \cdot 10^{-8} \text{ cm}$ (calculated from the <i>formula of mass</i> , see # 1)	<b>Unknown</b> Proton <b>rms charge radius</b> is $r_p = 0.8750(68) \cdot 10^{-13} \text{ cm}$
14	<b>The fundamental frequency of the gravity field:</b> $\omega_g = \sqrt{4\pi\epsilon_0 G} = 9.158082264 \cdot 10^{-4} \text{ s}^{-1};$ $G = 6.6742 \cdot 10^{-8} \text{ g}^{-1} \cdot \text{cm}^3 \cdot \text{s}^{-2},$ $\epsilon_0 = 1 \text{ g} \cdot \text{cm}^{-3}$	<b>Unknown</b>
15	<b>The fundamental wave radius of the gravity field:</b> $\tilde{\lambda}_g = c / \omega_g = 327.4 \text{ Mkm}$	<b>Unknown</b>
16	<b>The gravitational spectrum of nucleon wave shells:</b> $r = \tilde{\lambda}_g z_{m,n};$ $z_{m,n} \text{ are roots of Bessel functions}$	<b>Unknown</b>

17	<p><b><i>The background spectrum of the hydrogen atom:</i></b></p> $\frac{1}{\lambda} = R \left( \frac{1}{n^2} - \frac{1}{(n + \delta n)^2} \right);$ <p><math>\delta n = \delta r / r_0</math></p>	<b>Unknown</b>
18	<p><b><i>The nature of the Lamb shift:</i></b> the shift is precisely equal to the frequency gaps between the nearest spectral terms of the background spectrum (see # 17)</p>	<b>An erroneous concept</b> based on an influence of invented (non-existed) virtual particles
19	<p><b><i>The precise derivation of binding energy in atoms without use</i></b> of the relation <math>\Delta E = \Delta m \cdot c^2</math></p>	<b>Unable</b>
20	<p><b><i>The physical meaning of the speed</i></b> of light <math>c</math> in the relation</p> $E_0 = m_0 c^2;$ <p><math>m_0</math> is the <b><i>associated mass</i></b> of a particle (see # 1). Speed of light <math>c</math> is <i>the basis wave speed of exchange of matter-space-time at the subatomic level.</i></p>	<b>Unknown</b>  $m_0$ is the “ <i>rest</i> ” mass.
21	<p><b><i>Internal spatial structure of atoms, i. e.,</i></b> the disposition of nucleons in atoms (The latter defines the structural variety at the molecular level in Nature: “genetic code”)</p>	The fixed (strictly geometrical) disposition of nucleons is  <b>Unknown</b>
22	<p><b><i>Internal g-lepton structure of nucleons:</i></b> <b><i>Proton</i></b> and <b><i>Neutron</i></b> are similar in structure to isotopes <math>^{28}_{14}\text{Si}</math> and <math>^{29}_{14}\text{Si}</math>, respectively, according to Shell-Nodal Atomic Model (<math>m_g = 68.22 m_e</math>)</p>	Quark structure (does not similar to crystal)
23	<p><b><i>Crystal structure of solids,</i></b> including forbidden by mathematical laws of crystallography</p>	<b>Unable</b>
24	<p><b><i>The structure of all isotopes and their masses</i></b> (including limiting masses: minimal and maximal for every isotope)</p>	<b>Unable</b>
25	<p><b><i>The nature of Mendeleev’s Periodic Law:</i></b> the similarity of nodal structure of external atomic nucleon shells.</p>	<b>Different explanation:</b>  electron structure of atoms
26	<p><b><i>The fine structure constant physical meaning:</i></b> the scale correlation between basis and superstructure of wave (between oscillatory and wave processes in waves)</p>	<b>Unknown</b>
27	<p><b><i>The unified description</i></b> of electromagnetic, gravitational, and strong (nuclear)  interactions</p>	<b>Unable</b>

Let us to leave Table 1 without comments. We assume that everybody can come to the same conclusion after looking through the comparative table. Namely one must note that we meet here with an absolutely new physical theory advantages of which, with respect to SM, are clear and unconditional. As was mentioned above possibilities of SM are limited (and fully exhausted) that essentially restrains the further development of physics. The data presented in Table 1 corroborates and clearly reflects the latter conclusion.

An analysis of advantages of the DM shows that we are on a new way in principle in our understanding the regularities of nature, the structure of matter-space-time. In order to justify such an optimistic conclusion, we will consider in the next section those basic phenomena studying of which has had the main influence on the development of quantum electrodynamics – the main theory (realm) of modern physics. The description of these phenomena on the basis of the DM changes essentially our relation to some modern concepts and theories, including quantum electrodynamics.

## 5. Analysis of an advantage of new theory with an example of an elucidation of the nature of cosmic (“relict”) microwave background radiation, the Lamb shift and anomalous magnetic moment of an electron.

The hydrogen atom is a simplest paired centrally symmetric proton-electron system. According to the DM, the hydrogen atom is also a pure wave dynamic formation. It means that a proton, just like an electron or any elementary particle, is in a state of continuous dynamic exchange (equilibrium) with environment through the wave process of the definite unchanged fundamental frequency  $\omega$  (recalling a micropulsar).

From the above definition it follows that elementary particles of the Dynamic Model, being unceasingly pulsing microobjects, can be regarded as unexhausted sources of the so-called zero point energy (the energy of “quantum vacuum”, in the language of modern physics).

*Longitudinal* oscillations of the *spherical* wave shell of the proton provide an interaction in radial direction (more correctly *exchange* of matter-space and motion-rest) with the surrounding field-space and with the orbiting electron. The orbital motion of the electron is associated with the transversal *cylindrical* wave field. Therefore, the common three-dimensional wave equation (2.1) is valid for both cases. Both dynamic constituents of the proton-electron system have to be described, respectively, by *spherical* and *cylindrical* wave functions.

The wave equation (2.1) in a general form is

$$\Delta\hat{\Psi} - \frac{1}{c^2} \frac{\partial^2 \hat{\Psi}}{\partial t^2} = 0. \quad (5.1)$$

The solution of the equation led us to the spectral formula of the hydrogen atom, obtained for the first time in an unknown earlier expanded comprehensive form, *i.e.* in the form where not “quantum numbers  $m$  and  $n$ ”, but **right radial solutions – roots  $z_{i,j}$  of Bessel functions  $J(kr)$  and  $Y(kr)$**  – are presented [2, 6].

$$h \frac{c}{\lambda} = \frac{m_0 c^2 A^2}{2r_0^2} \left( \frac{|\hat{e}_p(kr_m)|^2 z_{p,1}^2}{z_{p,m}^2} - \frac{|\hat{e}_q(kr_n)|^2 z_{q,1}^2}{z_{q,n}^2} \right), \quad (5.2)$$

where

$$\hat{e}_l(kr) = \sqrt{\frac{\pi k r}{2}} (J_{l+\frac{1}{2}}(kr) \pm i Y_{l+\frac{1}{2}}(kr)), \quad (5.3)$$

$A$  is the constant equal to the oscillation amplitude at the sphere of the wave radius ( $kr = 1$ ) (its formula is not presented here),  $m_0$  and  $r_0$  are mass and radius of the proton,  $h$  is the Planck constant.

The orbiting electron in hydrogen (both in equilibrium and excited states) *constantly* exchanges the energy with the proton at the fundamental frequency inherent in the subatomic level  $\omega_e$ . This exchange process between the electron and proton has the dynamically equilibrium character and runs on the background of the superimposed oscillatory field of the center of mass of the proton and its spherical shell.

The natural (background) perturbation  $\delta r / r_0$  of the orbital radius  $r_0$  in the **equilibrium state** is responsible for the origin of **radiation at the level of background**.

A resulting formula for the relative value of the background perturbation  $\delta n = \delta r / r_0$  [7] has the form

$$\frac{\delta r}{r_0} = \sqrt{\frac{2Rh}{m_0 c}} \cdot \frac{e_p(z_{p,s})}{Z_{p,s}} - \beta_n \frac{r_e^2}{r_0^2} \sqrt{\frac{2Rh_e}{m_0 c}} \cdot \frac{e_m(z_{m,n})}{Z_{m,n}}, \quad (5.4)$$

where  $R$  is the Rydberg constant,  $r_e = 4.17052597 \cdot 10^{-10} \text{ cm}$  is the radius of the wave shell of the electron (the electron radius for brevity) determined in the DM from the formula of mass of elementary particles (3.1) at the conditions  $\varepsilon_r = 1$  and  $m = m_e = 9.109382531 \cdot 10^{-28} \text{ g}$ .

On the basis of (5.2), with allowance for (5.4) and taking into account the Bessel's functions of the zero order,  $p = q = m = 0$ , characteristic for the proton-electron system in an equilibrium state, we arrive at the spectrum of the zero wave perturbation, the **background spectrum**:

$$\frac{1}{\lambda} = R \left( \frac{1}{n^2} - \frac{1}{\left( n + \sqrt{\frac{2Rh}{m_0 c}} \cdot \frac{e_p(z_{p,s})}{Z_{p,s}} - \beta_n \frac{r_e^2}{r_0^2} \sqrt{\frac{2Rh_e}{m_0 c}} \cdot \frac{e_m(z_{m,n})}{Z_{m,n}} \right)^2} \right), \quad (5.5)$$

where  $n = 1, 2$ ;  $\beta_n$  are numerical factors taking into account the fact an excitation of the hydrogen atom on the zero level and using by this reason the first unequal to zero roots of Bessel functions,  $j'_{0,2}$  and  $j'_{0,3}$  (Table 2), corresponding to the extremes of the first potential radial shells.



The results of calculations by the formula (5.5) under the above conditions are presented in Tables 2 and 3.

**Table 2.** The roots of Bessel functions,  $Z_{p,s}$  and  $Z_{m,n}$ , and the numerical factors  $\beta_n$  used for calculations by (5.5),  $n = 1, 2$ .

$s$	$Z_{p,s}$ [8]	$Z_{m,n}$ [8]	$\beta_1 (n=1); \beta_2 (n=2)$
1	$y_{0,1} = 0.89357697$	$y'_{0,1} = 2.19714133$	
2	$y_{0,2} = 3.95767842$ $j'_{0,2} = 3.83170597$	$y'_{0,1} = 2.19714133$ $j'_{1/2,1} = 1.16556119$	$\beta_1 = 1.203068949$ $\beta_2 = 1.018671584$
3	$y_{0,3} = 7.08605106$ $j'_{0,3} = 7.01558667$	$y'_{0,1} = 2.19714133$ $j'_{1/2,1} = 1.16556119$	$\beta_1 = 1.203068949$ $\beta_2 = 1.018671584$

**Table 3.** The terms,  $1/\lambda$ , of background spectrum (5.5) of the hydrogen atom;  $n = 1$ .

$s$	$Z_{p,s}$	$Z_{m,n}$	$\beta_n$	$1/\lambda, cm^{-1}$ (5.5)	$\lambda, cm$	$T, K$	$T_{exp}, K$ [9]
1	$y_{0,1}$	$y'_{0,1}$		41.751724	0.023951	12.10805	
2	$y_{0,2}$ $j'_{0,2}$	$y'_{0,1}$ $j'_{1/2,1}$	$\beta_1$	9.40602023 9.67863723	0.106315 0.103320	<u>2.72774</u> 2.80680	<u>2.728 ± 0.002</u>
3	$y_{0,3}$ $j'_{0,3}$	$y'_{0,1}$ $j'_{1/2,1}$	$\beta_1$	5.240486 5.255841	0.190822 0.190265	1.51974 1.52419	

The zero level of wave exchange (interaction with environment) is not perceived visually and integrally characterized by the absolute temperature of zero exchange. It exists as a standard energetic medium in the Universe because the hydrogen atom is the more abundant substance in cosmic space. Actually, the wave

$$\lambda = 0.106315 cm \quad (5.6)$$

(4.11) is within an extremum of the spectral density of equilibrium cosmic microwave background. The absolute temperature of zero level radiation with this wavelength is

$$T = \frac{0.290}{\lambda} = 2.72774 K. \quad (5.7)$$

**Table 4.** The terms,  $1/\lambda$ , of background spectrum (5.5) of the hydrogen atom;  $n = 2$ .

$s$	$Z_{p,s}$	$Z_{m,n}$	$\beta_n$	$1/\lambda, cm^{-1}$ (5.5)	$\lambda, cm$	$T, K$
1	$y_{0,1}$	$y'_{0,1}$		5.219748	0.191580	1.5137
2	$y_{0,2}$ $j'_{0,2}$	$y'_{0,1}$ $j'_{1/2,1}$	$\beta_2$	1.1758681 1.211154	0.850436 0.825659	0.3410 0.3512
3	$y_{0,3}$ $j'_{0,3}$	$y'_{0,1}$ $j'_{1/2,1}$	$\beta_2$	0.6550701 0.6582849	1.526554 1.519099	0.18997 0.1909

The temperature (5.7) is close to the temperature of “relict” background measured by NASA's Cosmic Background Explorer (COBE) satellite to four significant digits ( $2.728 \pm 0.002 K$ ) [9].

Unfortunately, modern physics erroneously interprets the nature of origination of cosmic microwave background. The latter is regarded as a “relict” background radiation left after the Big Bang. This hypothesis has turned out to be doubt and subjected last time to close scrutiny, especially due to the new data obtained by Hubble Space Telescope. There are many publications on this subject, in particular, the book „Bye Bye Big Bang, Hello Reality” by William C. Mitchell (2002) discusses all the open questions about the Big Bang theory.

An important proof of the correctness of the background radiation formula (5.5) and, hence, of basic features of the elementary particles structure, originated from the DM, are values of differences of basic energetic terms corresponding to Bessel functions  $j'_{0,2}$  and  $y_{0,2}$ .

As it turned out the **theoretical** values obtained for the  $(j'_{0,2} - y_{0,2})_{n=1}$  (Table 3) and  $(j'_{0,2} - y_{0,2})_{n=2}$  (Table IV) terms differences,  $\Delta\left(\frac{1}{\lambda}\right)cm^{-1}$ , **coincide** with high precision with the most accurate **experimental** values obtained for the  $1S$  and  $2S$  Lamb shifts of the hydrogen atom:  $L_{1,s} = 8172.837(22)$  MHz and  $L_{2s-2p} = 1057.8446(29)$  MHz [10] (Table 5)!

**Table 5.** The frequency gaps,  $\Delta v$ , between the nearest background terms in the hydrogen atom

$n$	$s$	Terms differences	$\Delta(1/\lambda), cm^{-1}$	$\Delta v, MHz$	$\Delta v_{exp}, MHz$ [10]
1	2	$(j'_{0,2} - y_{0,2})_{n=1}$	0.272617	<b>8172.852</b>	<b>8172.837(22)</b>
	3	$(j'_{0,3} - y_{0,3})_{n=1}$	0.015355	460.3313	
2	2	$(j'_{0,2} - y_{0,2})_{n=2}$	0.0352859	<b>1057.84466</b>	<b>1057.8446(29)</b>
	3	$(j'_{0,3} - y_{0,3})_{n=2}$	0.0032148	96.37727	

The latter data is the strong blow on to the QED concept of “**virtual**” **particles** invented initially just for the description of the “anomalous” magnetic moment of an electron (we will consider the latter below) and the Lamb shifts. Physicists, instead of to study the world, have began by this way to construct the subjective **virtual world**. As a result the theory of quantum electrodynamics – the peak of advantages of the “virtual” physics – was developed. Let us to recall in this connection an opinion of Richard P. Feynman (who is one of the major creators of QED) on this subject: „*The theory of quantum electrodynamics describes Nature as absurd from the point of view of common sense*” [11].

Let us to confirm the rightfulness of the above conclusion and Feynman’s opinion (about “absurdity”) with the next but very important in principle example. The matter is that the DM enables to explain also logically and simply the nature of the so-called “anomaly” of the magnetic moment of the electron [12]! We will proceed to this issue now.

The wave motion of the hydrogen atom, as a paired proton-electron system of the field of exchange, generates in the simplest case (in equilibrium) an elementary *electric (longitudinal) moment* (moment of the *basis* [2])

$$N_e = e(r_0 + \delta r_0) \quad (5.8)$$

and the corresponding *magnetic (transversal) moment* (moment of the *superstructure*)

$$\mu_e = \frac{v_0}{c} N_e = \frac{v_0}{c} e(r_0 + \delta r_0), \quad (5.9)$$

where the term  $\delta r_0$  includes all small deviations of the orbital radius  $r_0$  caused by different constituents of specific motion of the electron in the **intra-atomic wave field**;  $e$  is the electron's exchange charge,  $v_0$  is the oscillatory speed of boundary wave shell of the hydrogen atom equal to the Bohr speed,  $c$  is the base wave (phase) speed of the wave exchange equal in value to the speed of light.

The term  $\delta r_0$  takes into account the following three main additional motions that perturb (modulate) trajectory of the orbiting electron:

- (1) the circular motion of the center of masses of the hydrogen atom, because the hydrogen atom, as a whole, oscillates in the spherical field of exchange with the amplitude (characteristic for the wave sphere, at  $kr = 1$ ) defined by the fundamental wave radius  $\lambda_e$ ;
- (2) oscillations of the wave shell together with the orbiting electron and oscillations of the center of mass of the hydrogen atom with the amplitude defined by the Bohr radius  $r_0$  and the first root of the spherical Bessel functions of the zero order  $z_{0,s} = b'_{0,1}$ , (responding to the extremum of the first kinetic shell);
- (3) oscillations of the center of mass of the electron itself, as a whole, with respect to the center of mass of the hydrogen atom, defined by the radius of the wave shell of the electron  $r_e$  and the roots of Bessel functions responding to zero and maximum of the first kinetic shell,  $y_{0,1}$  i  $y'_{0,1}$ .

The theoretical value of the total magnetic moment of the electron  $\mu_e(th)$  is presented in an expanded form as

$$\mu_e(th) = \frac{ev_0}{c} \left[ r_0 + \left( \frac{c}{\omega_e} + \frac{r_0}{b'_{0,1}} \right) \sqrt{\frac{2Rh}{m_0 c}} + \beta r_e \frac{y_{0,1} + y'_{0,1}}{2y_{0,1}y'_{0,1}} \sqrt{\frac{2Rh_e}{m_0 c}} \right], \quad (5.10)$$

where  $h_e = 2\pi m_e v_0 r_e$  is the orbital action of the electron (analogous to the Planck constant  $h$ ) produced at its own rotation around own center of mass with the speed  $v_0$ , realized during the electron orbiting around the proton with the same speed (the first Bohr speed  $v_0$ ). The coefficient  $\beta = 1.00155$  in the last term (insignificantly different from the integer 1) takes into account the natural indeterminacy in weight contributions of two items defined correspondingly by the two roots of Bessel functions,  $y_{0,1}$  i  $y'_{0,1}$ .

The substitution of numerical values for all quantities entered in (5.10) gives the following theoretical values for the total magnetic moment of the electron and its constituents:

$$\mu_e(th) = (1854.801894 + 0.957111963 + 0.112845073 + 0.00550792) \cdot 10^{-26} J \cdot T^{-1} = 1855.877359 \cdot 10^{-26} J \cdot T^{-1}. \quad (5.11)$$

The value obtained is **in agreement with Einstein-de-Haas's experiment** [13]!

The **first, major, term** in (5.10) relates to the **orbital magnetic moment** of the electron, bound in the hydrogen atom,

$$\mu_{e,orb} = \frac{v_0}{c} e r_0. \quad (5.12)$$

A half of this value is called in physics the **Bohr magneton**:

$$\mu_B = \frac{v_0}{2c} e r_0 = 927.400947(80) \cdot 10^{-26} J \cdot T^{-1}. \quad (5.13)$$

An introduction of this physical quantity is a result of **erroneous theoretical derivation** of the **average value of circular current** caused by the orbiting electron in the hydrogen atom, that is convincingly shown in [13]. This is why an agreement of the theoretical value  $\mu_e$  with Einstein-de-Haas's experiment has not been achieved at that time (the double difference of the proposed theory and the experiment took place then). We will not consider this principal question here, but only note that the aforementioned error essentially (unfortunately from our point of view) influenced (and influences currently) on the right way of the development of physics.

The **second and third terms** take into account an influence (upon the value of the orbital magnetic moment) of the aforementioned natural perturbation of the orbital motion of the electron.

The only **fourth term** in (5.10) has the direct relation to the **electron proper** ("spin") **magnetic moment**, its **true value** (see (5.11)) is

$$\mu_s = 5.50792 \cdot 10^{-29} J \cdot T^{-1}. \quad (5.14)$$

If one subtracts the value (5.13) of one Bohr magneton  $\mu_B$  (ascribed, as it turned out erroneously [13], to the electron's spin magnetic moment) from (5.11), we obtain the absolute value

$$\mu_e = \mu_e(th) - \mu_B = 928.476412 \cdot 10^{-26} J \cdot T^{-1}, \quad (5.15)$$

which coincides with the absolute "2002 CODATA recommended value" accepted for the magnet moment of the electron (within uncertainty in the last two figures):

$$\mu_{e,CODATA} = 928.476412(80) \cdot 10^{-26} J \cdot T^{-1}. \quad (5.16)$$

The magnetic moment of an electron is defined **in modern physics** by the equality

$$\mu_e = (1 + a_e) \mu_B, \quad (5.17)$$

where  $a_e$  is called the **magnetic moment anomaly of the electron**. The latter shows the exceeding of the expected value of the magnetic moment of the electron (obtained on the basis of aforementioned erroneous derivation) in one Bohr magneton (5.13), following from semi-classical field theories, over the accepted value based on experiment (5.16).

The whole extended form of the equation on the “anomaly”  $a_e$ , including functional expressions for factors of the  $\alpha^n$  terms, requests more pages for its location than they are in this paper.

We show here the equation on the current theoretical value of  $a_e(th)$  **in the concise form** derived now [14] up to the forth order in the fine-structure constant  $\alpha$ :

$$a_e(th) = 0.5\left(\frac{\alpha}{\pi}\right) - 0.328478965579... \left(\frac{\alpha}{\pi}\right)^2 + 1.181241456... \left(\frac{\alpha}{\pi}\right)^3 - \\ - 1.5098(384) \left(\frac{\alpha}{\pi}\right)^4 + 4.382(19) \cdot 10^{-12} = 1.1596521535(12) \cdot 10^{-3} \quad (5.18)$$

where

$$\alpha = \frac{e^2}{4\pi\epsilon_0\hbar c} = 7.297352533 \cdot 10^{-3}, \quad (5.19)$$

is the fine-structure constant [15]; with this  $\epsilon_0 = 8.854187817... \cdot 10^{-12} F \cdot m^{-1}$  is the so-called “*permittivity of free space*” (or “*electric constant*”).

The derivation of  $\alpha_e$  with such a high precision is regarded in physics as one of the advantages of QED, because other ways of the derivation were not found till now.

Let us turn again to the two presented above formulas, (5.18) and (5.10) (related with (5.17)), which actually describe the same quantity – the magnetic moment of the electron, and compare them. By this way we will compare two theoretical approaches:

- (1) new one (dialectical) presented here and
- (2) modern (quantum electrodynamical, “virtual”) accepted currently in physics.

The derivation of the equation (5.18) rests on the concept of **virtual** (invented) particles. Therefore, the expanded form of the equation is extremely complicated. Actually, the coefficient 1.5098(384) of the  $\alpha^4$  term (calculated with big uncertainty,  $\pm 384$ ) consists of more than **one hundred huge 10-dimensional integrals!** Therefore, because of the complicated mathematical structure of coefficients of the  $\alpha^n$  terms, a special system of massively-parallel computers was developed for the calculation of (5.18). In fact, we deal here with the masterly mathematical fitting (adjusting), which reached in the course of more than 55 years, passed after the work by H. A. Bethe [16] and T. A. Welton [17], of the highest extent of perfection due to the hard efforts of many skilled theorists over the World.

Whereas, Equation (5.10), derived on the basis of the Dynamic Model of Elementary Particles, does not contain any integrals, but nevertheless logically and non-contradictory leads to the same precise value of  $\mu_e$ . Moreover, the current QED precise value of  $\mu_e$  (or  $a_e(th)$ ) has been achieved in the course of more than 50 years of hard efforts of many skilled theorists over the World. The precise derivation based on the DM did not require so much time and huge efforts.

An additional comment for the above comparison is not necessary. The simplicity, clear logic and the precision of calculations justify in favor of the new theory.

## 6. Fundamental parameters of the gravitational field originated from the new theory

The **law of central exchange** at the level of the gravitational field, originated for the first time from the DM, is presented in the following form:

$$F = \frac{\omega_g^2 m_1 m_2}{4\pi\epsilon_0 r^2}, \quad (6.1)$$

where  $\omega_g$  is the **fundamental frequency of the gravitational field of exchange** – the **fundamental parameter of the gravitational field** unknown up to now,  $m_1$  and  $m_2$  are the (associated) masses of two particles a distance  $r$  apart,  $\epsilon_0 = 1 \text{ g} \cdot \text{cm}^{-3}$  is the absolute unit density of matter.

According to Newton's law of universal gravitational, every particle attracts every other particle with a force  $F$  given by

$$F = G \frac{m_1 m_2}{r^2}, \quad (6.2)$$

where  $G$  is the **gravitational constant**, which, according to modern measurements, has the value

$$G = 6.6742(10) \cdot 10^{-8} \text{ g}^{-1} \cdot \text{cm}^3 \cdot \text{s}^{-2}. \quad (6.3)$$

From a comparison of two equations: theoretical originated from the DM (6.1) and Newtonian experimental (6.2), which both relate to the same phenomenon, it follows that

$$G = \frac{\omega_g^2}{4\pi\epsilon_0}. \quad (6.4)$$

Thus, the DM for the first time discover the functional bond of the **gravitational constant**  $G$  with the fundamental parameter of the gravitational field – **fundamental gravitational frequency**  $\omega_g$ . Hence, knowing the experiment value of  $G$  (6.3), we find the value of  $\omega_g$ , which proven to be a very small one:

$$\omega_g = \sqrt{4\pi\epsilon_0 G} = 9.158082264 \cdot 10^{-4} \text{ s}^{-1}, \quad (6.5)$$

and the **wave gravitational radius** of an elementary particle

$$r_g = \frac{c}{\omega_g} = 3.273528773 \cdot 10^{13} \text{ cm} \approx 327,4 \text{ Mkm}, \quad (6.6)$$

where  $c = 2.99792458 \cdot 10^{10} \text{ cm} \cdot \text{s}^{-1}$  is the basis speed of exchange at the fundamental frequencies of exchange of matter-space-time,  $\omega_e$  and  $\omega_g$ .

The wave gravitational radius determines the wave gravitational sphere with the **transient wave zone**, which divides the spherical space-field of a particle into the near oscillatory domain (domain of basis) and the far wave domain (domain of superstructure). If the particles form planetary cosmic systems, big planets cannot exist in this domain because, in the process of their formation, the transient domain is the place of the most intensive motion. In our Solar system, the transient domain is represented by the rings of asteroids of the Sun, adjoined to the shell of the gravitational radius  $r_g$ .

The gravitational radius (6.6) of elementary particles defines, in accordance with solutions of the wave equation in the range of superlow frequencies, the radii of wave shells of the gravitational domain:

$$r = r_g z_{m,n} = 327.4 z_{m,n} \text{ Mkm},$$

which are realized in the spectrum of Keplerian shells-orbits (assuming in the first approximation that Kepler's shells are spherical and, hence, the orbiting is circular).

The existence of the gravitational frequency  $\omega_g$  and the gravitational radius  $r_g$  (along with the fundamental frequency  $\omega_e$  and wave radius  $\lambda_e$  of the subatomic level) of elementary particles shows the indissoluble bond of micro- and megaobjects of the Universe in the unit complex of the Infinitely Small and Infinitely Big, as the coexisting polar oppositions **Yes** and **No**.

Many interesting things originate from the DM, including those concerned with the discovery of the unknown earlier fundamental parameters of the gravitational field [2]. Let us at the end of this section to turn a special attention to the following result bound up with the fundamental frequency  $\omega_g$ .

The gravitational frequency  $\omega_g$  defines the **radial time wave-period**  $T_g$ ,

$$T_g = \frac{2\pi}{\omega_g} = 0.686080898 \cdot 10^4 \text{ s}. \quad (6.7)$$

The **azimuthal time wave of the fundamental tone**  $T_c$  corresponds to the above period:

$$T_c = 4\pi T_g = 8.621546841 \cdot 10^4 \text{ s}. \quad (6.8)$$

Its value is actually equal to the Earth's day ( $24 \text{ h} = 8.640 \cdot 10^4 \text{ s}$ ). The **time wave**  $T_c$  repeats the structure of **spatial wave** of the fundamental tone at the Bohr orbit,  $\lambda = 4\pi r_0$ , and the analogous structure of the azimuthal (transversal) electron wave of the fundamental tone,  $\lambda_e = 4\pi r_e$  (where  $r_e$  is the radius of the electron).

Hence, taking into account (6.7) and (6.8), the gravitational constant  $G$  (6.4) can be also presented in the following way

$$G = \frac{16\pi^3}{T_c^2 \varepsilon_0}. \quad (6.9)$$

The above relationships, (6.8) and (6.9), show that **Earth** is in the **harmonic resonance bond** with the fundamental gravitational frequency  $\omega_g$ . Just like the **electron** on the Bohr orbit is in the **harmonic resonance bond** with the fundamental frequency of the subatomic and atomic levels  $\omega_e$ .

**The latter means that Earth (just like the hydrogen atom among all elements of the periodic table) is fundamentally distinguished from other planets, taking a special place in the field-space of the Solar system and maybe in Cosmos on the whole!**

## 7. Conclusion

1. Essential principles of a new theory of matter-space-time, realized in particular in the Dynamic Model of Elementary Particles (DM), were established.

2. The DM is the only currently existed theory which discovers the nature of origination of mass and electric charge of elementary particles, and unknown earlier fundamental parameters of electrostatic and gravitational fields.
3. The magnetic moment of an electron with its “anomaly” and the Lamb shifts described up to present solely by quantum electrodynamics (QED), and cosmic microwave background radiation [18], an origination of which is ascribed currently to Big Bang, *etc.* have obtained for the first time the simple and logically non-contradictory solutions in the framework of the DM, beyond QED and the Big Bang hypothesis.
4. It is very important to stress that the **nature of the above phenomena by the natural way (logical and mathematical) originates from the new theory of matter-space-time (DM)** which relies on unquestioned *achievements of the world philosophy*. Whereas the modern description of the phenomena by the QED theory and the Big Bang hypothesis (we turn a **special attention** to the fact) **does not reveal the real nature** of the phenomena. The matter is that QED in the framework of *formal logic* is based on a **fictitious concept of virtual (non-existed) particles invented** for the description of the phenomena found first experimentally, which none physical theory existed at that time was able to explain. As concerns the **Big Bang** hypothesis attempting to explain the cosmic microwave background radiation, it is nothing more as a **fruit of imagination** which, judging from our and numerous other data appeared in the last time, is the erroneous concept.
5. We regard the new theory of matter-space-time as **much promising** because, **first**, it essentially extends our knowledge about nature (that is clear seen from Table 1). **Second**, all phenomena considered here (just like other ones analyzed by the authors of the theory beginning from 1996 and already published) have obtained the **clear image and logical explanation** along with the **simple mathematical** description **as against** contradictory and mathematically complicated descriptions in the framework of modern theories. The latter concerns first of all to quantum mechanics and quantum electrodynamics.
6. A discovery of fundamental parameters of the gravitational field has led us to the theoretical solution (in principle, do not considered here) of the problem on **control over the gravitational field of material objects**. The latter will serve in the nearest future as the basis for inventions of different machines and apparatuses of new generation (just like it took place in history with all fundamental discoveries in physics).

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