h-SPACE THEORY

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ABSTRACT The *h*-space theory is a variant of unified physical theory – a theory of everything. This theory was built *de novo*, as the existing physical theories are incompatible and so unsuitable for unification. A new approach is needed, and has been developed by re-evaluating the definitions of primary physical concepts. The starting point for the re-evaluation was the following equation – $Et = mvL$, where energy – E, time – t, length – L, mass – m, velocity – v. Analysis of these physical concepts resulted in the construction of a unique equation of the primary concepts such as space, length, energy and velocity. From this, models could be developed that explain all well-known physical phenomena. In addition, *h*-space theory predicts phenomena rejected by the current mainstream theories, such as limits to gravitational and electrostatic interactions, and the possibility of cold fusion (as a consequence of the electric charge definition, a modification of Coulomb's law and the definitions of elementary particles in *h*-space theory). The final section of this article describes a number of experimental tests that could be used to verify the *h*-space theory.

OUTLINE

1. METAPHYSICAL PRINCIPIA OF *h*-SPACE THEORY

Let's start a building of unified physical theory with the most general notion describing the totality of observed phenomena, as anything that can be said to be. This concept is Being. We take it in the formulation of Martin Heidegger as Being in ontology and higher Being as a subject of theology. "*But if we recall once again the history of Occidental-European thought, then we see that the question about being, taken as a question about the being of beings, is double in form. It asks on the one hand: What are beings, in general, as beings? Considerations with the province of this question come, in the course of the history of philosophy,*

under the heading of ontology. The question "What are beings" includes also the question, "Which being is the highest and in what way is it?" The question is about the divine and God. The province of this question is called theology. The duality of the question about the beings can be brought together in the title "onto-theo-logy." The twofold question, What are beings? asks on the one hand, What are (in general) beings? The question asks on the other hand, What (which one) is the (ultimate) being (Martin Heidegger, "Kant's Thesis about Being", "Pathmarks", Cambridge University Press, 1998, Page 340)." Complete definition of the being of ontology will be considered as the aim in constructing a unified physical theory. To begin with analysis of being in ontology we will start with definitions of being given by Georg Wilhelm Friedrich Hegel. According to G. W. F. Hegel, Being is initially undetermined Being and is equal to Nothing, which transforms into determined Being, Reality. "*In Becoming, the Being which is one with Nothing, and the Nothing which is one with Being, are only vanishing factors; they are and they are not. Thus by its inherent contradiction Becoming collapses into the unity in which the two elements are absorbed. This result is accordingly Being Determinate (Being there and so). … Hence Being Determinate is (1) the unity of Being and Nothing, in which we get rid of the immediacy in these determinations, and their contradiction vanishes in their mutual connection – the unity in which they are only constituent elements. And (2) since the result is the abolition of the contradiction, it comes in the shape of a simple unity with itself: that is to say, it also is Being with negation or determinateness: it is Becoming expressly put in the form of one of its elements, viz., Being (G. W. F. Hegel, "Encyclopedia of Philosophical Sciences", Part 1, § 89)."* In other words, Being, according to Hegel's definition, represents both Nothing and Being as a unity of opposites, which, as a whole is still Nothing or Being devoid of definitions. Let us try to translate this definition into the language of equations. This can be done, assuming that Nothing – as Being devoid of definitions – corresponds to one as unity formed by the product of opposites $A = A$ and $non\text{-}A = 1/A$. Why product, rather than sum of opposites? First, because sum of opposites is zero and zero is not Being devoid of definitions, zero corresponds to the non-existence. Second, in one as product, the variables are inversely interdependent, so they quantitatively and, consequently, qualitatively are opposites. In sum, there are no quantitative opposites, which are equal through invers interdependency, but there is rather declining of one at the expense of other. Thus, the sum cannot be regarded as a formalization of the unity of equal opposites. If the above is true, then the product $(A)(non\text{-}A) = 1$, i.e. $(A)(1/A) = 1$, must occur in the basic formulas of modern physics. In this context we noticed that the following equations:

$$E = h\nu \qquad E = mc^2 \qquad F = ma$$

contain the same ratio of notions: energy (E), time (t), length (L), mass (m) and velocity (v).

$$Et = mvL$$

Lets us assume that it is no coincidence and the desired ontological concept of Being, $(A)(non\text{-}A) = 1$, i.e. $(A)(1/A) = 1$, is expressed in this ratio. Then, the next step is to compare the notions of energy (E), time (t), length (L), mass (m), velocity (v) and the ontological concept of Being as the product of $A = A$ and $non\text{-}A = 1/A$ equal to 1. For this, we will analyze in detail definitions of each of these notions.

1.1 DEFINITION OF TIME

From the beginning of philosophy time is associated with change and cannot be separated from motion. Aristotle asked question about relation between time and motion in his "Physics". "*But as time is most usually supposed to be (3) motion and a kind of change, we must consider this view (Aristotle, "Physics", Book IV, Part 10)."* Although Aristotle suggested differences between time and motion, we will consider time as not a primary concept, but derived from the motion defined as a change. If we go to practice, defining the time is always comparison of some motion with a standard motion in clock. By measuring time we characterize the ratio of a velocity of the tested motion to a velocity of the motion in the clock quantitatively, in dimensionless units. In this sense, time is a secondary, technical concept, originated from motion as primary notion, i.e. in other words, time results as ratio of different velocities, quantitative characteristics of motion.

1.2 DEFINITION OF VELOCITY

The notion of velocity should be reduced to the notion of motion, since it represents a quantitative value of motion as a change. This is the same ratio of length, as in the case of the concept of time,

because time is nothing but a quantitative value of motion.

1.3 DEFINITION OF MASS AND SPACE

Generally speaking, mass is the product of a certain "density" of matter and a certain volume. From first look, the "density" can be reduced to the energy concept. Volume contains two concepts: space of certain dimension and length. Length, as energy, is a primary concept. Neither energy, nor length can be reduced to a more elementary concept. For space we will use Hegel's definition, which characterize space primarily as three dimensions. *"Space has, as the concept in general (and more determinate than an indifferent self-externality) its differences within it: (a) in its indifference these are immediately the three dimensions, which are merely diverse and quite indeterminate (G .W. F. Hegel. "Philosophy of Nature", § 198)."* According to Hegel's ontology, space and time are interdependent. "*This disappearance and regeneration of space in time and of time in space is motion; - a becoming, which, however, is itself just as much immediately the identically existing unity of both, or matter (G.W.F. Hegel. "Philosophy of Nature", § 203)."* Since above, time was reduced to concept of motion that means not time, but motion exists in unity with the space. Before analysis of this unity in details, next we will look more thoroughly to existing definitions of space, or, more exactly, n-dimensional linear space in geometry. The n-dimensional linear space is a direct descendant of Euclidean geometry, which is the geometry of real three-dimensional space used in physics.

"*Definition 1. A linear space is n-dimensional if it contains a linearly independent system consisting of n vectors, and any system consisting of a large number of vectors is linearly dependent. The number n is called the dimension of linear space. Thus, the dimension of space - it is the largest number of linearly independent vectors (N. V. Efimov and E. R. Rozendorn, "Linear algebra and multidimensional geometry", 1969, page 35, Russian edition)."*

"Definition 2. The system of vectors $\boldsymbol{a}, \boldsymbol{b}, \boldsymbol{c}, \ldots \boldsymbol{q}$ *is called linearly dependent if there is the equality*

$$a\boldsymbol{a} + \beta\boldsymbol{b} + \gamma\boldsymbol{c} + \ldots + \chi\boldsymbol{q} = 0,$$

where from the numbers $a, \beta, \gamma, \ldots \chi$ *at least one is non-zero.*

Definition 3. The system of vectors $\boldsymbol{a}, \boldsymbol{b}, \boldsymbol{c}, \ldots \boldsymbol{q}$ *is linearly independent if the equation*

$$a\boldsymbol{a} + \beta\boldsymbol{b} + \gamma\boldsymbol{c} + \ldots + \chi\boldsymbol{q} = 0,$$

is possible only if $a = \beta = \gamma = \ldots = \chi = 0$.

(N. V. Efimov and E. R. Rozendorn, "Linear algebra and multidimensional geometry", 1969, page 25, Russian edition)."

"Zero space. Let L is the set consisting of only one element. What this element is we do not care. We denote it by the letter θ. *We define for set L linear operations, assuming that* θ *in the sum with itself gives the* θ *and when* θ *is multiplied by any real number, we also obtain* θ. *It is easy to see that in this case, the requirements of the axioms I) – 8) are met. Thus, a set L is a real linear space consisting of a single, zero element. Clearly, with the same result set L can be defined as a complex space. Note. All other (real or complex) linear space must have an infinite number of elements. (N. V. Efimov and E. R. Rozendorn, "Linear algebra and multidimensional geometry", 1969, page 16, Russian edition)."*

Since dimensions originated from the framework of three-dimensional Euclidean geometry, this forces us to consider other dimensions of space in a similar way. In this case, zero-dimensional space, as defined in the cited text, is not realistic, since the vector of zero length does not match anything, i.e. a physical object of zero length does not exist. This means that either any zero-dimensional space does not exist and is just a convenient mathematical construction, or the definition of zero-dimensional space requires revision. A revision is obvious if we look closely at the above quotation. There, the definition of zero-dimensional space does not follow from the general definition of the dimension of space. Zero-dimensional space introduced as a separate definition corresponding to the eight axioms of linear space. Let's try to define the zero-dimensional space based on a common definition of the dimension where "the dimension of space is the largest number of linearly independent vectors". Three-dimensional space requires three linearly independent vectors, two-dimensional – 2, one-dimensional – 1, then zero-dimensional – 0. Accordingly, zero-dimensional space is characterized by the absence of linearly independent vectors, and that also means that all vectors of zero-dimensional space are linearly dependent, including a system consisting of a single vector. Additionally, the vectors, as real objects of zero-dimensional space, should have non-zero length; the same as all other vectors in

spaces of any dimensions.

Definition 1. The length (modulus) of a vector of n-dimensional space of any dimension is not zero.

The linear dependence of the vector of zero-dimensional space means that for a given vector, $\boldsymbol{a}$, having non-zero modulus, $|\boldsymbol{a}|$, the factor a must be different from zero, and the product of the vector, $\boldsymbol{a}$, by a factor, a, should be zero.

$$a\boldsymbol{a} = 0,$$

where a and $|\boldsymbol{a}|$ are not equal to zero.

This is possible if the vector, $\boldsymbol{a}$, has a non-zero modulus of length, $|\boldsymbol{a}|$, and is oriented in such a way that in any given direction vector length is zero. In other words, the vector is located simultaneously in two opposite directions. Visually, in three-dimensional space, it corresponds not to a segment but to a ball, with a radius equal to the length of the vector, and it is directed away from or toward the center (in two-dimensional space - the circle of that radius; in one-dimensional space – the length is equal to double the length of the vector). Algebraically, a linear dependence of such a vector is expressed in terms of its zero sum of the two lengths of the vector (the vector modulus is $|\boldsymbol{a}|$) with opposite signs.

$$a\boldsymbol{a} = a(-|\boldsymbol{a}| + |\boldsymbol{a}|) = 0,$$
a and $|\boldsymbol{a}|$ are not zero, but $\boldsymbol{a} = -|\boldsymbol{a}| + |\boldsymbol{a}| = 0$

Accordingly, the new definitions of zero-dimensional space and linearly dependent vector will be as follows.

Definition 2. A zero-dimensional space is a set of linearly dependent vectors.

Definition 3. Object of zero-dimensional space is a linearly dependent vector. Linearly dependent vector is a vector whose projection on any direction is zero, i.e. is the sum of two modules having plus and minus signs.

In this view, generally accepted definition of vector as a directed segment fully corresponds to the object of non-zero space, for example, the object of three-dimensional space. Such an object can be defined as a linearly independent vector.

Definition 4. Object of non-zero space is a linearly independent vector. Linearly independent vector is a vector whose projection on a unique line is equal to its module having a plus or minus sign.

Following from the definitions above, an object of zero-dimensional space can also be defined as an undirected line segment.

Definition 5. A linearly dependent vector is a non-directed (omnidirectional) segment, collinear and opposite simultaneously to any vector.

That is, a linearly dependent vector is a segment that has one defined end but no definite position for other end. For example, in three-dimensional space such an indefinite position of the end defines a three-dimensional surface of a sphere whose radius corresponds to the length of the object of zero-dimensional space. In addition, one has to also assume that the beginning and the end are interchangeable for such an object. In zero-dimensional space, this object can be represented as a curve of arbitrary direction, whose length is the length of the object.

Thus, according to the presented concept of zero-dimensional space, we will not talk about single vector/object characterized by a zero length, but about a set of linearly dependent vectors/objects having non-zero lengths.

Since the definition of a vector includes, besides the length (modulus), the notion of direction, the concept of a vector is unthinkable without the concept of motion, defining the direction of motion in non-zero space. This allows to redefine the dimension of space as the maximum number (n) of independent motions, instead of linearly independent vectors.

Definition 6. The dimension of space represents the maximum number (n) of independent motions.

This means, for example, that in a three-dimensional space, the motion of any object is a linear combination of its motion in the opposite directions of each of three independent motions, two-dimensional – a combination of two independent motions, and in the case of one-dimensional space – a combination of movements in opposite directions of one motion. In the case of zero-dimensional space, its objects are moving

in all directions, i.e. visually it is similar to an expanding balloon.

In a formalized form, the n-dimension can be defined as n-dimensional volume, i.e. l to the power of n – l^n.

1.4 DEFINITION OF MOTION

Given the above definition of n-dimensional space, the notion of motion in non-zero space is a sum of independent motions along the axes of a Cartesian coordinate system. The independence of the motion implies that it cannot be a sum of motions along the remaining axis. Since motion is defined along the axes of a Cartesian system of n-dimensional space, the value of velocity, v_n, in n-dimensional space must depend on the value of the n-dimensional volume, l^n (see details below). In zero-dimensional space it is impossible to move along the axis, since it has no independent motions. Consequently, motion in zero-dimensional space is an expansion taking place everywhere, along all "axes". According to the definition of the Being as a unity of *A* and *non-A*, the ontological Being contains the concept of motion, as a change from *A* to *non-A* and vice versa, in the *non-A*.

1.5 DEFINITION OF LENGTH

As mentioned above, the length, *L*, and energy, *E*, concepts cannot be reduced to anything, i.e. they are equivalent to the primary concepts - the opposites, *non-A* and *A*. A symbol of motion is included in *non-A*. Motion is not possible without the concept of length and space. Consequently, the concept of length, *L*, corresponds to *non-A*, since it contains both motion, v_n, and n-dimensional space, l^n, concepts.

1.6 DEFINITION OF ENERGY

Based on the above, the concept of energy corresponds to the symbol *A*.

1.7 EQUATION OF UNIVERSE

Thus, the analysis of the concepts of Being allows us to associate the product,

$$(A)(non\text{-}A) = (A)(1/A) = 1$$

with the following equation,

$$(E)(v_n l^n L) = 1$$

where $A = A$ is energy (E), and $non\text{-}A = 1/A$ is length ($v_n l^n L$) comprising the concepts of motion (velocity, v_n) and n-dimensional space (volume, l^n).

Further development of the equation of Being, $(E)(v_n l^n L) = 1$, requires its quantitative definition. According to Hegel's definitions: "*Being-for-self is first, immediately a being-for-self – the One. Secondly, the One passes into a plurality of ones – repulsion – and this otherness of the ones is sublated in their ideality – attraction. Thirdly, we have the alternating determination of repulsion and attraction in which they collapse into equilibrium, and quality, which in being-for-self reached its climax, passes over into quantity (G. W. F. Hegel. "Science of Logic", Book 1, Volume 1, § 319). The difference between quantity and quality has been stated. Quality is the first, immediate determinateness, quantity is the determinateness which has become indifferent to being, a limit which is just as much no limit, being-for-self which is absolutely identical with being-for-other – a repulsion of the many ones which is directly the non-repulsion, the continuity of them (G. W. F. Hegel. "Science of Logic", Book 1, Volume 1, § 387)."* In other words, the ontological Being in terms of *A* and *non-A* requires quantification. This can be done if we will use, again, the mentioned equations of physics. One of them contains the Planck constant, which is equal to the product of energy and time. Let us assume that this constant represents Being in quantity. Since in our definition time through velocity incorporated in length in the equation – $(E)(v_n l^n L) = 1$ – we can redefine the dimension of Planck constant as the product of energy and length. In this case, because length, as $non\text{-}A = 1/A = v_n l^n L$, is opposite to energy, as $A = E$, then, if the length unit is meter, the dimension of energy should be measured as a meter to the power of minus one. Introduced in this way, the modified Planck constant ("Planck constant") has no dimension and should directly quantify the product $(E)(v_n l^n L) = 1$. Further, since this product is equal to one, the use of a modified "Planck constant", h, requires introducing a reciprocal factor – h^{-1}. Accordingly, quantification of Being implies modification of $(E)(v_n l^n L) = 1$ into the following equation:

$$1 = h^{-1}h = (E)(v_n l^n L)$$

In this equation, unit corresponds to smallest thing

defined by modified Planck constant – h. Its opposite is a set of units and it is defined as a reciprocal of the value of modified Planck constant – h^{-1}. Thus, the left part of the equation – $1 = h^{-1}h$ – is explicitly defined in quantity, while the right part – $(E)(v_n l^n L)$ – is still quantitatively undefined. To determine quantitatively the right part, we will use the principle of symmetry. This principle is another expression of the unity of opposites, A and *non-A*, because if there is A, it must exist also its inverse, and this is *non-A*. In other words the principle of symmetry is the expression of ontological Being as unity of opposites. From the principle of symmetry in case of one thing, which we define it as an n-object, the symmetry of A and *not-A* is the distribution of the value of h to equal factors – $A = E = h^{1/2}$ and $non\text{-}A = v_n l^n L = h^{1/2}$. This definition however does not reflect the opposite character of A and *non-A* = $1/A$. To meet this condition, we divide $A = h^{1/2}$ by $h^{1/2}$ and, conversely, we multiply the $non\text{-}A = h^{1/2}$ by $h^{1/2}$. Secondly, the symmetric version includes the reverse procedure: multiplication of $A = h^{1/2}$ by $h^{1/2}$ and the division of $non\text{-}A = h^{1/2}$ by $h^{1/2}$. We define these symmetrical variants as two forms of n-object: α- and β-. To simplify the presentation of this symmetrical variants, we introduce the coefficient of $q = h^{-1/2}$. Based on its role, we define it as a factor of symmetry. Then the definition of an n-object can be written as follows:

n-object of α-form

$$h = (E/q)(l^n v_n L q)$$

n-object of β-form

$$h = (Eq)(l^n v_n L/q)$$

Similar to the definition of one of Being, as an n-object of α- and β-form, the principle of symmetry allows us to apply the same approach of symmetry for the determination of the set of Being. This gives the next symmetrical variants for the set of Being: $A = E = h^{-1}$, $non\text{-}A = l^n v_n L = 1$ and $A = E = 1$, $non\text{-}A = l^n v_n L = h^{-1}$. Accordingly, all variants for one and the set of Being will be formulated by the following equations:

n-objects of α-form

$$1 = h^{-1}h = (h^{-1}E/q)(1 l^n v_n L q)$$
$$1 = h^{-1}h = (1E/q)(h^{-1} l^n v_n L q)$$

n-objects of β-form

$$1 = h^{-1}h = (h^{-1}Eq)(1 l^n v_n L/q)$$
$$1 = h^{-1}h = (1Eq)(h^{-1} l^n v_n L/q)$$

In these equations, energy, as one, unite, ($E/q = h$ or $Eq = 1$) and as the set ($E = h^{-1}$ or $E = 1$), is quantitatively defined completely, but length, $non\text{-}A = l^n v_n L$, is only partially defined. Undefined are values of l^n and v_n. In order to deal with their quantification, we should return to the concept of the space dimension. In the case of zero-dimensional space, the coefficients of l^n, v_n are equal to 1, because any number in the power of zero is 1. This corresponds to an indefinite character of motion direction for objects of zero-dimensional space. Thus, n=0-objects of zero-dimensional space have an unambiguous definition of length, $non\text{-}A = L$. In the case of n≠0-objects we have to remind ourselves that space is defined as the opposite to motion, and consequently the coefficient of the space dimension l^n is the inverse function to the coefficient of velocity v_n, i.e. their product is equal to 1, $l^n v_n = 1$. Since the coefficient of l^n is l raised to the power of n, then v_n is v raised to the power of $-n$. Next, we should determine the l and v values. Since l^n and v_n are included in the *non-A* their values should be determined by the value of $non\text{-}A = h^{1/2}$. This means that the value of $non\text{-}A = h^{1/2}$ must be distributed symmetrically between l^n and v_n, on the basis of equation $l^n v_n = 1$, by the same way as it was done for A and *non-A*. This results to next definitions – $v_n = (h^{1/4})^{-n}$ and $l^n = (h^{1/4})^n$. Finally, we have a complete mathematical definition of the ontological Being as follows:

n-objects of α-form

$$1 = h^{-1}h = (h^{-1}E/q)(1 l^n v_n L q)$$
$$1 = h^{-1}h = (1E/q)(h^{-1} l^n v_n L q)$$

n-objects of β-form

$$1 = h^{-1}h = (h^{-1}Eq)(1 l^n v_n L/q)$$
$$1 = h^{-1}h = (1Eq)(h^{-1} l^n v_n L/q)$$

Unified Equation of Universe

$$1 = h^{-1}h = h^{-1}(Eq/q)(l^n v_n L q/q)$$

where $E = h^{1/2}$, $L = h^{1/2}$, $q = h^{-1/2}$, $v_n = (h^{1/4})^{-n}$, $l^n = (h^{1/4})^n$.

The resulting equations introduce the idea of matter based on a premise of its symmetry

expressed in the equations as ratio of the concepts. We can say that the initial state of the ontological Being as unity of opposites is a state without symmetry, Nothing – One as a number. In this form, Being is a zero-dimensional space of objects. Its development is consistent with the formation of new symmetry – new dimensions of space, as a gradual increase in the number of independent motions. Consequently one-, two-, three-dimensional space of nowadays and finally up to the four- and five-dimensional space in the future (see details about a restriction of dimensions below) are characterized by the presence of one, two, three, four and five independent motions, respectively. As a result of this, the causal nature of events of our world as Being is generated by its appearance, as the development of Being, where $A = A$ expressed itself as a reason, which denies and gives a consequence, vanishes into *non-*$A = 1/A$.

Why one in the equations is a product of values defined by a modified Planck constant? Could these values be defined by other, different "Planck constants"? The answer is yes, but in this case it will be not our universe. In each such universe, the "Planck constant" will determine all its quantitative properties, in a similar way as in our world. In addition, the value of the "Planck constant" depends on the units, which means that there are objects with absolute unites of length and velocity. Since the "Planck constant" has a finite value, our universe has discrete character and consists of a finite number of objects. At this stage we cannot give specific values and we will use the formal value of "Planck constant" – h. Its actual value and the actual values of the absolute units of length and velocity will be given in the last section, in "The physical content of h-space theory". Different units will generate different universes, so the infinity of matter can exist as an unlimited set of universes with a "Planck constant" of the same value but differing in the units, as well as universes with different values of "Planck constant". The equation of the Multiverse, where h is changed to infinity, can be written as follows:

Unified Equation of Multiverse

$$1 = (1^{-1} \times ... \times h^{-1} \times ... \times \infty)$$
$$(1 \times ... \times h \times ... \times \infty) =$$
$$= (1^{-1} \times ... \times h^{-1} \times ... \times \infty)$$
$$(1 \times ... \times (Eq/q)(l^n v_n Lq/q) \times ... \times \infty)$$

where $E = h^{1/2}$, $L = h^{1/2}$, $q = h^{-1/2}$, $v_n = (h^{1/4})^{-n}$, $l^n = (h^{1/4})^n$, and h belongs to the set of natural numbers.

The primary role of the modified Planck constant in the theory is emphasized by the presence of its symbol, h, in the title of the theory.

2. METAPHYSICAL FOUNDATION OF *h*-SPACE THEORY

In this section we will further define ontological Being as expressed in the equations presented in the first chapter.

2.1 DEFINITION OF A CYCLIC MOTION OF n=0-OBJECTS OF n=0-SPACE

The full definition of ontological Being, given in the previous chapter, consists of four symmetric equations implying definition of Being as both unit and set. The unit of Being was defined as an n-object of α- and β-form. The set of Being was defined as a set of n-objects characterized by the total value of length and energy equal to h^{-1} or 1. Accordingly, motion of Being can be defined as a change of the total value of length and energy. The n=0-objects and n=0-space are primordial, while formation of the n≠0-objects and n≠0-spaces is a posterior process. Formally, this order is expressed in the definition of the values of the coefficients of space, l^n, and velocity, v_n (for n=0-objects of zero-dimensional space these values are equal to one). The primary nature of zero-dimensional objects and space implies the primary motion of Being as the motion of n=0-objects of zero-dimensional space. What is this motion? By definition, the motion of Being is self-sufficient. This is possible if the motion of n=0-objects is cyclical. Accordingly, this cyclic motion should be described by the above-mentioned equations:

$$1 = h^{-1}h = (h^{-1}E/q)(1l^0 v_0 Lq) \quad (1.\alpha)$$
$$1 = h^{-1}h = (1E/q)(h^{-1}l^0 v_0 Lq) \quad (2.\alpha)$$
$$1 = h^{-1}h = (h^{-1}Eq)(1l^0 v_0 L/q) \quad (1.\beta)$$
$$1 = h^{-1}h = (1Eq)(h^{-1}l^0 v_0 L/q) \quad (2.\beta)$$

where $E = h^{1/2}$, $L = h^{1/2}$, $q = h^{-1/2}$, $v_0 = (h^{-1/4})^0 = 1$, $l^0 = (h^{1/4})^0 = 1$.

As a starting point of cyclic motion, we begin with the state of a set of n=0-objects described by equation 1.α. In this state, the total values are

$^1E = h^{-1}$, $^1L = 1$. Respectively, n=0-objects of the α-form must be combined "in parallel", as the length of the n=0-object of α-shape is equal to the total length – $^1L = Lq = 1$. Correspondingly, the number of n=0-objects is calculated as $^1E/(E/q) = h^{-1}/h = h^{-2}$. Then, from formula 2.α in second state, the total length of n=0-objects of α-form is h^{-1}. This implies motion from the first state to the second, and this motion can be graphically represented as shown in the figure 1 as follows. At the beginning of motion, each object is moving with a constant velocity v_0 relative to next object, i.e. one object moves relative to second with velocity v_0, while the second moves relative to the third one with the same velocity v_0 and so on. This means that the velocity of the first object relative to the last one will be a product of the number of parallel n=0-objects and velocity v_0.

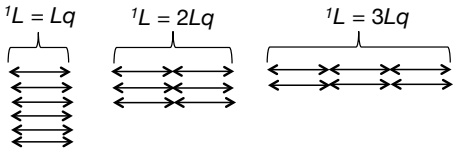

Figure 1. Schematic representation of n=0-objects of the α-form "in parallel" orientation.

What will happen when the total length becomes equal to double the length of the n=0-object? If we consider that all n=0-objects are always arranged in parallel to each other, and the total length is the doubled length of the n=0-object, then the number of parallel n=0-objects along the length of the n=0-object is reduced by two times. Next, it is not single n=0-objects, but pairs of n=0-objects ($^1L = 2Lq$) that will be in parallel, and so will move relative to each other. When the total length reaches a value equal to the length of three n=0-objects, then the number of parallel n=0-objects is reduced, and triplets of n=0-objects ($^1L = 3Lq$) will move relative to each other. It is obvious for such defined motion that an increase in total length correlates with a decrease in the velocity of the n=0-objects relative to each other, an outcome of the decrease in the number of parallel n=0-objects. Time of the motion with certain velocity will increase while the total length increase. We will define the number of parallel n=0-objects per length of n=0-object, as the density of n=0-objects, ρ_0.

The motion of n=0-objects of the α-form will occur until they reach a state described by equation 2.α. In this state, characterized by the total values of energy $^2E = 1$ and length $^2L = h^{-1}$, n=0-objects of the α-form are placed "head to tail" relative to each other. Their amount is the value: $^2E/(E/q) = {}^2L/Lq$ (Fig. 2).

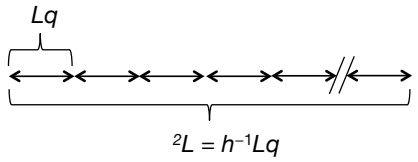

Figure 2. Schematic representation of n=0-objects of the α-form in "head to tail" orientation relative to each other.

The number of sets of "head to tail" n=0-objects of the α-form is the ratio of the total energy of the first state, $^1E = h^{-1}$, (1.α), to the total energy of the second state, $^2E = 1$, (2.α) – $^1E/{}^2E = h^{-1}$. We will designate this motion as the α-phase of the motion of Being. As noted above for this phase of motion, the density ρ_0 will decrease over time as a result of the increase of the total length, up to the value described by the second state (^2L) (Fig. 2). The density ρ_0 can be calculated as the ratio of the total length of the second state (^2L) to the value of the total length at any given time. The density ρ_0 for "head to tail" n=0-objects of the α-form of the second state (^2L) is one. In the second state of α-phase (2.α), the total energy $^2E = 1$ is equal to the energy value of the n=0-object of the β-form. This suggests a transition of total energy of the set of "head to tail" n=0-objects of the α-form, into energy of a single n=0-object of the β-form. In other words, a set of the n=0-objects of the α-form, characterized by a total energy $^2E = 1$ and a total length $^2L = h^{-1}$, will become an n=0-object of the β-form, characterized by energy – $Eq = 1$ and length – $L/q = h$ (2.β) As a result, n=0-objects of the β-form appear in the number equal to the ratio $^1E/{}^2E = h^{-1}$, arranged "in parallel", that implies the motion of n=0-objects of the β-form as an increase in the total length of the n=0-objects of the β-form, similar to the scheme described above for n=0-objects of the α-form at α-phase. The motion of n=0-objects of the β-form from the second state (2.β) to the first state (1.β) can be defined as the β-phase of the cyclic motion of Being. When the increasing total length of the β-phase reaches a total length of the first state (1.β) $^1L = 1$, the motion of n=0-objects of the β-

form will end. Since the total length of the first state (1.β) at β-phase, ${}^1L = 1$, is equal to the length of an n=0-object of the α-form ($Lq = 1$), then the set of "head to tail" n=0-objects of the β-form, characterized by total energy ${}^1E = h^{-1}$ (1.β) and total length ${}^1L = 1$, will transform into n=0-objects of the α-form. This means that the whole set of the "head to tail" n=0-objects of the β-form will transform into parallel n=0-objects of the α-form, in the amount of ${}^1E/(E/q) = h^{-1}/h = h^{-2}$. Since it was at this condition that we began our consideration, we have described a cyclic motion of the n=0-objects.

2.2 DEFINITION OF n≠0-OBJECTS AND n≠0-SPACES

According to the previous section, apart from n=0-space and n=0-objects, the space can have nonzero-dimensions. These dimensions derive from dependent motion of zero-dimensional space as the definition of one, two, three, etc. independent motions. In other words, n≠0-space evolves from of zero-dimensional space, and n≠0-objects from the n=0-objects. Formally, this is expressed in the quantitative definition of the coefficients of l^n and v_n (for n=0-objects they are equal to 1). If for n=0-objects their velocity, relative to each other, is equal to 1, the velocity of n≠0-objects relative to the n=0-objects is $v_n = (h^{1/4})^{-n}$. Because n≠0-objects originate from n=0-objects, both n≠0-objects and n=0-objects exist in α- and β-forms.

Definition 1. The velocity of n≠0-objects relative to n=0-objects is the ratio of change of the total length between the n≠0- and n=0-objects to a change of the total length between the n=0-objects. If the change of total length between n=0-objects is equal to one, the change of the total length between n≠0- and n=0-objects is equal to v_n. Velocity is dimensionless, since it is the ratio of lengths.

Velocity is an immanent part of length and, accordingly, the energy and length of the n=0- and n≠0-objects are defined as follows:

	α-form	β-form
Energy (E_n)	E/q_n	Eq_n
Length (L_n)	Lv_nq_n	Lv_n/q_n

Since, in this definition, the velocity v_n is included in length, the length of an n≠0-object will increase with the dimension (n). If the length of an n≠0-object is greater than the total length of the n=0-objects, the n≠0-object will not be formed, since the total length of Being cannot be less than the length of single n≠0-object. Consequently, the formation of n≠0-objects and n≠0-spaces will occur sequentially, when the total length of the n=0-objects will be greater than the length of n≠0-object. The space of higher dimensions will contain a space of smaller dimensions and the n≠0-object will exist in n≠0-space of the same dimension or higher.

Graphically, n≠0-objects in n≠0-spaces represent segments of certain length and direction. This follows from the fact that in a Cartesian coordinate system any n≠0-object is uniquely characterized by length only. n-dimensional volume is not characteristic of the n≠0-object, but is characteristic of n≠0-space. In contrast to the n≠0-objects, an n=0-object in n≠0-space has no certain direction, because zero-dimensionality is characterized by dependent motions. Graphically, in three-dimensional space, such dependent motions correspond to a ball with a radius equal to the length of the n=0-object; in two dimensional space – the circle of the same radius; in one dimensional space – a segment equal to double the length of the n=0-object. Any linear motion relative to the n=0-object takes place simultaneously in two opposite directions relative to its center. An n=0-object in a zero-dimensional space can be represented as a curve of arbitrary direction, whose length is equal to the length of an n=0-object. The total length of the zero-dimensional space of the n=0-objects increases, it means that the curve of the total length of the n=0-objects is not closed.

From the principle of symmetry, an independent motion is possible as a decrease or as an increase of the total length of the n=0-objects, so the formation of n≠0-spaces (i.e. the definition of independent motions) defines the concept of direction of motion. In a zero-dimensional space, direction is not possible, or, in other words, the direction is arbitrary, and is not defined in any one time. The total length of the objects in a zero-dimensional space is always increasing. This means that in n≠0-spaces an n=0-object will split into two n≠0-object moving in opposite directions relative to each other, with velocity v_n relative to n=0-objects. In regard to n=0-objects in n≠0-spaces, the definition of directions can be

determined as direction relative to the centers n=0-object. This determines in n≠0-spaces two types of n=0-objects differing in the direction of motion relative to their centers. Therefore, we can assume that with the emergence of n≠0-spaces during a cycle, not only n≠0-objects, but also n=0-objects will split into two types of n=0-objects, that differ in their direction of motion relative to their centers. In three-dimensional space these directions are from and to the center of ball; in two-dimensional space – from and to the center of the circle; and in one-dimensional space – from and to the middle segment that is equal to twice the length of an n=0-object. We will designate these two types of n=0-objects as n=0-objects(II) of "−" and "+" types – n=0-objects(II)"−","+". Correspondingly, n=0-objects described above in the cycle have no definition of direction and will be designated as n=0-objects(I)(Fig. 3).

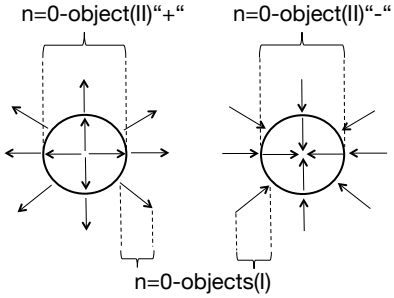

Figure 3. Graphical representation of n=0-objects(I) and n=0-objects(II)"−","+".

Thus, during cyclic motion of n=0-objects(I), with the emergence of n≠0-spaces, n=0-objects(I) will split into n≠0-objects and n=0-objects(II)"−","+". Based on the principle of symmetry, we can assume that for each n=0-object(I) included in the cycle there is one n=0-object(I) transforming into two n≠0-objects, initially moving in opposite directions and into two n=0-objects(II)"−","+". The next question is the definition of the values of energy and length of the n≠0-objects and n=0-objects(II)"−","+". The generation of two n-objects from one n=0-object(I), in terms of equations, can only mean a symmetrical distribution of the values of length and energy, i.e. a symmetrical distribution of the coefficient of symmetry, q. With this in mind, the equation for n-objects generated from n=0-objects(I) of the α-form can be written as follows:

$$h = (E/q_0q_0)(v_n{}^nLq_0q_0), \text{ where } q_0q_0 = q$$

As already noted above, the length of the n-object cannot be greater than the total length on α- and β-phases. For the α-phase, the length of generated n-objects of α-form is:

$$L_n = Lv_nq_0,$$

where $v_n = (h^{1/4})^{-n}$, $q_0 = h^{-1/4}$, $L = h^{1/2}$.

The maximum total length in the α-phase is h^{-1}. This value corresponds to the length of an n=5-object.

$$L_5 = h^{1/2}(h^{-1/4})^5h^{-1/4} = h^{-1}$$

Thus, from one n=0-object(I) of α-form at α-phase two oppositely directed n-objects of α-form can be formed, for which the spatial dimension can be n = 0, 1, 2, 3, 4, 5. Similarly, at the β-phase of the cycle, n-objects can have dimension n = 0, 1, 2, 3. The maximum total length in the β-phase is 1. This value corresponds to the length of an n=3-object.

$$L_n = Lv_n/q_0,$$

where $v_n = (h^{1/4})^{-n}$, $q_0 = h^{-1/4}$, $L = h^{1/2}$.

$$L_3 = h^{1/2}(h^{-1/4})^3/h^{-1/4} = 1$$

As mentioned above, the density of n=0-objects(I) along the total length is the same, and it determines the velocity of n=0-objects(I) relative to each other. With the formation of n=0-objects(II)"−","+" and n≠0-objects, this density will be changed when one n=0-object(I), from the total length, is substituted by the pair of n=0-objects(II)"−","+" or a pair of n≠0-objects. I.e. the density of n=0-objects(I) along the total length in the location of n=0-objects(II)"−","+" or n≠0-objects is less than elsewhere in space of the total length, where n=0-objects(II)"−","+" or n≠0-objects are not present. Taking into account the n=0-objects(II)"−","+" and n≠0-objects, the total density of n-objects along the total length will remain the same.

2.3 DEFINITION OF RELATIVE MOTION OF n=0-OBJECTS(II)"−","+" AND n=0-OBJECTS(I)

As mentioned above, in the n≠0-space a motion is directed relative the center of

n=0-objects(II)"−","+". This means that n=0-objects(I), generating motion in the cycle, are directed toward the center of n=0-object(II)"−", and from the n=0-object(II)"+". The amount of so directed n=0-objects(I) is determined by the density of the undirected n=0-objects(I), ρ_0. In addition, this value varies depending on the dimension of space. Because of the central symmetry of the motion of n=0-objects(I) relative n=0-objects(II)"−","+" this value can be fully defined as the ratio of the density ρ_0 to the surface area of a n-dimensional sphere of radius R, through which n=0-objects(I) move. For three-dimensional space, the density of n=0-objects(I), ρ_3, is equal to the value of ρ_0 divided by the value of the surface area of a three-dimensional sphere of radius R:

$$\rho_3 = \rho_0/4\pi R^2 = \rho_0/4\pi n^2$$

where $R = n$ – distance from the center to the selected point in space, as measured in the length of n=0-object(I), and n belongs to the set of natural numbers.

This equation is valid for distances greater than the length of an n=0-object(I). If the distance R is such that the value $4\pi R^2$ exceeds the value ρ_0, then the density ρ_3 of n=0-objects(I) directed to or from the n=0-objects(II)"−","+" is formally less than one. Since the density is the amount of n=0-objects(I) per unit equal to the length of n=0-object(I), and it can take only integer values, then less than one means zero, the absence of directed n=0-objects(I). This suggests that at a distance greater than a certain value the amount of n=0-objects(I) directed to or from the n=0-objects(II)"−","+" is zero.

What is the density ρ_n of the directed n=0-objects(I) at a distance, from the n=0-objects(II)"−","+", smaller then the length of n=0-object(I)? It is obvious, that the density of the directed n=0-objects(I), ρ_n, cannot exceed the density of the undirected n=0-objects(I), ρ_0, i.e., the density of a directed n=0-objects(I), ρ_n, at a distance less than the length of the n=0-object(I) must be less or equal to ρ_0. To fulfill this, we propose that the density ρ_n dependence on the distance R varies in an inverse relationship, and is directly proportional to the surface area of the n-dimensional sphere of radius R. For three-dimensional space, the equation for density ρ_3 is:

$$\rho_3 = \rho_0 4\pi R^2 = \rho_0 4\pi/n^2$$

where $R = 1/n$, n belongs to the set of natural numbers, and R is measured in the length of n=0-object(I).

If the distance R is so small that the value of n^2 is greater than $\rho_0 4\pi$, then density ρ_3 of a directed n=0-objects(I) is zero. Given all the above, in three dimensional space, the density distribution of n=0-objects(I), directed relative to an n=0-object(II)"−" schematically can be represented as in the figure 4.

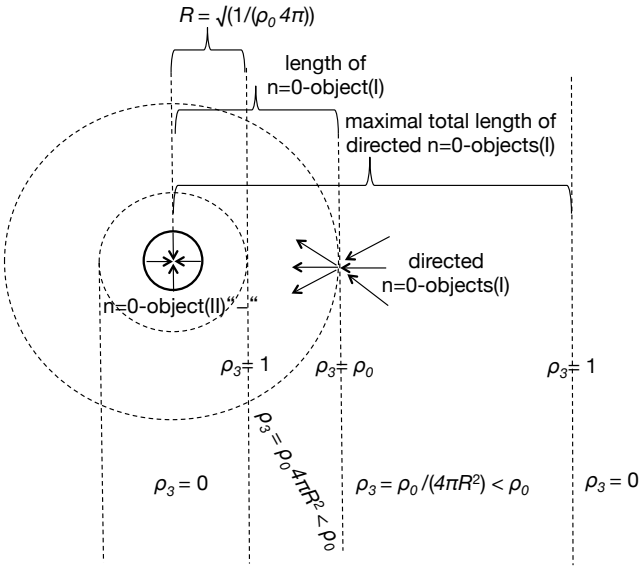

Figure 4. Distribution of the density ρ_3 of directed n=0-objects(I) relative to n=0-objects(II)"−".

The above equations determine the density distribution of directed n=0-objects(I) relative to n=0-objects(II)"−","+" in three-dimensional space. This is based on the density of the undirected n=0-objects(I) being constant, i.e., ρ_0. Nevertheless, density ρ_0 is not always constant. As noted above, in the presence of n=0-objects(II)"−","+" density ρ_0 is smaller in comparison with other locations where n=0-objects(II)"−","+" are not present. This is due to the fact that for the generation of n=0-objects(II)"−","+" (also for the n≠0-objects) n=0-objects(I) are spent (one n=0-object(I) is used for a pair of n=0-objects(II)"−","+" or n≠0-objects), and, accordingly, their density at a given location is less. At a distance R from the n=0-objects(II)"−","+" in three dimensional space this decrease in the density of n=0-objects(I), ρ_M ,

should be determined as follows:

$$\rho_M = M/2(4\pi R^2)$$

In this equation, M represents the number of n=0-objects(II)"−","+", and $M/2$ is the number of n=0-objects(I) spent on generation of these n=0-objects(II)"−","+". The inverse dependence of density ρ_M on $4\pi R^2$ is due to the characteristic three-dimensional density distribution of the undirected n=0-objects(I), spent on the generation of the n=0-objects(II)"−","+" at a distance R from n=0-objects(II)"−","+". The value of R is measured in units equal to the length of the n=0-object(I).

Let us assume that at a distance R from a group of n=0-objects(II)"−","+" there is n=0-object(II)"−","+" (or another group of n=0-objects(II)"−","+"). The density of the undirected n=0-objects(I) at the position of the n=0-object(II)"−","+" will be characterized by a gradient in the direction of the group of n=0-objects(II)"−","+". The closer to the group, the lower the density of the undirected n=0-objects(I). Because the velocity of an n=0-object(II)"−","+" is defined relative to n=0-objects(I), the density gradient of the n=0-objects(I) will cause a motion of the n=0-object(II)"−","+" in the direction of the gradient, from higher to lower density of n=0-objects(I). Accordingly, if the density of the undirected n=0-objects(I) is the same in all directions, then an n=0-object(II)"−","+" will not move in some direction. In this case, all n=0-objects(II)"−","+" uniformly move away from each other as a result of the above-described increase in total length of n=0-objects(I) that reduces their density.

Since the distance in the equation for ρ_M is measured in the length of n=0-object(I), the value of the density change, ρ_M, should vary discretely. In addition, if the distance is so large that the value of $8\pi R^2$ exceeds the value of M, then, the density change is zero, similar to the cases described above. In the case of one n=0-object(II)"−","+" the density ρ_M decreases to less than one (from the equation for three-dimensional space), i.e. the value of ρ_M is zero. A minimal density change, where ρ_M is equal to one, occurs for $8\pi \approx 25$ n=0-objects(II).

The equations above describe static n=0-objects(II)"−","+". If we now consider n=0-objects(II)"−","+" that move to a new location, the total density of n=0-objects(I) and n=0-objects(II)"−","+" temporarily declines in the place of origin and increases in the new position. This will cause a temporary density gradient along the direction of movement of the n=0-objects(II)"−","+". Since the total density should be the same along the total length, this means that n=0-objects(I) will be displaced by the n=0-objects(II)"−","+" from their new location and by moving in all directions, ultimately n=0-objects(I) will occupy the old n=0-objects(II)"−","+" location of lower density, thus providing a uniform total density along the total length. I.e. the total density will remain the same as before the movement of the n=0-objects(II)"−","+". If the n=0-objects(II)"−","+" do not stop, the density gradient of n=0-objects(I) will continue (the density will be greater ahead of the moving n=0-objects(II)"−","+" and less behind the n=0-objects(II)"−","+") and n=0-objects(I) will move in a direction opposite to the movement of the n=0-object(II)"−","+" (Fig. 5).

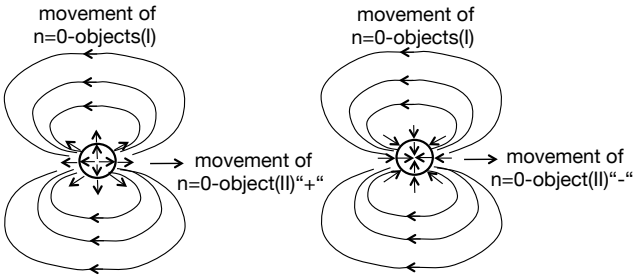

Figure 5. Distribution of the displaced n=0-objects(I) by the moving n=0-objects(II)"−","+".

The density gradient of undirected n=0-objects(I) formed during the motion of n=0-objects(II)"−","+" means the same gradient of directed n=0-objects(I). For example, because there are more undirected n=0-objects(I) in front of the moving n=0-object(II)"+" than behind it, the number of n=0-objects(I) in the collinear direction of movement is greater than the number of oppositely-directed n=0-objects(I) behind the moving n=0-object(II)"+". In a group of moving n=0-objects(II)"−","+" of one type the contribution of each will be summarized. If the group consists of n=0-objects(II)"−","+" of both types, then the n=0-objects(I) will be undirected. Where n=0-objects(II)"−","+" move along closed trajectories, it can be assumed that n=0-objects(I) can form closed, spatial structures. In these spatial

structures, n=0-objects(I) will move relative to each other regardless of the motion n=0-objects(I) as components of the total length of the cycle.

2.4 DEFINITIONS OF RELATIVE MOTIONS OF n=0-OBJECTS(II)"−","+"

2.4.1 DEFINITION OF THE RELATIVE MOTION OF n=0-OBJECTS(II)"−","+" OF THE SAME TYPE

Where there is a pair of n=0-objects(II)"−","+" of the same type, n=0-objects(I) move between them in opposite directions (Fig.6).

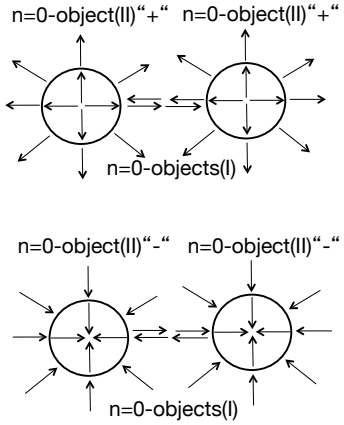

Figure 6. Orientation of the directed n=0-objects(I) between n=0-objects(II)"−","+" of the same type.

This movement of n=0-objects(I) relative to each other and, simultaneously, relative to n=0-objects(II)"−","+" is a repulsion of the n=0-objects(I), and hence a repulsion of the n=0-objects(II)"−","+". In other words, the total length of the opposing n=0-objects(I) between the n=0-objects(II)"−","+" will increase. The velocity of this movement is the product of density of the n=0-objects(I), ρ_n, for a given distance between the n=0-objects(II)"−","+", and unit of velocity v_0 – $\rho_n v_0$. Since the total length of the directed n=0-objects(I) between the n=0-objects(II)"−","+" will grow, the density, ρ_n, will decrease proportionally. In this case, the movement of non-directed n=0-objects(I) in all directions will compensate for the decrease in density of directed n=0-objects(I). Thus, the total density of directed and undirected n=0-objects(I) will remain the same.

The equation for the density of directed n=0-objects(I) in three-dimensional space was given above. Accordingly, the velocity of repulsion of the n=0-objects(II)"−","+" of the same type for a distance $R = n$ is determined as follows:

$$V = \rho_3 v_0 = v_0\rho_0/4\pi R^2 = v_0\rho_0/4\pi n^2$$

where $R = n$ belongs to the set of natural numbers and is measured in the length of n=0-object(I).

This equation is valid for a distances greater than the length of n=0-object(I), up to a maximum distance R, corresponding to a density of directed n=0-objects(I) equal to one. For longer distances, as mentioned above, the density ρ_3 and, consequently, the relative velocity of n=0-objects(II)"−","+" is zero. I.e. n=0-objects(II)"−","+" will not move relative to each other.

The distance between n=0-objects(II)"−","+" can be less than the length of n=0-object(I). As suggested above, in this case, the dependence of the density of directed n=0-objects(I) on the distance is reversed. Accordingly, in three-dimensional space, the velocity of repulsion of n=0-objects(II)"−","+" of the same type for a distance of $R = 1/n$ is determined as follows:

$$V = \rho_3 v_0 = v_0\rho_0 4\pi R^2 = v_0\rho_0 4\pi/n^2$$

where $R = 1/n$; n belongs to the set of natural numbers, R is measured in the length of n=0-object(I).

This equation, is valid up to a distance R, corresponding to the density of n=0-objects(I) equal to one. This will be, if n is equal to $\sqrt{(4\pi\rho_0)}$. At all distances less than $R = 1/\sqrt{(4\pi\rho_0)}$ the density of n=0-objects(I), directed to or from the n=0-objects(II)"−","+", is zero. Accordingly, n=0-objects(II)"−","+" will not move relative to each other.

2.4.2 DEFINITION OF THE RELATIVE MOTION OF n=0-OBJECTS(II)"−","+" OF DIFFERENT TYPES

For n=0-objects(II)"−","+" that differ in type (Fig. 7), the movement of n=0-objects(I) between them is co-directional. This movement is a decrease of the total length of the n=0-objects(I) between the n=0-objects(II)"−","+", which means the attraction of n=0-objects(II)"−","+".

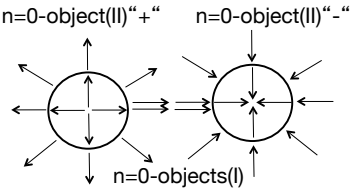

Figure 7. Orientation of the directed n=0-objects(I) between n=0-objects(II)"−","+" of the different types.

From the formula above, if the distance is greater than the length of n=0-object(I), then the attraction will increase the density ρ_3 of co-directed n=0-objects(I) between the n=0-objects(II)"−","+". Accordingly, the density of undirected n=0-objects(I) will decrease. If the distance is less than the length of n=0-object(I), then n=0-objects(II)"−","+" will also move towards each other, however the density of the directed n=0-objects(I) will decrease, in a similar manner as the velocity of repulsion between the same type n=0-objects(II)"−","+". If the distance is reduced to a value of $R = 1/\sqrt{(4\pi\rho_0)}$, the velocity of attraction of the n=0-objects(II)"−","+" will collapse to zero. If the distance is reduced further, the n=0-objects(II)"−","+" will overlap and thus be co-directed. They will then attract each other because, once overlapped, there are no n=0-objects(I) between them. The velocity of this attraction of n=0-objects(II)"−","+" is the velocity of their motion relative to each other, v_0.

Next, we will analyze a change in the relative velocity of repulsion of n=0-objects(II)"−","+" of the same type. Let consider two n=0-objects(II)"−","+" that are initially stationary, and where the distance R between them is greater than the length of n=0-object(I). The velocity of one n=0-object(II)"−","+" relative to another is determined according to the above equations, and is equal to V_R. Upon motion of these objects at a given velocity, the distance between them will increase to $R + \Delta R$. What will be the velocity of repulsion of n=0-objects(II)"−","+" at a distance $R + \Delta R$? Since n=0-objects(II)"−","+" move consistently relative to n=0-object(I) of different densities, from distance R to $R + \Delta R$, then the velocity will gradually accumulate. I.e., velocity at a distance $R + \Delta R$ is the sum of V_R and $V_{R+\Delta R}$. This motion is accelerated and the increase in velocity will tend to zero with increasing distance between objects. The attraction of n=0-objects(II)"−","+" can be described in a similar fashion. If they are initially not moving and the distance between them is R, then they will attract each other with velocity V_R. By moving with this velocity they will reduce the distance between them to $R - \Delta R$. Accordingly, the velocity for this distance will increase by the value of $V_{R-\Delta R}$, defined for distance $R - \Delta R$, and will be equal to the sum of the values $V_R + V_{R-\Delta R}$. In general, the equation for the velocity in three-dimensional space can be written as follows:

$$V = (v_0\rho_0/4\pi) \sum_{R}^{R \pm \Delta R} R^{-2}$$

where $R \pm \Delta R$ and R are distances measured by the length of n=0-object(I).

If the distance between the n=0-objects(II)"−","+" is smaller than the length of n=0-object(I), then this sum is not possible, since there are no consecutive n=0-objects(I) between n=0-objects(II)"−","+". n=0-objects(I) are in parallel. Accordingly, the relative velocity is determined for a distance between the n=0-objects(II)"−","+", without summing to the previous one, for the previous distance.

In addition, we will consider a situation when the initial velocity of the n=0-objects(II)"−","+", V, is directed perpendicular to the velocity of attraction/repulsion, and one of these n=0-objects(II)"+","-" is staying away from the other at a distance R. Then for distance equal to one, the summarized velocity V_Σ in three-dimensional space, equal to product of $v_0\rho_\Sigma/4\pi$, can be calculated as one leg of a right triangle. The second leg of this triangle is equal to the initial velocity V, while its hypotenuse is equal to the maximal velocity defined by the density ρ_0, $v_0\rho_0$. Accordingly for a distance R in three-dimensional space, the summarized velocity V_Σ is defined by the following equations:

$$V_\Sigma = v_0\rho_\Sigma/4\pi R^2 = \sqrt{((v_0\rho_0)^2 - V^2)}/4\pi R^2 = \\ = v_0\rho_0\sqrt{(1 - V^2/(v_0\rho_0)^2)}/4\pi R^2$$

where the density ρ_Σ is:

$$\rho_\Sigma = \rho_0\sqrt{(1 - V^2/(v_0\rho_0)^2)}$$

2.4.3 DEFINITION OF THE RELATIVE MOTION OF GROUPS OF n=0-OBJECTS(II)"−","+" OF BOTH

TYPES

The density of the undirected n=0-objects(I), ρ_0, around each of the groups of the n=0-objects(II)"−","+" will be lower than the density in other areas of space, where n=0-objects(II)"−","+" are not present. According to the definition given in the section "Definition of relative motion of n=0-objects(II)"−","+" and n=0-objects(I)", the density ρ_M of n=0-objects(I) in three-dimensional space at distance R is defined by:

$$\rho_M = M/2(4\pi R^2)$$

where R is measured in the length of n=0-object(I), M is the number of n=0-objects(II)"−","+".

The gradient of the density ρ_M of n=0-objects(I) between the groups of n=0-objects(II)"−","+" means movement of one group of the n=0-objects(II)"−","+" to another. If each of the groups is neutral i.e., contains equal amounts of n=0-objects(II)"−","+" of both types, then there will be only this attraction of the groups. The velocity of the attraction from the distance R to the distance $R - \Delta R$ is defined as the following sum, similar to the equations for velocity of attraction/repulsion between pairs of n=0-objects(II)"−","+":

$$V = (v_0 M/8\pi) \sum_{R}^{R-\Delta R} R^{-2}$$

where $R - \Delta R$ and R are distances measured by the length of n=0-object(I).

If each of the groups consists predominantly of n=0-objects(II)"−","+" of the same type, in addition to the described attraction, these n=0-objects(II)"−","+" will be repulsed or attracted to each other as described above for pairs of n=0-objects(II)"−","+". Furthermore, for a complete description, it is necessary to take into account the decrease of density ρ_0 of undirected n=0-objects(I).

2.5 DEFINITIONS OF RELATIVE MOTIONS OF n=0-OBJECTS(II)"−","+" AND n≠0-OBJECTS

Movement of n≠0-objects relative to n=0-objects(II)"−","+" makes sense only if their lengths overlap, i.e. for collisions of n≠0-objects and n=0-objects(II)"−","+". According to the definition given in the section "Definition of n≠0-objects and n≠0-spaces", n≠0-objects always overlap with cycling n=0-objects(I), i.e. they are constantly moving relative to n=0-objects(I) or, in other words, exist in a "medium" consisting of n=0-objects(I). In contrast to the n=0-objects(I), n=0-objects(II)"−","+" are characterized in terms of motion direction relative to their centers. Accordingly, n≠0-objects will move to the center of n=0-objects(II)"−", and away from the center of n=0-objects(II)"+".

2.5.1 DEFINITION OF THE MOTION OF n≠0-OBJECTS RELATIVE TO n=0-OBJECTS(II)"−"

Motion of an n≠0-object towards the center of an n=0-object(II)"−" means that it can not move from the center of the n=0-object(II)"−", i.e. the n≠0-object must be absorbed by the n=0-object(II)"−". The absorption of the n≠0-object is possible as its transition to the n=0-objects(I), since earlier in the cycle n≠0-objects formed from the n=0-objects(I). Accordingly, as a result of absorption of the n≠0-object by the n=0-object(II)"−", the density ρ_0 of n=0-objects(I) will be increased in the position of the n=0-object(II)"−". Due to the increase in density, the velocity of the n=0-object(II)"−" will be increased in the movement direction of absorbed n≠0-object. The value of the density increase can be calculated as a ratio of the length of the n≠0-object generated with the formation of the n-dimensional space during the cycle, to the length of the absorbed n≠0-object. Accordingly, the absorption of n≠0-object, having length ${}^nL = Lv_n q_x$, by n=0-object(II)"−" can be defined by the following equations:

$$p = (Lv_n q_0)/(Lv_n q_x)$$

or

$p = (Lv_1 q_0)/(Lv_1 q_x)$ for objects of one-dimensional space

$p = (Lv_2 q_0)/(Lv_2 q_x)$ for objects of two-dimensional space

$p = (Lv_3 q_0)/(Lv_3 q_x)$ for objects of three-dimensional space

The factor p defines the increase of velocity and

can only be greater than one, since the minimal density of n=0-objects(I) ρ_{min} can not be less than one, i.e. one n=0-object(I). The maximum value of factor p is equal to the density of n=0-objects(I) – ρ_0. The velocity increase of the n=0-object(II)"−", as a result of absorption of the n≠0-object, will be the product of the factor p and velocity v_0, pv_0, since an increase in density per unit means an increase in speed per v_0.

2.5.2 DEFINITION OF THE MOTION OF n≠0-OBJECTS RELATIVE TO n=0-OBJECTS(II)"+"

Since n≠0-objects and n=0-objects(II)"+" are oriented in opposite directions, where an n≠0-object collides with an n=0-object(II)"+" it must be repulsed. In others words, the n≠0-object must reverse its direction of motion relative to the n=0-object (II)"+". Since, there is no absorption, the value of velocity of the n=0-object(II)"+" will not change.

2.6 SECONDARY FORMATION OF n≠0-OBJECTS

In the section "Definition of the motion of n≠0-objects relative to n=0-objects(II)"−" ", the absorption of n≠0-objects by n=0-objects(II)"−" will increase the density of n=0-objects(I) in the direction of n≠0-objects and, consequently, increase the velocity of the n=0-objects(II)"−" by pv_0, in the same direction. What will happen in the opposite situation, when the density of directed n=0-objects(I) will decrease, followed by a decrease of velocity of the n=0-object(II)"−"? From the principle of symmetry we can assume that there will be a reverse event – the transformation of the n=0-objects(I) into the n≠0-object. In this case, the factor p can be calculated as the difference in the densities of n=0-objects(I). The situation with decreasing density of directed n=0-objects(I), and the decreasing velocity of n=0-object(II)"−", will take place, for example, as the result of attraction between n=0-objects(II)"−" and n=0-objects(II)"+" in the distance range from one to $R = 1/\sqrt{4\pi\rho_0}$. This corresponds to a decrease in density of the directed n=0-objects(I) from ρ_0 to one. Consequently, the factor p for three-dimensional space can be calculated as follows:

$$p = (4\pi\rho_0 R_2^2) - (4\pi\rho_0 R_1^2),$$

$$p = (4\pi\rho_0/n^2) - (4\pi\rho_0/m^2) = 4\pi\rho_0((1/n^2) - (1/m^2))$$

where $R_1 = 1/m$, $R_2 = 1/n$ – distances 1 and 2; $R_1 < R_2$ or $m > n$; n and m belong to the set of natural numbers.

Before defining the length of the generated n≠0-object we need to know the direction of its movement and its dimension (n). First, since each n=0-object(II)"−" moves in a certain unique direction, the generated n≠0-object should keep the same direction as the n=0-object(II)"−". Second, from the principle of symmetry, the n≠0-object should have all possible dimensions (n) in three-dimensional space. Accordingly, the factor p for each n≠0-object will be three times less. Respectively, the equation defining the length, ${}^nL$, of the generated n≠0-object is:

$$ {}^nL = Lv_n q_x = 3Lv_n q_0/p = $$
$$ = 3Lv_n q_0/4\pi\rho_0((1/n^2) - (1/m^2)) $$

Since n, m are limited to values between 1 and $\sqrt{4\pi\rho_0}$, then, respectively, the lengths of n≠0-objects are limited. In particular, for n=1-objects, these values are ${}^1L_{min} = 3Lv_1 q_0/4\pi\rho_0$ and ${}^1L_{max} = 3Lv_1 q_0/4\pi$. In the case of equations for objects of two-and three-dimensional space, the velocity v_1 should be replaced by v_2 and v_3, respectively.

Additionally, we will consider a situation when a n≠0-object is generated by one n=0-object(II)"−", and then absorbed by a second n=0-object(II)"−". n=0-object(II)"−", absorbing n≠0-object, can move toward or away from emitting n=0-object(II)"−" with a relative velocity V. Accordingly, the velocity of the emitted n≠0-object relative to the absorbing n=0-object(II)"−" will change. If movement is away, then the velocity of the n≠0-object relative to the absorbing n=0-object(II)"−" will be equal to $v_n - V$, i.e. v_n will decrease by $1/(1 - V/v_n)$ times. When n=0-objects(II)"−" are approaching each other, the velocity of the emitted n≠0-objects will increase to $v_n + V$, i.e. the velocity will increase by $(1 + V/v_n)$. However, these changes in the velocity of n≠0-objects cannot occur formally, because the objects of non-zero-dimensional space have a constant velocity relative to objects of zero-dimensional space. Constancy of the velocity can be achieved if the change is proportional, but in the opposite direction, to the length of the n≠0-object. I.e. length of n≠0-object, ${}^nL'$, will

increase in the first case and decrease in the second as defined, according to the following equation:

$$^{n}L' = {}^{n}L(1/(1 - V/v_n))$$
$$^{n}L' = {}^{n}L(1/(1 + V/v_n))$$

Because of this effect, the maximum and minimum lengths of the emitted n≠0-objects, absorbed by the n=0-object(II)"−", will change and the range between them will be extended.

COMMENTS

Why does *h*-space theory use a vector representation of objects rather than any other? This is because the vector representation of objects is unique to describe the physical world. All real objects are moving. In non-zero-dimensional spaces, movement is defined by the concept of direction as an increase or decrease in the total length of objects, and thus it defines objects as vectors with particular lengths and directions of movement. In zero-dimensional space, where there is no concept of direction, zero-dimensional objects are defined as omnidirectional vectors.

The concept of space in the proposed theory is fundamentally different from that of modern physics, where n-dimensional space is believed to be just a frame of reference, or in the case of special theory of relativity (STR), a fundamental parameter associated with the notion of time. In *h*-space theory, the appearance of non-zero-dimensional space defines the number of independent motions and their directions. I.e. the development of matter is realized as an increase of the number of independent movements along the axes of a Cartesian system, which means the formation of n-dimensional spaces. Zero-dimensional space is the initial state of matter, where there is motion of objects without the concepts of independent movement and direction in space.

3. THE PHYSICAL CONTENT OF *h*-SPACE THEORY

This section compares the constructed metaphysical theory to real physical phenomena. To begin, we determine quantitatively the "Planck constant" and the absolute length and absolute velocity of n-objects.

3.1 DEFINITION OF "PLANCK CONSTANT" AND THE ABSOLUTE UNITS OF LENGTH AND VELOCITY

To determine the value of the "Planck constant" we will consider the following facts. We exist in three-dimensional space, consequently, the physical phenomena must be compared with the events in three-dimensional space of the theory, i.e. with the movements of n=0,1,2,3-objects during the α-phase of the cycle. On the β-phase of the cycle, three-dimensional space arises and disappears in result of the transition from β-phase to α-phase. Among the n=0,1,2,3-objects only n=0-objects(II)"−" are able to absorb and emit, under certain conditions, n=1,2,3-objects. The orbital electrons in atoms have similar properties, to absorb and emit electromagnetic quanta. Consequently, as a first approximation, we can assume that the electron is n=0-object(II)"−", and the quanta of the electromagnetic fields can be either n=1-, or n=2-, or n=3-objects. In order to determine the objects of a particular dimension that correspond to quanta of the electromagnetic field, we note that in the three-dimensional space length of an n=0-object(II)"−" can be equal to a minimum length of the generated n=1-object (but not n=2- or n=3-objects). This will take place when the density ρ_0 decreases to a value comparable to q_0 :

length of the n=0-object(II)"−"
$$L_0 = Lq_0v_0 \text{ where } v_0 = 1$$

minimal length of the generated n=1-object
$$^{1}L_{min} = Lv_1q_0/4\pi\rho_0 \text{ where } v_1 = q_0,\ q_0 = h^{-1/4}.$$

According to these equations, for objects of two- and three-dimensional spaces such equality is not possible for density ρ_0. At higher density (at $\rho_0 = q$) the equality is possible for objects of two-dimensional space, but only at the moment of formation of three-dimensional space. Such density ρ_0 is – $q = q_0q_0$, and the total length, i.e. the size of the universe - $h^{-1/2}$. Accordingly, the minimum length of the generated n=2-object at this density ρ_0:

$$^{2}L_{min} = (3Lv_2q_0/4\pi\rho_0) \approx Lq_0$$

where $v_2 = q_0q_0$, $\rho_0 = q_0q_0$.

Later, in the three-dimensional space, lengths of

objects of two- and three-dimensional spaces will always be greater than length of n=0-object(II)"−". Thus, the quanta of the electromagnetic field can only match objects of one-dimensional space. The confirmation of this should be the equality between the radius of the electron (which is the length of the n=0-object(II)"−") and the minimum wavelength of electromagnetic waves that have not been generated by distant cosmic objects, i.e. have not come from the past of our universe. This radiation occurs, for example, in collision experiments as bremsstrahlung. The classical electron radius is $\approx 10^{-15}$ m. As discussed below, in the section "Elementary particles", the proton is proposed to consist of two positrons and one electron. The linear size of the proton is $\approx 10^{-15}$ m, and accordingly, the electron is of the same order. The minimal detected wavelength of electromagnetic radiation is also $\approx 10^{-15}$ m. Thus, by this correlation, electromagnetic quanta correspond to the objects of one-dimensional space – n=1-objects. Further, on the basis of this correspondence and from the given above equation $\rho_0 = q_0$, one can calculate a value of q_0 by using the minimum and maximum values of quanta (waves) of the emission spectra of electrons in atoms. According to the section "Secondary formation of n≠0-objects", ρ_0 is the ratio of the maximal length of the emitted n=1-object to the minimal length of the emitted n=1-object ($^1L_{max} = Lv_1q_0/4\pi = 1/4\pi$ and $^1L_{min} = Lv_1q_0/4\pi\rho_0 = 1/4\pi\rho_0$). The values of maximum and minimum lengths of electromagnetic quanta in the atomic absorption/emission spectra are $\approx 10^{-5}$ m and $\approx 10^{-15}$ m, respectively. Then, since nowadays $\rho_0 = q_0$, the value of the density ρ_0, as well as the coefficient q_0, is equal to $\approx 10^{10}$. Hence q is $\approx 10^{20}$ ($q = q_0q_0$). From the value of q, the "Planck constant" h can be calculated as $h = q^{-2} \approx 10^{-40}$. The value of L is then $\approx 10^{-20}$, and the inverse constant $h^{-1} \approx 10^{40}$. In addition, since $\rho_0 = q_0$, and $v_1 = q_0$, then the velocity of h-space expansion, ρ_0v_0, (at density ρ_0 and $v_0 = 1$) is currently reduced to a value comparable to the value of velocity of n=1-object, v_1, i.e. the velocity of light, c. We can also calculate values of the absolute units of length and velocity. From the section "Definition of n≠0-objects and n≠0-spaces", n=1-objects with lengths equal to the absolute unit of length are generated during the cycle. These lengths correspond to the minimal length of the quanta from the atomic absorption/radiation spectrum, i.e. $\approx 10^{-5}$ m. The unit of velocity, v_0, can be calculated from the value of the velocity of an n=1-object, v_1, i.e. from the velocity of light. According to the section "Definition of n≠0-objects and n≠0-spaces", v_1, expressed in absolute units, is equal to the value of q_0, i.e. $\approx 10^{10}$. This value, for the absolute unit length $\approx 10^{-5}$ m, can be calculated from the value of the speed of light, $\approx 3 \times 10^8$ m/s, by assuming that the absolute unit of time equal to $\approx 10^{-3}$ s. This means that the absolute velocity unit is equal to $\approx 10^{-5}/10^{-3}$ m/s.

COMMENTS

It should be noted that modern physics denies the existence of the boundaries of the spectrum of electromagnetic radiation and, therefore, the above calculations are not correct. However, the assertion about the absence of boundaries is a consequence of electromagnetic theory. In fact, atomic radiation is measured in the mentioned above range, except for high energy cosmic gamma radiation, which originates from the distant past. The reason for the generation of high energy gamma rays is discussed below, in the section "Cosmology".

The proposed descriptions of physical phenomena by using a finite number of n-objects having finite sizes implies the discrete nature of these processes. Therefore, h-space theory is quantum theory, in which the continuity appears only as an approximation at certain, large scales.

The proposed theory is based on the ratio – $Et = mvL$, which reflects the basic equations of modern physics: $E = h\nu$, $E = mc^2$, and $F = ma$. This ratio is also present in Heisenberg's uncertainty principle, $\Delta E \Delta t \geq h$, which quantitatively defines probabilities for these variables through the Planck constant. In the theory described here, the "Planck constant" is a unique constant, and defines not probability but the exact values of length and velocity. In this way, discrete matter is described quantitatively through the absolute, natural units of length and velocity. In modern physics, units are chosen arbitrarily, although, natural units were suggested by Max Karl Ernst Ludwig Planck in 1899. Planck pointed out that the value of any physical dimension can be obtained from the multiplication and division of the constants c, G, h, and he suggested these values be considered as natural units of measurement: length – $l = (hG/c^3)^{1/2} = 10^{-35}$ m;

density – $\rho = c^5/hG^2 = 10^{96}$ kg/m^3, mass – $m = (hc/G)^{1/2} = 10^{-5}$ g. Early, in 1881, a similar system of natural units was introduced by Geoge Johnstone Stoney.

In *h*-space theory, the value of the inverse "Planck constant" – $h^{-1} = 10^{40}$ coincides with the value of the ratio of the electromagnetic interaction constant to the constant of gravitational interaction α_e/α_g. Dirac introduced this in 1937 when analyzing the hypothesis of reduction of the gravitational constant in time. It is also equal to the ratio of the size of the observable universe $\approx 10^{26}$ m to the size of the nucleon $\approx 10^{-14}$ m, and to the ratio of age of the universe $\approx 10^{17}$ s to a time unit, obtained by dividing the size of the nucleon at the speed of light $\approx 10^{-23}$ s. The number 10^{40} is also defines a number of elementary particles in the universe (see "Cosmology").

Since in the proposed theory, all values are determined by a unique constant, "Planck constant", it solves the problem of fine-tuned universe, when existing universe can only occur because of the certain values of universal fundamental physical constants. In the proposed theory "Planck constant" may have other values in others universes, that defines existence of the Multiverse.

3.2 ELEMENTARY PARTICLES

From the section "Definition of "Planck constant" and the absolute units of length and velocity", the electron is identical to an n=0-object(II)"−". Therefore, an n=0-object(II)"+" should be a positively charged particle. It can be either a positron or a proton. This restriction follows from the fact that among the known elementary charged particles the only stable members are protons, electrons and positron (if electrons and positron are non-interacting). According to modern physics, the other elementary particles are unstable and decay to the stable ones: the electron, positron or proton. Electrons and positrons are point-like particles with one center of scattering. Their masses are equal and we can assume that the positron is an n=0-object(II)"+" (Fig. 8). The proton, from experimental data, has several scattering centers, so-called partons, which are known as three quarks: two positively charged and one negatively. This allows us to suggest that the proton is a complex of two positrons, i.e. two n=0-objects(II)"+", and one electron, n=0-object(II)"−", between them (Fig. 8).

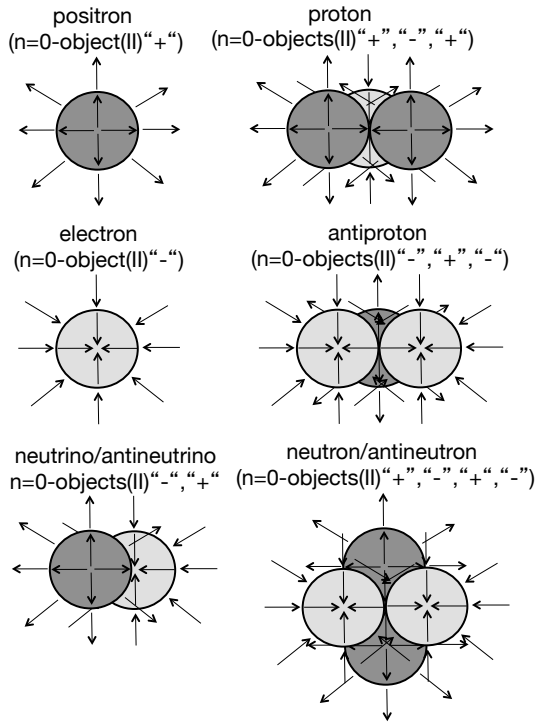

Figure 8. Elementary particles and n=0-objects(II)"−","+".

Similarly, the antiproton can be represented as a complex of two electrons and one positron in between. In favor of the electron-positron composition of the proton is the fact of detection of electrons and positrons in the collision of protons beams. Accordingly, the linear size of the proton (the current estimate of the proton radius (CODATA-2006) is $0{,}8768 \pm 0{,}0069 \times 10^{-15}$ m) is about twice the linear size of the electron (Fig. 8). Further, if the assumption about composition of the proton is true, then its mass must be three times the mass of the electron/positron. However, the mass of the proton is known to be 1836 times the mass of the electron, i.e. 612 times more than it in the proposed theory. Below, in the section "Electrostatics", we explain this discrepancy. Briefly, it comes from the determination of the mass of the proton and electron from their charge-to-mass ratio (e/m), when the elementary charge (e) is considered to be the same for the proton and electron. In the suggested theory, their electric charges are not equal. The proton has less charge than the electron. This generates a mass difference that is, in reality, a difference in electric charge. In the proposed theory, the concept of gravitational and inertial masses of particles and atoms corresponds to the amount of

n=0-objects(II)"−","+" (see "Classical Mechanics"). In order to determine the mass of the proton, we will follow a direct approach, where its mass is determined through the mass of a hydrogen atom. For this, the mass of a certain number of hydrogen atoms is determined, and then the mass of one hydrogen atom is calculated. This method has been used in modern physics, and the mass of the proton was considered to be equal to the mass of a hydrogen atom because the mass of an electron was assumed to be three orders of magnitude smaller than the mass of the proton. According to the suggested theory, the mass of the proton is three-quarters ($1.255293666891 \times 10^{-27}$ kg) of the mass of a hydrogen atom ($1.673724889188 \times 10^{-27}$ kg), because in addition to the proton the hydrogen atom has one orbital electron. Accordingly, the electron/positron mass is equal to one quarter of the mass of a hydrogen atom – $0.418431222297 \times 10^{-27}$ kg.

Neutrons are known to decay into a proton and an electron (without taking into account an antineutrino), so it can be assumed that a neutron is a complex of two positrons and two electrons (Fig. 8). The antineutrino was introduced to explain the spread of the electron energy observed for β-decay of neutrons in the nuclei of atoms. In the theory described here, the electrons are mobile in the nucleus, i.e. their velocity after the decay of nuclei can be different. This eliminates the need to suggest the generation of an antineutrino to explain the velocity spread of the electron in the resulting β-decay. Neutron decay is possible because the positrons do not completely cover the electrons, allowing the possibility that an electron can absorb n=1,2,3-objects, so increasing its speed to a magnitude sufficient to leave the neutron. In contrast to the neutron, the proton has a single electron, and this is better shielded by the two positrons, so reducing the probability of absorption of n=1,2,3-objects and, consequently, the probability of the proton decay by the loss of an electron. The observation that neutrons can be scattered by protons also fits into this scheme of a neutron. Neutrons will be repelled from the proton in the collision of positrons of the proton with positrons of the neutron. A similar explanation can be applied to the scattering of electrons by neutrons. Free electrons are scattered by the electrons of the neutrons. In the proposed schemes shown in figure 8, the compositions of the neutron and antineutron are the same, and they are the same particle. Electrons and positrons in the proton and neutron are attracted/repulsed with velocity 10^{-2} m/sec (about the velocity of the electrons and positrons in the proton and neutron, see below, "Electrostatics", "Atomic nucleus").

It is known that a positron and an electron will annihilate each other to produce gamma rays. This phenomenon has been observed by interaction with a detector material, and also by colliding beams of electrons and positrons (in a vacuum). If the relative speed of the electron and positron is small, then annihilation is likely to occur through the formation of an intermediate bound state of a positron-electron pair – positronium. In the proposed theory, the formation of gamma rays in collisions of electrons and positrons has the same reason as in the case of the spectral radiation of atoms. There is a decrease in density of directed n=0-objects(I) (see below, "Atoms and spectra") i.e., the generation of gamma rays is not accompanied by the disappearance of an electron and a positron; they form a symmetrical pair of n=0-objects(II)"−","+" (Fig. 8). This pair can be defined as an antineutrino or neutrino. The antineutrino is detected indirectly by the detection of gamma rays emitted as a result of its reaction with a proton accompanied by the formation of a neutron and a positron, which then react with electron to form gamma rays. If we add antineutrino/neutrino, as a pair of n=0-objects(II)"−","+", to a proton then the resulting composition of n=0-objects(II)"−","+", is just equal to the sum of a neutron and a positron. Thus, we can conclude that the annihilation of electrons and positrons, in addition to gamma rays, results in formation of antineutrino/neutrino. They either do not interact with the detector material or interact, and generate again the gamma rays. It is known that the collision of electrons and positrons at high speed can result in the formation of hadrons. In the interpretation described above, this is possible because hadrons are formed as complexes of positrons and electrons, and the high speed of collision increases the likelihood of this process.

From the above definitions of neutron and proton, the observation of unstable particles resulting from the bombardment of targets by protons, and in proton colliding beams, can be understood as unstable complexes of positrons and electrons. For example, π-mesons (pions) are unstable particles of three charge types – neutral, negative and positive. Pions can be generated in

collisions of protons and antiprotons, as well as between positrons and electrons. Since the neutral pion can decay into two gamma rays, or a gamma ray and electron-positron pair, or two electrons and two positrons, it can be assumed that it has the same composition as the neutron, but a different spatial organization. In other words, the neutral pion is a neutron that has decayed to two electron-positron pairs – two neutrinos, or into individual electrons and positrons (Fig. 9).

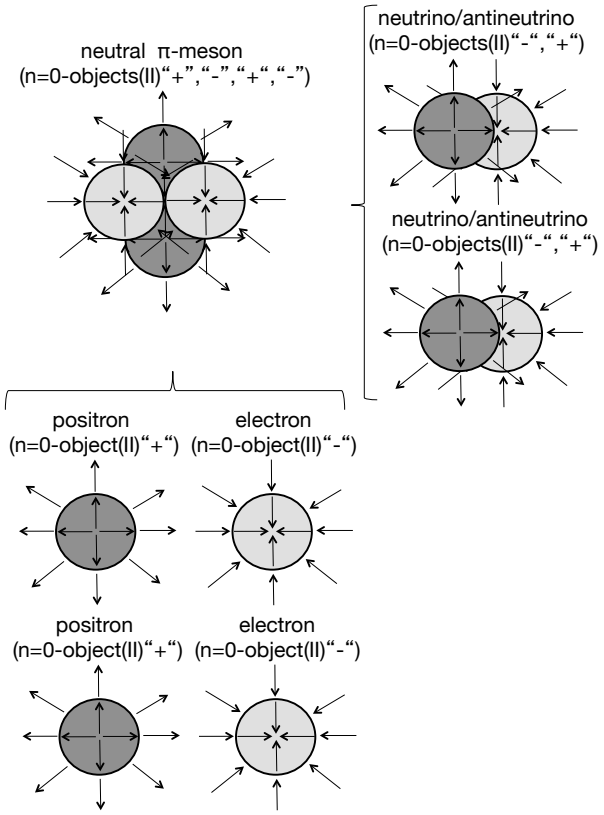

Figure 9. Decay of neutral π-meson.

A negative pion decays into a negative muon, which in turn decays into an electron. A positive pion decays into a positive muon, which then decays into a positron. During these decays, neutrinos and antineutrinos are also generated: the muon neutrino/antineutrino – during pion decay, and the electron neutrino/antineutrino – during muon decay. Consequently, we can assume that the positive muon has the same composition as that of a proton, but a different spatial organization, which may not be stable, and causes the decay of the proton (Fig. 10). Since a neutrino is an electron-positron pair, different types of neutrinos cannot exist. Therefore, there is only one type of neutrino/antineutrino. One consequence of this conclusion is that the phenomenon of neutrino oscillation (the transformation of one type of neutrino to another) cannot be real, and the observed shortage of solar neutrinos requires a revision of the cosmological model of the Sun (see "Cosmology").

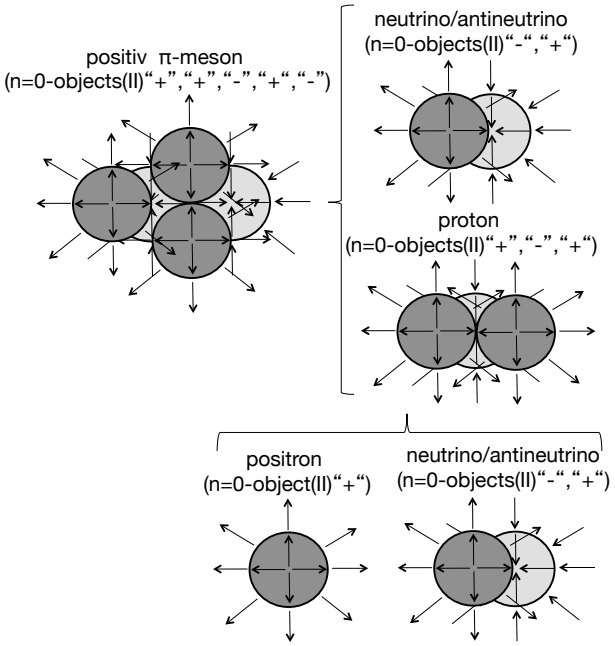

Figure 10. Decay of positiv π-meson.

Different spatial arrangements in the case of the muon and proton mean different distributions of charge, which will affect the value of charge-to-mass ratio in a given direction and hence the mass of observed particles (see the sections on the charge-to-mass ratio and mass of particles, below), suggesting a smaller mass of the muon compared to the proton. Further confirmation that the positive muon is the same as the proton is the experimental observation of muonium – an exotic hydrogen like atom having a positive muon as a nucleus. Muonium is produced by collision of a positive muon with a solid target and electron capture from the target material. In general, we can assume that the nature of all unstable particles can be explained in a similar way to that described above.

COMMENTS

In the suggested interpretation, the variety of particles from modern theories is reduced to various combinations of electrons and positrons, representing the true elementary particles. This eliminates the problem of the disappearance of anti-particles, the baryon asymmetry problem,

because there are positrons as well as the electron in the nucleus (see below "Atomic nucleus"). Their interaction does not lead to annihilation but to the formation of other particles, as electrons-positrons complexes. Such coexistence of the electrons and positrons is consistent with the detection of antiparticles by the earth-orbiting spacecraft PAMELA(*http://en.wikipedia.org/wiki/Payload_for_Antimatter_Matter_Exploration_and_Light-nuclei_Astrophysics*). This data indicated a high content of positrons (more than ten positrons per hundred electrons). According to contemporary theory, the amount of positrons should be lower. In the suggested theory an unequal amount of free electrons and positrons can be explained by the fact that nuclei contain a higher concentration of positrons compared to electrons. In the proposed model of particles there is no place for quarks. The internal, parton structure of protons or neutrons simply reflects their electron-positron composition. More specifically, the areas of negative and positive charge within protons and neutrons, defined as the partons, are really uncompensated parts of electrons and positrons. The fact that particles other than electrons and gamma rays have never been detected in electron beam collisions is in agreement with the proposed model of elementary particles.

3.3 ELECTROSTATICS

Since we have identify an electron and a positron as an n=0-object(II)"−" and an n=0-object(II)"+", respectively, it follows that the electrostatic attraction/repulsion of electric charges is the attraction/repulsion of the n=0-objects(II)"−","+". According to the section "Definition of the relative motion of n=0-objects(II)"−","+"", repulsion is typical for n=0-objects(II)"−","+" of the same type, and attraction is typical for n=0-objects(II)"−","+" of different types. The electric field in this case is formed by the directed n=0-objects(I) of the cycle. The distribution of the electric field, vector $\boldsymbol{E}$, of a point charge, is the distribution of the density of directed n=0-objects(I) out of the n=0-object(II)"+" and to the n=0-object(II)"−", respectively (Fig. 11). We can define this density of the directed n=0-objects(I) as $\boldsymbol{\rho_E}$. Based on this interpretation of the electrostatic interaction, n=0-objects(I) can be defined as particles of the vacuum or either. Accordingly, n=0-objects(I), the particles of the vacuum/either compose the three-dimensional space of universe and their movement relative to each other results in the expansion of the universe. The speed of this expansion is determined by the density of vacuum particles (n=0-objects(I)), ρ_0. The vacuum particles are polarized around electrons and positrons, i.e. n=0-objects(I) become directed relative to n=0-objects(II)"−","+".

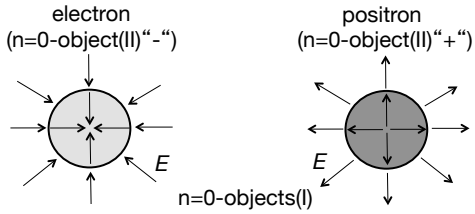

Figure 11. Distribution of the electric field, vector $\boldsymbol{E}$, as the density distribution of directed n=0-objects(I) around the n=0-objects(II)"−","+".

As shown in the "Definition of the relative motion of n=0-objects(II)"−","+"", the attraction/repulsion of n=0-objects(II)"−","+" occurs as a result of increase/decrease of the density of co-directed/oppositely-directed n=0-objects(I). Density of the undirected n=0-objects(I) varies according to the density changes of the directed n=0-objects(I), so the total density of directed and undirected n=0-object(I) remains constant (unless we consider the phenomenon of electro-magnetic induction; see below). If the distance between the electrons and positrons is greater than the absolute length unit ($\approx 10^{-5}$ m), the velocity of this attraction/repulsion in three-dimensional space is inversely proportional to the square of the distance (in absolute units, $\approx 10^{-5}$ m), analogous to Coulomb's law. Accordingly, the velocity of attraction/repulsion of electrons and positrons for a given distance R can be written as follows:

$$\boldsymbol{V_E} = \boldsymbol{\rho_E}\, v_0 = v_0\rho_0/4\pi R^2 \text{ (for three-dimensional space)}$$

Velocity, $\boldsymbol{V_E}$ represents the value of the velocity change, $\boldsymbol{\Delta V}$, for the electron/positron at a distance R from the other electron/positron. If an electron/positron started moving with velocity $\boldsymbol{V_E} = v_0\rho_0/4\pi R^2$ at distance R and reached a distance $R \pm \Delta R$, then its velocity, as described in "Definition of the relative motion of n=0-objects(II)"−","+"", is the sum of the velocities for the distance $R \pm \Delta R$ and R:

$$\boldsymbol{V_{sum}} = (v_0\rho_0/4\pi) \sum_{R}^{R \pm \Delta R} R^{-2}$$

where $R \pm \Delta R$ and R are distances measured by the length of n=0-object(I).

Since $\boldsymbol{V_E}$ is value of the velocity increase, this velocity change corresponds to an acceleration, which determines the force of Coulomb's law for the electrons/positrons.

Absolute units of length and velocity are used in the equations given above, implying discrete changes in velocity as a function of the distance. Since the absolute unit of length is small ($\approx 10^{-5}$ m) and electric charges actually represent a set of n=0-objects(II)"−","+", the effect of discreteness is not noticeable for macroscopic bodies. Influences of each n=0-objects(II)"−","+" will be sum up.

The equations above also imply that the electrostatic interaction has a boundary, a boundary corresponding to the distance at which the density of the directed n=0-objects(I), $\boldsymbol{\rho_E}$, is one, i.e. one directed n=0-object(I). This distance for a single electron/positron is equal to $R = \sqrt{(\rho_0/4\pi)}$.

If the distance is less than the absolute length unit, then (according to "Definition of the relative motion of n=0-objects(II)"−","+"") attraction/repulsion occurs respectively with a decrease/increase of density of the directed n=0-objects(I) between the n=0-objects(II)"−","+". Velocity is not calculated by simple addition, as described above, but is defined by the following equation:

$$\boldsymbol{V_E} = \boldsymbol{\rho_E} v_0 = v_0\rho_0 4\pi/n^2$$
(for three-dimensional space)

where the distance $R = 1/n$ and n belongs to the set of natural numbers.

This equation is true for distances between the absolute length unit, $R \approx 10^{-5}$ m, down to $R \approx 10^{-10}$ m (for $n = \sqrt{(4\pi\rho_0)}$). At distances less than $R = 1/\sqrt{(4\pi\rho_0)} \approx 10^{-10}$ m, before the electron and positron overlap, the density of the directed n=0-objects(I) is less than one and, hence, the velocity of attraction/repulsion is zero. Thus if the electrons/positrons are separated by a distance that lies between $\approx 10^{-10}$ m to $\approx 10^{-15}$ m, they will not be attracted or repelled. In modern physics it is assumed that Coulomb's law is correct up to a distance of 10^{-15} m. This came from the Rutherford's experiments on the scattering of alpha particles by gold atomic nuclei. The observed distribution of the scattered alpha particles in the Rutherford's experiments was consistent with the calculations on the basis of Coulomb's law. Accordingly, the minimum distance between the centers of alpha particles and gold atomic nuclei was calculated from equality of the kinetic energy of the alpha particles to the potential energy of the Coulomb repulsion of the nucleus. This minimum distance was found to be 10^{-14} m and later it was corrected to 10^{-15} m. It is necessary to underline that Rutherford's experiments, as well as later experiments in particle accelerators, did not provide direct data of the veracity of Coulomb's law up to the distance of 10^{-15} m. Only the data from experiments with macroscopic charged bodies can be considered as direct observations in support of this. In the proposed theory, Coulomb's law, an inverse-square law for point charged particles such as electrons/positrons, cannot be applied to Rutherford's experiments calculations, since the charges of both the alpha particles and gold atomic nuclei are not point charges. In addition, the orbital electrons must have significant electrostatic effect on the alpha particle; the mass of an electron is 14 times less than that of the alpha particle (see "Atomic nucleus"). (In Rutherford's experiments the electrostatic effect of the electrons was considered to be negligible due to their small masses.) Accordingly, in the proposed theory the observed elastic scattering of alpha particles in Rutherford's experiments is possible as a result of the direct collisions of alpha particles with the gold atomic nuclei, i.e. the collisions of positrons of the alpha particles with positrons of the nuclei of gold atoms. It is also possible that the particles will be scattered before reaching the distance $\approx 10^{-5}$ m. Dispersion of alpha particles in such a collision is the same as in the collision of charged particles (according to Coulomb's law) because in both cases there is a symmetrical deflection of particles relative to the center of the particle (i.e. center of the positron having a spherical shape) reflecting another particle.

As described in "Definition of the relative motion of n=0-objects(II)"−","+"" upon the collision of n=0-objects(II)"−","+", i.e. when they overlap, their relative velocity will be equal to the absolute velocity unit, 10^{-2} m/s. For example, in

the proton, the electron is attracted to the positron with this velocity.

Since the electron is an n=0-object(II)"−", a comparison of Coulomb's law and the equation above implies that the electron charge corresponds to the density ρ_0 of n=0-objects(I) directed to an n=0-object(II)"−" through the surface of the sphere. In other words, the electron charge is equal to the amount of directed n=0-objects(I), ρ_0, through the spherical surface. It is known that an increase in the number of electrons on a charged body is defined as an increase in the charge and this causes an increase of velocity of attraction/repulsion of charged bodies. For the proposed definition of the electron charge, as the density ρ_0, the summation of the charges is possible only if the electrons/positrons are separated on a charged body at a distance greater than the length of n=0-object(I) ($\approx 10^{-5}$ m). Then, there will be an increase in the velocity of attraction/repulsion of charged bodies as a result of the geometric summation of velocities between the separated electrons/positrons of charged bodies. If the electrons/positrons are located relative to each other at the distance less than the length of n=0-object(I) ($\approx 10^{-5}$ m), the velocity of attraction/repulsion of charged bodies will not increase, since all electrons/positrons in this case define the same charge, the same density of directed n=0-object(I) ρ_0, as single electron/positron. Moreover, in the presence of electrons/positrons, the density will decrease according to the section "Definition of relative motion of n=0-objects(II)"−","+" and n=0-objects(I)". I.e. the number of directed n=0-objects(I) to or from the n=0-objects(II)"−","+" can not exceed ρ_0, but can only be equal to or less than ρ_0. For example, for the proton, as a composite particle consisting of two positrons and one electron in between, the density of directed n=0-objects(I) around proton is variable, but does not exceed ρ_0 (Fig. 12). From the sides of the positrons (n=0-objects(II)"+"), n=0-objects(I) are directed from the proton and their density decreases closer to the electron side. In the region of the electron, n=0-objects(I) are directed to the proton, i.e. in the proton n=0-objects(I) are mainly directed from the proton, but also there are regions where n=0-objects(I) are directed to the proton. In other words, the proton has a spatial distribution of charge that varies with sign and magnitude. Regions of the same charge-sign will have the density of the directed n=0-objects(I) less or equal to that of the electron/positron.

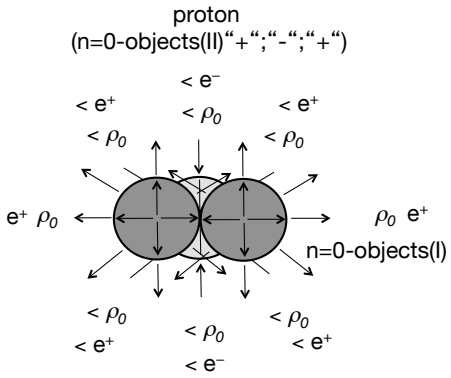

Figure 12. Density of directed n=0-objects(I) around proton. $\mathbf{e^-}$($\mathbf{e^+}$) is a charge of electron (positron) equal to the density ρ_0 of directed n=0-objects(I).

Thus, the total charge of a proton cannot exceed the charge of an electron/positron. A similar density distribution of directed n=0-objects(I) will apply to any other complex particle consisting of electrons and positrons. Accordingly, the charge of the composite particle is less than the charge of an electron/positron and corresponds to the amount of directed n=0-objects(I) not through the entire spherical surface of the particle, but only through a certain part of the surface. In order to calculate the charge of the composite particle, we can assume that the distribution of directed n=0-objects(I) is proportional to the number of uncompensated electrons or positrons divided by the number of all electrons and positrons in the particle. Then, the proton charge, as the number of directed n=0-objects(I) through the surface around the proton, is equal to one-third of the charge of the electron. I.e. n=0-objects(I) are directed over one-third of the surface area around the proton. The remaining two-thirds of the surface is neutral, i.e. n=0-objects(I) are not directed relative to the proton. This definition of the charge of composite particles can explain the difference of the charge-to-mass ratio (q/m) of an electron and a proton, not only by greater inertial mass of the proton (three times the mass of the electron/positron), but also lower charge (one-third of the electron charge). As a result, the charge-to-mass ratios of electron and proton differ by 9 times. In modern physics, this difference is equal to 1836. The remaining difference of 204 times can be explained by the method used to compare charge-to-mass ratios, which are calculated from the

movement of particles in an electric or magnetic field. In the case of an electron, its charge is distributed centrally symmetric (i.e. n=0-objects(I) come centrally symmetric through the spherical surface), and its movement in a external field depends only on the charge, but the charge of the proton is not distributed centrally symmetric, and its movement depends on its orientation relative to the direction of the external field vector. Figure 13 represents the charge distribution of the proton in an external electric field. The electron and positrons of the proton will move in opposite directions, resulting in a proton as dipole directed along the electric field (Fig. 13).

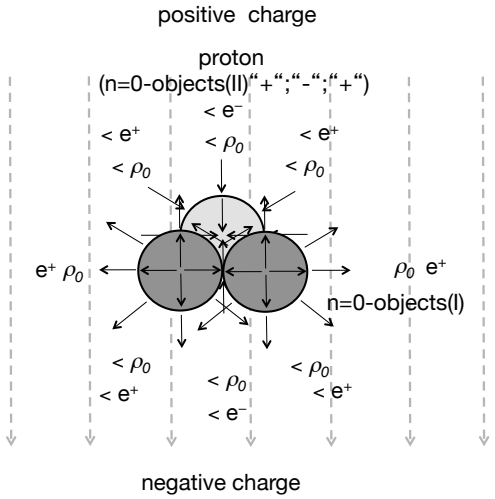

Figure 13. Charge distribution of the proton in the external electric field.

The lines of the field of uncompensated positive charge of the proton are not directed along the external field. This causes the proton to move more slowly than if it had an uncompensated positive charge with a centrally symmetric distribution, as in an electron. In modern physics, the comparison of the charge-to-mass ratios was calculated on the basis that the electric field of the proton has the same central symmetry as that of the electron. Thus, despite the actual proton charge being equal to one third of the electron charge (one-third of n=0-objects(I) directed to the electron), a movement of the proton in the electric field is less than it would have to be if the distribution of the charge were similar to that of electron. I.e. the charge-to-mass ratio of the proton calculated from its deviation in the electric field is less than the charge-to-mass ratio of the electron by more than nine-fold, and it can achieve a reduction up to 1836 times.

The electron charge was first calculated by Geoge Johnstone Stoney. He used Faraday's laws of electrolysis to determine the charge of a monovalent ion. Later, Robert Andrews Millikan determined the electron charge using oil-drop experiments. In the proposed theory, the electron charge is larger than it is in modern physics for the following reasons. The electron mass proposed by the theory is equal to one-fourth of the mass of hydrogen atom ($1.67372345992908 \times 10^{-27}$ kg), i.e. the electron mass is $0.418431222297 \times 10^{-27}$ kg. This makes it heavier than that accepted in modern physics ($9.10938291 \times 10^{-31}$ kg). The charge to mass ratio of the electron is defined independently of the determinations of electron charge and mass, for example, in experiments on the deflection of electrons by a magnetic field. Therefore, to keep the same charge to mass ratio, the electron charge ($1.602176565 \times 10^{-19}$ C) must be increased by the same factor as the electron mass. Since the electron mass increase is $459.34090863((0.41843122 \times 10^{-27})/(9.10938291 \times 10^{-31}))$, the electron charge is $7.35945239 \times 10^{-17}$ C. Further, as the proton mass is three times greater than the electron mass, and the charge to mass ratio of the proton is 1836 times less than the charge to mass ratio of the electron, the effective charge of the proton, as defined by the deflection in a magnetic field, is 612 times less than the electron charge, i.e. $1.202524900582 \times 10^{-19}$ C. The actual proton charge (not the effective charge) is less than three times the charge of electron, $2.45315079 \times 10^{-17}$ C. Thus, the effective proton charge is comparable with the charge of the electron in modern physics. This implies that the conventional charge of an electron is in reality the effective charge of a proton or ion. Indeed, the electron charge, determined for instance by G. J. Stoney, is a charge of a monovalent ion (according to the formula $e = F/\mathcal{N}$, where e is the charge of the electron, and F is the Faraday constant (charge), i.e. the charge of one mole of ions; and $\mathcal{N}$ is the Avogadro constant, i.e. the number of ions per mole). In Millikan's experiment the electron charge was also determined as the ionic charge, i.e. the minimal difference of charged oil droplets.

In the proposed definition of electrical interactions, "force" (i.e. change of velocity V_E) of a moving charge will be applied to the other charge immediately. This is due to the velocity

dependence on the density of directed n=0-objects(I) between the charges, which is defined by the three-dimensionality of space. In other words, when the distance between the charges is changed this changes the density of directed n=0-objects(I) and, as a consequence, the velocity, without delay. This is true regardless of whether the charges are moving relative to each other or are at rest, which corresponds to the concept of the direct action of bodies at a distance (about changes occurring during the motion of charges, see "Electric current, magnetic field of constant current and the magnetic properties of matter"). In this case, the change is passed through a continuous medium, ether, consisting of n=0-objects(I), as in the case of the concept of short-range interactions. The medium, consisting of directed n=0-objects(I) and localized between the charges, is compressed/expanded resulting in charge attraction/repulsion. At the same time, non-directed n=0-objects(I) of the medium repel each other constantly, causing expansion of the medium.

The Lorentz transformation cannot be applied to an electric field of the proposed theory, since this field is a medium of directed n=0-objects(I), and charge is their density, which is independent of the choice of reference system. Nevertheless, the density of directed n=0-objects(I) will change with the movement of electrons/positrons, which will result in a magnetic field (see about the magnetic field below).

The Coulomb equation described above originates from three-dimensional space, and long-range electrostatic interaction is due to the geometric nature of velocity determined by the density n=0-objects(I). Given the definition of the electron charge as the density of n=0-objects(I) ρ_0, the electric field vector $\boldsymbol{E}$ of a point charge represents the density of n=0-objects(I) $\boldsymbol{\rho_E}$ for the number (k) of electrons:

$$\boldsymbol{E} = \boldsymbol{\rho_E} = k\rho_0/4\pi R^2$$

In four-dimensional space, the velocity of the electrostatic interaction will be inversely proportional to distance to the power of three.

COMMENTS

In contrast to existing theories, in which the nature of electric charge is not known, the electric charge in the proposed theory has a geometric definition. It represents the amount of directed particles of vacuum (directed n=0-objects(I)). In the case of elementary particles – electrons and positrons, particles of the vacuum (n=0-objects(I)) are distributed around elementary particles centrally symmetric and inversely proportional to the surface area of a three-dimensional sphere. In the case of composite particles, the directed particles of the vacuum do not pass across the entire spherical surface of the composite particles, but only through a certain part of the surface. I.e. the electrostatic field of charged particles is formed by real particles that comprise the expanding vacuum, and not by virtual quanta of the electromagnetic field, as presented by modern physics. This eliminates the need for Heisenberg uncertainty principle to allow for the existence of virtual photons and their exchange between the charges to explain the nature of the electrostatic attraction/repulsion.

In the absence of elementary particles and composite particles, the particles of the vacuum (n=0-objects(I)) are not directed and move in all directions, with a velocity comparable nowadays to that of light. Visually, this movement is similar to the expansion of a gas. In other words, instead of the stationary ether there is expanding ether with a velocity comparable to the speed of light. The presence of elementary particles – electrons and positrons, causes polarization of the vacuum particles, and they become directed relative to the elementary particles, and thus the elementary charge is formed.

In the suggested theory the values of the charge of an electron/positron and its mass are higher than the values used in modern physics.

The equations of the proposed theory determine the velocity for a given distance between charges, and thus the value of velocity change. Modern physics uses the concept of force. Since force is reduced to acceleration, i.e. to a change of velocity, we can say that the equations of the proposed theory match the equation of Coulomb's law.

In contrast to modern theories, the proposed theory predicts that at a distance of $\approx 10^{-5}$–10^{-10} m Coulomb's law is not correct. Within this distance range, there is a decrease in the velocity of attraction/repulsion in direct ratio to the square of the distance. In the range of $\approx 10^{-10}$–10^{-15} m, the velocity of attraction/repulsion of electrons/positrons is equal to zero. If the distance between the

electrons/positrons is less than $\approx 10^{-15}$ m, i.e. if they overlap, their relative velocity is constant and equal to $\approx 10^{-2}$ m/s.

From the correspondence of Coulomb's law to the equation above, describing the distribution of the n=0-objects(I) as being inversely proportionally to the square of three-dimensional sphere, it follows that the established laws of physics are such that they characterize space, namely its dimension and movement. This implies that space is real and not just a reference frame, introduced for more convenient description of the matter within it. In the proposed theory, matter is the n-dimensional space of moving n-objects.

3.4 ATOMIC NUCLEUS

According to modern concepts, atomic nuclei consist of protons and neutrons. Based on the above descriptions of the proton and the neutron (Fig. 8), we propose that nuclei are stable complexes of positrons and electrons. In other words, it is not protons and neutrons but rather electrons and positrons that are the constituent elements of nuclei. In this framework, neutrons and protons represent the simplest systems of positrons and electrons. The phenomenon of beta-decay, the emission of electrons and positrons from the nucleus, is then readily accounted for in a model based on the electron-positron composition of nuclei. In this case, the electrons and positrons are not born in the decay of nuclei.

In the proposed theory, electrons and positrons repel/attract each other with velocity $\approx 10^{-2}$ m/s, when they overlap. Where electrons and positrons overlap in the nucleus, Coulomb's law does not apply. Attraction of positrons and electrons does occur within the nucleus, something that is not considered in existing theories. In this model, the need for a strong interaction, as introduced in modern physics, is eliminated. In the suggested model, a attraction/repulsion of positrons and electrons in the nucleus is possible only in a narrow range of distances, comparable with the dimensions of the electron, 10^{-15} m, because at this distance electrons and positrons overlap.

If there is no strong interaction, then how does nuclear decay result in the release of so much energy? As already mentioned, the attraction and repulsion of positrons and electrons in the nucleus occurs with a low velocity, $\approx 10^{-2}$ m/s. However, this velocity is valid for distances comparable to the $\approx 10^{-15}$ m. If the distance is increased, then from $\approx 10^{-10}$ m the velocity of repulsion of positrons/electrons increases, reaching a maximum that is comparable to the speed of light at a distance of $\approx 10^{-5}$ m. The splitting of nuclei produces daughter nuclei that are separated by more than $\approx 10^{-5}$ m, and as a result their velocity will increase up to light-speed which explains the appearance of so much energy (a reason for splitting into daughter nuclei is described bellow).

The nucleus of the hydrogen atom is a single proton, which consists of a complex of two positrons and one electron (Fig. 14a, showing positrons in dark grey, and electrons in light grey). To define atomic nuclei that are heavier than hydrogen, we will consider consequent increases in the number of electrons and positrons with increasing atomic number. We introduce the idea of nuclear stability, meaning the stability of the spatial configuration of electrons and positrons, and also note that nuclei are always positively charged. Taking the periodic table of elements as giving the correct nuclear ratios of neutrons and protons, the nuclear charge for each element can be calculated similarly to the charge of the proton. This calculation is valid in the case when all electrons and positrons are exposed on the surface of the nucleus. In other words, when the nucleus does not contain electrons and positrons that are completely shielded by other electrons and positrons. The charges of atomic nuclei, expressed in terms of the electron charge, are given in figures 14a, b, c, d, e after the designation of the proton-neutron composition.

In the case of isotopes, the spatial configuration of electrons on "orbits" around their nuclei must be similar to each other. Because the orbital electrons compensate the positive charge of the nucleus, resulting in a neutral atom, we can assume that the geometry of the electrons "orbits" of atoms reflects the geometry of uncompensated positrons in the nuclei of these atoms. With that said, let us consider further other than the proton electron-positron complexes. The electron-positron pair can be added to a proton. This complex corresponds to a positive π-meson (described above). Among other unstable combinations are complexes of two protons – a diproton, and two neutrons – a dineutron. Their existence is hypothetical in modern physics. Other possible combinations, not correlated with known particles and nuclei, are marked with a question

mark.

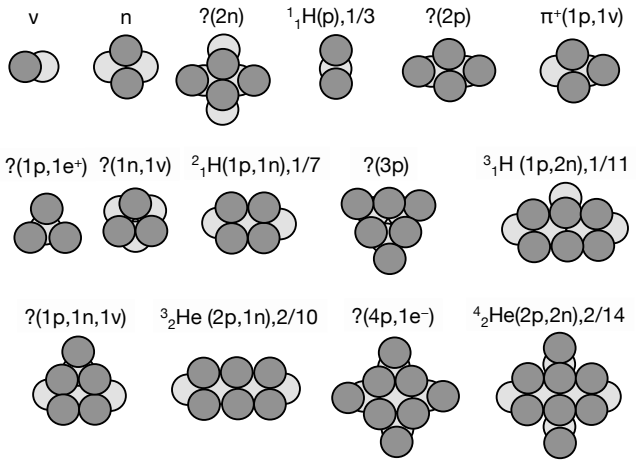

Figure 14a. Models of elementary particles and atomic nuclei.

The complex of a neutron and a proton is a deuteron, and adding one more neutron this becomes a triton. In the case of helium $^{4}_{2}$He, there are two protons and two neutrons, and in $^{3}_{2}$He there is one neutron and two protons. The proposed electron/positron compositions of helium $^{3}_{2}$He, tritium, neutrons and protons are consistent with the formation of helium isotope $^{3}_{2}$He by the electron beta decay of tritium $^{3}_{1}$H, and with neutron absorption by helium $^{3}_{2}$He, with subsequent decay to tritium and a proton. The nucleus of lithium $^{7}_{3}$Li should consist of three protons and four neutrons, and the three uncompensated positrons in the lithium nucleus should form of a triangle (Fig. 14b). To determine the configuration of the nuclei of isotopes of beryllium $^{9}_{4}$Be ($^{8}_{4}$Be, $^{10}_{4}$Be), we will use quadrangle geometry, since all of them have four uncompensated positrons, corresponding to four electrons in "orbits" around their nuclei. The same approach of the geometry of uncompensated positrons in the nucleus can be used to describe the geometry of the electrons on "orbits" around the nucleus. Like for the proton (see above), the electric charges of the nuclei for all atoms, i.e. density distribution of directed n=0-objects(I), are always less than the charge of single electron/positron.

Note here that the charge for many nuclei, calculated as the ratio of the number of uncompensated positrons to the total number of electrons and positrons, is equal to one-seventh of the electron charge (Fig. 14a, b, c, d, e). This value represents one-seventh of the surface area around free electron, through which the directed n=0-objects(I) are coming. It also reflects the fact that in these nuclei the ratio of protons to neutrons is one to one.

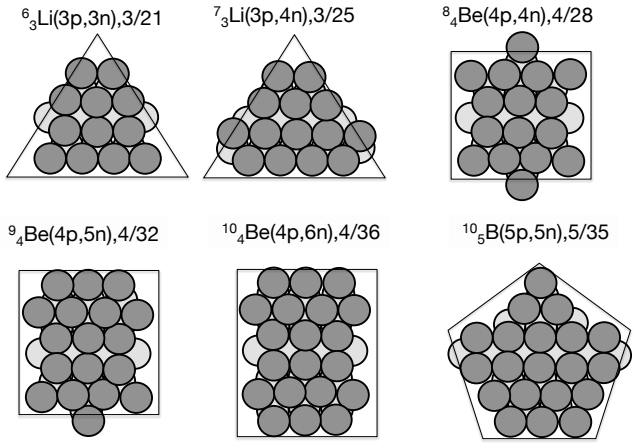

Figure 14b. Models of atomic nuclei.

The nuclei of the first and second rows of the periodic table of elements are presented in figures 14a, b, c and d. The nuclei of hydrogen and helium are three-dimensional. In the second period, all the nuclei are located in one plane. It is obvious that as the number of electrons and positrons increases, they must be located in several planes. I.e. we can assume that in the third period, electrons and positrons of nuclei are arranged in two layers. Then, for example, for the first two elements, sodium and magnesium, the geometric shape of two layers of electrons and positrons should be similar to lithium and beryllium (elements of the same groups), in the form of the triangle and square respectively (Fig. 14e). The next two elements, aluminum and silicon must accordingly contain two layers of electrons and positrons packed in penta- and hexagons. The fourth period begins with potassium and, based on its atomic weight in comparison to the similarly shaped sodium atom, one can assume that it has a three-layered nucleus. This should also be true for calcium, as well as for the transition metals in the subgroups and for the elements of the main groups of same period. The nuclei of the elements of the fifth period would have four layers, with the size of the layers increasing with the numbers of electrons and positrons packed in the nuclei. In general, the size of the layers should increase with increasing numbers of electrons and positrons packed in the nuclei. The known alternation of stable isotopes within the transition metals may indicate that the increase in the number of

electrons and positrons in their nuclei occurs with a certain repetitive change in the shape of these nuclei. In these plane nuclei their middle parts are electrically neutral and positive charges are located on their perimeters. Accordingly, in the atoms the orbital electrons must be located in planes around the nuclei to compensate their positive charges.

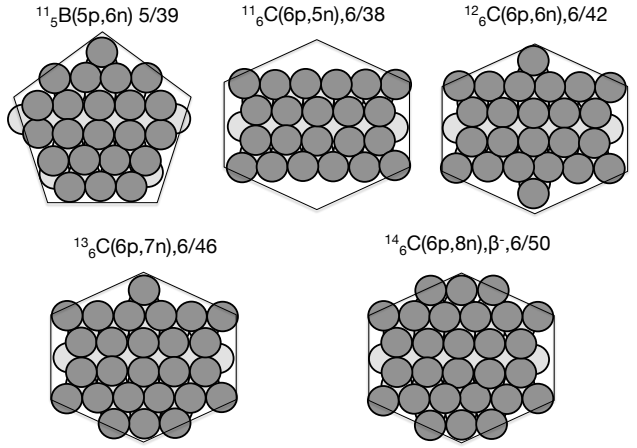

Figure 14c. Models of atomic nuclei.

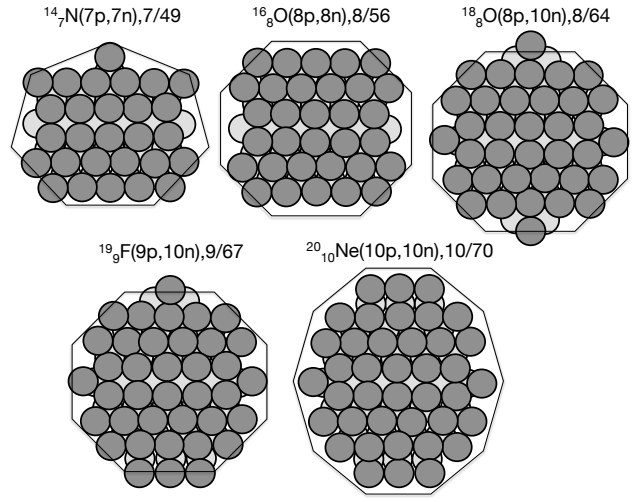

Figure 14d. Models of atomic nuclei.

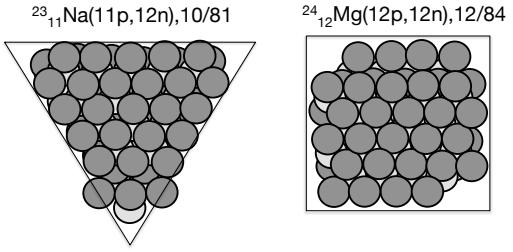

Figure 14e. Models of atomic nuclei.

Formation of the nuclei of atoms more complex than hydrogen, according to modern physics, takes place solely in the stars, as a result of thermonuclear fusion. It is believed that the high temperature provided by these conditions overcomes the Coulomb repulsion of the positively charged hydrogen nuclei, allowing the attractive force of the strong interaction to form nuclei of heavier atoms. Further, the subsequent explosions of stars (supernova explosions) provide the material for the formation of planets, which explains the diversity of chemical elements found on the planets. In the suggested theory, there is no such thing as a thermonuclear fusion, since there is no strong interaction and Coulomb repulsion at atomic distances. According to the section "Electrostatics", below the absolute length unit, 10^{-5} m, the attraction/repulsion of charges does not increase but decreases with decreasing distance. This reduction continues to a lower limit of 10^{-10} meters. If the distance is less than this, from 10^{-10} to 10^{-15} meters, then there is no attraction/repulsion between charges. Further, if the electrons and positrons overlap, they will move relative to each other with a velocity of attraction/repulsion of 10^{-2} meters per second, and the nuclei will be formed as electron-positron complexes. This model predicts that nuclear fusion of two atoms can occur by overcoming a force of repulsion that decreases with distance only in the range from 10^{-5} to 10^{-10} m. The positive charge of one nucleus will be compensated by the charge of orbital electron of another atom. The orbital electrons are located at the same distance from the nucleus – from 10^{-5} to 10^{-10} m.

COMMENTS

In the proposed theory, the nucleus is made up of relatively mobile electrons and positrons spatially packed in layers. Beta decay can be explained by a violation of the interaction between electrons and positrons composing nuclei and neutrons. In this model, there is no need to introduce a weak interaction. During beta decay of nuclei, the emitted electrons and positrons have different velocities. This eliminates the need to introduce a neutrino in order to conserve the energy balance. Nevertheless, a neutrino exists in the proposed theory and represents an electron-positron complex. In the proposed theory, the strong interaction force is excluded. The nuclei are stable due to electrostatic attraction and repulsion of the electrons and positrons. Moreover, at the nucleus distance of $\approx 10^{-15}$ m a Coulomb interaction does not occur. Instead, electrons and positrons repel

(attract) with a constant velocity ≈ 10^{-2} m/s.

In the proposed model of the nucleus there is no place for the so called thermonuclear fusion, and for energy release due to a mass defect.

3.5 ATOMS AND SPECTRA

According to modern physics, atoms consist of electrons, protons and neutrons, and their properties are described by quantum mechanics. An electron in an atom exists in the form of electron clouds, described by a probability distribution of the electron density. In the obsolete Bohr model, electrons were thought to revolve in orbits around the nucleus, which consisted of neutrons and protons. In the simplest case of a hydrogen atom one electron revolved in orbits around one proton. The electron ground state is an orbit closest to the proton and higher orbits correspond to the excited states. The transition from a higher to a lower orbit is accompanied by the quantum of electromagnetic radiation. In the proposed theory, the structure of atoms differs from the quantum and Bohr models. For example in a hydrogen atom, the electron does not revolve around a proton as in the Bohr model, and is not distributed in the form of an electron cloud as in quantum mechanics. Electron behavior is determined by the electrostatic interaction described above. Accordingly, the electron will be electrostatically attracted to the positron of the proton and will stay at a distance R_{min}:

$$R_{min} = 1/\sqrt{4\pi\rho_0}$$

where $R = 1/n$ – the distance between the n=0-object(II)"−","+", n belongs to the set of natural numbers and the maximum n_{max} is equal to $\sqrt{4\pi\rho_0}$.

Given that today ρ_0 is ≈ 10^{10} (the definition of the ρ_0 values is given above), the distance R_{min} is equal to ≈ 10^{-5} in absolute units, or ≈ 10^{-10} in meters. This value corresponds to the known radius of the electron orbit for hydrogen atom in the ground state, or to the atomic radius. Thus, we can conclude that electron is at rest relative to the nucleus in the ground state. Accordingly, the atom will be in the excited state if the electron is at a distance greater ≈ 10^{-10} m. This excited state is unstable as the electron is electrostatically attracted to the nucleus until it returns to the distance of the ground state. According to the section "Secondary formation of n≠0-objects", if the distance between an electron (n=0-object(II)"−") and a positron (n=0-object(II)"+") is less than one absolute unit, ≈ 10^{-5} m, the electron will be attracted to the positron and will emit n=1,2,3-objects. At a distance of ≈ 10^{-5} m the velocity of attraction is maximal, and is comparable to the speed of light. With decreasing distance from ≈ 10^{-5} m to ≈ 10^{-10} m, the velocity of attraction is not increased, as in the case of Coulomb's law, but decreases to zero at a distance of ≈ 10^{-10} m. From this description of electron behavior, it follows that if the electron velocity reaches a value greater than the velocity of attraction to the proton at ≈ 10^{-5} m, then the electron can leave the atom.

By summarizing the above we can say that, in an atom the electron behavior is determined by two processes. One of them is the absorption of n=1,2,3-objects by the electron, causing its velocity increase as well as an increase its distance from the nucleus to the point where this velocity can be compensated by attraction to the nucleus. In the extreme case, the electron leaves the atom. The second process is the attraction of an electron to a position closer to the proton, and this is accompanied by emission of n=1,2,3-objects. Such a closest position it can reach (the ground state) is at a distance of ≈ 10^{-10} m (Fig. 15).

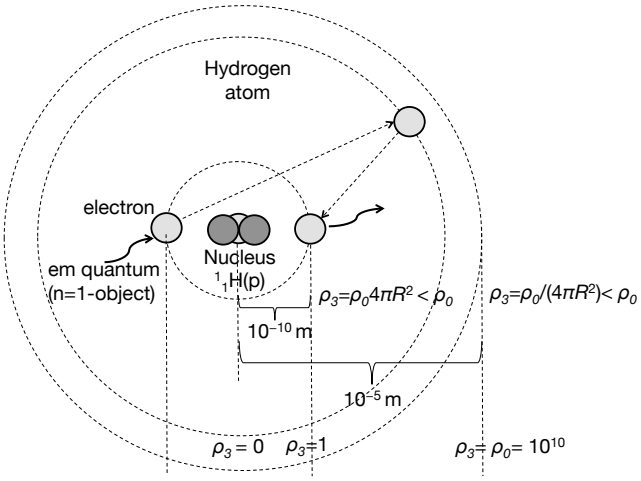

Figure 15. Model of hydrogen atom.

In this model of the hydrogen atom, the electron oscillates relative to the proton between the excited and ground states. It should also be noted that the spatial position of the electron in the ground state is not arbitrary. As shown above (Fig. 8), the proton contains an electron, and the orbital electron in the ground state will takes a position closer to that of the positron of the proton than to the electron of the proton.

Positronium, as a system of electron and positron, will not be as stable as the hydrogen atom, since the electron has the potential to be attracted to the positron until their complete overlap, forming a pair of n=0-objects(II)"−","+". Thus, a hydrogen atom is the more stable complex of n=0-objects(II)"−","+", than a positronium.

The formation of any antiatom is less probable process, since the electron absorbs quanta of the electromagnetic field and increases its velocity, while positron reflects electromagnetic quanta without changing its speed. Therefore, in the electron-positron pair, the electron is mobile and oscillates around the positron. The spatial distribution of electrons around nucleus in atoms heavier than hydrogen will be defined by the nucleus geometry. I.e. ground state of electrons will depend on the spatial distribution of directed n=0-objects(I) around the nucleus.

Next, we consider the transition of an n=0-object(II)"−" (electron) from a remote position to a position closer to an n=0-object(II)"+" (positron), in the range from the absolute unit $R \approx 10^{-5}$ m to $R \approx 10^{-10}$ m ($R = 1/n$, where n is in the range from $n = 1$ to $n = \sqrt{4\pi\rho_0}$). The result of this transition is that the electron emits objects of one-, two- and three-dimensional spaces. The spectrum of the emission (absorption) of hydrogen atoms for n=1-objects can be determined according to the equation for the length ${}^1L$, from the section "Secondary formation of n≠0-objects".

$$ {}^1L = 3Lq_0 v_1/4\pi\rho_0((1/n^2) - (1/m^2)) $$

where $m > n$.

Given the above calculated values $v_1 \approx 10^{10}$, $\rho_0 \approx 10^{10}$, $q_0 \approx 10^{10}$, $L \approx 10^{-20}$, the length ${}^1L$ of the emitted n=1-objects in absolute units is:

$$ {}^1L = 3Lq_0 v_1/(4\pi\rho_0((1/n^2) - (1/m^2))) = $$
$$ = 10^{-20}10^{10}10^{10}\,3/(4\pi 10^{10}((1/n^2) - (1/m^2))) = $$
$$ = 3/(4\pi 10^{10}((1/n^2) - (1/m^2))) $$

or in meters:

$$ {}^1L = 10^{-5}\,3/(4\pi 10^{10}((1/n^2) - (1/m^2))) = $$
$$ = 3/(4\pi 10^{15}((1/n^2) - (1/m^2))) $$

According to modern physics, the electromagnetic quantum is generated when the electron moves from a remote "orbit" to a near one. Quanta form groups, so-called series. One of them is named the Balmer series:

$$ \lambda = 1/R((1/2^2) - (1/m^2)) = $$
$$ = 1/(1.09 \text{ x } 10^7((1/2^2) - (1/m^2))) $$

where m is greater than two, and $R = 1.09 \text{ x } 10^7$ m^{-1}.

While the Balmer series equation and the suggested above equation for the generation of n=1-objects are similar in form, they differ in the values $4\pi 10^{15}$ and $1.09 \text{ x } 10^7$. What do these differences mean? If, in the proposed equation, n is one, then the electron is at the maximal distance corresponding to the absolute length unit, $\approx 10^{-5}$ m. At this distance from the nucleus, the density of the directed n=0-objects(I) is maximum. The value of m is always greater than n, which means that an electron is transferred to a shorter distance from the nucleus and emits a n=1-object. The shortest possible distance is $\approx 10^{-10}$ m. In all these cases, when n is equal to one, the wavelength of an emitted n=1-object will be around value ${}^1L = 3/4\pi 10^{15}$ i.e. in the range of gamma or X-rays. In order to get a range for the Balmer series, the value of n must be of the order of 10^4, then the value $4\pi 10^{15}$ can be reduced to $1.09 \text{ x } 10^7$ by making the common factor from the expression - $((1/n^2) - (1/m^2))$ and reducing n to 2 ($m > n$). This corresponds to the distance of the emitting electron from the nucleus of the 10^{-4} absolute length unit or of the order of $10^{-5} \text{ x } 10^{-4} = 10^{-9}$ meters. Thus, we can conclude that the electrons emits photons corresponding to the Balmer series if it is in close proximity, 10^{-9} meters, to the ground state $\approx 10^{-10}$ m and, accordingly, with a low density of the directed n=0-objects(I).

According to the section "Secondary formation of n≠0-objects" (about the minimum and maximum length of generated n=1-objects), the quanta, n=1-objects, emitted by a hydrogen atom will be in a certain range of wavelengths ${}^1L_{min} = 3Lv_1q_0/4\pi\rho_0$ and ${}^1L_{max} = 3Lv_1q_0/4\pi$. Given the values of $L \approx 10^{20}$, $q_0 \approx 10^{10}$, $v_1 \approx 10^{10}$ and $\rho_0 \approx 10^{10}$, and absolute units of length $\approx 10^{-5}$ m, these wavelength limits are equal to ${}^1L_{min} \approx 10^{-15}$ meters and ${}^1L_{max} \approx 10^{-5}$ meters. These values are valid for a resting atom. If the atom is moving with certain velocity V, then the boundaries will change due to the Doppler effect, discussed below. For example, if the atom emits photons and is moving in the direction opposite to

the direction of emission, the speed of the emitted photon absorbed by another atom will be formally smaller and, according to the Doppler effect (see "Optics"), this speed reduction will lead to an increase in the length of the photon. How much is this increase of the length, is determined by the velocities of the atom. In the opposite situation, when the atom moves in the direction of radiation, length will be reduced.

As described above, the wavelengths range of emission/absorption of orbital electrons from ${}^{1}L_{min} \approx 10^{-15}$ m to ${}^{1}L_{max} \approx 10^{-5}$ m includes X-rays (from 10^{-12} m to 10^{-7} m) and gamma rays (less than 10^{-11} m). X-rays and gamma rays overlap. According to modern physics, gamma rays are emitted by the nucleus, and X-rays are emitted by the orbital electron of an atom. For the overlapping range, terminological distinction between X-rays and gamma rays is conventional and reflects only the method of the rays generation. From the suggested theory, this distinction is not correct since gamma rays as well as any electromagnetic rays are emitted/absorbed by orbital electrons, not by the atomic nucleus. In this regard, the interpretations of the basic processes involving gamma rays are changed (see "Optics"), such as the photoelectric effect, Compton scattering, electron-positron pair generation, and the phototransmutation. In the case of the photoelectric effect, gamma rays are absorbed by the orbital electrons, not by nucleus, and, the resulting increase in speed allows electrons to leave the atom. Generation of an electron-positron pair occurs as a result of gamma-ray absorption by the nuclear electron increasing its velocity and causing a distortion of nucleus, followed by radiation of not only electrons but also of positrons from the nucleus. In the case of phototransmutation, when a gamma ray knocks out nucleons from the nucleus, the process of nucleus disintegration takes place, similar to electron-positron pair generation. The nuclear electrons will absorb gamma rays, so increasing their velocity to a point where they can leave the nucleus in complexes consisting of electrons and positrons i.e. as nucleons (protons and neutrons). The proposed theory also accounts for the Mossbauer effect, the resonant and recoil-free emission and absorption of gamma rays by atomic nuclei bound in a solid. Since in the suggested theory the orbital electrons can absorb/emit gamma rays, they, but not the atomic nucleus, are responsible for the resonant emission/absorption of gamma rays, similar to resonant optical fluorescence, which is characterized by the emission of photons with the same frequency as that of their absorption (e.g. resonance fluorescence yellow doublet of sodium).

It is known, that in the atomic spectra a single spectral line is actually a set of very close lines. Modern physics gives several reasons to explain this. One of them is the interaction of nuclear magnetic moment with the magnetic field of the electrons. This explains the hyperfine structure. In addition, there are lines, which are designated as the fine structure. They are produced by interactions that depend on the magnitude and relative orientation of the orbital and spin angular momentum of electrons and nuclei. How can these structures be explained by the suggested theory? In the above explanation of the spectrum of the hydrogen atom, the density of directed n=0-objects(I) around the nucleus (proton) is, by default, ρ_0, but as seen from the figures 12 and 15, it is not true for all positions of the electron relative to the nucleus. The density of directed n=0-objects(I) varies depending on the position of an electron around nucleus. This means that in the above equations, the value of the density may be less than the maximum, ρ_0. Accordingly, the emitted photons will have set of different lengths. Just how large a range of radiation, i.e. how wide the splitting of lines will be determined by the stability of the electron positions around the nucleus of an atom. This stability in turn is determined by the geometry of the charge distribution in the nucleus, i.e. by the relative position of electrons and positrons in nucleus.

In addition to the fine and hyperfine structure there is also splitting of spectral lines of atoms in a magnetic field - the Zeeman effect, and in an electric field – the Stark effect. In the proposed theory, these effects can be explained by the changes in the density of directed n=0-objects(I) between the orbital electrons in atoms and nuclei caused by action of magnetic and electric field on distribution of electrons and positrons in the atomic nucleus.

COMMENTS

The proposed explanation of the spectra of the hydrogen atom is based on the concept of the change of density of directed particles of vacuum between the electron and positron in the range $\approx 10^{-5}$– 10^{-10} m. This change occurs when the

electron changes its position relative to the positron of nucleus from a remote position, characterized by a higher density of directed particles of the vacuum (and so also a higher electron velocity), to a closer position having a lower density. Electrons will tend to stay at a position close to the nucleus due to the decrease of the particle density of the vacuum and the radiation of photons. The closest stable position, ground state, is 10^{-10} m. The electron can be also at intermediate positions between $\approx 10^{-5}$–10^{-10} m, if there is a compensation of its attraction to nucleus by repulsion from other orbital electrons and the nucleus electrons. In the given description, the electron is not a distribution of electron density, but an object of certain length and shape. The probabilistic nature of the electron is excluded. The emission of photons has a classical reason. In this case there is no problem that the electron will collapse into the nucleus as in the ground state, at a distance of 10^{10} m, the electron has zero velocity and the zero density of the directed particles of vacuum. According to the suggested model of the atom, electrons oscillate around the nucleus. In modern physics an electron is transferred to a different state, or "orbit", after emission of a quantum of energy. In the proposed theory, the events are reversed; the quantum is emitted when an electron reaches the corresponding "orbit" position relative to the nucleus as a result of attraction to the nucleus. In this case, there is no question about how the electron "decides" what quantum of energy to radiate. The characteristics of emitted quanta are determined by the position to which the electron has moved.

In the proposed theory, besides the generation of n=1-objects, quanta of electromagnetic fields, n=2-objects and n=3-objects are generated. These objects have velocities exceeding the speed of light, 10^{18} m/s and 10^{28} m/s respectively. Their lengths are in the range: from ${}^{2}L_{min} \approx 10^{-5}$ m to ${}^{2}L_{max} \approx 10^{5}$ m and from ${}^{3}L_{min} \approx 10^{5}$ m to ${}^{3}L_{max} \approx 10^{15}$ m respectively.

3.6 ATOMS AND MOLECULES

In the previous section, the general structure of the atom and the spectral characteristics of the hydrogen atom were analyzed (Fig. 15). They are defined by the electrostatic interaction of electrons and nuclei, i.e. by the fact that the attraction of the electron to the nucleus decreases with decreasing distance from $\approx 10^{-5}$ m to $\approx 10^{-10}$ m and becomes zero at a distance of $\approx 10^{-10}$ m. In the range of distances from the ground state orbit ($\approx 10^{-10}$ m) of the electron to the nucleus, i.e. from $\approx 10^{-10}$ m to $\approx 10^{-15}$ m, electrostatic interactions are absent. In this section, we will further analyze the general features of atoms. First, while it is observed that the electron is attracted to a nucleus with tremendous force, for some unknown reason it stays infinitely in a ground state orbit and does not collapse inwards to the nucleus. In the proposed scheme, this is explained by that electron has a zero velocity of attraction to the nucleus at ground state. Another feature of atoms is their elasticity, i.e. after the collision of their electron shells, the electrons in atoms are preserved, they do not collapse into the nucleus. It appears that atoms repel elastically. In the suggested theory, this elasticity of atomic interactions has the following explanation. After a collision between a stationary and moving atom, the electrons of the stationary atom will gain velocity and move from the ground state orbit ($\approx 10^{-10}$ m) across the area in between $\approx 10^{-10}$ m and $\approx 10^{-15}$ m, but without interacting with the nucleus (the probability of collision of an electron with the nucleus is small because of their small sizes), and will continue to move into the region (on the opposite side of the atom) of interaction with the nucleus (electrostatic attraction), between $\approx 10^{-10}$ m and $\approx 10^{-5}$ m. As a result, the electron, being on the opposite side of the atom, will again be attracted to the nucleus. The nucleus will gain some speed and the atom as a whole will be displaced, i.e. it can be represented as an elastic ball. Here, we should note that in this scheme, it is obvious that the velocity of the moving orbital electron is redistributed between the electrons and positrons of nucleus. Accordingly, the mass of the nucleus, as represented by the number of electrons/positrons, should not be so different from the mass of the electron. This is true in the proposed theory. The total mass of the proton is only three times bigger than the mass of the electron. Another feature of atoms is their linear size about 10^{-10} m. Modern physics does not answer the question why atom has such linear size. In the proposed theory, the atomic radius, as the radius of its ground state orbit, follows from the equation for the velocity of attraction/repulsion of electrons/positrons at distances less than absolute length unit (length of n=0-object(I)). This equation includes the density of n=0-objects(I), ρ_0,

and its value determines the radius of the ground state orbit. The value of ρ_0 is determined by the value of the "Planck constant" *h*. This size of an atom, 10^{-10} m, is the minimal size. The maximum size of an atom in modern physics is not limited. In the proposed theory, the maximum size of an excited atom is 10^{-5} m. If the electrons are farther than 10^{-5} m, there will not be a characteristic emission/absorption spectrum of the atom. Although, theoretically there is no atomic boundary in modern physics, there are experimental data on the maximum size of a hydrogen atom. The radius of the excited hydrogen atom is 3.39×10^{-6} m (*http://pubs.acs.org/doi/abs/10.1021/ed068p454*. A correction for this article – *http://pubs.acs.org/doi/abs/10.1021/ed069p946.2*), gives a value that is consistent with the maximum size of an atom in the proposed theory, $\approx 10^{-5}$ m.

The proposed structure of the atom also explains the existence of molecules. The reason for their formation is the same as described above, the dependence of attraction/repulsion between the nucleus and electrons. Instead of the electron, the nucleus of the other atom can occupy a ground state position relative to the nucleus of its neighbor, not moving in position relative to the other. Such a system will be stable if the electrons of the joined atoms move freely outside their nuclei and not between them. This will provide a pulling effect of electrons on the nuclei of the molecule, as in the case of atoms, causing the movement of molecule as a whole. According to this, the hydrogen molecule can be represented as shown in figure 16a.

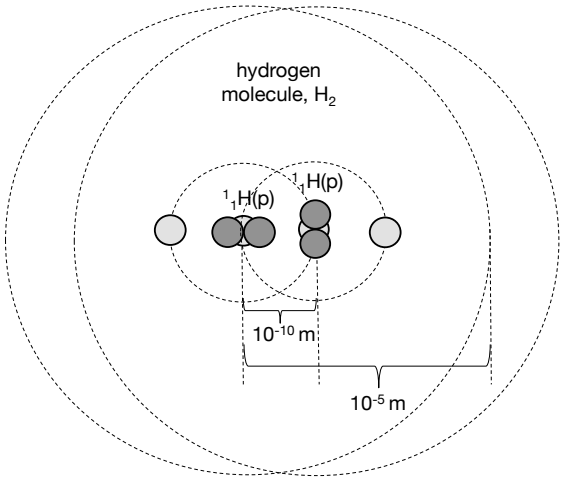

Figure 16a. Model of hydrogen molecule.

Here, the nuclei of the two hydrogen atoms are orthogonal, since in this orientation they are in a stable state, where the electron of one nucleus is attracted to the positrons of the adjacent nucleus. In a similar way, a water molecule can be represented as shown in figure 16b.

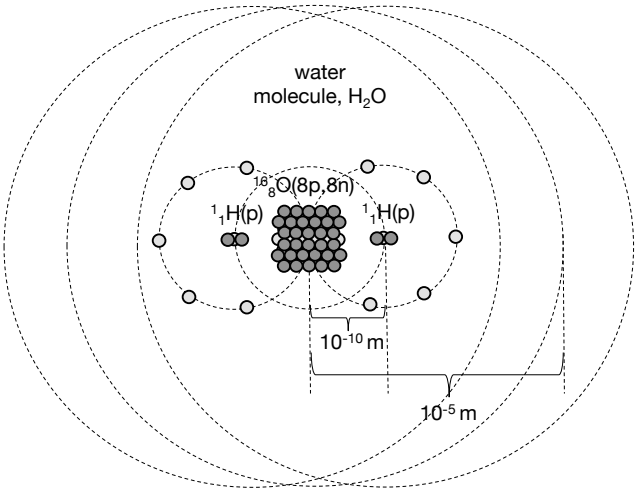

Figure 16b. Model of water molecule.

Since two electrons are exposed on the surface of the oxygen nucleus, the most stable arrangement of the hydrogen nuclei is a position in front of these electrons. The same approach can be applied for the construction of other molecules. In molecules with a great number of electrons and positrons, the nuclei cannot be in a plane, and are most likely arranged in several planes. For example, this is likely in the case of carbon dioxide, CO_2, because of the size of the nuclei of atoms of oxygen (Fig. 16c).

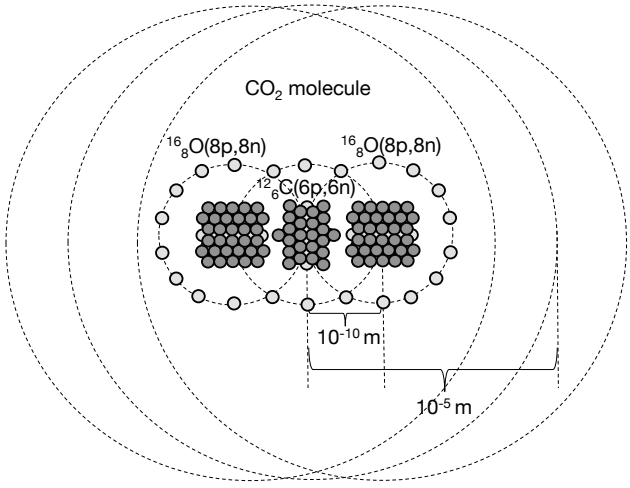

Figure 16c. Model of carbon dioxide molecule.

In contrast to existing theories in which electrons are placed in "layers" of differing orbits, in the proposed schemes of atoms and molecules

the electrons are placed at one basic orbit, the ground state. From this position, electrons can go to higher orbits if their velocity is changed by collisions with other atoms or by absorption of electromagnetic quanta, n=1-objects. As we can see for the water molecule in figure 16b, electrons in ground state orbits can be arranged symmetrically around atomic nuclei. For a molecule of carbon dioxide (Fig. 16c), such symmetry seems to be also possible.

The four states of matter are solid, liquid, gas, and plasma. The atoms and molecules making up a solid body are tightly packed. The interactions of atoms in molecules are more stable than in a solid, as the molecules can be in solids, liquids, or the gaseous state. In molecules, if the nuclei are on the ground state electronic orbit (Fig. 16a,b,c) and the electrons are located on the periphery, then in the solid the nuclei should be located away from each other, and the electrons located between the nuclei.

3.7 RADIOACTIVITY

One feature of unstable atoms is the spontaneous decay of nuclei with the emission of elementary particles or parts of the nucleus. For example, beta-radioactive elements emit electrons or positrons. It is believed that the weak interaction is responsible for radioactive decay, but the cause of spontaneous emission is not known. In the suggested theory, n=1-objects, the quanta of electromagnetic field, and n=2- and n=3-objects are generated successively during the cycle. Also, n=1-, n=2- and n=3-objects are generated together in any process defined as electromagnetic radiation. Absorption of n=1-, n=2- and n=3-objects by electron will cause an increase in electron velocity. The velocity of n=2- and n=3-objects is greater than the velocity of n=1-objects (i.e. the speed of light) by ten and twenty orders of magnitude – 10^{18} m/s and 10^{28} m/s, respectively. Their lengths are also greater, by the same orders of magnitude. Objects with such velocities and lengths should be intensively absorbed and emitted by electrons across the whole universe. If the electrons absorbing them are within nuclei, their speed will increase and cause nuclear disintegration with the emission of electrons, positrons, or their complexes. Not all n=1-objects, and hence n=2- and n=3-objects, can cause nuclear disintegration by this means. For example, the absorption of thermal photons during heating does not alter the rate of radioactive decay. On the other hand, nuclei can be destroyed by collisions with n=1-objects like gamma rays. n=2- and n=3-objects, respectively, that are generated together with gamma rays can also destroy atomic nuclei. In this case, the velocity of electrons that have absorbed n=1-, n=2- and n=3-objects, will be sufficient to leave the atom. This velocity is equal to the maximum velocity of attraction/repulsion of the electrons/positrons at the distance from the nucleus equal to $\approx 10^{-5}$ meters, and is comparable to the speed of light. Since the velocities of the n=2- and n=3-objects are significantly higher than the velocity of n=1-objects, they will be absorbed faster than the n=1-objects and thereby more often destabilize the nucleus of atoms. I.e. the nucleus can be destroyed before the n=1-objects reach them. Because of high velocity of n=2- and n=3-objects they should be evenly distributed over the entire universe. In other words, they should form the background across the universe, which is the reason of spontaneous radioactive decay. In favor of the proposed mechanism of spontaneous radioactivity is the fact that it depends on the cosmic scale processes. In particular, radioactive decay was found depend on the position relative to the Sun (*http://arxiv.org/abs/0808.3283, http://arxiv.org/pdf/1207.5783v1.pdf*). In the suggested mechanism, the radioactive decay also should depend on the electronic environment of the nucleus, because orbital electrons will absorb the n=1-, n=2- and n=3-objects, and thus, will shield the nucleus, so slowing the decay. This idea has support by the evidence that the positive ionization of radioactive atoms, i.e. removal of electrons from the electron shell, causes an increase in the rate of decay (*Jung, M. et al., (1992) First observation of bound-state beta minus decay. Phys. Rev. Letts. 69: 2164; Bosch, F. et al., (1996) Observation of bound-state beta minus decay of fully ionized 187Re: 187Re–187Os Cosmochronometry. Phys. Rev. Letts 77 (26): 5190–5193.*)

3.8 ELECTRIC CURRENT, MAGNETIC FIELD OF CONSTANT CURRENT AND THE MAGNETIC PROPERTIES OF MATTER

It is known that electric currents in metals represent the motion of electrons (n=0-objects(II)"−"). According to the previous section, moving n=0-objects(II)"−","+" replace n=0-objects(I), thereby increasing the density ρ_0 of

n=0-objects(I) ahead of n=0-objects(II)"−","+", in the direction of motion. Forced n=0-objects(I) will move back and compensate the reduced density of n=0-objects(I) behind the n=0-objects(II)"−","+" (Fig. 5). If n=0-objects(II)"−","+" move with a constant velocity, an equilibrium will be established when displaced n=0-objects(I) have filled the area behind the moving n=0-objects(II)"−","+". At the same time, in direction parallel to the motion of n=0-objects(II)"−","+" the density of n=0-objects(I) will be greater than the density ρ_0 that existed before the motion. We will define this density excess over the value of ρ_0 as $\boldsymbol{\rho_\Delta}$. In the direction perpendicular to the direction of motion of the n=0-objects(II)"−","+", the density of n=0-objects(I) will not change, since the density increase created by the motion of one n=0-object(II)"−","+" will be compensated by the decrease of another one moving in front (Fig. 17). The direction of n=0-objects(I) of density $\boldsymbol{\rho_\Delta}$ depends on the type of moving n=0-object(II)"−","+", i.e. on the sign of charge. In the section "Electrostatics" we defined the distribution of vector $\boldsymbol{E}$ of the electric field as the distribution of density, $\boldsymbol{\rho_E}$, of n=0-objects(I) directed to or from n=0-objects(II)"−","+", i.e. $\boldsymbol{E} = \boldsymbol{\rho_E}$. In the case of an electric current, we will do the same, and define the density distribution of directed n=0-objects(I), $\boldsymbol{\rho_\Delta}$, as the vector $\boldsymbol{E_i}$, where $\boldsymbol{i}$ is the symbol of current (Fig. 17).

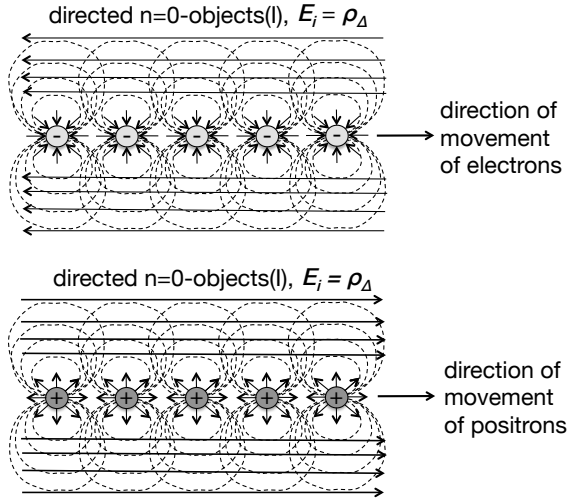

Figure 17. Distribution of the density of directed n=0-objects(I) displaced by moving electrons and positrons.

Then, $\boldsymbol{E_i} = \boldsymbol{\rho_\Delta}$. According to the figure 17 in the case of collinear currents, n=0-objects(I) of high density occurring in the space between the n=0-objects(II)"−","+" are collinear. This means that between the conductors the total length of co-directed n=0-objects(I) of density $\boldsymbol{\rho_\Delta}$, and the space they have formed will be compressed, as in the case of compression of co-directed n=0-objects(I) between an electron (n=0-object(II)"−") and a positron (n=0-object(II)"+"). Accordingly, the conductors will be attracted to each other. If the currents in conductors are opposite, then n=0-objects(I) of density $\boldsymbol{\rho_\Delta}$ are also in opposite directions and their total length, as well as the space formed by these n=0-objects(I), will be expanded. Thus in the case of magnetic interactions, we can talk about the expansion and contraction of space of directed n=0-objects(I) of density $\boldsymbol{\rho_\Delta}$.

The magnetic interaction is different from the electrostatic one. Electrostatic interactions represent the expansion/contraction of space of directed n=0-objects(I), the density of which does not exceed the density of the undirected n=0-object(I), ρ_0. Decrease/increase in the density of directed n=0-objects(I) is compensated by an increase/decrease in the density undirected n=0-objects(I) and, thus, the overall density of the directed and undirected n=0-objects(I) is always ρ_0. In the case of the magnetic interaction, the density of directed n=0-objects(I), $\boldsymbol{\rho_\Delta}$, is the excess over the value of their density, ρ_0. This excess density can exist only as a closed motion of the directed n=0-objects(I). Accordingly, the magnetic interaction is the change in density $\boldsymbol{\rho_\Delta}$, resulting in the expansion/contraction of space of directed n=0-objects(I) forming a closed line. Because of the closure, changes in the density $\boldsymbol{\rho_\Delta}$ are not accompanied by changes of density ρ_0 of undirected n=0-objects(I). At the same time, a redistribution of n=0-objects(I) between closed structures and the opened, expanding space of undirected n=0-objects(I) takes place during the generation or destruction of a magnetic field.

In modern physics, the magnetic field is characterized by the concept of magnetic induction, $\boldsymbol{B}$. In the proposed definition of the magnetic interaction of electric currents, the direction of the magnetic induction $\boldsymbol{B}$ does not match the vector $\boldsymbol{E_i}$ that we have introduced. Vector $\boldsymbol{E_i}$, and vector $\boldsymbol{B}$ are perpendicular to each other. Nevertheless, a relationship between the two vectors exists because in modern physics the magnetic induction $\boldsymbol{B}$ can be expressed through the magnetic vector potential – $\boldsymbol{A}$ ($\boldsymbol{B}$ = rot$\boldsymbol{A}$). The

magnetic vector potential $\boldsymbol{A}$ then has the same direction as vector $\boldsymbol{E_i}$, describing the directed n=0-objects(I) forming lines of magnetic field. For this reason, we assume that the magnetic vector potential $\boldsymbol{A}$ corresponds to the vector $\boldsymbol{E_i}$. Earlier, the vector potential was considered only as a convenient mathematical formality, and the field formed by them was not accepted as feasible. However, its reality was confirmed later in experiments detecting the Ehrenberg–Siday–Aharonov–Bohm effect predicted by W. Ehrenberg, R. E. Siday (1949), and Y. Aharonov, D. Bohm (1959). According to our definition, the magnetic vector potential $\boldsymbol{A}$ is real because it describes the directed n=0-objects(I) formed by an electric current (movement of n=0-objects(II)"−","+"). In order to describe magnetic interactions and to modify the Maxwell equations we will use the following equation: $\boldsymbol{B} = \mathrm{rot}\boldsymbol{E_i}$. Given that $\boldsymbol{E_i} = \boldsymbol{\rho_\Delta}$, this equation can also be written as $\boldsymbol{B} = \mathrm{rot}\boldsymbol{\rho_\Delta}$.

The velocity of magnetic attraction/repulsion will increase with the increase of density $\boldsymbol{\rho_\Delta}$. The density $\boldsymbol{\rho_\Delta}$ depends on several parameters. First, $\boldsymbol{\rho_\Delta}$ will increase with increasing charge (the amount of n=0-objects(II)"−","+"), because more n=0-objects(I) will be displaced. Secondly, $\boldsymbol{\rho_\Delta}$ will increase with the velocity of moving n=0-objects(II)"−","+". In the extreme case, when the velocity of n=0-objects(II)"−","+" reaches the maximum defined by density of displaced n=0-objects(I) ρ_0, an increase of the magnetic field will be maximal and will not change with further increases in the speed of n=0-objects(II)"−","+". In other words, when electrons are accelerated beyond the speed of light (note that $v_0\rho_0$ is comparable to the speed of light), the magnetic field will reach its maximum, after which it will not change further. If the velocity of the charge is initially higher the relative velocity of displaced n=0-objects(I), $v_0\rho_0$ (i.e. above the speed of light), then n=0-objects(I) can not be displaced, since n=0-objects(II)"−","+" will be faster than n=0-objects(I). As a result, a magnetic field will not be generated, and there will not be the typical "flow" of displaced n=0-objects(I) around moving n=0-objects(II)"−","+".

According to Biot-Savart law, the modulus of vector $d\boldsymbol{B}$ of the current I in a conductor, dl, at the distance R from it, and for the angle a between the vectors dl and R, is defined as follows:

$$dB = \mu\mu_0\, dl\, I \sin a / 4\pi R^2$$

Taking into account that: (a) the current is equal to the charge dq per unit of time dt, $I = dq/dt$, (b) the charge q can be expressed as the product of a variable k (corresponding to number of electrons) and the density of n=0-objects(I) ρ_0, $q = k\rho_0$, then the modulus of vector $d\boldsymbol{B}$ can be expressed as follows:

$$dB = \mu\mu_0\, dl \sin a\, dk\rho_0 / 4\pi R^2 dt$$

Given the expression for the magnetic induction vector $\boldsymbol{B} = \mathrm{rot}\boldsymbol{\rho_\Delta}$, we have the following relationship between the densities of n=0-objects(I) ρ_0 and $\boldsymbol{\rho_\Delta}$:

$$d(\mathrm{rot}\boldsymbol{\rho_\Delta}) = \mu\mu_0\, dl \sin a\, dk\rho_0 / 4\pi R^2 dt$$

This equation can be modified to reflect the fact that in the case of electrostatic interaction the velocity was shown to be determined by the density of n=0-objects(I), $\boldsymbol{\rho_E}$, according to the equation $\boldsymbol{\rho_E} = k\rho_0 / 4\pi R^2$. By taking this in account, we can write the following equation containing the densities $\boldsymbol{\rho_E}$ and $\boldsymbol{\rho_\Delta}$:

$$d(\mathrm{rot}\boldsymbol{\rho_\Delta}) = \mu\mu_0\, dl \sin a\, d\boldsymbol{\rho_E} / dt$$

For the Ampere's law, describing the magnetic interaction between conductors carrying currents, the magnetic force is proportional to the current I, the vector product of the length element $\boldsymbol{dl}$ of the conductor, and the magnetic induction $\boldsymbol{B}$:

$$d\boldsymbol{F} = I[d\boldsymbol{l}\, \boldsymbol{B}]$$

Generally, the force determines the change in velocity ΔV (per time unit). In the suggested theory, this change is equal to the velocity as the product of a certain density of n=0-objects(I), ρ, and a velocity unit v_0. We will define the change of velocity for Ampere's law as the V_A. Accordingly, V_A can be written as, $\Delta V = V_A = \rho_A v_0$. Then, the modulus of Ampere force, F_A, ($dF = Idl\, B$) for orthogonal $d\boldsymbol{l}$ and $\boldsymbol{B}$ can ($I = qv = k\rho_0 v$), according to Ampere's law, be defined as the change in velocity:

$$F_A = \Delta V = V_A = \rho_A v_0 = v_0 k \rho_0 v dl \mathrm{rot}\boldsymbol{\rho_\Delta}$$

Accordingly, there is the following distribution of density of directed n=0-objects(I) $\boldsymbol{E_A} = \boldsymbol{\rho_A}$:

$$\boldsymbol{E_A} = \boldsymbol{\rho_A} = k\rho_0 vdl\,\mathrm{rot}\boldsymbol{\rho_\Delta}$$

Ampere force is a special case of the Lorentz force. Given the definition of charge, $q = k\rho_0$, and magnetic induction $\boldsymbol{B} = \mathrm{rot}\boldsymbol{\rho_\Delta}$, the modulus of the Lorentz force, F_L, acting on a moving electrons with velocity $\boldsymbol{v}$, ($\boldsymbol{F} = q[\boldsymbol{vB}]$), can be written as follows:

$$F_L = \Delta V = V_L = \rho_L v_0 = v_0 k\rho_0 v\,\mathrm{rot}\boldsymbol{\rho_\Delta}$$

Accordingly, the following equation for the density of directed n=0-objects(I) $\boldsymbol{E_L} = \boldsymbol{\rho_L}$, defining a velocity change of moving electron, can be written as:

$$\boldsymbol{E_L} = \boldsymbol{\rho_L} = k\rho_0 v\,\mathrm{rot}\boldsymbol{\rho_\Delta}$$

According to the STR, from Lorentz transformations, the value of magnetic field depends on the choice of reference frame. In the proposed theory, the value of the magnetic field ($\boldsymbol{B} = \mathrm{rot}\boldsymbol{E_i} = \mathrm{rot}\boldsymbol{\rho_\Delta}$) is determined not by the velocity of the chosen reference frame, but by a velocity relative to a unique reference frame, i.e. the expanding space of n=0-objects(I). Since this expanding space is the movement of n=0-objects(I) in all directions with velocity $v_0\rho_0$, slightly greater than the speed of light, the magnetic interaction may exist only if the velocity of the electrons/positrons is close to the speed of light. In other words, the magnetic field is determined by the velocity of charge relative to the velocity of n=0-objects(I) of expanding space, $v_0\rho_0$. If the electron velocity relative to the Earth is close to the speed of light, then the electron velocity will also be close to the speed of light, regardless of the speed of the Earth. If we assume that the Earth's velocity relative to the space of n=0-objects(I) is close to its velocity relative to the cosmic microwave background (*371 km/s, http://en.wikipedia.org/wiki/Cosmic_microwave_background_radiation*), then the Earth's velocity is smaller than the speed of light by at least three orders of magnitude.

From the interaction of linear conductors carrying currents described above, the attraction of solenoids is a consequence of the attraction by their collinear turns. This explains the result of the classical experiment by Hans Christian Oersted on the interaction of a linear conductor and a magnetic needle. As seen in figure 18, the most stable position of the solenoid relative to the linear conductor is a position where the current in the linear conductor has the same direction as in a conductor of the solenoid, i.e. where there is an attraction of their currents.

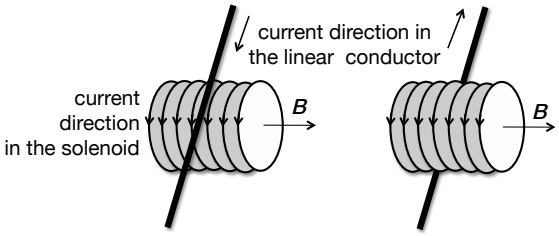

Figure 18. Orientation of the linear conductor interacting with solenoid.

The proposed mechanism of magnetic interaction can also explain the lack of interaction between an electrically charged body and a magnet. The magnetic field lines, formed by directed n=0-objects(I) are closed. Electric field lines of charge are not closed. In some locations, directed n=0-objects(I) of overlapping magnetic and electric fields can be co-linear or can be oppositely directed. In this location the space formed by them will shrink or expand, respectively. However, this can not lead to an attraction or repulsion of the magnet and charge, as contraction/expansion of the space of directed n=0-objects(I) does not begin from the magnet and end on the charge, as in the case of the electrostatic interaction of charges or the magnetic interaction.

As mentioned above, directed n=0-objects(I) form magnetic field lines as enclosed space structures. In these, the n=0-objects(I) move relative to each other regardless of the movement of undirected n=0-objects(I) of the cycle. This means that when a magnetic field is generated by a current, i.e. by movement of n=0-objects(II)"−","+", then vacuum particles, n=0-objects(I), transit from the cycle motion to the directed movement in enclosed space structures of the magnetic field.

In modern physics, the magnetic field of atoms is considered to be produced by the intrinsic magnetic moments of their electrons. The intrinsic magnetic moment of an electron is generated by the internal angular momentum, i.e. by its spin. In general, spin and intrinsic magnetic moment are excepted to be fundamental properties of elementary particles, like charge and mass. Spin is not associated with a real rotation of the particle, it is postulated as a quantum state. According to the classical definition, the magnetic

moment is generated by the current. The question about a current associated with the intrinsic magnetic moment of the electron is considered to be incorrect. Both concepts were originally proposed in 1925 by George Uhlenbeck, and Samuel Goudsmit, in order to explain atomic spectra and, in particular, the Zeeman effect. The Stern-Gerlach experiments, which demonstrated that a beam of silver atoms passing through a special magnetic field gradient is split into two beams, was an additional motivation for the introduction of a magnetic moment for the electron. According to quantum theory of Bohr-Sommerfeld, the orbital, and consequently the magnetic moments of silver atoms with one electron in the outer shell is zero, so the atoms should not deviate in magnetic field at all in the Stern-Gerlach experiment. Accordingly, and contrary to the Bohr-Sommerfeld theory, the atoms possess a magnetic moment. This has been postulated as an intrinsic magnetic moment of the electron. In the suggested theory, the electrons do not possess an intrinsic magnetic moment at all, since the electron has no internal currents. Rather, the electrons move in atoms, they are oscillating around the nucleus and so produce a changing magnetic field. In this way, the atom always has a magnetic moment. This movement of an electron is not spherically symmetric because of the nuclear geometry. This differs from the quantum model of Bohr-Sommerfeld for silver atoms, for which the orbital magnetic moment is zero. Thus, according to the proposed theory, in the Stern-Gerlach experiments, a beam splitting into two can be explained by the non-zero orbital magnetic moment. I.e. the observed splitting could result from the orientation of atomic magnetic dipoles relative to an external field. When the magnetic dipoles are perpendicular, such atoms will not be affected by the magnetic field. For other atoms, the magnetic dipoles can be oriented in the same or in the opposite direction. For free electrons, not for atoms, the spin of electron has not been confirmed experimentally and, according to the theoretical calculations it is not possible to detect splitting of the electron beam in a experiment similar to the Stern-Gerlach experiment (*D.V. Sivukhin, "Course of General Physics", Volume5, Part1, Paragraph 36, Russian edition*).

In the proposed theory, the Zeeman effect can also be explained without postulating an intrinsic magnetic moment of the electron and an internal angular momentum – spin. The splitting of the spectra in the presence of a magnetic field, the Zeeman effect, can be explained by the change in electron mobility with respect to the nucleus in result of interaction of an external magnetic field and the magnetic field generated by moving electrons around the nucleus.

COMMENTS

In contrast to existing theories, the magnetic field, described by the suggested theory, is generated only by the motion of electrons/positrons. Electrons do not have their own magnetic moments forming a magnetic field of permanent magnets.

According to the proposed definition, the magnetic field is composed by directed vacuum particles, i.e. directed n=0-objects(I) of density $\boldsymbol{\rho_{\Delta}}$, which is the density excess over density ρ_0 of omnidirectional vacuum particle, undirected n=0-objects(I). This density $\boldsymbol{\rho_{\Delta}}$ will be produced by the movement of charged particles (electrons/positrons), as a result of the displacement of n=0-objects(I). Displacement from the location of the electrons/positrons is a consequence of the alignment, maintaining the same density of the objects (all objects in this location) by taking into account the emerging electrons/positrons. The displaced vacuum particles, n=0-objects(I), do not resist the movement of electrons/positrons. In other words, the electrons/positrons are not slowed down by the vacuum particles, because there is no interaction between undirected n=0-objects(I) and electrons/positrons, n=0-objects(II)"−","+", similar to the interaction between n=0-objects(II)"−","+".

The vacuum is a moving medium, an expanding ether with a velocity determined by the density of vacuum particles, n=0-objects(I), and nowadays comparable to the speed of light.

3.9 ELECTROMAGNETIC INDUCTION

Electromagnetic induction is the process of generating electrical potential difference in a conductor placed in a changing magnetic field. The potential difference can generate an electric current in a closed conducting loop or in solid massive conductors (Foucault currents). To explain this phenomenon within the framework of our theory, we consider two groups of electrons that are remote from each other, and within a

body placed in changing magnetic field. Electrostatic repulsion of the electrons in groups, as well as their attraction to the nuclei of atoms is determined by the electrostatic field, i.e. by value of the density of directed n=0-objects(I), $\boldsymbol{\rho_E}$. Its maximum value is equal to the density of undirected n=0-objects(I), ρ_0. The density of undirected n=0-objects(I) will be changed as a result of their displacement by moving electrons/positrons generating the magnetic field. Accordingly, the density of directed n=0-objects(I), $\boldsymbol{\rho_E}$, in the electrostatic field will also change ($\boldsymbol{\rho_E} = \rho_0/4\pi R^2$). It will decrease with increasing current, concurrent with increasing density of displaced directed n=0-objects(I), $\boldsymbol{\rho_\Delta}$, of the magnetic field. In other words, the magnetic field changes are accompanied by opposite changes of the electrostatic field. Generation of the magnetic field gradient will cause the gradient in the electrostatic field, i.e. density gradient of directed n=0-objects(I), $\boldsymbol{\rho_E}$. This means that the speed of electrostatic repulsion of the electrons in the two groups is no longer the same as it was before the change of the magnetic field. In the weaker changing magnetic field, the density $\boldsymbol{\rho_E}$, as well as the electron velocity, is greater than in the group of electrons with a strong changing magnetic field, where density $\boldsymbol{\rho_E}$ is lower. As a result, the electrons from the region of weaker changing magnetic field (greater density $\boldsymbol{\rho_E}$) will move into the region of stronger changing magnetic field (lower density $\boldsymbol{\rho_E}$). This generates the electrical potential difference and current induction. This mechanism can also describe the phenomenon of self-induction, which occurs when a current is turned on or off. Accordingly, the change of magnetic field of the self-induction current is opposite to the changes of magnetic field of the current that caused the induction. This description corresponds to Lenz's law when an induced current is always in such a direction as to oppose the motion or change causing it.

Given the definition of the vector of electric current $\boldsymbol{E_i}$, the equation describing the law of electromagnetic induction (one of Maxwell's equations) can be written as follows:

$$\mathrm{rot}\boldsymbol{E} = -\, d\boldsymbol{B}/dt \text{ and } \boldsymbol{B} = \mathrm{rot}\boldsymbol{E_i}$$
$$\Rightarrow \mathrm{rot}\boldsymbol{E} = -\, d(\mathrm{rot}\boldsymbol{E_i})/dt \text{ or}$$
$$\mathrm{rot}\boldsymbol{E} = -\, \mathrm{rot}(d\boldsymbol{E_i}/dt) \text{ or } \boldsymbol{E} = -\, d\boldsymbol{E_i}/dt$$

Given that $\boldsymbol{E} = \boldsymbol{\rho_E}$ and $\boldsymbol{E_i} = \boldsymbol{\rho_\Delta}$, the equation describing the law of electromagnetic induction can be reduced to the following expression of the densities $\boldsymbol{\rho_E}$ and $\boldsymbol{\rho_\Delta}$:

$$\boldsymbol{\rho_E} = -\, d\boldsymbol{\rho_\Delta}/dt$$

COMMENTS

In the suggested theory, the cause of electromagnetic induction is the same as in classical physics – change of the electrostatic field is due to change in magnetic flux. Accordingly, the self-induction phenomenon is explained by the same reason. Nevertheless, in the proposed theory there is a medium, the ether, and this medium is changing during an electromagnetic induction, rather than the exchange field composed of virtual photons responsible for electromagnetic interactions. In the suggested theory, the potential difference is possible, as in classical physics, due to a different number of electrons at the same density n=0-objects(I) $\boldsymbol{\rho_E}$. In the case of the electromagnetic induction, for the same number of electrons there is the different density of n=0-objects(I) $\boldsymbol{\rho_E}$, due to the change of charges move, i.e. due to the change of magnetic flux.

3.10 SUPERCONDUCTIVITY

Superconductivity is the phenomenon of zero electrical resistance and ejection of the magnetic field from the volume of a superconductor (Meissner effect). The superconducting state occurs in certain materials when they are cooled below a characteristic temperature. In the suggested theory, this phenomenon is explained as follows. Lowering the temperature reduces the mobility of the electrons, because it reduces the number of thermal photons (n=1-objects) absorbed by the electrons. In the extreme case, in the superconducting state, the electrons are fixed relative to the atomic nuclei at a minimum distance. This distance is $\approx 10^{-10}$ m and corresponds to the electron orbit of ground state of the unexcited atom. By applying an electrical potential difference to the superconductor the conduction electrons will move between the nucleus and the orbital electrons in ground state. I.e. they will be located at a distance from the nucleus, as well as from the ground state electrons, less than 10^{-10} m. At this distance, the electrostatic attraction of conduction electrons to the nucleus and the repulsion of the electrons from each other are absent (see "Electrostatics"). Since the

electrons are not moving beyond a distance of 10^{-10} meters, they cannot radiate n=1-objects. Accordingly, electrical current will not have any resistance.

The proposed mechanism of superconductivity can also explain quantum tunneling of electrons when they escape through an insulating layer. This represents the superconductivity of some of the electrons in the non-low temperature conditions. Due to the structural characteristics of conductors and insulators, their composition and the value of current, some electrons can fall into the same area between the nucleus and the orbital electrons of ground state as in the case of the superconductor. As a result, there is a current flow without loss through an insulator i.e. there is a tunneling of electrons.

Attraction or repulsion of conduction electrons in a superconductor is possible when they overlap or collide with nuclei or electrons of a superconductor. The velocity of this interaction is the absolute velocity unit, 10^{-2} m/s.

The Meissner effect can be explained in the proposed theory by the same reason as in classical physics. Changing the magnetic flux induces currents in the superconductor. The magnetic field of the induced currents is directed opposite to the external field. As a result, the external magnetic field is compensated by the induced field and the superconductor is expelled from the magnetic field. The magnetic flux of the external field can be changed in two ways. In one case, a magnet is moved above a superconductor. The second variant corresponds to a situation where, initially, the external field is inside the conductor. The magnet lies on the conductor. Then, the transition of the conductor to the superconducting state will be accompanied by changes of the structure of the conductor (changes in the distribution of valence electrons in atoms) and these changes will cause changes in the external field. As a result, these changes in the external field will induce an opposite current. The magnet will emerge over the superconductor.

Since in the proposed theory, electrons do not possess an intrinsic magnetic moment, we can assume that the magnetic properties of ferromagnetic materials are due not to an orientation of the magnetic moments of electrons in the direction of the external field, but rather to co-orientation of microscopic electronic currents, and not currents in atoms. These currents are likely to be located in typical ferromagnetic domains, characterized by a certain direction of the magnetic field. In a ferromagnetic, the magnetic fields of these domains are parallel. We can assume that in the domains there is the motion of conduction electrons and since the permanent magnets have no energy losses, they display the phenomenon of superconductivity.

COMMENTS

In the proposed description, zero electrical resistance in the superconductor follows from the laws of electrostatic interactions at distances less than the absolute unit length $\approx 10^{-5}$ m, namely from the lack of electrostatic interaction in the range from $\approx 10^{-10}$ m to $\approx 10^{-15}$ m. This mechanism applies to both conventional superconductors and to high-temperature superconductors i.e., superconducting ceramics. This differs from existing theories, since modern physics has only the Bardeen-Cooper-Schrieffer theory to explain low-temperature superconductivity and there is no theory for superconducting ceramics.

3.11 QUANTA OF ELECTROMAGNETIC FIELD AND MAXWELL'S EQUATIONS

In the suggested theory, electromagnetic waves or quanta of electromagnetic fields correspond to n=1-objects. In contrast to the electromagnetic waves, n=1-objects are not defined in terms of electric and magnetic fields. Nevertheless, the lengths of n=1-objects depend on the electromagnetic field characteristics, because these characteristics reflect the values of n=0-objects(I) density. I.e. the emission of quanta of the electromagnetic field, i.e. n=1-objects, is caused by a decrease in the density of directed n=0-objects(I) when the electron (n=0-object(II)"−") transits from the remote orbit to the near position relative to the nucleus (see below, where synchrotron radiation is described as another example of the generation of n=1-objects). The lengths of the generated n=1-objects (lengths of "electromagnetic waves") are determined by the difference in the densities of directed n=0-objects(I) corresponding to these positions. In the reverse process, where n=1-objects are absorbed by electrons (n=0-objects(II)"−"), the density of directed n=0-objects(I) is increased and the electrons increase their velocity. Thus, a

complete picture of the emission and absorption of n=1-objects by electrons is as follows. Initially, the change of magnetic field will change the velocity of free conduction electrons in the emitter. Due to the interaction of these electrons and the nuclei of atoms, the transfer of electrons from orbit to orbit will result in the generation of n=1-objects. Further, the emitted n=1-objects can be absorbed by electrons of the receiver. This means generation of an electric current and, consequently, generation of the magnetic field. Thus, n=1-object functions as a carrier, delivering the velocity parameters of electrons from the emitter to the receiver.

In modern physics, light is an electromagnetic wave. The quantitative equality of speed of light and the constant c in the Maxwell's equations for electromagnetic waves is considered as a confirmation of their identity. In the suggested theory, the speed of light and constant c are not identical, and they correspond to different phenomena. The constant c is used for normalization in the equations of electrodynamics in the CGS metric system of physical units. For example, in the equation for the Lorentz force (and similarly in the equation of Ampere's law).

$$\boldsymbol{F} = (q/c)[\boldsymbol{v}\mathrm{rot}\boldsymbol{B}]$$

According to the Lorentz equation, the effect of a magnetic field on a moving electron is inversely proportional to the constant c. This inverse dependence is consistent with the definition of the constant c as velocity $v_0\rho_0$, since the more the electron velocity v relative to the velocity $v_0\rho_0$, the more n=0-objects(I) are displaced, and the density $\boldsymbol{\rho_\Delta}$ is higher that causes stronger magnetic field and attraction/repulsion. In addition, the value of the velocity defined by the density ρ_0, $v_0\rho_0$, is equal to the known value of the constant c. The speed of light corresponds to the speed of n=1-objects, but not to the velocity of n=0-objects(I), $v_0\rho_0$.

In classical electrodynamics the electrostatic and magnetic interactions, as well as electromagnetic waves, are described by Maxwell's equations system:

$$\mathrm{rot}\boldsymbol{E} = -\,d\boldsymbol{B}/dt \qquad (1)$$
$$\mathrm{div}\boldsymbol{B} = 0 \qquad (2)$$
$$\mathrm{rot}\boldsymbol{B} = \mu\mu_0\boldsymbol{j} + \mu\mu_0\varepsilon\varepsilon_0 d\boldsymbol{E}/dt \qquad (3)$$
$$\mathrm{div}\boldsymbol{E} = \rho/\varepsilon\varepsilon_0 \qquad (4)$$

where $\boldsymbol{j}$ – the electric current density, $\mu\mu_0\varepsilon\varepsilon_0 d\boldsymbol{E}/dt$ – the density of the displacement current, ρ – volume charge density.

In the proposed theory, Maxwell equations can also be used to describe the electric and magnetic phenomena, but not electromagnetic waves. In this case however, one of the equations must be changed, namely, the characteristic of the displacement current, $\mu\mu_0\varepsilon\varepsilon_0 d\boldsymbol{E}/dt$, must be removed. Maxwell used this component of the equation to get the equations for the electromagnetic wave in the ether. He assumed that in the ether as a dielectric, a displacement current density is possible and would be determined by the change of the electric field $\mu\mu_0\varepsilon\varepsilon_0 d\boldsymbol{E}/dt$. As a result, the total current equal to the sum of conduction current and displacement current was introduced. The interactions of charges and currents could then be combined into the so-called electromagnetic waves, presenting them as waves propagating in the ether, and where electric and magnetic fields induce each other. After Maxwell, the concept of the ether was replaced by that of the vacuum, but $\mu\mu_0\varepsilon\varepsilon_0 d\boldsymbol{E}/dt$ remained in the existing definition of electromagnetic waves. Since a current cannot exist in the vacuum, including a displacement current, the changing electric field, $\mu\mu_0\varepsilon\varepsilon_0 d\boldsymbol{E}/dt$, that formerly defined the displacement current, was considered to be able to induce a magnetic field without the charge current. It was assumed that the electric field induces a magnetic field and vice versa, thereby creating an electromagnetic wave in a vacuum instead of in the ether. If we remove $\mu\mu_0\varepsilon\varepsilon_0 d\boldsymbol{E}/dt$, the wave equation for the neutral conductor (i.e. if $\rho = 0$ in equation (4)) is equivalent to the equation attributed to the electromagnetic wave. For the vacuum, as a non-conductive medium (i.e. when $\rho = 0$ in equation (4) and $\boldsymbol{j} = 0$ in equation (3)), if the displacement current, $\mu\mu_0\varepsilon\varepsilon_0 d\boldsymbol{E}/dt$, is removed from equation (3), the equation of electromagnetic waves cannot be written, since the right side of equation (3) will be zero. Without $\mu\mu_0\varepsilon\varepsilon_0 d\boldsymbol{E}/dt$, and taking into account $\boldsymbol{B} = \mathrm{rot}\boldsymbol{E_i}$, the modified Maxwell's equations can be written as follows:

$$\mathrm{rot}\boldsymbol{E} = -\,d(\mathrm{rot}\mathbf{E_i})/dt \qquad (1)$$
$$\mathrm{div}(\mathrm{rot}\boldsymbol{E_i}) = 0 \qquad (2)$$
$$\mathrm{rot}(\mathrm{rot}\boldsymbol{E_i}) = \mu\mu_0\boldsymbol{j} \qquad (3)$$
$$\mathrm{div}\boldsymbol{E} = \rho/\varepsilon\varepsilon_0 \qquad (4)$$

Next, we can use the definitions of the volume

charge density, $\rho=dq/dV$, and the electric current density, $j = vdq/dV$ (v is the velocity of the charge q, V is the volume):

$$\boldsymbol{E} = -d\boldsymbol{E_i}/dt \quad (1)$$
$$\mathrm{div}(\mathrm{rot}\boldsymbol{E_i}) = 0 \quad (2)$$
$$\mathrm{rot}(\mathrm{rot}\boldsymbol{E_i}) = \mu\mu_0 vdq/dV \quad (3)$$
$$\mathrm{div}\boldsymbol{E} = dq/\varepsilon\varepsilon_0 dV \quad (4)$$

Then, we can redefine these equations by substitution of the vector $\boldsymbol{E_i}$ and vector $\boldsymbol{E}$ for the density of n=0-objects(I) $\boldsymbol{\rho_\Delta}$ and $\boldsymbol{\rho_E}$, respectively. To do this, we use the expression for the charge q, $q = k\rho_0$ (where k corresponds to the number of electrons), as well as the proposed equations above for $\boldsymbol{E}$ and $\boldsymbol{E_i}$, $\boldsymbol{E} = \boldsymbol{\rho_E}$ and $\boldsymbol{E_i} = \boldsymbol{\rho_\Delta}$. We then have the following modified Maxwell's equations, in which the parameters of the magnetic (vector $\boldsymbol{E_i}$) and electric (vector $\boldsymbol{E}$) fields are expressed in terms of density of n=0-objects(I) $\boldsymbol{\rho_E}$, ρ_0 and $\boldsymbol{\rho_\Delta}$:

$$\boldsymbol{\rho_E} = -d\boldsymbol{\rho_\Delta}/dt \quad (1)$$
$$\mathrm{div}(\mathrm{rot}\boldsymbol{\rho_\Delta}) = 0 \quad (2)$$
$$\mathrm{rot}(\mathrm{rot}\boldsymbol{\rho_\Delta}) = \mu\mu_0 vdk\rho_0/dV \quad (3)$$
$$\mathrm{div}\boldsymbol{\rho_E} = dk\rho_0/\varepsilon\varepsilon_0 dV \quad (4)$$

The relationship between the densities $\boldsymbol{\rho_E}$, ρ_0, and $\boldsymbol{\rho_\Delta}$ can also be expressed through the Biot-Savart law for the current in a conductor dl, at the distance R from it, and for the angle a between the vectors dl and R, as follows:

$$d(\mathrm{rot}\boldsymbol{\rho_\Delta}) = \mu\mu_0 dl \sin a\, dk\rho_0/4\pi R^2 dt$$
$$\text{or } d(\mathrm{rot}\boldsymbol{\rho_\Delta}) = \mu\mu_0 dl \sin a\, d\boldsymbol{\rho_E}/dt$$

When we combine the first and fourth equation, the following equation can be written:

$$-d(\mathrm{div}\boldsymbol{\rho_\Delta})/dt = dk\rho_0/\varepsilon\varepsilon_0 dV$$

According to this equation we can say that during electromagnetic induction there is a change of magnetic flux, reflecting a change in the density of directed n=0-objects(I) $\boldsymbol{\rho_\Delta}$ – $d(\mathrm{div}\boldsymbol{\rho_\Delta})/dt$. This change is accompanied by an opposite change in the density ρ_0 of undirected n=0-objects(I) – $dk\rho_0/\varepsilon\varepsilon_0 dV$ per volume unit, causing an opposite change in the density of directed n=0-objects(I) $\boldsymbol{\rho_E}$ of the electrostatic field. According to the third equation, the density of directed n=0-objects(I) $\boldsymbol{\rho_\Delta}$ is generated only if there is a current, i.e. a motion of electrons (positrons). The lines composed by n=0-objects(I) of density $\boldsymbol{\rho_\Delta}$ are closed. This is presented in figures 5 and 15, and is expressed by the second equation.

The proposed modifications of Maxwell's equations, described in the terms of n=0-objects(I) density, $\boldsymbol{\rho_E}$, ρ_0, and $\boldsymbol{\rho_\Delta}$, reflects interdependence of electric and magnetic fields, without taking into account the generation of electromagnetic quanta, n=1-objects. If the generation of n=1-objects takes place, then this should mean a change of the density of directed n=0-objects(I) according to the following equation:

$$^1L = Lq_0 v_1/4\pi\rho_0((1/n^2) - (1/m^2))$$

In this case, the displacement current, $\mu\mu_0\varepsilon\varepsilon_0 d\boldsymbol{E}/dt$, can be expressed in terms of the density of n=0-objects(I) – $\mu\mu_0\varepsilon\varepsilon_0 d\boldsymbol{\rho_E}/dt$, and that means a definition of the changes in the density of n=0-objects(I) in time. In other words, when Maxwell added the displacement current, $\mu\mu_0\varepsilon\varepsilon_0 d\boldsymbol{E}/dt$, in his system of equations, he actually defined by this a generation of the n=1-objects, in addition to the definitions of the electric and magnetic fields.

COMMENTS

In contrast to existing theories, in the proposed theory light does not have electrical and magnetic characteristics, i.e. electromagnetic quanta are not the particles or waves of the electromagnetic field. The electromagnetic quantum is an object of one-dimensional space, an n=1-object, while the electric and magnetic fields are composed of n=0-objects(I), objects of zero-dimensional space, the vacuum. The relationship between these two is that the n=1-objects are generated as a result of changes in the density of n=0-objects(I) of the vacuum in a certain direction, i.e. as a result of changes in the electric and magnetic fields. In other words, objects of zero-dimensional space, of the vacuum, are turned into objects of one-dimensional space. In the reverse situation, n=1-objects can be absorbed by the electrons, n=0-objects(II)"−", leading to a change in their velocity and consequently to a change in the electrical and magnetic characteristics of the vacuum around the electrons.

3.12 OPTICS

In the proposed theory, phenomena related to this branch of physics can be described as follows.

3.12.1 The absorption of light is the absorption of n=1-objects (i.e. photons, electromagnetic quanta) by n=0-objects(II)"−" i.e. by the electrons of the atoms. In modern physics, a free electron cannot absorb a photon, only electron within atoms can do this, since in this case the laws of conservation of energy and momentum cannot be true simultaneously for free electron. Namely, if an electron in state 1 has energy E_1 and momentum p_1, and after absorbing a photon, the electron is in state 2, with energy E_2 and momentum p_2, then the balance of the transition from state 1 to state 2 after the absorption of a photon of energy $h\omega$ and momentum $h\omega/c$ is as follows:

$$\text{the energy is } E_2 - E_1 = h\omega = m_e v_e^2/2$$
$$\text{the momentum is } p_2 - p_1 = h\omega/c = m_e v_e$$

These equations are not compatible with each other for any possible velocity of the free electron, because its velocity will always be less than the speed of light, but from the equations it must be equal to the double speed of light.

$$((h\omega)/(h\omega/c)) = ((m_e v_e^2/2)/(m_e v_e)) \text{ or } c = v_e/2$$

In the suggested theory, the photon has no momentum ($h\omega/c$), and therefore the analysis presented above cannot be applied. The photon can be absorbed by a free electron or by an electron as a part of an atom. Absorption of an n=1-object by an electron increases its velocity in the direction of the n=1-object. In this scheme, energy is conserved since the electron kinetic energy increases by an amount determined by the characteristics of the photon, and the direction of motion is also preserved since the electron increases its speed in the direction of the photon. The increase in electron velocity can be calculated as follows. After absorption of a photon of wavelength λ, the velocity of the electron will increase by pv_0. v_0 is the absolute velocity unit $\approx 10^{-2}$ m/s, and p is determined according to the equation from the section "Definition of the motion of n≠0-objects relative to n=0-objects(II)"−" ":

$$p = Lq_0 v_1/\lambda$$

where $Lq_0 v_1 = 1$ is measured in absolute units of length, $\approx 10^{-5}$ meters.

Accordingly, if $Lq_0 v_1 = 1$ and λ are expressed in meters, the pv_0 in meters per second is:

$$pv_0 = (10^{-5}/\lambda)10^{-2}$$

3.12.2 The reflection of light is the result of collision of n=1-objects (i.e. photons, electromagnetic quanta) with n=0-objects(II)"+" i.e., with the positrons of atomic nuclei. If, in the collision with n=0-object(II)"−", n=1-objects move toward its center, and are absorbed by it, a collision of n=1-objects with n=0-object(II)"+" represents the symmetric case of movement of n=1-objects from the center of n=0-object(II)"+", i.e. the reflection of n=1-objects by n=0-object(II)"+". The electromagnetic quantum has no momentum and its reflection will not change the position and velocity of the positron. Momentum is characteristic only for n=0-objects(II)"−","+" (electrons and positrons). The energy of a photon will also not be changed, only its direction will be reversed relative to the center of the positron.

3.12.3 The interference of light is explained as follows. Movement of n=1-objects towards a certain place will increase the total density of objects there, along the length of the n=1-objects. A similar increase in total density occurs in the case of the motion of electrons (n=0-objects(II)"−"), leading to the generation of magnetic field characterized by a density $\boldsymbol{\rho_\Delta}$ of n=0-objects(I). From this place of increased density, n=0-objects(I) will move in to align to the density ρ_0. The propagation velocity of density fluctuations, respectively, is determined by the density ρ_0 of n=0-objects(I). In the suggested theory, this velocity is close but slightly more than the speed of light. In the case of two groups of n=1-objects having the same lengths and a constant phase difference, i.e. coherent electromagnetic radiation, the propagating density fluctuations of the n=0-objects(I) from two groups of n=1-objects will interfere. The greater number of the n=1-objects in each group, the lower the density of n=0-objects(I). In an interference pattern, the maximum of the density n=0-objects(I) will be in the presence of the minimum number of n=1-objects, and vice versa. The suggested interpretation is partially consistent with the concept of the ether. The propagation of light as n=1-objects leads to the spread of the density fluctuations of n=0-objects(I) in the ether;

a medium consisting of n=0-objects(I) (i.e. a vacuum composed of n=0-objects(I)). As mentioned above, n=1-objects are not waves. The wave behavior of n=1-objects is a reflection of the wave processes that occur in a vacuum composed of n=0-objects(I). It is a reaction of n=0-objects(I) to the motion of n=1-objects. Since changes in the density of n=0-objects(I) also occur when electrons and positrons are in motion (n=0-objects(II)"−","+"), interference will also be observed for these particles, and for their complexes, such as protons, neutrons and atoms.

3.12.4 The diffraction of light is a consequence of the interaction of secondary (reverse) waves of the n=0-objects(I), that emerge as a result of the reflection of primary waves from an obstacle. These primary waves are generated by the motion of n=1-objects (as in the case of electrons and positrons). Accordingly, diffraction can be explained as follows. A wave in the medium of n=0-objects(I), caused by the motion of a photon (or other particles), will be reflected from an obstacle, and the reverse, secondary wave will interfere with the primary wave, so changing the space of n=0-objects(I) and changing the direction of motion of the photon in this space. The speed of waves of n=0-objects(I) is determined by the density of n=0-objects(I) ρ_0 and is greater than the speed of light.

3.12.5 Light pressure, as demonstrated in the Lebedev's experiments, is due to the absorption of n=1-objects by n=0-objects(II)"−" (electrons) within atoms. This increases the velocity of electrons in the direction of the absorbed photons. This means that in the suggested interpretation there is no redistribution of momentum between photons and the target. A photon, as an n=1-object, has no momentum. Only n=0-objects(II)"−","+", electrons and positrons, have momentum.

3.12.6 Light scattering is due to a change in direction of n=1-objects as a result of their reflection from n=0-objects(II)"+" (positrons) within atomic nuclei. This is true if the scattering refers only to the transformation of the angular distribution of light flux. If there is a change in frequency of photon, then the absorption of n=1-objects by electrons and the secondary generation n=1-objects has occurred. Again, since n=1-objects do not have momentum, their reflection will not change the speed of n=0-objects(II)"+" (positrons).

3.12.7 Polarization corresponds to the motion of n=1-objects in a preferred direction. For example, photons, as n=1-objects, can be placed in the same plane by passage through a polarizing filter. This corresponds to a plane-wave and is defined as linear polarization. Such an orientation of n=1-objects is likely to result from their reflection from nuclei that are arranged into a certain atomic lattice. In the case of circular polarization, n=1-objects probably form a tube or a cylinder.

3.12.8 The photoelectric effect is the emission of electrons from a substance illuminated by electromagnetic radiation, i.e. it is the process where electrons within atoms absorb photons and are then ejected from atoms. In the suggested theory, orbital electrons of atoms can absorb n=1-objects, so increasing their velocity sufficiently to allow them to leave the atom.

3.12.9 Phototransmutation (**photodisintegration**) occurs in result of the absorption of gamma rays by electrons in the nuclei of atoms, which causes the disintegration of the nuclei with the emission of neutrons, protons, and electrons. According to the equation above, in paragraph "Absorption of light", the absorption of gamma rays ($\approx 10^{-15}$ m) causes an increase of the electron velocity by an amount comparable to the speed of light $\approx 10^8$ m/s. Accordingly, electrons and positrons comprising atomic nuclei can overcome the maximum velocity of attraction to nuclei, which occurs at a distance of $\approx 10^{-5}$ m and is of comparable magnitude (see "Atoms and spectra", "Atomic nucleus"). They can then leave the atom.

3.12.10 The Compton effect is the inelastic scattering of electromagnetic quanta by free electrons, accompanied by an increase in the wavelength of the scattered radiation. The effect is observed for short wavelengths of quanta – X-rays and gamma rays. Part of the energy of the photons is transferred to a scattering electron. In the suggested theory, the photon does not transfer momentum to the free electron. The photon is absorbed by an electron, and that increases its velocity in the direction of the photon movement. For X-rays and gamma rays, this increase is comparable to the speed of light $\approx 10^8$ m/s. Such

an electron, that has absorbed gamma ray, corresponds to the scattering electron. It will lose speed in interactions with its surrounding electrons. Secondary radiation from such a slow electron will have a wavelength longer than the original radiation. The secondary radiation corresponds to the scattered radiation of the Compton effect. If the electron absorbs a photon having a wavelength greater than the X-ray or gamma radiation, the velocity of the electron will be lower and, therefore, lower the speed difference between this electron and the surrounding electrons. Accordingly, the energy loss will be smaller and the Compton effect will not be so prominent above background radiation.

3.12.11 Photoluminescence is a process in which a substance absorbs photons and then re-radiates photons. In the suggested theory, this process corresponds to the generation of secondary n=1-objects after the absorption of the primary n=1-objects by electrons.

3.12.12 The Doppler effect. In modern physics, there are longitudinal and transverse Doppler effects. First, we will consider the longitudinal effect. If a receiver is moving away from a light source at a speed V, the formal velocity of the emitted n=1-object (quantum) becomes equal to $(c - V)$ relative the receiver, i.e. the velocity is decreased by a factor $1/(1 - V/c)$. If the receiver approaches the light source at a speed V, the velocity of the emitted n=1-objects becomes equal to $(c + V)$, i.e. the velocity increases by a factor $(1 + V/c)$. However, in the suggested theory, the velocity of n=1-objects is constant relative to n=0-objects(II)"−","+" (electrons/positrons), i.e. relative to the receiver. To keep the velocity constant, the length of n=1-objects should be changed by the same factor, but in the opposite direction. This means that the wavelength of received quanta, l', (on the receiver) will be equal to the wavelength, l, (from the emitter) increased in the first case and decreased in the second.

$$l' = l(1/(1 - V/c)) \qquad l' = l(1/(1 + V/c))$$

Accordingly, on the basis of a constant velocity $c = v_1$, the frequency of received quanta, ν', can be expressed as follows:

$$l' = c/\nu' = c/\nu(1 - V/c) \qquad l' = c/\nu' = c/\nu(1 + V/c)$$
$$\nu' = \nu(1 - V/c) \qquad \nu' = \nu(1 + V/c)$$

These equations are inconsistent with the classical ones for waves in a medium (where c is the speed of wave propagation in the medium), when there is a stationary receiver and a moving source ($\nu' = \nu/(1 - V/c)$ and $\nu' = \nu/(1 + V/c)$). At the same time, they correspond to the case of the stationary source and moving receiver ($\nu' = \nu(1 - V/c)$ and $\nu' = \nu(1 + V/c)$). When compared with the STR, the proposed equations are in agreement with the approximation in STR for low velocities:

$$\nu' = \nu\sqrt{(1 - V/c)}/\sqrt{(1 + V/c)} \approx \nu\,(1 - V/c)$$
$$\nu' = \nu\sqrt{(1 + V/c)}/\sqrt{(1 - V/c)} \approx \nu\,(1 + V/c)$$

The exact equations for the longitudinal Doppler effect in STR, not the approximations used for low velocities, do not coincide with the equations of the proposed theory. In STR, the factor $\sqrt{(1 - v^2/c^2)}$ from the time dilation equation, $dt' = dt/\sqrt{(1 - v^2/c^2)}$, is used. Here, it should be noted that the use of this factor leads to inconsistence of initial conditions. On the one hand, the longitudinal Doppler effect assumes velocities of v and c that are codirected. On the other hand, the same velocities, c and v, are not on the same line according to the factor $\sqrt{(1 - v^2/c^2)}$, implying that c and v are the hypotenuse and cathetus of a right angled triangle. From this reason, we consider the exact equations for the longitudinal Doppler effect in the STR to be incorrect. Supporters of the STR argue for the legitimacy of using the factor $\sqrt{(1 - v^2/c^2)}$ from Minkowski geometry, where it can be obtained from the constancy of the square of the interval, $ds^2 = ds'^2$ (where $ds'^2 = c^2dt'^2$ and $ds^2 = c^2dt^2 - dl^2$) for all inertial frames of reference, independently of the direction of the velocities as follows:

$$c^2dt'^2 = c^2dt^2 - dl^2$$
$$c^2dt'^2 = (c^2 - v^2)dt^2$$
$$dt' = \sqrt{(1 - v^2/c^2)}dt$$

The flaw in this argument is that Minkowski geometry preserves the orthogonality of Euclidean geometry, and introduces the 4-th coordinate, c^2dt^2, in such a way that the spatial component dl can not be co-directed to the time component cdt, since the equation $ds^2 = c^2dt^2 - dl^2$, expressing the algebraic dependence of ds, cdt, and dl, is characteristic of a right triangle with legs ds and dl,

and hypotenuse *cdt*. This dependence is expressed in the factor $\sqrt{(1 - v^2/c^2)}$, and brings us to the already mentioned internal contradiction in the equation for the longitudinal Doppler effect in the STR.

In the case of the transverse Doppler effect, there is no difference between the STR and the proposed theory. In the theory, a formal change of the velocity of n=1-objects can be calculated according to the Pythagorean theorem. Let the light source move in a circle, centered on the receiver. We then have a right triangle of velocities, with one of the legs being equal to the linear velocity v of the light source, and directed at right angles to the next leg, which is equal to the velocity V_Σ – from the moving source to receiver in the center of the circle. The hypotenuse of a triangle is equal to this maximum speed, i.e. to the speed of light. Accordingly, the velocity V_Σ is determined as follows:

$$V_\Sigma = \sqrt{(c^2 - v^2)} = c\sqrt{(1 - v^2/c^2)}$$

As in the case of the longitudinal effect, wavelength is changed in the opposite direction by a formal change of velocity:

$$l' = l/\sqrt{(1 - v^2/c^2)}$$

Accordingly, the following equation coincides with equation for the transverse Doppler effect in the STR.

$$c/\nu' = c/\nu\sqrt{(1 - v^2/c^2)} \quad \text{or} \quad \nu' = \nu\sqrt{(1 - v^2/c^2)}$$

COMMENTS

The mechanism of the reflection of light in modern physics is different from the proposed one, since the reflected photons in the theory are the same as the incident photons, but with changed direction as a result of collision with positrons within nuclei. In modern physics, the reflected photons are new, secondary photons.

3.13 MOTION OF CHARGED PARTICLES IN ELECTRIC AND MAGNETIC FIELDS

In a uniform electric field, an electron/positron will be deflected by electrostatic interactions described in "Electrostatics". In a uniform magnetic field, the deviation of charged particles will take place in accordance with the Lorentz force. This is an attraction/repulsion of the electron as a result of the relative motion of the directed n=0-objects(I) that comprise the magnetic field lines of density $\boldsymbol{\rho_\Delta}$. In figure 19, magnetic fields are created by two oppositely directed currents; by the current of the moving electrons, and by the current generating the external magnetic field in solenoid.

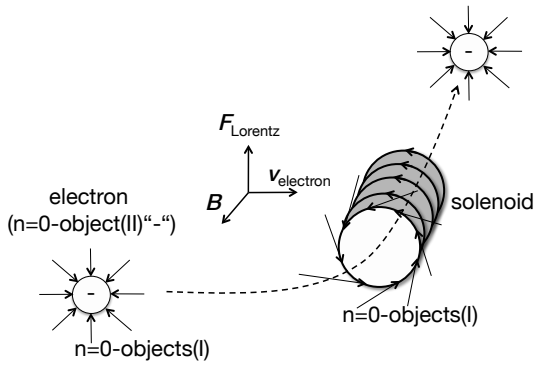

Figure 19. Scheme of the deflection of electron in the magnetic field.

Since the n=0-objects(I) of these fields are oppositely directed, electrons will be deflected up as a result of repulsion of these magnetic fields. This is consistent with the known results for the electrons having such a velocity, $\boldsymbol{v}$, and the direction of magnetic induction, $\boldsymbol{B}$. In the case of positively charged particles, the n=0-objects(I) of magnetic fields are collinear and the particles will move in the opposite direction.

According to modern physics, the Lorentz force does not do the work because the magnetic induction vector $\boldsymbol{B}$ is directed perpendicular rather than along the particle trajectory. In the proposed theory, the magnetic induction vector $\boldsymbol{B}$ is expressed through the vector $\boldsymbol{E_i}$ ($\boldsymbol{B} = \mathrm{rot}\boldsymbol{E_i}$) Accordingly, the Lorentz force does work on the deflection of a charged particle, since the vector $\boldsymbol{E_i} = \boldsymbol{\rho_\Delta}$ of the magnetic field that defines the repulsion/attraction is not perpendicular, but is directed along the particle trajectory.

It is known that the deflection of charged particles in electric and magnetic fields is dependent upon their velocity. Experimental studies of this dependence were conducted by Joseph John Thomson and Walter Kaufmann. In the Kaufmann experiments, electrons of differing velocity were transmitted simultaneously through the transverse electric and magnetic fields (Fig. 20).

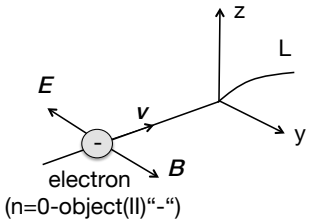

Figure 20. Scheme of the Kaufmann experiment.

It was found that with increasing velocity of electrons, their acceleration was less than expected, and the deflection is determined in accordance with the formula:

$$z^2 = (eB^2 l^2\sqrt{(1 - v^2/c^2)})y/2c^2Em_e$$

where z and y – the deflection along the axes of the same name, $\boldsymbol{E}$ and $\boldsymbol{B}$ - the electric field and the magnetic induction, v – velocity of the electron, l – distance to the screen, m_e – mass of the electron, e – electric charge of the electron, c – the speed of light.

The observed reduction of acceleration was proposed to be because of increased electron mass m, according the equation: $m = m_e/\sqrt{(1 - v^2/c^2)}$. In the suggested theory, the reduction of acceleration is not connected with a mass increase, but with the same decrease of the electron charge. The electron charge, e, is determined by the density on undirected n=0-objects(I), $e = \rho_0$. It corresponds to the maximum velocity of interaction between the electrons, $v_0\rho_0$. If one of the two electrons (n=0-objects(II)"−") has velocity, v, perpendicular to the velocity of their repulsion, their total velocity relative to each other is determined by the following equation (see "Definition of the relative motion of n=0-objects(II)"−","+" of different types"):

$$V_\Sigma = v_0\rho_\Sigma/4\pi R^2 = v_0\rho_0(\sqrt{(1 - v^2/(v_0\rho_0)^2)})/4\pi R^2$$

where $\rho_\Sigma = \rho_0\sqrt{(1 - v^2/(v_0\rho_0)^2)}$.

This implies that the charge of electron, $e_v = \rho_\Sigma$, moving perpendicular to the direction of attraction/repulsion with the velocity, v, is determined by the following equation:

$$e_v = e\sqrt{(1 - v^2/(v_0\rho_0)^2)}$$

where $v_0\rho_0 \approx c$, $e = \rho_0$, $e_v = \rho_\Sigma$

This dependence is present in the Kaufmann equation.

Charged particles moving at relativistic velocities along trajectories curved by a magnetic field will emit electromagnetic radiation – synchrotron radiation. In the suggested theory, the cause of this radiation is the same as in the case of atomic emission – the decrease in density of directed n=0-objects(I). In contrast to atoms, where the density decrease is due to electrostatic attraction at a distance between $\approx 10^{-5}$ m to $\approx 10^{-10}$ m, in this case the reduction occurs as a result of directional changes of moving electrons/positrons. As mentioned above, moving electrons/positrons generate an excess of directed n=0-objects(I) in front of them, due to the fact that the moving electrons/positrons displace n=0-objects(I) from the space they occupied. If electrons/positrons change their direction of motion, the excess of directed n=0-objects(I) from the previous direction will turn to n=1-objects. The reason for the direction change is the action of the magnetic field, the Lorentz force. Therefore, one can say that the work of the Lorentz force to change the direction of moving electrons/positrons leads to the emission. When particles are moving with nonrelativistic velocities along circular or spiral trajectories in a magnetic field, the emission of electromagnetic rays is called cyclotron radiation.

3.14 GRAVITATIONAL ATTRACTION

To understand the gravitational attraction we refer back to the idea from the section "Definition of relative motion of n=0-objects(II)"−","+" and n=0-objects(I)", where the density of undirected n=0-objects(I) around n=0-objects(II)"−","+" (i.e. electrons and positrons), ρ_0, was shown to decreased. The magnitude of this decrease in density ρ_M is determined by the following equation and is inversely proportional to the square of the distance R:

$$\rho_M = M/2(4\pi R^2)$$

where R – distance measured in the length of n=0-object(I), M – the number of n=0-objects(II)"−","+".

The density gradient of undirected n=0-objects(I), which are moving relative to each other, means

that electrons/positrons attract each other along the gradient, regardless of their charge (see "Definition of relative motion of n=0-objects(II)"−","+" and n=0-objects(I)"). The velocity of attraction from the distance R to the distance $R - \Delta R$ is defined by the following sum of velocities, similar to the velocity of attraction/repulsion of pairs of n=0-objects(II)"−","+":

$$V = (v_0 M/8\pi) \sum_{R}^{R-\Delta R} R^{-2}$$

where $R - \Delta R$ and R are distances measured by the length of n=0-object(I), M – the number of n=0-objects(II)"−","+".

Similar to the attraction shown between bodies (composed by electrons and positrons), non-zero-dimensional objects, like electromagnetic quanta (n=1-objects), will also be attracted by bodies consisted of electrons and positrons, as a result of the movement of undirected n=0-objects(I) having density gradient created by bodies.

In the suggested theory, as in the case of electrostatic interaction, the gravitational force has an upper bound, i.e. a maximum distance of the gravitational attraction, R_{max}. This distance corresponds to the minimum change in density equal to a single n=0-object(I). The lower boundary, i.e. the minimum distance of the gravitational attraction, R_{min}, corresponds to the length of an n=0-object(I). The maximum distance of the gravitational attraction can be calculated as follows. Assume that the density, ρ_M, is the same all along the linear size of a body. In the formula above, a linear body size can be used as the unit of length to measure the distance R, not the length of n=0-object(I). In this case, there is no need to sum parts, corresponding to length of n=0-objects(I). Then, the density ρ_M will be inversely proportional to the square of the distance and the unit of discreteness is not the length of n=0-object(I), but the linear body size, along which the density value ρ_M is the same. As an example, we can determine the maximum boundary of gravitational attraction for the Sun, and for the Earth. From the equality of the density ρ_M to one ($1 = \rho_M/8\pi R^2$), the maximum distance R_{max}, in units of Sun diameters (10^9 m), is the square root of $\rho_M/8\pi$, $\sqrt{(\rho_M/8\pi)}$. The value of the density of n=0-objects(I), ρ_M, for the Sun, ρ_{Sun}, can be defined as equal to $\rho_0 = 10^{10}$. That is based on the following considerations. In the section above describing atomic nuclei, and in the section bellow about stars formation, it was assumed that stars are composed of densely packed electrons and positrons, the same as atomic nuclei. From this analogy, the density of n=0-objects(I) in the volume occupied by electrons and positrons should be reduced by the amount of their number falling on the length of n=0-object(I). Based on the values of the length of an n=0-object(I), 10^{-5} m, and the length of electron/positron, 10^{-15} m, it follows that along the length of each n=0-object(I) it would be possible to assemble around 10^{10} electrons/positrons, and these would form overlapping arrangements similar to that shown in atomic nuclei (Fig. 14d). Since the density of n=0-objects(I), ρ_0, is equal to $\approx 10^{10}$, it thus corresponds to the density of n=0-objects(I), ρ_M, displaced by electrons/positrons matter of stars. Consequently, the density of n=0-objects(I) for the sun, ρ_{Sun}, is equal to $\approx 10^{10}$. This means that all n=0-objects(I) are displaced by electrons/positrons of the stars. According to equation $R_{max} = \sqrt{(\rho_{Sun}/8\pi)}$, R_{max} is then equal to $\approx 10^4$ Sun diameters (10^9 m), or 10^{13} meters. This is comparable with the distance from the Sun to the Kuiper belt. A similar calculation for the Earth, given its diameter is $\approx 10^7$ m, and assuming the maximum change in density, ρ_{Earth}, is of the order $\approx 10^6$–10^7, gives a gravitational boundary of about 10 million kilometers, which is 10 times smaller than the distance from the Earth to the Sun (Fig. 21).

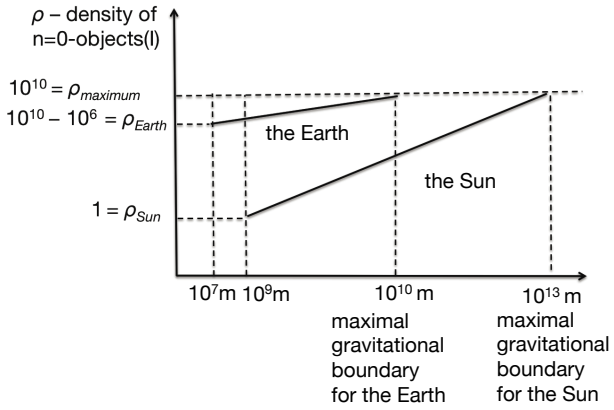

Figure 21. Comparison of the gravitational boundaries for the Earth and the Sun.

Since gravity has boundary in the proposed model, the formation of galaxies is different and is not a

result of gravitational contraction of the hydrogen masses (see section "Cosmology"). As described in the section "Electrostatics", changes in the electrostatic field of moving charges does not act with the velocity of interaction, but instantly. This is because the velocity of attraction/repulsion of charges is determined by the spatial distribution of density of directed n=0-objects(I) between them, and follows an inverse square law. An inverse square law applies also for gravitational interactions, but there are some differences. In the case of charge interactions, the density of undirected n=0-objects(I), ρ_0, determining the density of directed n=0-objects(I), is constant with the motion of charges. In the case of gravity, the density of the undirected n=0-objects(I), which determines the interaction, is the density ρ_M of undirected n=0-objects(I) replaced by the gravitating body. The process of displacement is not instantaneous, but occurs at a velocity that depends on the initial density of undirected n=0-objects(I) ρ_0, and is comparable to the speed of light. Accordingly, a moving body displaces the undirected n=0-objects(I) from the body volume at velocity $v_0\rho_0$, and, consequently, there is a time delay in changing the gravitational attraction of the moving body. In another case, when one body is at a resting state and the other is moving, the resting body acts on the moving body instantly. The consequence of this mechanism of gravitation is that when a body moves faster than $v_0\rho_0$, the undirected n=0-objects(I) will not be replaced by this body. The moving body will leave the area earlier than the n=0-objects(I). As a result, the body moving at such a speed does not generate gravity. This relationship can be expressed in terms of the effective gravitational mass, M_{ef}, and resting mass, M, as follows: $M_{ef} = M(1 - V/v_0\rho_0)$. If a body revolves around another body, the effective gravitational mass, M_{ef}, of a rotating body is: $M_{ef} = M\sqrt{(1 - V^2/(v_0\rho_0)^2)}$.

A consequence of the proposed mechanism of gravitation, which is based on the change in density ρ_0, is a change of the charge of an electron in a gravitational field, since the elementary charge is determined by the density of undirected n=0-objects(I), ρ_0. The increase of density ρ_M (increase of gravity) corresponds to a decrease in ρ_0, i.e. a decrease of the elementary charge. In the suggested theory, the observed gravitational redshift can be explained by a decrease in the density ρ_0, since, according to the equation for the generated quantum (see "Secondary formation of n≠0-objects"), its wavelength is inversely proportional to the density ρ_0.

$$\lambda = {}^1L = Lv_1q_0 3/4\pi\rho_0((1/n^2) - (1/m^2))$$

The closer generating atoms are to a massive body, the lower is the density ρ_0 and, consequently, the longer the wavelength and the greater the shift of the observed spectral lines to the red region of the spectrum. From experimental data for light emitted at a distance r from a massive body (and received at infinity), the shift is approximately equal to:

$$z_{approx} = GM/c^2r$$

where z_{approx} – the shift of spectral lines under the influence of gravity (as measured by an observer at infinity), G – Newton's gravitational constant, M – mass of the gravitating body, c – the speed of light, r – the radial distance from the center of the source body.

Another consequence of the proposed mechanism of gravitation is the existence of so-called black holes. By definition, a black hole is a region in space, which cannot emit light quanta due to the strong gravitational attraction. In the suggested theory, this is possible because of the reduction in density of undirected n=0-objects(I), ρ_0, from 10^{10} down to 1. This means that the velocity of gravitational attraction, $v_0\rho_0$, will be greater than the speed of light. As noted above, the decrease in density of undirected n=0-objects(I) by 10^{10} times is typical for all stars, including the Sun. Thus, the velocity of Sun gravity is greater than the speed of light, and therefore we can say that Sun has a black hole inside. In addition, since the density of n=0-objects(I) inside the Sun is minimal, i.e. equal to 1 (n=0-objects(I) are displaced by electrons/positrons) inside the Sun, the generation of electromagnetic rays is not possible, since the change in the density of n=0-objects(I) is less than 1 is not possible. The same is valid for all the stars. This follows from the equation for generated electromagnetic quanta, n=1-objects:

$$\lambda = {}^1L = Lv_1q_0 3/4\pi\rho_0((1/n^2) - (1/m^2))$$

Therefore, stars are cold inside. Radiation occurs only at the surface, since there the density of n=0-objects(I) is greater than one.

COMMENTS

In the suggested theory, the cause of gravitational attraction is due to the presence of the density gradient of the vacuum particle (undirected n=0-objects(I)). It is formed around the body because of the three-dimensional density distribution of the displaced vacuum particles from the volume of the gravitating body. As a result, a body will move along this density gradient of the vacuum particles towards the gravitating body. Thus, as in general relativity, the underlying basis of gravity is geometric, the existence of three-dimensional space. Unlike general relativity, the suggested theory posits that the various gravitational effects are explained not by time dilation, but by a change of density (about general relativity, see below) of the vacuum particles (undirected n=0-objects(I)) in three-dimensional Euclidean space.

In contrast to existing theories of gravitation, which describe interactions over unlimited distances, the proposed theory of gravitational attraction has a maximal boundary defined by the mass. Because of this, the gravitational interaction should be redefined as the gravitational attraction. If a body of greater mass can attract a body of lower mass, the body of lower mass may not be able to act on a body of greater mass if the latter body is far from the maximal boundary of gravity of the body of lower mass.

3.15 CLASSICAL MECHANICS

Classical mechanics is based on Newton's laws and the principle of Galilean relativity. Let us consider each of Newton's laws in terms of the proposed theory.

Newton's first law says. *"Every body persists in its state of being at rest or of moving uniformly straight forward, except insofar as it is compelled to change its state by force impressed (from the original Latin of Newton's Principia translated to English, http://en.wikipedia.org/wiki/Newton's_laws_of_motion)."* Given that atoms are made up of n=0-objects(II)"−","+", the laws of classical mechanics describe the relative motions of the n=0-objects(II)"−","+". The velocity of n=0-objects(II)"−","+" is constant in the absence of their attraction or repulsion and the generation of n=1-, n=2- and n=3-objects. Consequently, the Newton's first law express nothing but the constancy of the velocity of n=0-objects(II)"−","+".

The second law of Newton states the following. *"The change of momentum of a body is proportional to the impulse impressed on the body, and happens along the straight line on which that impulse is impressed (from the original Latin of Newton's Principia translated to English, http://en.wikipedia.org/wiki/Newton's_laws_of_motion)."* In modern physics, a force is defined as the product of the acceleration and the inertial mass. In the proposed theory, the concept of inertial mass is defined as the amount of n=0-objects(II)"−","+". Gravitational mass has the same definition. The direct proportionality of gravitational and inertial mass is due to the definition of mass as the amount of n=0-objects(II)"−","+". Acceleration is a change in velocity per unit of time. The time unit, as discussed in the first pages of the theory, is an unit of velocity. Accordingly, the concept of force is a secondary concept, which is more convenient for determination of motion with variable speed, but it can be reduced to a derivative of the velocity. More simply stated, the concept of force is nothing more than another designation of a change in velocity. In the proposed theory, the central force acting on an object (as in the case of gravitational and electrostatic interactions) is defined in terms of the change of velocity due to the density gradient of n=0-objects(I) around n=0-objects(II)"−","+" (electrons, positrons). The gradient is determined in inverse proportion to the square of the distance, which is due to the three-dimensionality of space. In other words, accelerated motion, i.e. movement with increasing velocity, is not a result of the force acting on a body but rather a consequence of its location in a region of space with a characteristic density gradient of n=0-objects(I). This means that the concept of force is not a fundamental concept, in contrast to the concept of velocity. Accordingly, the concept of inertial forces is consistent, since like any other force, it describes motion with variable velocity by changing the direction of motion. There is then no need for a source of inertial forces.

Newton's third law states. *"To every action there is always an equal and opposite reaction: or the forces of two bodies on each other are always equal and are directed in opposite directions (from the original Latin of Newton's Principia translated to English, http://en.wikipedia.org/wiki/Newton's_laws_of_motion)*

." In the proposed theory, this law is due to the symmetry of repulsion of n=0-objects(II)"−","+".

In classical mechanics, momentum is defined as a product of velocity and inertial mass, and the momentum conservation law establishes the equality of a product of velocity and inertial mass for the closed system in two different states. Inertial mass determines the number of n=0-objects(II)"−","+". Thus, the law of conservation of momentum reflects the fact that the change in velocities of n=0-objects(II)"−","+" in a closed system is a result of a redistribution of the velocities of n=0-objects(II)"−","+". In the suggested theory, the momentum conservation law is valid for a system consisting of only n=0-objects(II)"−","+", i.e. electrons and positrons. In contrast to the modern physics, the interaction of the photon and electron causes no redistribution of momentum. The photon is absorbed by an electron, leading to an increase in electron velocity in the direction of the photon. If the photon is reflected from the positron, the positron will not change its velocity.

In contrast to momentum, energy is proportional to the square of velocity, and is not a vector, but a scalar. This concept of energy is different from that used in the proposed theory, in which energy is the opposite of length. Why is the classical concept of energy defined by the square of velocity? We consider this is due to the orthogonality of Euclidean space. In such space the square of velocity is a scalar form of velocity, which allows the algebraic operations of addition and subtraction in the three-dimensional space, i.e. along three orthogonal axes. Accordingly, describing the energy of n=0-object(II)"−","+", i.e. square of the velocity of n=0-object(II)"−","+", enables one to express the conservation of n=0-objects(II)"−","+" velocities in the form of a scalar sum of squares of velocities of n=0-objects(II)"−","+". For example, if in three-dimensional space several n=0-objects(II)"−","+" have different velocities, these velocities can be decomposed into the projections along three orthogonal coordinate axes. By adding the squares of these projections we can get square of the total velocity of the system. This square of total velocity defines the energy of the entire system of n=0-objects(II)"−","+".

COMMENTS

The proposed theory is entirely consistent with the laws of classical mechanics. It holds the principle of relativity of Galileo and Newton's laws. In contrast to classical mechanics, the proposed theory provides an unambiguous definition of mass as the number of n=0-objects(II)"−","+" (electrons/positron). The concept of force is defined as an auxiliary, secondary notion. The motion of n=0-objects(II)"−","+" is primary, and change of their velocity defines the concept of force (for the given amount of moved n=0-objects(II)"−","+"). The laws of conservation of momentum and energy are consequences of the primacy and constancy of motion of n=0-objects(II)"−","+".

3.16 SPECIAL THEORY OF RELATIVITY (STR) AND GENERAL THEORY OF RELATIVITY (GTR)

3.16.1 STR was built as an electrodynamics of moving bodies based on two postulates. One of them is the constancy of the speed of light in all inertial frames of reference, or, in other words, the independence of the speed of light from the motion of the light source. The second is the principle of relativity. It is assumed that all inertial frames of reference are equivalent and there is no special frame of reference for the laws of electrodynamics – Maxwell's equations, or for the laws of mechanics. Why did these postulates and STR based on them appear in physics? At the time when STR was created, the existence of an ether, an all pervading, fundamental reference frame, was being actively discussed. The Michelson-Morley experiment gave negative results in the detection of an ether wind (light was considered as a wave in the ether, and the ether wind would change the speed of light). If an ether had been detected, then it would have represented a special frame of reference for the phenomena of electrodynamics, and the STR would not have been necessary. However, in the absence of an ether, all inertial frames of reference were considered to be equivalent and therefore the Maxwell's equations had to maintain their form in different frames of reference, similar to classical mechanics. Experimentally, this was not found to be the case. There was asymmetry between frames of reference due to the fact that, for example, the speed of charge current and, consequently, the existence of a magnetic field depended on the choice of the frame. Also, the speed of light was supposed to be constant on the basis of experimental data, but the

use of Galilean transformation required changes of it. Instead of Galilean transformation, Einstein proposed to use the Lorentz transformation and by this means eliminated the asymmetry between different inertial reference frames. In this way, he implemented the principle of relativity and the postulate of the constancy of the speed of light.

The proposed theory is consistent with the postulate of STR regarding the constancy of the speed of light, but in contrast to STR the constancy of the speed of light has a cause - the spatial dimension. Since light quanta are n=1-objects, i.e. objects of one-dimensional space, they are always moving at the same velocity relative to n=0-objects(II)"−","+" of zero-dimensional space, regardless of the speed of n=0-objects(II)"−","+". If the reference system is changed, the constancy of the speed is provided by the inverse relation of the length of photons, as expressed by the Doppler effect (see section on "Optics"). Further, if in Maxwell electrodynamics and so also in the STR, the electromagnetic field and electromagnetic quanta have the same nature and are defined by Maxwell's equations, then in the proposed theory the electromagnetic quanta and the electromagnetic field are different entities of nature. The field consists of objects of zero-dimensional space, n=0-objects(I), while photons are the objects of one-dimensional space, n=1-objects. (As noted above, there is a connection between them. Electromagnetic field change can lead to the generation of n=1-objects.) Therefore, the speed of light in the Michelson-Morley experiment would not change relative to an ether wind because light is not a wave in the ether. In the proposed theory, the ether exists as n=0-objects(I) moving in three-dimensional Euclidean space. Because of this, an attraction/repulsion of charges (electrons/positrons) is defined in the Maxwell's equations by the maximum density of n=0-objects(I) ρ_0 (for an electrostatic field) or its change $\boldsymbol{\rho_\Delta}$ (for a magnetic field), generated by the motion of electrons/positrons.

In contrast to the STR, the proposed theory posits that different frames of reference are not equal. I.e. the second postulate, the relativity principle, is not valid for phenomena of electrodynamics. There is a unique absolute frame of reference – an ether, the frame associated with the space of n=0-objects(I) moving relative to each other. Since the electrostatic field of the charge is defined by the density of n=0-objects(I), ρ_0, it cannot be changed (without gravity) when the frame of reference is changed. In the absence of gravity, magnetic induction also does not depend on the choice of the reference frame, since it determines the change in density of directed n=0-objects(I), $\boldsymbol{\rho_\Delta}$, relative to undirected n=0-objects(I) of density ρ_0. As suggested above, in Maxwell's equations the constant c corresponds to a product of velocity v_0 and maximum density of n=0-objects(I) ρ_0, $v_0\rho_0$, and it is not the speed of light. Therefore, it should not obey Galilean transformation for velocity. The maximal velocity $v_0\rho_0$ decreases with time, since density ρ_0 was greater in the past than at present. To date, it is comparable with the speed of light and corresponds to the constant c.

According to the proposed theory, it is also wrong to use STR to describe the motion of a body consisting of atoms. If, in the case of photons, STR is consistent with the proposed theory, it is because of the photons length, as the objects of one-dimensional space, is changing in Doppler effects and keeping constancy of the speed of light. The same changes in length are not applicable to the objects of zero-dimensional space, n=0-objects(II)"−","+" (electrons and positrons) composing atoms. In other words, there is no Lorentz contraction of lengths of physical objects in the suggested theory. Also, STR is not suitable for explaining the dynamics of bodies composed of atoms. The increase in mass of a body with increasing velocity is not possible. The inertial mass is determined by the number of electrons/positrons, and this number cannot depend on the speed. Therefore, there is no infinitely large mass at the speed of light. The velocity of electrons/positrons are not limited by the speed of light. In the early universe, the velocity of electrons/positrons was greater than the speed of light because the density of n=0-objects(I) ρ_0 was higher than today, giving them a higher velocity of electrostatic interaction.

Another difference between the proposed theory and STR is the conception of time. In the proposed theory, as in classical mechanics, time is just a matter of agreement. Time is an artificial concept, introduced for convenience to describe the motion of objects, and must be defined as the same in all inertial frames of reference. In special relativity, because of the heterogeneity of time in different frames of reference, there are temporal paradoxes, such as the twin paradox, due to time dilation in the moving frame of reference. In the

proposed theory, this is not possible.

3.16.2 GTR. The concept of space-time is used in GTR as it is in the special theory of relativity. In general relativity, the gravitational potential is identified with the space-time metric. Space-time is curved by a body having mass, and this causes a gravitational attraction. In the proposed theory, all phenomena take place in Euclidean space. Since both general and special relativity use the concept of space-time rather than Euclidean space, we consider these theories to be incorrect models to describe phenomena.

Phenomena, which in modern physics are explained only by general relativity, have their own interpretations in the proposed theory. For example, the gravitational redshift in general relativity is explained by gravitational time dilation. In the proposed theory, it is explained by a decrease in the density of n=0-objects(I) ρ_0 around the gravitating body (see "Gravitational attraction"). The existence of black holes can also be explained by changes in density of n=0-objects(I) ρ_0. Due to the high density of electrons and positrons, a density gradient of n=0-objects(I) will be formed where the speed of gravitational attraction is greater than the speed of light, causing photons to be unable to overcome this attraction. The same reason will also cause the gravitational delay of electromagnetic quanta – the effect of Shapiro. Another phenomenon predicted by general relativity is the gravitational deflection of light. In the proposed theory, this results from the same attraction as for the Shapiro effect. Because of the high speed of light, gravitational attraction of photons is not as noticeable as for slow-moving electrons and positrons (n=0-objects(II)"−","+"). The precession of the orbit of Mercury in the suggested theory has no obvious explanation. However, this value can be the result of the influence of other planets in the solar system, since in the proposed theory gravitational attraction has a maximal boundary.

COMMENTS

In the proposed theory, in contrast to the STR, the speed of a body is not limited by the speed of light. The velocity of electromagnetic interactions is limited by a maximum density of the vacuum particles, n=0-objects(I), ρ_0. The velocity determined by this density ρ_0, $v_0\rho_0$, is comparable to the speed of light, the velocity of object of one-dimensional space. The objects of two- and three-dimensional space move at velocities greater than this, 10 and 20 orders of magnitude above the speed of light, respectively.

3.17 QUANTUM MECHANICS

Quantum mechanics was created to explain the atom, since a classical planetary model was not satisfactory and was valid only as the Bohr model. Without the Bohr postulates, the atom would have to die as a result of energy loss by electrons (in the form of electromagnetic radiation) and their collapse into the nucleus. This paradox was formally resolved by quantum mechanics, where electrons were not allowed to have trajectories. Quantum mechanics has parameters related only to the initial and final stationary states of the electrons in atom, but not to any trajectories. Instead of the coordinates and velocities of the electron, probability values were used to describe these stationary states.

The proposed theory of the atom returns to the classical description of electron motion as having a trajectory. Electrons can move closer to the nucleus from more remote positions. At the closer distance, a photon can be generated if it complies with the integer value of the energy of the emitted photon. In this case, emission of a photon reduces the velocity of the electron. Ultimately, the electron can occupy the minimum distance at which its velocity becomes equal to zero relative to the nucleus. This distance is $\approx 10^{-10}$ m. If there is no such compliance, then the electron will not radiate, and will continue to move to the other side of the nucleus, and away from it until its attraction to the nucleus leads to a complete stop and subsequent reversal back to the nucleus at a speed corresponding to a given distance from the nucleus. In contrast to the planetary model, the proposed theory predicts that electrons do not have strictly defined orbits, but rather changing trajectories. This distinguishes also the proposed theory from quantum mechanics, where there is no concept of electron trajectories in the atom. One can say that the electron oscillates around the nucleus, with a maximum distance from the nucleus of $\approx 10^{-5}$ m. At the distance $\approx 10^{-10}$ m, the electron is at rest relative to the nucleus and does not emit photons. The absorption of a photon by an electron will increase electron velocity and distance from the nucleus.

Another problem that was solved by

quantum mechanics is the wave-particle duality. When particles pass through a thin metal film, diffraction rings are formed on a screen behind the film. A similar pattern is observed in the case of X-rays. Since X-radiation is believed to be a wave, it was suggested that particles can act in a similar manner, like waves. This phenomenon was termed the wave-particle duality. To explain this in quantum mechanics, it was decided to replace the notion of a trajectory with the concept of a superposition of states, more precisely, the superposition of probability of alternative states, i.e. probability for a particle to be at the same time in alternative states. In this context, the particle in each experiment can be detected with a certain probability, in one of these states. In the suggested theory, there is no wave-particle duality. Wave feature of particles in such phenomena as diffraction and interference are not due to the wave nature of the particles, but because of the generation of waves in the vacuum, which consists of n=0-objects(I) (see "Optics"). The cause of waves of the n=0-objects(I) is the motion of photons or other particles, since they displace the n=0-objects(I). The displaced n=0-objects(I) move like a wave and the velocity of these waves is close to the speed of light (slightly higher). Waves of n=0-objects(I) create waves of particles, moving relative to the n=0-objects(I). This mechanism can explain the interference in the double-slit experiment, where the intensity of particles was set so low that only one particle could pass through the slits at any time. The same interference pattern is observed at both high and low particle fluxes. Quantum mechanics argues that this result is the inherent property of the particles, their nondeterministic, probabilistic behavior, according to the uncertainty principle. In the proposed theory, this interference pattern arises from the interference of waves of n=0-objects(I), displaced by moving particles. In this way, the interpretation of the two-slit experiment is returned to the deterministic view.

The proposed theory also explains the discreteness of atomic spectra. Space, in the proposed theory, is composed a finite number of n=0-objects(I), so space is not infinitely divisible, i.e. matter is discrete. Since the number of n=0-objects(I), defining their density in the certain area of the space, is finite, then the difference of densities for different electron positions are also integers that determines the length of the generated n=1-object, as a multiple of an integer unit (see "Atoms and spectra").

3.17.1 QUANTUM TUNNELING

In the proposed theory, explanation of the phenomenon of quantum tunneling does not require the uncertainty principle. As presented above (see "Superconductivity"), the tunneling of the electron has the same nature as superconductivity. It is due to the lack of interaction of the tunneling electron with the nucleus and electrons between 10^{-15} m and 10^{-10} m from the nucleus of atom.

3.17.2 THE CASIMIR EFFECT

The Casimir effect is the attraction of electrically neutral conductors and insulators. The distance, from which the effect becomes detectable, is a few micrometers. With decreasing distance the attractive force increases in inverse proportion to the distance in power of four. In modern physics, the effect is explained by quantum fluctuations of virtual particles of the electromagnetic field. In the proposed theory, the effect can be due to density fluctuations of n=0-objects(I). The fact that the length of n=0-object(I), $\approx 10^{-5}$ m, is comparable with the distance at which the Casimir effect begins to appear (several micrometers) fits with the proposed interpretation.

COMMENTS

The main difference between the proposed theory and the quantum theory is the deterministic character of physical phenomena and the rejection of their probabilistic nature. The uncertainty principle is not a principle of nature; at best it is a statistical description, at worst – it is a delusion. Quantization of physical quantities is a manifestation of the discreteness and finiteness of matter of our universe.

3.18 COSMOLOGY

3.18.1 EVOLUTION OF THE UNIVERSE

In the proposed theory, the development of the universe is represented as follows. Objects constituting the universe are moving relative to each other, resulting in a periodically contracted and extended universe. This cyclical expansion has two phases, the α-phase and the β-phase, that

oscillate between each other. In the initial state, the universe is zero-dimensional space, i.e. consists of objects of zero-dimensional space – n=0-objects(I). The universe has a minimal linear size at the beginning of the β-phase, when its size is equal to the size of objects of zero-dimensional space of the β-phase – $L/q = h$. Since the value of h is equal to 10^{-40} times of the absolute unit of length (which is $\approx 10^{-5}$ m), the minimal linear size of the universe is 10^{-45} m. As a result of the relative motion of objects of zero-dimensional space, n=0-objects(I) of the β-phase, the universe will expand and at some moment reach a linear size equal to the length of objects of one-dimensional space of the β-phase, (n=1-object), $\approx 10^{-25}$ m. The equal amount of n=0-objects(I) of the β-phase becomes n=1-objects and n=0-objects(II)"−","+", having a length $\approx 10^{-35}$ m. Further expansion will lead to the emergence of two-dimensional space and n=2-objects having the length $\approx 10^{-15}$ m. Finally, expansion of the β-phase will lead to the emergence of a three-dimensional space and n=3-objects with a characteristic length $\approx 10^{-5}$ m. This length, $\approx 10^{-5}$ m, corresponds to the absolute length unit, $\approx 10^{-5}$ m. At this point, when three-dimensional space will appear, simultaneously, a transition from the β-phase to the α-phase will occur. Zero-dimensional space of the α-phase will arise and expand to a linear size equal to the length of objects of one-dimensional space of the α-phase, which will lead to the formation of one-dimensional space and its objects, n=1-objects. I.e. on the α-phase, in addition to zero-dimensional space one-dimensional space will appear, and n=1-objects of the α-phase will be generated from objects of the zero-dimensional space of the α-phase. The equal amount of the n=0-objects(I) will become n=1-objects and n=0-objects(II)"−","+". At this time, objects of zero-dimensional space, n=0-objects(I) and n=0-objects(II)"−","+", will coexist with the objects of one-dimensional space, n=1-objects, as in the case of β-phase. Further, the one-dimensional universe will continue to expand until it reaches a size equal to the length of objects of two-dimensional space of the α-phase (n=2-objects), $\approx 10^{5}$ m. Accordingly, in addition to one-dimensional space, two-dimensional space will appear, in which there will be objects of zero-, one-, two-dimensional spaces. Similarly, when the linear size of the expanding universe reaches $\approx 10^{15}$ m, in the α-phase, three-dimensional space and its objects (n=3-objects) will appear. Because the density of the n=0-objects(I) will decrease with time (with an increase in total length), then over time the speed of expansion of the universe for the same distance between two points will decrease.

According to the section "Electrostatics", the density ρ_0 to date is $\approx 10^{10}$ and, consequently, the velocity of the universe expansion is $\approx 10^{8}$ m/s, i.e. comparable to the speed of light. It should be noted that the above value of the density of n=0-objects(I) corresponds to one, described in the second section, "head to tail" set of n=0-objects. The number of such sets is $\approx 10^{40}$. They are located in parallel to each other. Since, in every set there are 10^{40} n=0-objects(I), the number of other n-objects of non-zero spaces (based on the proportional ratio) is also a number of the same order. Since the number of sets is $\approx 10^{40}$, the total number of n-objects is equal to $\approx 10^{80}$. This means that the number of electrons, positrons, protons and neutrons in our universe is about 10^{80}, which is consistent with estimates in modern physics.

The n=0-objects(II)"−","+" of the α-phase in the one-, two- and three-dimensional spaces have the same linear size $\approx 10^{-15}$ m, despite the fact that their volume is different. Based on the linear size of the universe, the linear size of the n=0-objects(II)"−","+" and their number of 10^{80}, the relative distribution of the n=0-objects(II)"−","+" in n-dimensional spaces can be determined. A simple calculation shows that in one-dimensional space, they should overlap, since their total volume is more than volume of one-dimensional space for its maximal linear size $\approx 10^{5}$ m, corresponding to the transition from one-dimensional to two-dimensional space – $10^{80} \times 10^{-15} > 10^{5}$ m. In the case of two-dimensional space, the situation is similar - $10^{80} \times 10^{-15x2} > 10^{15x2}$ m^2. It varies with the formation of three-dimensional space, since its volume at the time of formation, i.e. with linear dimensions of $\approx 10^{15}$ m, will be greater than the total volume of n=0-objects(II)"−","+" - $10^{80} \times 10^{-15x3} < 10^{15x3}$ m^3. Thus, if before the formation of three-dimensional space, all the electrons and positrons overlap, from the moment of formation of three-dimensional space they can be distributed without overlapping each other. In addition, since there are n=1-objects in three-dimensional space, i.e. quanta of the electromagnetic field with a wavelength of

$\approx 10^{-5}$ m, as well as, n=2-objects and n=3-objects, then electrons can absorb them and so increase their speed. This means that at the moment of formation of three-dimensional space, electrons and positrons will go from a dense overlapping state to a state of scattering relative to each other. In other words, formation of the three-dimensional universe will cause an explosion, the dispersion of matter consisting of overlapping electrons and positrons. A similar state of the overlap of electrons and positrons takes place in the nuclei of atoms. I.e. we can say that in the proposed theory proto-matter has a nuclear structure.

At the beginning of the three-dimensional space, the density ρ_0 was greater than today. The initial density can be calculated as the ratio of the maximum density $\rho_0 \approx 10^{40}$ to the linear size of the universe, expressed in absolute units of length. For the transition from two- to three-dimensional space, characterized by length $\approx 10^{20}$, such calculation gives a value for the density $\rho_0 \approx 10^{20}$, that is 10^{10} times more than the present value of the density $\rho_0 \approx 10^{10}$. The density ρ_0 determines the wavelength of electromagnetic radiation in inverse proportion (see "Atoms and spectra"). An increase in the density ρ_0 causes a decrease in the length of generated electromagnetic quanta. This means that today it is possible to detect the gamma rays of cosmic origin of the early universe with the minimal length $\approx 10^{-26}$ m. Because these gamma rays are formed in the early development of three-dimensional space, their source today should be seen as coming towards us from a maximum distance. The existence of such phenomena, as gamma ray bursts and the detection of cosmic gamma rays of ultrahigh-energy, fit into the proposed idea.

The age of the universe is estimated to be about 10^{10} years. In the proposed theory, the age of universe is the same. It corresponds to the period from the beginning of the expansion of the total length of n=0-objects(I) to the value of the present size of the universe, about 10^{26} m. Today, the velocity of expansion of the total length of n=0-objects(I) is $v_0\rho_0$, which is roughly equal to the speed of light. Previously, the velocity of the expansion of the universe was greater and the distance less, and consequently the time of expansion was much smaller and can be ignored. To determine the age of the universe i.e., the time of expansion of the total length of n=0-objects(I), the known size of the universe is divided by the speed of light. The result is 10^{18} seconds, or about 10^{10} years. Similarly, we can calculate the time from the beginning of the universe before the generation of the three-dimensional universe. As mentioned above, three-dimensional space is formed when the linear size of the universe reaches $\approx 10^{15}$ m which, in absolute length units (length of n=0-objects(I), $\approx 10^{-5}$ m), is equal to a length of $\approx 10^{20}$. Accordingly, the density of the n=0-objects(I) is equal to $\approx 10^{20}$, and the velocity of the expansion, in absolute units of velocity, is $\approx 10^{20}$. Upon transfer of absolute units of velocity, 10^{-2} m/s, to meters per second, this velocity is $\approx 10^{18}$ m/s. By dividing the length of $\approx 10^{15}$ m by the speed $\approx 10^{18}$ m/s, we get the time from the beginning of the universe to the appearance of the three-dimensional universe, $\approx 10^{-3}$ s.

According to modern astrophysics, the universe is expanding with acceleration. Experimental evidence of this is a distance difference determined from the brightness of supernovae and their redshift according to Hubble's law. The distance determined from the red shift is smaller than it should be from the brightness of supernovae. These observations have been interpreted as evidence that the acceleration is being driven by the action of dark energy. In the proposed theory, this discrepancy has another explanation due to the incorrect determination of distance from redshift. Nowadays, the redshift of Hubble's law has theoretical explanation not by the Doppler effect (as it was at the time of discovery of Hubble's law), but according to a cosmological model relating recessional velocity to the expansion of the universe. The Doppler redshift is limited to one unit, otherwise the objects will move at a speed greater than the speed of light. Besides the Doppler redshift there is redshift caused by gravitation, and the gravitational redshift can be greater than one unit. The observed redshifts are greater than one unit and so can be considered as gravitational in origin. The gravitational redshift in the proposed theory is due to a decrease in density ρ_0 (see section "Gravitational attraction"). The less distance to a massive body, the lower the density ρ_0 and, accordingly, the greater wavelength and larger the redshift. In the early universe, the density ρ_0 was greater than today. Accordingly, the gravitational redshift from distant cosmic objects of the early universe will be less than redshift from closer objects. This explains the less than expected redshift for distance determined from brightness

of supernovae. Thus, the universe is not expanding with acceleration and there is no need for the concept of dark energy.

The proposed theory has a simple explanation for the existence of relic radiation. The formation of one-dimensional space means the generation of n=1-objects (electromagnetic quanta), whose length is equal to the absolute unit of length $\approx 10^{-5}$ m. This length corresponds to the wavelength of relic radiation. Thus, the relic radiation represents n=1-objects of one-dimensional space that have remained after their absorption by electrons. Obviously, n=2- and n=3-objects generated in result of the formation of n=2 -, n=3-dimensional spaces of the universe, should also exist in the three-dimensional space. They are predicted to have tremendous speed, $\approx 10^{18}$ m/s and 10^{28} m/s respectively, as well as considerable lengths, $\approx 10^{5}$ m and 10^{15} m, respectively. Similar to the objects of one-dimensional space, they are absorbed/emitted by electrons and reflected from positrons without changing their velocity. At the beginning of the formation of the universe, electrons and positrons are not moving relative to each other. Absorption of the n=1-, n=2-, n=3-objects will increase velocity of the electrons and this will lead to the spatial separation of the moving electrons from the resting positrons. Such separation will create electrostatic attractions resulting ultimately in the formation of atomic nuclei having more positrons than electrons. This will then allow the formation of atoms and, accordingly, the generation of gravitational attraction. Gravitational attraction and collisions of atoms will generate, in turn, n=1-, n=2-, n=3-objects. Thus, the formation of matter, stars and planets in the universe, is possible due to the energy (velocity) of electrons after absorption of n=1-, n=2-, n=3-objects, generated with the formation of the n=1-, n=2-, n=3-dimensional spaces of our universe.

The existing universe is not unique. According to the section "Metaphysical principia of *h*-space theory", for our universe, the "Planck constant" is equal to a certain value. Other constant values, as well as other absolute units of length and velocity, define the different universes. Moreover, all the universes have the same laws as, for example, the Coulomb law or law of gravitation attraction.

3.18.2 EVOLUTION OF STARS AND PLANETS

The proposed formation of the three-dimensional universe, as an explosion of the densely packed electron-positron protosubstance, suggests that the stars can be remnants of this protosubstance. This differs from the modern cosmological models where the raw material of stars is atomic hydrogen, and the stars are formed due to gravitational compression of the hydrogen mass. The formation of stars from protosubstance at the early stages of the universe would explain the structure of the universe that we see, and not require a gravitational attraction between distant stars, which the proposed theory predicts is limited by the mass of each star (see "Gravitational attraction"). For example, the star nearest to us from the constellation Centaurus is comparable in size to Sun but is placed at a distance that is approximately three orders of magnitude greater than the maximal distance of the gravitational attraction by these stars (according to the proposed theory). If the stars and galaxies formed by gravitational condensation of the hydrogen mass, then our galaxy could not arise because of the limited action of the stars gravity. On the contrary, such galaxies are possible if the stars in the galaxies are formed after the explosion of protosubstance and subsequent condensation at the beginning of the universe, when the density of matter is sufficient for the action of gravity of electron-positron protosubstance to form the galaxies. Further expansion of the universe would lead to increasing distances between stars. This mechanism of galaxy formation can explain the fact that many peripheral stars in galaxies have high velocities and cannot be held by gravity. Accordingly, there is no need for the concept of dark matter to retain the peripheral stars in the galaxies. Some observations confirm the formation of stars in the early stages of the universe (*http://www.nature.com/nature/journal/v477/n7362/full/nature10377.html*). This means that all galaxies are the same age, and the stars in galaxies should be formed in the early universe.

The number of positrons in the stars must be greater than that of electrons. This follows from the fact that the electrons absorb n=1-, n=2- and n=3-objects and thereby acquire a certain velocity, unlike positrons which reflect these objects without changing their velocity. Since n=1-, n=2-, n=3-objects are produced during the evolution of the universe, they will knock out electrons from the electron-positron

protosubstance. Then, due to gravity, the remnants of the electron-positron protosubstance, dominated by positrons, will gather in stars. Accordingly, electrons compensating the positive charge of the star will be located at some distance, for example, in the corona of the Sun. In this case, the energy radiation of the stars is not generated in thermonuclear fusion reactions of protons, but it is the decay energy of the positive electron-positron protosubstance, similar to the decay energy of the positive nuclei of atoms.

Dense packing of electrons and positrons in the stars suggests that they, as well as Sun, represent black holes. In the section "Gravitational attraction", it was mentioned that due to the minimum density of n=0-objects(I) inside of stars there is minimal radiation, i.e. the inside of the Sun is not hot, but cold. With increasing distance from the center of Sun, the density of n=0-objects(I) increases. Accordingly, the energy of the emitted photons increases, producing an increase in temperature with distance from the surface of the Sun (as for all other stars). This gradient of n=0-objects(I) density also implies that electrostatic interactions are weaker near the surface of Sun and became stronger away from it. Solar activity in this case can be explained by changes in electron-positron composition of the stellar surface. Since in the proposed theory, only electrons can absorb and emit electromagnetic rays, the sunspots are predicted to be areas in which there are changes in the content of electrons that are absorbing and emitting electromagnetic quanta. Accordingly, in the brighter areas there is a process of decay of positively charged electron-positron complexes accompanied by the emission of electromagnetic quanta by electrons, while in the black spots the reverse process occurs, the absorption of electromagnetic quanta by electrons. This represents an increase of the electron velocity in sunspots compared to the light areas. As a consequence, there is a directional movement of electrons between sunspots and the external light areas, which means the formation of strong magnetic fields.

Unlike stars, planets can be seen as complexes of atoms, and not dense nuclear packing of electrons and positrons typical for stars.

COMMENTS

The proposed theory is consistent with existing theories in part in that the universe is expanding after the Big Bang. However, in detail, it significantly differs from modern cosmological ideas. The energy of the stars is not the energy of thermonuclear reactions, and the insides of stars are not extremely hot, they are relatively cold. The chemical elements of the higher atomic numbers are created inside of planets or on the surface of stars, but not as a result of the fusion of hydrogen inside stars. The relic radiation is not cooled down radiation from the Big Bang, but represents objects of one-dimensional space formed at initial stage of universe evolution.

APPENDIX 1. CONSEQUENCES OF *h*-SPACE THEORY BEYOND MODERN PHYSICS

TETRANEUTRON, DIPROTON, DINEUTRON, MULTI-MUONS

In the suggested theory, due to the fact that protons and neutrons are complexes of electrons and positrons, the formation of unstable complex having more electrons and positrons, such as tetraneutron (*http://en.wikipedia.org/wiki/Tetraneutron*), diproton (*http://en.wikipedia.org/wiki/Isotopes_of_helium#Helium-2_.28diproton.29*) and dineutron (*http://en.wikipedia.org/wiki/Dineutron*) is possible (see Fig. 14a). According to the modern theoretical concepts, these complexes do not exist. Muons, in the suggested theory, have the same composition as protons, but in contrast to the proton, an unstable spatial configuration. Because of this, we can also consider as real the multi-muons, as unstable complexes, clusters of electrons and positrons. Multi-muons were detected in collisions of protons and antiprotons (*http://arxiv.org/abs/0810.5357*). Another unstable cluster can be a complex of three protons shown in figure 14a.

VARIABILITY OF CONSTANTS

In the proposed theory, the speed of light and the "Planck constant" are both constants. The charge of the electron corresponds to the density of n=0-objects(I) ρ_0 and, accordingly, decreases with time. This reduction in charge can explain the results obtained by astronomer John K. Webb, who in 1999, discovered that light from a distant quasar

12 billion light years, is absorbed by metal ions in interstellar clouds, but the absorbed photons do not correspond to the spectra of the metals. Since the interaction of light with matter is determined by the fine-structure constant, a, then it has been suggested that a had a different value. This assumption is not consistent with modern physical concepts. All three constants, which determine the alpha ($a=e^2/hc$) – the electron charge (e), the speed of light (c) and Planck constant (h), cannot be changed. In the proposed theory, however, the electron charge is not constant. Accordingly, the alpha should decrease with time, offering an explanation for the observed change in the absorption/emission spectrum of metals.

BOUNDARY OF GRAVITY AND KUIPER BELT

In the proposed theory, the effect of gravity has a boundary that is determined by the density and size of a body. In the suggested theory, it is assumed that the Sun has a maximum density ρ_M , similar to the density of atomic nuclei. Under these conditions, the density of n=0-objects(I) ρ_M is maximal and equal to ρ_0, $\rho_M = \rho_0 = 10^{10}$. The boundary of the Sun's gravity can be calculated, taking into account the linear dimension of the Sun, and is $\approx 10^{13}$ m (see "Gravitational attraction"). This is comparable to the distance from the Sun to the Kuiper Belt, $\approx 10^{13}$ m.

To assess the limits of gravity of the planets (see "Gravitational attraction"), their density ρ_M is assumed to be less than that of the Sun. Then, the density of n=0-objects(I) ρ_M is $\approx 10^6$–10^7. The calculation for the Earth shows that the boundary of its gravitational action is around 10 million kilometers.

ANTI-GRAVITY

The cause of gravity in the proposed theory is due to the reduction in density of n=0-objects(I) ρ_0, or, more precisely, the change in the density of the vacuum ρ_M, around the body, as a result of the displacement of n=0-objects(I) by the body. In addition to gravity, a change in the density of n=0-objects(I) ρ_0 takes place during the generation of magnetic field. It is characterized by the density $\boldsymbol{\rho_\Delta}$ appearing as the result of electrons/positrons motion. Changes in the magnetic field, i.e. the changes in the density of n=0-objects(I) $\boldsymbol{\rho_\Delta}$, is associated with changes in the density of n=0-objects(I) ρ_0, and therefore should lead to a change in the gravitational attraction, which is associated with the decrease in the density ρ_0.

COLD FUSION

The majority of cold fusion experiments were performed as electrolysis of heavy water with a palladium cathode. The presence of helium and nuclear transmutations were reported (*http://en.wikipedia.org/wiki/Cold_fusion*). These results are contrary to the official current view on the synthesis of helium nuclei from deuteron, where it requires high temperatures and should be accompanied by the emission of gamma rays. If helium was detected, the gamma rays were not. In another type of cold fusion experiments nickel powder was saturated with hydrogen at high pressures and heated to several hundred degrees. The heat excess was detected in the amount typical for nuclear reactions (*http://arxiv.org/pdf/1305.3913.pdf*). According to the patent application, the nickel powder after use contained a number of different elements, indicating both nuclear fusion and nuclear decay (*http://www.journal-of-nuclear-physics.com/files/Patent_WO-2009-125444.pdf*). Hydrogen was not consumed in the amount typical for a chemical reaction. Also, emission of positrons and low-energy gamma rays was reported, as well as the absence of long-lived radioactive elements.

In the proposed theory, cold fusion can be explained by the positron-electron composition of nuclei. Nuclei are positively charged as they have more positrons than electrons. Additionally, in the proposed theory, Coulomb interactions at the atomic scale show an altered dependence with distance.

1. In the atoms at a distance 10^{-15} to 10^{-10} meters there is no attraction/repulsion of electrons and positrons;
2. In the atoms, attraction/repulsion increases from zero at 10^{-10} meters to a maximum at 10^{-5} meters from the nucleus;
3. In the nucleus there is no strong interaction. Electrons and positrons are held by their attraction and repulsion to each other with a velocity of 10^{-2} meters per second.

In the proposed theory, the problem of overcoming the Coulomb repulsion between the nuclei is not relevant for a range of distances from 10^{-15} to 10^{-10} meters. Nuclear repulsion exists

only in the range 10^{-5}–10^{-10} m, and it can be compensated by an attraction to the electrons placed at the same distance from the nucleus. Heating of the proton-saturated nickel powder increases electrons and protons mobility. The consequence of this will be an increased rate of collisions between electrons from nickel and protons from the hydrogen atoms. Such collisions can also occur if there is a current of electrons and oppositely directed proton current. Moreover, the protons will collide with each other when they are exuded from the surface of the metal granules. Collision of electrons and protons will lead to:

1. proton decay to one electron and two positrons;
2. proton decay to an electron-positron pair and a free positron;
3. formation of neutrons, which are complexes of two positrons and two electrons.

The free positrons and electrons resulting from proton decay can interact with the device material and generate heat and gamma radiation. In the case of decay to electron-positron pairs (neutrinos in the proposed theory), it possible that these pairs can either fuse with nickel nuclei and result in the synthesis of heavier elements, or cause decay of nickel nuclei. Emerging neutrons can also cause the synthesis of the heavier elements and nickel nuclei decay. Thus, in the proposed theory the generation of heat and nuclear transmutations are the consequences of proton decay. The further decay of nickel nuclei induced by proton decay will also contribute to the thermal radiation. The lack of long-lived radioactive elements suggests that the proton decay into free positrons and electrons is a major factor in the thermal radiation, and the formation of neutrons and neutrinos is less likely. Otherwise, a fusion of nickel nuclei with neutrons could generate the long-lived radioactive elements.

FORMATION OF FOUR-DIMENSIONAL SPACE

In the proposed theory, after a while three-dimensional space is predicted to be replaced by four-dimensional space. The important question then is when this can happen. To answer this it is necessary to compare the length of objects of four-dimensional space with the current linear dimension of the universe. Today, the linear size of the universe is estimated at $\approx 10^{26}$ m. With the creation of four-dimensional space, the length of objects of four-dimensional space, and the total length of the universe in absolute length units is 10^{30}. Since the absolute unit of length is equal to $\approx 10^{-5}$ m, it follows that the current size of the universe is close to the total length of the beginning of four-dimensional space. Thus, the change from three-dimensional space to four-dimensional space could be very soon. Another estimate of the time of transition can be obtained by assuming the identity of the constant $c = 1/\sqrt{\varepsilon_0\mu_0}$ and the velocity $v_0\rho_0$. The transition to four-dimensional space, as has been stated above, can happen at a linear size of the universe equal to the length of n=4-object. In this case, the velocity $v_0\rho_0$ will be reduced to the value equal to the velocity of one-dimensional objects, i.e. to the speed of light. A comparison of the values of the constant c (velocity $v_0\rho_0$) and the speed of light can provide a rough estimation of the transition time. The constant c is the inverse square root of the product of the vacuum permeability, μ_0, and the vacuum permittivity, ε_0. In this product, the value of μ_0 is accurate and does not require the definition from the experiment. On the contrary ε_0 is determined from experiment.

Changes that will accompany the emergence of four-dimensional space, as noted in the section "Electrostatics", are the change of electrostatic interaction from an inverse dependence on the square of the distance to the third degree of distance. This will lead to the destruction of atoms, which can be later regenerated. Electrons will be located at other positions in the new atoms. Accordingly, the gravitational attraction will also change its dependence on distance, from the inverse square of distance to the inverse third degree of distance.

CHARGE CLUSTERS

The phenomenon of charge clusters was studied by Ken Shoulders (*http://www.rexresearch.com/ev/ev.htm, http://www.svn.net/krscfs/Charge%20Clusters%20In%20Action.pdf*). These clusters have sizes in the micrometer range, and have an excess of electrons in the ratio of the order of one positive ion for 100,000 electrons. The number of electrons in the cluster is 10^8–10^{11}. Stability of the clusters, and the absence of repulsion between the electrons in them, has no explanation in modern physics. In the proposed theory, the size and stability of the clusters can be explained by electrostatic interaction at a distance of less than 10^{-5} m (see

"Electrostatics" and "Atoms and Spectra"). The number of electrons also fits with the size of clusters. The linear arrangement of electrons (having a linear size 10^{-15} m), when numbering 10^8–10^{11}, correlates with the cluster size, of around 10^{-6} m. If the cluster size becomes larger, i.e. the distance between the electrons increases, this will change the nature of the electrostatic interaction between electrons, and the cluster will not be sustainable.

APPENDIX 2. EXPERIMENTS TO TEST *h*-SPACE THEORY

VERIFICATION OF THE ELECTRON-POSITRON COMPOSITION OF PROTON AND NEUTRON

Background. In the proposed theory, protons and neutrons are made up of electrons and positrons.

Scheme of experiment. The existing facilities can be used to conduct experiments on the collision of low-energy electrons and positrons. According to modern physics, these energies would be too low to form protons and antiprotons. However, the proposed theory predicts that protons and anti-protons, as well as other particles, would be formed as different complexes of the positrons and electrons. Accordingly, the experimental installation would need to be configured for the detection of slow protons, antiprotons, and neutrons.

ABSORPTION OF PHOTONS BY ELECTRONS AND REFLECTION OF PHOTONS BY POSITRONS

Background. In the proposed theory, electrons absorb photons. This causes an increase in the velocity of the electrons. Positrons reflect photons without changing the velocity of the positrons.

Scheme of experiment. It is proposed to use the separate traps for electrons and positrons. Further, electrons and positrons are irradiated with photons and the mobility of electrons and positrons is tested.

VERIFICATION OF COULOMB'S LAW AT DISTANCES BELOW 10^{-5} METER

Background. The proposed theory suggests that Coulomb's law is not correct at the distance less than $\approx 10^{-5}$ m. There is a direct proportionality of electrostatic attraction/repulsion to the square of distance, i.e. the velocity of attraction/repulsion between electrons/positrons does not increase (according to modern physics), but it decreases in the range from $\approx 10^{-5}$ m to $\approx 10^{-10}$ m. If the distance is in the range from $\approx 10^{-10}$ m to $\approx 10^{-15}$ m, the velocity of attraction/repulsion of electrons and positrons is zero.

Scheme of experiment. The following experiments can be conducted to validate electrostatic attraction/repulsion at distances less than $\approx 10^{-5}$ m. An electron source is placed behind an electron filter with micrometer holes. The distances between pairs of holes range from millimeters to nanometers. Beyond the filter, a screen is placed which can register spots left by electrons that have passed the filter. The test allows a determination of electron spots with the distance between the holes in the filter. According to the suggested theory, reduction of the distance between adjacent holes down to 10^{-5} meters will cause increasing repulsion of the electron beams, and the electron spot on the detector screen will increase. But at distances less than 10^{-5} meters, there will be less repulsion between electron beams, and the resulting spots will be smaller. The maximum spot size must be at a distance of 10^{-5} meters. In contrast, according to modern physics, the repulsion of electron beams will increase with decreasing distance up to the collision of beams. Accordingly, the spots on the screen will also increase with decreasing distance between the holes in the filter.

Rather than pairs of electron beams, it would also be possible to use separate electron beams but with different diameters (diameters of holes in the filter). According to modern physics, with decreasing beam diameter, dispersion of the electron beam should increase due to mutual repulsion of electrons in the beam. Accordingly, the ratio of the spot diameter on the screen (for the same distance between the filter and the screen) to the initial diameter of the beam on the filter will increase. If the proposed theory is correct, then at beam diameters less than 10^{-5} meters, the dispersion of electrons will decrease, as will the ratio of the spot diameter on the screen to diameter of the beam on the filter.

THE CHANGE OF CHARGE NEAR NEUTRAL MOVING BODIES

Background. According to the proposed theory, the motion of electrons and positrons changes the density of n=0-objects(I) ρ_0. As a result, a magnetic field is generated that consists of n=0-objects(I) of density $\boldsymbol{\rho_4}$, and directed according to the sign of the charge. In the case of the motion of a neutral body, there is also a change in the density ρ_0, but n=0-objects(I) are not directed. The number n=0-objects(I), displaced by charged or neutral bodies depends on the speed and density of the bodies. Since the density ρ_0 determines the electron charge, then in the region near moving neutral bodies the value of density ρ_0 will by changed, i.e. the electrical charge will change.

Scheme of experiment 1. The electrostatic interaction of charges near the collision of masses could be measured, on the opposite sides of a shield stopping the moving body. For protection against electromagnetic radiation, a grounded screen should be placed between the shield and the device measuring charge interactions. In a similar way, the electrostatic interaction of charges can be measured near periodically moving masses, for example, near a rotating or linear moving neutral body.

Scheme of experiment 2. Electric current (pulses of electric current) is measured in a charged conductor when one end of the conductor is placed near a mass change, such as that generated by a rotating uncharged body. The other end is placed at some distance. Between the rotating body and the conductor, a screen is placed to protect against a possible electrons transfer induced by friction of the rotating body of air. The ideal case would be a rotating body in a vacuum chamber. Since the change of mass at a given point in space causes a change of density ρ_0, i.e. a change of charge, different potentials will be generated at different ends of the conductor.

DEFLECTION OF LIGHT BY CHANGE OF MAGNETIC FIELD

Background. Since magnetic field changes (as well as the gravity changes) are due to changes in the density of n=0-objects(I) ρ_0, light should deviate from a straight-line movement not only in strong gravitational fields but also as a result of changes in strong magnetic fields.

Scheme of experiment. The deflection of a beam of light is measured near a pulsed current conductor that creates strong magnetic pulses.

CHANGES IN THE WEIGHT OF A BODY NEAR A VARIABLE MAGNETIC FIELD

Background. According to the proposed theory, the density of n=0-objects(I), ρ_0, is changed by moving electrons and positrons. As a result, a magnetic field is generated. Accordingly, a change in magnetic field strength leads to a change in the density of n=0-objects(I), ρ_0. The gravitational interaction is due to changes in density ρ_0. For this reason, the local change of magnetic field will temporarily affect the gravitational attraction.

Scheme of experiment. It is proposed to produce unidirectional, pulsed, electric discharges. As protection against any electromagnetic radiation, a grounded screen should be installed. Behind the screen, the gravitational attraction is measured during the discharge. A similar experiment was carried out by Eugene Podkletnov and gave results consistent with the proposed theory (*Evgeny Podkletnov, Giovanni Modanese. Impulse Gravity Generator Based on Charged YBa2Cu3O7-x Superconductor with Composite Crystal Structure, arXiv physics/0108005, 30.08.2001*).

CHANGES IN THE WEIGHT OF A BODY NEAR OTHER MOVING BODIES

Background. According to the proposed theory, the density of n=0-objects(I), ρ_0, determines the gravitational attraction. This means that a change in density ρ_0, resulting from the motion of electrons and positrons (as well as ionized and unionized atoms), will cause a change in gravitational attraction. Motion of electrically neutral bodies will also change the density ρ_0.

Scheme of experiment. A dense body is accelerated to maximum speed and allowed to collide with the massive screens. Behind the screen the gravitational attraction is measured at the moment of the collision.

ACKNOWLEDGEMENT I am grateful to Michael Dyall-Smith for the advices and for the help in correcting the English version of the manuscript. I also would like to express my gratitude to the users of the following forums for the useful discussions and criticism: http://www.scientific.ru/dforum/altern, http://live.cnews.ru/forum/index.php?showforum=259.

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