

# Who will hack the Multiverse?

Vad Okoem (Bobrovskiy)

IMFSET – Distant School Cosmic-Meteo-Tectonics, Kamchatka, Rus.

Email: vadokoem@gmail.com

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*Abstract: Discussion about instantaneousness interaction transfer goes back to the times of Descartes. In the beginning of the 21st century, this issue switched from theoretical field into experimental.*

Science Magazine published list of accursed questions of science in its 125th anniversary issue [1]. The list started with the perennial question "What is the Universe made of?" A number of reasons preconditions complexity of solving mystic riddles of the Universe.

In the first instance, according to direct observation of the universe using astronomical instruments, the things discovered within the universe do not match what our models predict. There is approximately 5% of mass-energy, observable and measurable in the universe – from atoms to star clusters and galaxies. Dark matter makes up about 25% of the mass-energy of the Universe, and dark energy takes around 70%. Neither dark matter, nor dark energy haven't been directly observed, they have just been inferred. Thus, for instance, mystic gravitational phenomena, contradicting with the behavior of circular structures, consisting of stars in galaxies, as prescribed by Newton's theory, was named as the dark matter. Velocity increase of star circulation round the center of galaxy with increasing distance between the galaxy center and the stars was observed in such circular star clusters. This velocity increase, along with increase in distance from the axis, is observed only in case of solid-state bodies with strong molecular bonds. The first publication by Jan Oort (1928) [2] about existence of a "solid-state" stellar belt in our galaxy, appeared to be catastrophe waiting to happen with the Newtonian theory, which offered no room for analytical resolution of a problem with gravitational attraction between three and more objects with certain mass.

The profound difference between the energy density of the universe, we observe from correlation of matter and light, and the critical density which we observe the universe to have, was named as the dark energy. According to observation, the expansion of the universe is speeding up, contrary to the theory that predicted constant expansion or slowing expansion. As distinguished from the dark matter, the effect of which is evident in galaxies according to physicists, the dark energy is uniformly "spread" throughout the universe.

Every time, when plain observations are at variance with cosmological theory predictions, including "Big Bang" theory, cosmologists have to wriggle out and think up other obscure ideas, explaining the difference between predictions and observations, but not trying to interpret existing reality.

The second obstacle on the way to unearth a mystery of "What is the Universe made of?" is extremely complicated experimental setting up and interpretation of the experiments, suitable for solution to this riddle of the riddle. For now, expectations of cosmologists and astronomers

relate to astronomical observations and acquisition of new, more precise cosmological data. However, where and what shall we search for? Neither cosmologists, nor physicists do not know if the dark matter is the matter indeed. We observe mystical phenomena with no explanation within the existing paradigm of the world. What if the invented notions is just a poor show of our perceptions, based on initially wrong paradigm of the world? Is it possible to explain the physical world phenomena only by local interactions? How to explain through what the instantaneousness interaction transfer occurs? Is the universe unitary in its unitarity?

The great natural philosopher Rene Descartes (Jesuit college alumnus, warrior, thinker – mathematician, physicist and psychophysicologist...) introduced a concept of vortex (irrational) and expanded (rational) hypostasis of the universe into the natural science. Descartes claimed that ideal vortices in irrational realm of the universe, compliant and inherent to each object of real expanded realm, interact with each other in vortex hypostasis, creating visible and invisible phenomena in the observable expanded realm of the ambivalent (dual) universe.

This is how the discussion about instantaneousness interaction transfer started. Further, it was continued by Huygens, Hooke, Newton, and later on by Einstein... Sir Isaac Newton oftentimes jeered about Descartes' ideal vortices, saying "*Hypotheses non fingo*". The undercover protestant Mr. Newton, who believed in Pantocrator (the Almighty, Omnipotent, ...), holding professor office in Cambridge College, by a weird coincidence called Sancta Trinity, did not believe in Anglican Holy Trinity. Moreover, Sir Newton did not believe in ambivalence of the observable world neither around us, nor inside him. Newton was grateful to Descartes for his initiation into the temple of mechanical philosophy. But he separated particles from vortices, holding to particles and denying vortices. In the dual universe of Descartes actual measuring force was attributed to interaction of ideal vortices, inherent to real body. Out of Descartes' concept of dual universe, Newton accepted only real expansion and used Cartesian coordinate system. Parameters of ideal vortices interaction in vorticity realm cannot be measured by real means. Therefore, discussion about instantaneousness interaction transfer continued within the framework of force concept, appeared in the times of Descartes.

It should be noted that Hooke's, Coulomb's, Ampere's laws, etc., were discovered through experiments using ancient measures (weight, length and angle of rotation) and later on with the development of civilization, using sandglass and electric battery. The examples of virtual experiments for empirical discovery of elastic force, gravitational force, electromotive force (EMF), charged force and current intensity using plummet, ruler and protractor, are given in reference [3]. Each of experiments emphasizes actual measuring of the following parameters: spring extension/shortening, calibration turn angle of horizontal rod, balls weight, length of threads and angles of divergence or wire lengths and distance between them, as well as wire weight. It is not hard to prove that all numerous electrical measuring instruments, gaged with various unit of measurement, invented by our power-vapor-electro-thermonuclear hi-tech civilization, use the same ruler, protractor, weight and battery (see [3]). The most sophisticated measurements, let's say, measuring the mass of vector boson, not to mention easy measurements, can be easily reduced to weight, ruler, protractor, battery and quantum time standard (frequency), which replaced chronometer watch that, when the time came, replaced sandglass. Nevertheless, population of our planet, exalted with high technologies, have forgotten amazing simplicity and finite looseness of the measuring basis of the technocratic civilization, where practice and science actually measure only interaction parameters, while everything else is just assumption and guesswork, which had been called "mathematical simulation" over the last decade.

Philosophy of the closed universe, consisting of as little as two locally interacting objects (Hooke's law of interaction between spring and load, Newton's law of gravitational attraction between two objects, Coulomb's law of interaction of two charges, Ampere's law of interaction of

two currents, Wiener models of interaction of two electric generators, Bardeen-Cooper-Schrieffer model of interaction of two electrons in superconductor, ...) stumbled upon the problem of three objects, i.e. absence of analytical solution for evolution of system with three and more interacting objects. Within the framework of classical Newtonian mechanics, analytical solutions (i.e. exact formula substituted with physical quantities with exact answers at the output) exist only for local interactions. Rephrasing Einstein, mathematical expressions of laws on interaction of two objects are expressly definite; therefore, they bear no relation to current reality.

At the present development stage of the theory of matter and electricity, its elementary notion is an electric charge (symbol:  $Q$  or  $q$ ), measured in coulombs [C]. The notion of electric current intensity is the result of aggregate mathematical operations. At first, it is necessary to apply geometry and introduce a notion of conductor's cross sectional area (physical dimension [ $m^2$ ]), which is "transmitting" electricity. Then it is necessary to introduce a notion of time interval  $\Delta t$  for "measuring" the amount of immaterial electric fluid  $\Delta q$ , passed through the conductor's cross section, according to classical concepts. In case of the model, developed by Faraday, who proposed to apply the notion of positive discrete charges for metallic "electricity" conductors after his electrochemical experiments with electrolyte solutions, it is necessary to "calculate" the number of charges, passed through the conductor's cross section during  $\Delta t$  interval. After these operations, current intensity can be calculated for a conductor with measured cross section:  $I = \Delta q / \Delta t$ .

Time differentiation shall be applied to find instantaneous value of current intensity:  $i = dq/dt$ .

Thus, current intensity is not the elementary notion of the theory of matter and electricity. Current intensity can only be the "secondary" notion. Electric force (Coulomb force  $\mathbf{F}_C$ ), measured in the course of experiment, is also considered as the "secondary" notion.

The result of dividing  $\mathbf{F}_C$  by  $q$  is called an electric field vector ( $\mathbf{E} = \mathbf{F}_C / q$ ), known as "tertiary" notion.

The result of scalar multiplication of  $\mathbf{E}$  by displacement vector  $\mathbf{s}$  is called a potential that is "quaternary" notion.

The notions of potential difference, differential voltage, electric and magnetic energy, etc. stand far aside from primary notion.

Domination of the force concept in the theory of matter and electricity lasted until introduction of "field" notion by Faraday and the notions of electric and magnetic fields ( $\mathbf{H}$ ) by Maxwell. It is evident that  $\mathbf{E} = \mathbf{F}_C / q$  vector is the result of arithmetic operation.  *$\mathbf{E}$  vector is not actually an "existing essence".*

It is evident that  $\mathbf{H}$  vector also resulted from mathematical operations, applied to Ampere force, measured in the experiment by means of Biot-Savart-Laplace law (BSL).

Let us show how it works. Expression for elementary Ampere force:

$$d\mathbf{F}_A = I[d\mathbf{l}\mathbf{B}]$$

shall include indexes for wire 1 and 2:

$$d\mathbf{F}_{A1} = I_1[d\mathbf{l}_1\mathbf{B}_2].$$

Magnetic induction vector  $\mathbf{B}_2$ , determined by current intensity in wire 2 and geometry of relative positions of wires 1 and 2, is calculated by means of BSL law:

$$d\mathbf{B}_2 = (\mu\mu_0/4\pi)(I_2/r_2^3)[d\mathbf{l}_2\mathbf{r}_2].$$

It is evident that elementary vector  $d\mathbf{B}_2$  results from mathematical operation with  $I_2$  current intensity, taking into account relative positions of wires 1 and 2. By taking integral from BSL law it is possible to get the formula for elementary Ampere force:

$$d\mathbf{F}_{A1} = I_1[d\mathbf{l}_1](\mu\mu_0/4\pi)(I_2/r_2^3)[d\mathbf{l}_2\mathbf{r}_2]$$

for random position of wires 1 and 2.

This formula includes familiar (ever since learning Ampere's law at school) current intensity in both wires and geometric parameters of relative position of these wires.  $\mathbf{B}$  vector relates to  $\mathbf{H}$  vector through  $\mathbf{B}=\mu\mu_0\mathbf{H}$  expression.

Therefore, it is proved that  $\mathbf{H}$  vector, same as  $\mathbf{E}$  vector, *is not an existing essence*.

To draft the first equation of the famous equations system, Maxwell used an experimentally discovered differential form of Ohm's law:

$$\mathbf{j}=\sigma\mathbf{E}.$$

Here  $\mathbf{j}$  means current density vector,  $\sigma$  – specific conductivity of a conductive medium. Let us write down Maxwell system equation in an analogous form:

$$\Sigma\mathbf{j}=\text{rot}\mathbf{H}.$$

Therein, mathematical operation of taking the curl of  $\mathbf{H}$  vector has physical meaning of the "reason" for occurrence of current intensity with different density in different media. To specify physical parameters of media, let us write down this equation using one of numerous forms provided in textbooks:

$$\text{rot}\mathbf{H}=\mathbf{j}_{\text{cm}}+\mathbf{j}_{\text{diel}}+\mathbf{j}_{\text{vac}},$$

where "cm" means conducting material, "diel" - ideal nonconducting medium, "vac" – ideal environment (Maxwell's vacuum) with no matter in any form. Vector magnitude of current density has the following dimension:

$$[\mathbf{j}]=[\text{A}/\text{m}^2]=[\text{C}/(\text{sec}.\text{m}^2)].$$

Hence, in case of using the notion of current density for some media, such media shall contain free carriers, the amount of which is measurable! Since neither ideal Maxwell's dielectric, nor ideal Maxwell's vacuum allows for existence of free carriers, by convention, Maxwell named vectors as *fictitious current density*:

$$\mathbf{j}_{\text{vac}} \text{ and } \mathbf{j}_{\text{diel}} = (\partial\mathbf{D}/\partial t).$$

Here induction density  $\mathbf{D}=\varepsilon\varepsilon_0\mathbf{E}$ ,  $\varepsilon$  – relative dielectric constant of the media and  $\varepsilon_0$  – electric constant. Since  $\mathbf{E}$  vector is not actually "existing essence", then  $\mathbf{j}_{\text{diel}}$  is nothing but fictitious summand.

Having developed equations of his famous system based on Coulomb, Oersted, Ampere and Faraday experiments, Maxwell repeatedly warned his followers about the fact that the length of current density vector has physical meaning only for conductive media, containing electric fluid (or discrete charges), and that current density vectors in media without free charges (dielectric and vacuum) are *fictitious*. Maxwell also warned that his equation system could not be used to derive formulas that might be actually proved by experiment. Over one hundred years Maxwell's warning appeared to be absolutely fair. All numerous working equations in electrical engineering, radio engineering and electronics, etc., were derived through experiments or oversimplified assumptions upon application of Maxwell's system of equations, laden with *fictitious* values.

Even the classic formula of electron charge to mass ratio, used in physics laboratory practical for higher school, contains diode tube resistance, related to Ohm's law. Actually, the above equation is expressed as follows:

$$(e/m)=\alpha/(UR^2),$$

where  $e$  – electron charge,  $m$  – its mass in vacuum,  $\alpha$  - constant,  $U$  – differential voltage,  $R$  – resistance. Therefore, even this fundamental ratio does not fit Maxwell's system of equations.

Considering some features of Newtonian model of the unitary universe, it is necessary to note that denial of Cartesian model of ambivalent (expanded-vortex) universe, forces us to use *fictitious* values for electromagnetism equations, in particular. That said actual existence of objects, described by these *fictitious* values, *is impossible by convention!!!*

After the works of Bednorz and Muller (citizens of Switzerland, Nobel laureates in physics, 1985) it was found that superconductivity in a multicomponent ceramics with above helium temperature defies description using Ohm's law.

Indeed, high-temperature superconductivity (HTS) in ceramic ring can be observed after external EMF impulse applied to winding, wound around a part of HTS ring. HTS existence is supported by the fact that ferromagnetic material specimen can "hover" above horizontally positioned HTS ring for indefinitely long period. After removing external source of impulsive EMF from HTS ring winding, no internal EMF is applied to it, i.e.  $\varepsilon=0$ . Nonexistent resistance of HTS ring would simultaneously be its internal resistance ( $r$ ) and external load ( $R$ ):  
 $R+r=0$ .

Since HTS ring is a complete electrical circuit, let us try to apply Ohm's law for closed circuit:

$$I=\varepsilon/(R+r).$$

In this case current intensity is as follows:

$$I=0/0.$$

It is evident that application of such macroscopic notions as EMF, resistance and current intensity (consolidated by Ohm's law) to closed electric circuit (HTS ring), resulted in physical nonsense. Now we arrived at the fact that interaction between substance (ferromagnetic material) and "electricity" (ceramic HTS ring, once exposed to impulse from the external EMF source) can be observed with unaided eye. Now we see that it is possible to estimate actual interacting force between ferromagnetic material and HTS ring based on the results of "mechanical experiment". We also may conclude that application of classic "secondary, tertiary and quaternary" notions in form of  $I$ ,  $\varepsilon$ ,  $R$  and  $r$  resulted in physical nonsense. Therefrom it is possible to conclude that macroscopic approach is as unacceptable for such effects like HTS, showing existence of mesoscopic (nanoscale) clusters in macroscopic ring, as for quantum (microscopic) objects.

This example once again showed inapplicability of electromagnetism hypothesis for achieving accurate results during mathematical modeling of observable objects interaction. Such notion as electromagnetic field (EMF) is only a mathematical model, containing two orthogonal vectors –  $\mathbf{E}$  and  $\mathbf{H}$ . Therefore, EMF is not an "existing essence" as well. Thus theoretic arguments and mathematical models, based on macroscopic force, field, potential and other notions, are not quite applicable to quantum objects.

Let us ask the following questions – what is electron tunneling, what is the media, where the tunneling occurs? The answer is as follows: this is just a mathematical model, describing the effect, impossible in classical mechanics, when a particle does not possess enough energy to overcome mathematical obstacle, but "jumps over" or "dives under" the obstacle mathematically. Modeled tunneling effect once again underlines the fact that macroscopic notion of energy, derived from the formula for elementary work of force applied to elementary movement of a body ( $dA=F*dS$ ) is not quite applicable in a quantum world. Concurrently, we shall note that the notion of energy (physical dimension  $J=N*m$ ) is also derived using the same weight (as for the weight, physical dimension of any  $F$  force is  $[N]$ , i.e. any force can be calibrated in fractions of standard of weight) and ruler (physical dimension of  $dS$  is  $[m]$ ).

Let us ask a question: what is the wave function  $\Psi$ ?

The answer is as follows: wave function is a statistical probability distribution function for finding quantum object with random quantum parameters at random point of space. Wave function is a statistical notion. Wave function is an irrational notion, since all formulas containing  $\Psi$ , include irrational numbers  $\pi$  or  $e$  and irrational notions  $d$ ,  $\partial$  or  $\int$ . All formulas, containing  $\Psi$ , produce irrational, non-integral, approximate results.

In the Descartes' model of the ambivalent (expanded- vortex) universe, the expanded (rational) realm is described using rational discrete mathematics [4], operating rational objects and real events, providing answers in a form of rational numbers. The primitive object of the expanded hypostasis of the universe is a rational line in type of rod without cross section. Actual result of interaction between ideal vortices in irrational (vortex) realm of the universe is described within the framework of Newtonian and quantum mechanics by means of irrational continuous mathematics, operating irrational notions and providing the answers in a form of irrational numbers. The primitive notion, related to the irrational realm of the universe, is a circle, i.e. invisible and intangible, ideal (irrational) Descartes' vortex. Interaction of rational objects is of local nature (time and space distributed collisions, coupling, etc. of pairs of objects). Interaction of irrational (ideal) vortices is of nonlocal nature (interaction of all objects with all and any objects beyond time and space).

Critical step to the statistical nonlocality was made by A.A.Vlasov in his fundamental article "About the vibrational properties of an electron gas" [5], dated back to 1938: *"Circumstances, similar to those provided, set one thinking that the method of kinetic equation, taking into account only paired interaction – collision, is an approximation for a system of charged particles; such approximation is unsatisfactory, since significant role in this theory shall be given to interactions at remote distances and, consequently, the system of charged particles is not a gas, but a specific system, confined by remote forces. Consideration of these "remote forces" naturally results in such properties that do not exist in regular gas environment with properties, fitting kinetic equation standards."*

In his earlier book, dedicated to the theory of many-particle systems [6], the knowledge about delocalized particles had not been yet accumulated in separate parts, chapters and paragraphs. However, the outline of the general theory of "self-organization of everything in the world" can be already traced in this book.

The following argumentation is given in paragraph 6 "Theory of non-localized particles and quantum mechanics", Chapter 1 "Necessity of a suggested theory", part 1 "Theory basics" [6], page 38:

*"A precise determination of the boundaries of the theory [of many particles] can only be made from the point of view of some more general theory, that would include both quantum mechanics and our theory [of many particles] as particular cases. Up to the present, there is no such theory... The conclusion may be drawn from this that a theory should be constructed that is more mineral than quantum mechanics and in which the abandonment of the principle of localization would be completely embodied."*

A.Vlasov included [part I, 6] elaborate comparison of wave function  $\Psi$  and distribution function  $f$  in its most common form, as well as the first equation of Vlasov-Maxwell equations system, derived by means of quantum-mechanic Hartree method. Vlasov proved that the classical statistics and quantum mechanics cannot at the present time explain either the process of crystal formation or its periodic structure. It can be said that a thoroughgoing complete description of the crystal is quite impossible within the framework of these theories. The results indicated obtained by Vlasov show the limitations and inadequacy of the apparatus of quantum mechanics even over macro-intervals. Vlasov concluded that this refutes the principles of which, according to Bohr, have a universal, and hence an epistemological character.

Vlasov made analysis of physical and methodological problems, typical for the theory of many delocalized particles which includes individual and collective properties of particles, distant space-time connections, the problem of the relationship between "micro" and "macro", collective interactions, motion in a collective of particles, generalization of the particle concept, "test corpuscles", closure of physical systems and Cauchy's problem.

As the result of thorough analysis of the above problems, Vlasov provided far-reaching conclusions, in particular, of the solution of Cauchy's problem. Vlasov stated that the solution of Cauchy's problem does not always cover all the temporal processes included in the initial equations of this or that theory. Establishing the problem sometimes involves postulating physical conditions that sharply limit the range of possible solutions. It is therefore impossible to identify fulfillment of the general principle of causality with the solution of Cauchy's problem. The principle of causality as a philosophical assumption is not, of course, equivalent to particular methods of explaining temporal processes connected with the customary formulation of Cauchy's problem. The cause for some processes may consist not in the initial conditions for the function sought, but in other physical conditions that likewise determine it. Thus in the theory being set forth, for example, there arise, with continuous changes of the temperature and density of the medium, discontinuous and qualitatively new solutions (spatially periodic, nondamping solutions in the form of waves, etc.). From the mathematical point of view, these solutions are connected not with Cauchy's problem but with the problem as to the branching of the parameter entering into the equation. What is involved is thus the transfer of the cause (for some phenomena) from the initial conditions for the function sought to the initial conditions for a parameter, which, however, radically alters both the physical and mathematical side of the question. Herewith a definite step forward is taken towards a profounder knowledge of the physical significance of the principle of causality. Vlasov's approach became guarded welcome to the ideas of the now-known as Multiverse which was firstly presented by Everett [9].

It should be noted that the book [6] was the first to introduce a concept of self-organization, evidently expressed on page 92 in paragraph 13 "Migration to classical mechanics [from the theory of many non-localized particles]". Vlasov's expression for the force includes the continuous action (self-action) effect, which is expressed by the presence of the term  $\nabla_{r_i} K(|r_i - r_j|)|_{r_i=r_j}$ . Vlasov noted that in classical mechanics, this term should not be present. As proved before, multiplier in type of energy of "mutual interaction of particles" in the form of  $K(|r-r'|)$  existed is expressions for potential energy, while considering open-cycle self-organizing systems.

Vlasov gave more definite notion of self-organized systems regarding solutions, representing self-accelerated processes [6]. He deduced that such solution appears to have paradoxical properties, indicating the possibility of the self-acceleration of the system under the action of merely internal forces. However, it should be kept in mind that this solution holds true only for a condition where the condition of closure does not apply. It therefore does not contradict the laws of conservation, but presents a special nature of connection of the dynamic system with the surrounding medium, which in the theory [of many delocalized particles] being set forth does not reduce solely to the introduction of external forces. Thus, openness of a dynamic system is attributed not only to local interaction of the external forces with separate particle within system, but also to nonlocal interaction with vortex, "supplementary" realm of the universe.

Later Vlasov provided solution for self-organized open system of gravitational attraction of objects. It should be noted that the internal relation of the theory of many (non-localized) particles with quantum mechanics, proved in the book [6], became the reason for invention of such terms as "gravity crystallization" and "electromagnetic structures" [7]. The book [8] provides solutions for statistical problems of self-organization of thread-like and plate-like structures, where disk-shaped and fibrous statistical structures appear to be simpler, individual cases.

Approximately ten years later after A.A. Vlasov started preparation of his book "Theory of many particles", the mathematical interpretation of nonlocal principle that "all objects of a

system interact with all objects of this and other systems" was defined by Hugh Everett III [9]. Modern theory of Everett interpretation is referred to as Multiverse. David Deutsch [10] compares visible reality with fabric, woofed of interlacing threads. Reality of other worlds penetrate with our reality through these threads and has certain impact on it. Making use of Multiverse as communication means can open the way to instantaneous transmission of information at any distance.

Experimental works, conducted over the last decade, conclusively revealed the existence of quantum mechanical entanglement between not only two, but three particles [11], the scheme that indicates possibility of multilateral simultaneous quantum coupling and quantum key distribution. Thus, the issues of instantaneousness interaction switched from theoretical field into experimental. Continuing work in this area will probably provide an answer for the question "What is the Universe made of?".



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