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The NATURE of GRAVITATION: a New Insight

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One of the greatest problems of science of the XXI century:

WHAT IS GRAVITATION?

There is no immediate prospect of identifying the mediator of gravity.

Attempts by physicists to identify the relationship between the gravitational interaction and other known fundamental interactions are not yet resolved.

Richard Feynman:

"Today our theories of physics, the laws of physics, are a multitude of different parts and pieces that do not fit together very well. We do not have one basic structure from which all is deduced". Feynman's view is still topical. Therefore, any ideas relevant to understanding the

"<u>basic structure</u> from which all is deduced"

should be welcomed and cannot be rejected without first having been thoroughly debated

What does **"basic structure" mean?**



We are confident that,

until we understand <u>the origin of mass</u>, all our efforts to understand the nature of gravity are doomed to failure

What is mass? What is electric charge?

Answers to these and many other *questions are impossible to obtain in principle* within the framework of the

Standard Model

Because of obvious drawbacks, physicists are constantly searching for new solutions to improve the SM.

Most physicists prefer to improve the SM, without affecting its conceptual basis.

Today they place their hopes on <u>String Models of</u> <u>Elementary Particles</u>, which are regarded as dimensional microobjects – very small strings (less in size than atomic nuclei), but not as point like objects of the SM.

(A complete set of vibrational modes of the strings should describe all the diversity of elementary particles and their interactions, including gravitational)

A complex mathematical tool is used in this process, since the *strings are 10- and 11-dimensional structures*.

String Models, being yet more complicated abstract-mathematical models than SM, do not reflect the real image of elementary particles, trying to describe only their behavior.

We assume that

the generalized String Model is very far from its final form, if only the latter will be build ever completely.

And most importantly, from our point of view:

String Models do not solve the fundamental problem - the problem of the nature of mass and electric charge.

Therefore, the choice of String Models is unsuccessful. Such models have no prospects.



do not solve

the fundamental problem:

where does the mass of elementary particles come from?

Our approach to solving:

Atoms and elementary particles are inextricably linked with the general structure of the Universe!

Therefore, solution of the problem of

the structure of elementary particles and the origin of their mass

(which is "one basic structure from which all is deduced")

should begin with an accurate definition of the structure of the Universe as a whole

At the heart of the modern theories of physics are abstract-mathematical (fictional) <u>postulates</u>, which were taken subjectively. They represent the conceptual basis of the theories.

Our approach is based on <u>axioms</u> of dialectics (dialectical philosophy and dialectical logic), which reflect reality, have common sense, and are dialectically noncontradictory.

Axioms of dialectics regarded to the structure of the Universe

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

2. Mutual transformations of fields with opposite properties (for example, potential ⇔ kinetic) cause the

wave nature of the World.

The wave process, appearing at a level, generates waves going into an infinite series of embedded fields-spaces of lower and higher lying levels. 3. Any object of the Universe at a level simultaneously belongs to a lower situated infinite series of embedded fields-spaces; therefore, the structure of megaobjects of the Universe is defined by the structure of their microobjects.

4. Between objects, objects and the ambient field of matter-space-time, there exists **exchange** of matterspace-time occurring both at the same and between different levels.

5. The **longitudinal-transversal** structure of the wave field of exchange at an arbitrary level of the Universe is presented by the **spherical-cylindrical** wave field of matter-space-time. **The axioms of dialectics** reflect the fact that everything in the Universe, at all its levels, including micro- and mega-, is in **continuous oscillatorywave motion**.

Everything in the Universe obeys **the law of rhythm** and has a **wave nature**, and static fields do not exist.

The wave fields of all objects overlap.

Everything in the Universe is in **natural harmony**: a **natural harmonic relationship** exists between all fields, including electromagnetic and gravitational, as well as between any objects and phenomena.

Following the axioms of dialectics

Wave structure of matter-space-time can be described by the well-developed methods of classical wave physics, in particular, by the general wave equation

$$\Delta \hat{\Psi} - \frac{1}{c^2} \frac{\partial^2 \hat{\Psi}}{\partial t^2} = 0$$

This equation contains information on spherical and cylindrical components of the field of matter-space-time at all levels.

Relying on the axioms of dialectics, the problems of the origin of mass, charge and gravity were solved within the

Dynamic Model

(One of the two main theories of Dialectical Physics)

Internal space of a particle - The Universe



Outer space of a particle -The Anti-Universe

The Universe

According to Dynamic Model (DM)

an elementary particle is considered as a **spherical microobject** of a complicated internal structure,

being in **dynamic equilibrium** with the environment through the wave process of a welldefined frequency ω.

Longitudinal oscillations of its wave shell in the radial direction provide interaction with other objects and the surrounding field.

The spherical wave shell (characteristic sphere) *limits*

the **main part** of the particle from its **field part**, gradually merging with the surrounding field of matter-space-time.

The internal (main) part, limited by the wave shell, represents the **basis** of the particle, while the **field part** is its **superstructure**.

Such a model interprets an elementary particle as a **particular discrete physical point of an arbitrary level of matter-space-time** bounded by the characteristic sphere. **Elementary particle** (in accordance with the DM)

resembles

a local three-dimensional pulsating vortex of wave space (or antinode of a standing wave),

and looks like

a spherical micro pulsar

Thus, an elementary particle, considered as an interference micro formation, resembles a pulsating sphere in the wave space. With that, the space, which generates the sphere moving in this space, is regarded as an incompressible frictionless medium.

The movement involves a well-defined periodic swelling and shrinking of the sphere and its displacement as a unit whole in space.



Dynamic model of elementary particles

 \hat{p} is the two-dimensional density of exchange, or a pressure of the field of exchange; $\hat{p}dS$ and $(\hat{p} + \frac{\partial \hat{p}}{\partial r}dr)dS$ are powers of exchange of the ambient field of matterspace-time with an element dS of the shell of a particle.

Power of the central exchange F_s with the ambient field

(at the boundary of the spherical shell of a particle with the area S and radius r)

$$\hat{F}_{s} = \frac{4\pi r^{3} \varepsilon_{0} \varepsilon_{r}}{1 + k^{2} r^{2}} (1 - ikr) \hat{\upsilon} i\omega$$

 $\varepsilon_0 = 1 \ g \times cm^{-3}$ is the *absolute unit density*; ε_r is the *relative density*. $\hat{v} = v(kr)e^{i\omega t}$ is the *speed of wave exchange* (interaction)

- $k = \frac{2\pi}{\lambda} = \frac{\omega}{c}$ is the *wave number* corresponding to the well-defined fundamental frequency ω of the field of exchange
 - λ *c fundamental frequency* ω of the field of exchange (which is characteristic of the corresponding level of the Universe).

C is the *basis speed of wave exchange* of matter-space-time.

The general equation of the central exchange contains information about the

exchange of motion

$$\frac{4\pi r^3 \varepsilon_0 \varepsilon_r}{1+k^2 r^2} \left(\frac{d\hat{\upsilon}}{dt} + kr\omega\hat{\upsilon}\right) = \hat{F}_s$$

and the **exchange of mass**

$$\frac{4\pi r^3 \varepsilon_0 \varepsilon_r}{1+k^2 r^2} \omega (i+kr) \hat{\upsilon} = \hat{F}_s$$

Associated mass

$$m = \frac{4\pi r^3 \varepsilon_0 \varepsilon_r}{1 + k^2 r^2}$$

It is analogous to the *associated (hydrodynamic) mass* attributed to a moving body in liquid

(For example, a hollow pulsating elastic sphere or cylinder in water sets in motion all the surrounding water mass, which is called thereby *hydrodynamic*)

Elementary particles are finite-infinite in size

The **finite** particle size is limited by the spherical wave shell pulsating with the **exafrequency** ω_e . This frequency determines the **interaction** of particles at the micro level (**atomic** and **subatomic**).

The **infinite** particle size has no boundary, but it includes the far remote zone bounded by the spherical wave shell pulsating with the **ultimate low frequency** ω_g . This shell divides the oscillatory and wave regions of particles at the mega level, and determines the

gravitational radius of the particles.

The frequency ω_g , called **gravitational**, determines the **gravitational interaction of particles**.

The fundamental frequency responsible for the *exchange* (interaction) at the *atomic* and *subatomic* levels:

$$\omega_e = 1.869162505 \times 10^{18} \, s^{-1}$$

The fundamental wave radius of the field of the exchange:

$$\lambda_e = \frac{\lambda_e}{2\pi} = \frac{c}{\omega_e} = 1.603886998 \times 10^{-8} \, cm$$

The *fundamental wave diameter* $D = 2\lambda_e \approx 0.32 nm$ correlates with the average value of lattice parameters in crystals, defines the *average discreteness of the space* at the subatomic and atomic levels of the Universe.

The fundamental frequency responsible for the *exchange* (interaction) at the *gravitational* level - the *frequency of the gravitational wave field:*

$$\omega_g = \sqrt{4\pi\varepsilon_0 G} = 9.15814 \times 10^{-4} s^{-1}$$

 $G = 6.67428(67) \times 10^{-11} m^3 \times kg^{-1} \times s^{-2}$ is the gravitational constant.

The gravitational wave radius of elementary particles - *the elementary radial gravitational wave*:

$$\lambda_{g} = \frac{\lambda_{g}}{2\pi} = \frac{c}{\omega_{g}} = 3.274 \times 10^{13} \ cm = 327.4 \ Mkm$$

The existence of the gravitational frequency ω_g and the gravitational wave radius λ_g of elementary particles, along with the fundamental frequency ω_e and the fundamental wave radius λ_e of the particles, responsible for their exchange (interaction) at the subatomic and atomic levels, shows

the indissoluble harmonic bond of microand mega objects of the Universe in a single complex of infinitesimal and infinitely large. The fundamental wave gravitational radius λ determines the whole spectrum of wave gravitational shells of particles:

$$r = \lambda_g z_{m,n} = 327.4 \times z_{m,n} Mkm$$

 $(Z_{m,n} \text{ are roots of Bessel functions})$

and the relation between the shells:

$$r_s = r_1 \frac{z_{m,s}}{z_{m,1}}$$

			0	
S	$z_{m,n}=j_{0,s}$	r, Mkm	Planets*	
1	2.4048	787.3	Jupiter (778.3)	
3	8.6537	2833.2	Uranus (2870.99)	
6	18.0711	5916.5	Pluto (5913.5)	

*) Planets located in the relative proximity to the specified shells. The big half-axes of orbits are in brackets.

Some of the *H*-atomic wave shells, $r = \lambda_g z_{m,n}$

<i>S</i>	$j_{1,s}$	r _s , Mkm	Planets
1	3.831706	57.91	Mercury
2	7.015587	106.03 (108.2)	Venus
3	10.17347	153.76 (149.6)	Earth
4	13.32369	201.36 (178.0)	Toro
5	16.47063	248.93 (227.9)	Mars
6-	19.61586-	296.46	Asteroids
••		628.97	1 asteroid
3	41.61709		
4	44.75932	676.46	
5	47.90146	723.95	
6	51.04354	771.44 (778.3)	Jupiter

The big half-axes of orbits are in brackets.

The spectrum of the shells of Saturn; r_s , kkm			
S	$r_s(j_{1,s})$	$r_s(y_{1,s})$	$< r_s >$ (experiment)
1	60.33		
2	110.46	85.49	
3	160.18	135.34	137.64, 139.34
4	209.78	184.99	185.52
5	259.32	234.56	238.02
6	308.85	284.09	294.66 (3 satellites)
7	358.35	336.60	
8	407.85	383.10	377.40 (2 satellites)
• • •	•••	•••	•••
11	556.30	531.55	527.04 (Rhea)

The measure of the rate of exchange of matter-space-time at all levels is the exchange charge, or the power of mass exchange:

$$q = \frac{4\pi r^3 \varepsilon_0 \varepsilon_r}{1 + k^2 r^2} \omega = m\omega$$

Exchange charge of the electron represents (at the level of the fundamental frequency ω_e) is the **elementary quantum of the rate of mass exchange**

$$q_e = m_e \omega_e = e_C \sqrt{4\pi\epsilon_0} = 1.702691627 \times 10^{-9} g \times s^{-1}$$
$$e_C = 4.803204401 \times 10^{-10} g^{\frac{1}{2}} \times cm^{\frac{3}{2}} \times s^{-1}$$
is the **electron charge** in the CGSE_a system.

The neutron

is the basic particle of atomic systems

Gravitational charge of the neutron

$$q_{ng} = m_n \omega_g = 1,53392 \times 10^{-27} g \times s^{-1}$$

Neutron is the **fundamental quantum of mass** and the **fundamental graviton** with the gravitational charge of exchange q_{ng} .

The Universal Law of Exchange

(Originated from the DM; valid for dynamic spherical objects in any field of matter-space-time)

$$\left\langle F\right\rangle = \omega_f^2 \, \frac{m_1 m_2}{4\pi\varepsilon_0 r^2} \, *$$

(* - Averaged, for the inphase and antiphase ($\Delta \phi = o; \pi$) cases, modulo)

 m_1 and m_2 are **associated masses** of the objects, $\varepsilon_0 = 1 g \times cm^{-3}$ is the **absolute unit density**, \mathfrak{W}_f is one of the two **fundamental frequencies** $(\mathfrak{W}_e, \mathfrak{W}_g)$ For $\Delta \varphi = o$: $\langle F \rangle = -\omega_f^2 \frac{m_1 m_2}{4\pi \varepsilon_0 r^2}$

Coulomb's and Newton's laws

are

particular cases of the Universal Law of Exchange



describe, correspondingly, exchange-interaction at the level of the wave "*electric*" field on the basis of electron with the associated mass m_e and the exchange ("*electric*") charge

$$q_e = m_e \omega_e ,$$

and the exchange-interaction at the level of gravitational wave field on the basis of graviton-nucleon with the associated mass m_n and the exchange (*gravitational*) charge

$$q_{ng} = m_n \omega_g$$

The exchange charge of an electron q_e is responsible for the strengthof electromagnetic interactions, in particular, forinteratomic bonds in molecules and crystals.

Actually, the energy of *electron binding* is equal to

$$E_e = \frac{q_e^2}{8\pi\varepsilon_0 \lambda_e} \approx 4.49 \ eV$$

Strong (nuclear) interactions depend on the **exchange charges of nucleons** (q_n and q_p). Internodal neutron binding energy of length $r = 1.20 \cdot 10^{-8} \ cm$ (in the shell-nodal atomic model)

$$E = \frac{q_n^2}{8\pi\varepsilon_0 r} = 20.29 \; MeV$$

is characteristic of *strong* (*nuclear*) *interactions*.

The energy of fundamental interactions at each level is determined by the exchange charges squared.

If the energy (strength) of *electromagnetic* interaction is taken to be 1, then on this scale, the energy of *strong* interaction has the order of

$$q_n^2 / q_e^2 = 3.4 \times 10^6$$

and *gravitation* interaction –

$$q_{ug}^2 / q_e^2 = 0.8 \times 10^{-36}$$

Thus, the ratio of the orders of strength values of the three fundamental interactions: **strong**, **electromagnetic**, and **gravitational** is approximately the following:

$$10^6:1:10^{-36}$$

They overlap the range of 42 decimal orders in magnitude.

($q_{ug} = m_u \omega_g \approx 1.52 \times 10^{-27} g \times s^{-1}$, m_u is the unified atomic mass unit)

Gravitational frequency ω_g defines the radial time wave-period T_g , $T_g = 2\pi/\omega_g = 0.686077 \times 10^4 s$

and the azimuthal time wave of the fundamental tone T_c ,

$$T_c = 4\pi T_g = 8.62150 \times 10^4 s$$

(*Earth day*, $24 h = 8.640 \times 10^4 s$)

The *time wave* T_c repeats the structure of *spatial wave* of the fundamental tone on the Bohr orbit, $\lambda = 4\pi r_0$, and the azimuthal (transversal) electron wave of the fundamental tone, $\lambda_e = 4\pi r_e$, where r_e is the radius of the wave shell of an electron.

Thus, the gravitational constant G can be presented as

$$G = \omega_g^2 / 4\pi \varepsilon_0$$
 or $G = 16\pi^3 / T_c^2 \varepsilon_0$

The relationships show that the Earth is in harmonic resonance bond with the fundamental gravitational frequency ω_g .

Just like the **electron** on the Bohr orbit is in **harmonic resonance bond** with the **fundamental frequency of the subatomic and atomic levels** ω_{e} .

Thus, our Earth is fundamentally distinguished from other planets (just like the hydrogen atom differs from all other elements of the Periodic Table), taking a special place in the field-space of the Solar system and, perhaps, in the Cosmos as a whole!

Conclusion



Gravitation ?



particles?

Our solutions:

Elementary particles are spherical objects pulsating at the fundamental frequencies,

> Mass, *m* is associated (dynamic)

 ω_e and ω_a

Gravitational charge, q_g is the rate of exchange at the fundamental frequency ω_g , $q_g = m\omega_g$

GRAVITATION is the wave exchange (interaction) of gravitational charges The 19th International Conference on General Relativity and Gravitation (GR19) Mexico City 5 – 9 July, 2010

THE NATURE of GRAVITATION: a New Insight

Gravitational interaction of bodies is the result of the wave exchange of all elementary particles, components of bodies, individually at the fundamental frequency

$$\omega_g = 9.15814 \times 10^{-4} s^{-1}$$

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LITERATURE

[1] L.G. Kreidik and G.P. Shpenkov, *Dynamic Model of Elementary Particles and the Nature of Mass and "Electric" Charge*, Revista Ciencias Exatas e Naturais, Vol. 3, No 2, 157-170, (2001); http://shpenkov.com/pdf/masscharge.pdf

[2] L.G. Kreidik and G.P. Shpenkov, *Waves and Particles (An aternative view on the matter-space-time structure)*, Parts 1-3, in *"Foundation of Physics*; 13.644...*Collected Papers"*, Geo. S., Bydgoszcz, 1998, 69-130 pp.; http://shpenkov.com/Found.html

[3] L.G. Kreidik and G.P. Shpenkov, *Wave quanta*; http://shpenkov.com/pdf/WaveQuanta.pdf

[4] L.G. Kreidik and G.P. Shpenkov, *Atomic Structure of Matter-Space*, Geo. S., Bydgoszcz, 2001, 584 p.; http://shpenkov.com/atom.html

[5] G.P. Shpenkov, *Theoretical Basis and Proofs of the Existence of Atom Background Radiation*, Infinite Energy, Vol. 12, Issue 68, 22-33, (2006); http://shpenkov.com/pdf/TheorBasis.pdf

[6] G.P. Shpenkov, The Wave Nature of Gravitational Fields: General Characteristics; http://shpenkov.com/pdf/Gravitation.pdf



Dynamic Model is not an accidental invention or a fruit of imagination.

DM naturally proceeds from a new approach in physics based on dialectics.

Dialectical philosophical system with its logic surpasses the Aristotelian philosophy with its formal logic of limited possibilities, dominating currently in physics. Correct statement of the problem - half the success to get the right solution

The Dynamic Model gave rise the domino effect in physics:

A chain reaction occurred when a fundamental change of our view on elementary particles structure caused the discovery of new fundamental parameters, which then caused a change of basic notions, which then caused another change of accepted theories, and so on in linear sequence.

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Dynamic Model of Elementary Particles revealed also the next great mystery:

Why the <u>speed</u> c (equal to the speed of light) plays the fundamental role for the <u>internal energy</u> E of a <u>quiescent</u> particle?

$$E = m_0 c^2$$

According to DM, the **speed** c is an innate property of elementary particles as the **basis speed of their wave exchange (interaction) with the environment** at the **subatomic, atomic** and **gravitational levels**, both in rest and motion; therewith, m_0 is the **associated mass** of a particle.

Accordingly, *E* is the energy of wave exchange of matter-space-time of an elementary particle at the given levels; or *intrinsic dynamic energy of the particle which is regarded as a pulsating microobject of the Universe*.

Comparison of two models in physics: DM (new) and SM (current)



5	The fundamental frequency of the subatomic and atomic levels:	
1	$\omega_e = e/m_e = 1.869162559 \cdot 10^{18} s^{-1}$	Unknown
∟ _ 6	Static fields do not exist in Nature.	
1	"Electrostatic" fields are, actually, exofrequency fields of the fundamental frequency $(x, y) = (x + 5)$	Unknown
7	The objective transversal ("magnetic") charge of an electron on	
i -	the Bohr orbit:	Unknown
i I	$e_{H} = \frac{O_{0}}{C}e$	
8	The fundamental wave radius:	Unknown
1 1 1	$\lambda_e = c/\omega_e = 1.603886492 \cdot 10^{-8} cm$	
9	The ratio of electron's orbital magnetic moment,	
1	$\mu_{e,orb} = e \upsilon_0 r_0 / c ,$	Incorrect value
1	to its orbital moment of momentum,	$\frac{\mu_{e,orb}}{e} = \frac{e}{1}$
i	$\hbar = m_e \upsilon_0 r_0$:	$\hbar 2m_ec$
1	$\frac{\mu_{e,orb}}{\hbar} = \frac{e}{m_{o}c} = \frac{1}{\lambda_{o}} = k_{e}$	
г - I	The magnetic moment of an electron:	Incorrect value
10 1	$\mu_e = \frac{\upsilon_0}{c} e(r_0 + \delta r_0) = -1855.877359 \cdot 10^{-26} J \cdot T^{-1};$	$\mu_e = (1 + \alpha_e) \frac{e\hbar}{2m_e c} =$
1	$v_0 = 2.187691263 \cdot 10^8 \ cm \cdot s^{-1}$ is the Bohr speed	$= -928.476410(80) \cdot 10^{-26} J \cdot T^{-1}$

The proper magnetic moment of an electron (electron "spin" magnetic moment): $\mu_s = \frac{r_e}{z_{p,q}} \sqrt{\frac{2Rh_e}{m_0 c}} = -5.50792 \cdot 10^{-29} J \cdot T^{-1}$	Incorrect value $\mu_s = \mu_B = \frac{e\hbar}{2m_e c} =$ $= -927.400947(80) \cdot 10^{-26} J \cdot T^{-1}$
The radius of an electron shell (<i>electron's radius</i>): $r_e = \sqrt{\frac{m_e}{4\pi\varepsilon_0}} = 4.17052597 \cdot 10^{-10} cm_{;}$ $\varepsilon_0 = 1 g \cdot cm^{-3}, m_e = 9.10938253 \cdot 10^{-28} g$	Unknown Considered as a point like particle. Classical electron radius is $r_e = \left(\frac{v_0}{c}\right)^2 r_0 =$ 2.817940325 \cdot 10^{-13} cm
The radius of a proton shell (proton's radius): $r_p = 0.528421703 \cdot 10^{-8} \ cm$ (calculated from the <i>formula of mass</i> , see # 1)	Unknown Proton rms charge radius is $r_p = 0.8750(68) \cdot 10^{-13} cm$
The fundamental frequency of the gravity field: $\omega_g = \sqrt{4\pi\varepsilon_0 G} = 9.158082264 \cdot 10^{-4} s^{-1};$ $G = 6.6742 \cdot 10^{-8} g^{-1} \cdot cm^3 \cdot s^{-2}, \qquad \varepsilon_0 = 1 g \cdot cm^{-3}$	Unknown

15	The fundamental wave radius of the gravity field: $\lambda_g = c/\omega_g = 327.4Mkm$	Unknown
16	The gravitational spectrum of nucleon wave shells: $r = \lambda_g Z_{m,n};$ $Z_{m,n}$ are roots of Bessel functions	Unknown
17 1 1	The background spectrum of the hydrogen atom: $\frac{1}{\lambda} = R \left(\frac{1}{n^2} - \frac{1}{(n+\delta n)^2} \right); \qquad \delta n = \delta r / r_0$	Unknown
18	<i>The nature of the Lamb shift</i> : the shift is precisely equal to the frequency gaps between the nearest spectral terms of the background spectrum (see # 17)	An erroneous concept based on an influence of the invented (non-existed) virtual particles
19	The precise derivation of binding energy in atoms without use of the relation $\Delta E = \Delta m \cdot c^2$	Unable
	The physical meaning of the speed of light <i>c</i> in the relation $E_0 = m_0 c^2$; m_0 is the associated mass of a particle (see # 1). Speed of light <i>c</i> is the basis wave speed of exchange of matter-space-time at the subatomic level.	Unknown m_0 is the "rest" mass.

21	<i>Internal spatial structure of atoms</i> , <i>i. e.</i> , the disposition of nucleons in atoms (The latter defines the structural variety at the molecular level in Nature: " <i>genetic code</i> ")	The fixed (strictly geometrical) disposition of nucleons is Unknown
22	The g-lepton structure of nucleons: Proton and Neutron are similar in g-lepton structure to isotopes ${}^{28}_{14}Si$ and ${}^{29}_{14}Si$, respectively, according to Shell-Nodal Atomic Model $(m_g = 68.22 m_e)$	Quark structure (does not similar to crystal)
23	Crystal structure of solids , including forbidden by mathematical laws of crystallography	Unable
24	The structure of all isotopes and their relative masses (including limiting masses: minimal and maximal for every isotope)	Unable
25	<i>The nature of Mendeleyev's Periodic Law</i> : the similarity of nodal structure of external atomic nucleon shells.	Different explanation: electron structure of atoms
26	<i>The fine structure constant physical meaning:</i> the scale correlation between basis and superstructure of wave (between oscillatory and wave processes in waves)	Unknown
27	The unified description of electromagnetic, gravitational, and strong (nuclear) interactions	Unable

28	The nature of the spherical harmonics of wave and Schrodinger equations The spherical harmonics define polar-azimuthal coordinates of nodes and antinodes of standing spherical waves	<i>Unknown</i> As a result, an introduction in quantum mechanics of the conceptually unfounded notion of hybridization of atomic orbitals
29	The nature of integer and fractional quantization in quantum Hall effect	Fitting theory in the spirit of the virtual particles of quantum electrodynamics
	The nature of quantization in the Hall conductance (the resistance quantum) is naturally uncovered as an internal feature of atomic structures considered as wave formations, without accounting an influence of external magnetic fields.	Modern explanation is based on an imaginary quantum-mechanical fluid of a hypothetical new form and on a many body wave function. It predicts that the elementary excitations involve pseudo-particle charge carriers with charges that
	The deduced spectrum of fundamental resistances $R_e = -\frac{h}{e^2} \frac{m}{n}$	are fractions of the electronic charge.
30	Precise derivation of the neutron magnetic moment	L
	$\mu_{n}(th) = \frac{e\upsilon_{0}}{c} \left[\left(\hat{\lambda}_{e} + \frac{r_{0}}{y_{0,12}} \right) \sqrt{\frac{2Rh}{m_{0}c}} + \frac{r_{e}}{j_{0,12}} \sqrt{\frac{2Rh_{e}}{m_{0}c}} \right]$	Unable
i de la	$\mu_n(th) = -0.96623513 \cdot 10^{-26} J \cdot T^{-1}$,
31	Precise derivation of the proton magnetic moment	
	$\mu_{p}(th) = \frac{(e + \Delta e_{p})\upsilon_{0}}{c} \left(\lambda_{e} + r_{0} \frac{1}{\beta} \frac{(a_{0,11}' + y_{0,12})}{2(a_{0,11}' y_{0,12})}\right) \sqrt{\frac{2Rh}{m_{0}c}}$	Unable
	$\mu_p(th) = 1.410606662 \cdot 10^{-26} J \cdot T^{-1}$	۱ ۱

32	Objective (true) dimensionalities of physical quantities	
	in integer powers of units	
	Electric charge, $[q] = [m]/[t] = g \cdot s^{-1}$	
	Electric current, $[I] = [q]/[t] = g \cdot s^{-2}$	
	Circulation, $[\Gamma] = [I]/[c] = g \cdot cm^{-1} \cdot s^{-1}$	Incorrect dimensionalities
	Electric field strength, $[E] = [F]/[q] = cm \cdot s^{-1}$	(subjective, phenomenological)
	Magnetic field strength, $[B] = [F]/[q] = cm \cdot s^{-1}$	· · · · · · · · · · · · · · · · · · ·
	Electric field momentum density, $[D] = [\varepsilon_0][E] = g \cdot cm^{-2} \cdot s^{-1}$	Accepted in contemporary physics, the dimensionalities of physical avantities of
	Magnetic field momentum density, $[H] = [\varepsilon_0][B] = g \cdot cm^{-2} \cdot s^{-1}$	electromagnetism, based on the
	Potential, $[U] = [F][l]/[q] = cm^2 \cdot s^{-1}$	charge, current, and their derivatives,
	Resistance, $[R] = [U]/[I] = g^{-1} \cdot cm^2 \cdot s$	are
	Conductance, $[G] = [R]^{-1} = g \cdot cm^{-2} \cdot s^{-1}$	erroneous
	Resistivity, $[\rho] = [R][l] = g^{-1} \cdot cm^3 \cdot s$	
	Conductivity, $[\sigma] = [\rho]^{-1} = g \cdot cm^{-3} \cdot s^{-1}$	
	Inductance, $[L] = [U][t]/[I] = g^{-1} \cdot cm^2 \cdot s^2$	
	Other physical quantities of electromagnetism contained electric charge, current, and their derivatives with corrected dimensionalities.	
33	The Fundamental Period	
	of the Decimal Code of the Universe	Unknown
	$\Delta = 2\pi \lg e = 2.7287527$	

http://shpenkov.com/publications.html

Since the results of theoretical studies, carried out within the framework of the dialectical approach, proved to be effective,

having uncovered the previously unknown regularities of nature,

it can be argued that the dialectical approach is promising for physics.

Modern technologies are based mostly on a very primitive principle, namely on burning of mineral raw material (mineral oil, gas, and coal) and on use of radioactive materials.

In view of this, **ecological situation** of the world day by day **changes for the worse**.

The discovery of the wave **nature** of **gravity** and the **fundamental frequency** of the gravitational fields **make it possible to solve** the greatest problem of mankind on using the energy of gravity, in particular, on **managing** the **gravitational fields** of material **objects** in the gravitational fields of stars, planets and their satellites.



A scheme and parameters of wave motion-rest for the system: "central object M – satellite m"; L is the unit spiral of motion-rest; λ_{ζ} is the oscillatory wave (step) of spiral motion; v_z is the velocity of the central object M; m is the satellite; a is the radius-amplitude of rest (radius of an orbit); *ia* is the radius-amplitude of motion; V and *iV* are kinetic and potential velocities; w and *iw* are potential and kinetic accelerations, correspondingly.

The transverse potential-kinetic gravitational wave

$$\hat{\Psi} = (a + ia)e^{-i(\omega t - k_{\zeta}z)}$$

where
$$k_{\zeta} = \frac{2\pi}{\lambda_{\zeta}} = \frac{2\pi}{\upsilon_z T} = \frac{1}{\lambda_{\zeta}}$$



Graphs of the transverse gravitational wave, describing the circular motion-rest.



Graph of the **gravitational longitudinal-transverse field of four levels**; St is a **satellite**, P is a **planet**, Sr is a **star**, G is a **galactic core** (a); R is the wave of **right** helicity, L is the wave of **left** helicity (a negative wave) (b).