Fundamental Discovery of the Dialectical Unity Principle and its Consequences for Theoretical Physics

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Abstract

The whole reality (Universe) represents the unity in its diversity. What is the basic mechanism that creates the unity of being? Many thinkers have expressed the Unity Principle by saying "everything is connected to everything else", but nobody has detected its essence. On the base of dialectical logic, the Unity Principle is discovered which illustrate the exact mechanism how the physical Universe may work at its macro and micro levels. Fundamental discovery of the dialectical Unity Principle is a base on which new fundamentals of theoretical physics are built in the field of cosmology and particle physics.

Dialectical Logic and the Unity Principle

Contemporary theoretical physics enters the deep crisis resulting from its positivistic and post-positivistic approach supposing reality to be mechanical and atomistic made of point-like particles or one-dimensional strings where the essence of matter, energy, space and time are undetectable mysteries. But the Universe (reality) is dialectical (relational) and so it is accessible by dialectical logic. Our aim is to show that the Universe is built of elementary bipolar relations of opposites (+/-) named quantum dipoles or quantum connections. Dialectical logic has achieved its apex in Hegel´s rational idealistic philosophy. His Absolute Idea represents a divine mind or the process of creative divine thinking. While Einstein was finding the mind of God in a form of the exact mechanism how the Universe works, G.W.F. Hegel already, at the beginning of 19-th century, disclosed almost completely the manifestation of divine Mind within his dialectical logic and its basic categories like unity of opposites, relations "being-nothing", "whole-part", "one-many", "repulsion-attraction" "continuity-discontinuity", "quantity-quantum-quality-measure", "finitude-infinity", "subject-object", etc. [1]. Nevertheless Hegelian revolution in philosophy and dialectical logic has been unfinished as Hegel could not come to the final simple solution – detection of the exact mechanism of the Unity Principle which discovery allowed us not only to finish dialectical logic but also build new theoretical physics (particle physics and cosmology) on the true base. Can we know the truth and the nature of our Universe? Yes, of course, we can. Hegel showed that there are no hidden secrets or realities inaccessible by our critical rational thinking. His philosophy was optimistic and his dialectical logic - very effective and promising instrument. Hegel disclosed brilliantly that the world is rational and dialectical and therefore accessible by dialectical logic. It is impossible not to come to the knowledge of the truth if we apply strong critical thinking and logical reasoning as well as contemporary level of knowledge following from successful quantum mechanics which shows a quantum character and mutual interconnectedness of reality. Although all indications exist already for a long time, theoretical physicists have not found the exact mechanism how mater, energy, space and time are quantized and structured at the basic quantum level. The basic question is: What is the basic elementary constituent of which the whole reality is made and how is it built of its basic constituents? What is the mechanism that creates the unity of being? If we want to know the truth we need to detect how the Universe as a whole looks like. The WHOLE is everything what exists. It is an ABSOLUTE - UNITY that manifests itself through almost infinite variety of its forms. Although the reality looks like disintegrated into many different and independent spheres, we feel intuitively that a great variety of existing forms should have a common basis.

If we look at the reality (existence) or the Universe as a whole, we can see that it is not a pure continuum, but it is structured. A pure unstructured continuum is nothing. So the whole Universe as space is structured and, at the same time, represents the unity in its internal structuration - diversity. As the Universe is structured, it must be built of its basic structural constituents. That is the reason why the Universe is quantized. But at the same time it represents the Unity. It means that its basic structural constituents must be interconnected. But connections are also structural constituents of reality (Universe). Does the Universe have many different basic building constituents or not? If we say yes, we must explain – why, what are these different constituents and what is the reason of their difference? If we say that only one basic elementary structural constituent is sufficient, we need only to find it and explain its essence. As connections are also structural constituents, they just represent what we are searching for. Connection is something that connects two aspects of reality, it means, it connects "something (one side)" to the "other (other side)" and, at the same time, it is created of both that sides. In dialectical logic they are named opposites and their mutual relation is the unity of opposites (Figure 1).

Everything what exists creates the whole reality in its unity. At the highest level of abstraction we know that something exists. But this something is nothing without its relation to the other. "Something" cannot relate to itself (self-relation, self-reflection) without its relation to the "other", otherwise it is nothing. The other (-) represents the limit of something (+), through which it determines itself as a difference. "Something" and its "other side" are not two independent entities but

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Figure 1: Dialectical logic opposites and unity of opposites.
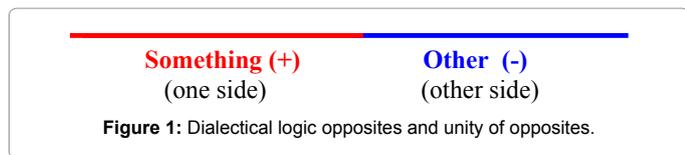
only two sides (opposites) of the same "one". It is irrelevant what side is "something" or "other". Both they relate to each other in order to relate to themselves. The whole "one" is a self-relation (self-reflection) only because it is a mutual relation of its two opposite sides. Any of these two opposites reflects itself into itself through its other side as through its own limit (mirror). "Something" and "other" create a mutual positive and negative relationship which cannot be static, but only dynamic in the sense that "something" repels from itself its "other" side by repulsion (negation), but at the same time holds and attracts it to itself by attraction (negation of negation). Repulsion and attraction are two opposite forces through which both opposite sides of the same "one" are in a mutual dynamic relation manifesting by motion – vibration, oscillation. Motion is energy as a result of mutual attraction and repulsion of opposites. Energy is a measure of mutual attraction and repulsion of opposites. This dynamic bipolar relation (+/-) represents the elementary structural constituent of which the whole reality (Universe) is made. We can name it an elementary quantum dipole or elementary quantum connection. Known particles as well as space including vacuum are made of these quantum dipoles. The unity of the Universe means that all its aspects are made of the same constituents – quantum connections (dipoles). Elementary quantum dipole (connections) is an elementary quantum of space thereby the volume of space is given by the number of elementary quantum connections.

The Whole and the Part

The exact mechanism of the Unity Principle follows just directly from the analysis of dialectical relations "whole-part" and "one-many". Contemporary physics divides the whole reality into its parts mechanically. Mechanical separation of parts from the whole means the destruction of their mutual relations so that these parts can come to mutual interactions only through local touch (contact). Localism dominates in contemporary theoretical physics, where mutual interactions between "point-like" particles are presented as a result of mutual exchange of virtual point-like bosons moving with a limited speed of light. It is very strange that such a naïve mechanical interpretation of interactions between particles was incorporated into the Standard Model although non-locality results directly from quantum mechanics.

The dialectic relation between the whole and the part means that any part is separated from the whole only if it is separated from all parts of the whole. At the same time, its separation means its connection to the whole, so to all rest parts of the whole. As a result every Part is connected to all rest parts of the Whole. This must be valid also for elementary parts of which the whole reality is made. As connections are also parts of the whole, there is no difference between parts and connections at the elementary quantum level. Any elementary part is connected to all rest parts of the whole. Such is possible only if the elementary part is a bipolar relation of opposites (+/-) where every "+" is connected to all "-" of the Universe.

Elementary connections are elementary parts and elementary parts are elementary connections of two opposite sides (+/-). The Unity Principle means that everything is connected (in relation) to everything else in the sense that every positive pole "+" (i) of the Universe creates

connections to all negative poles "-" (j), and so reciprocally. Bipolar connections +/- or (ij) represent the elementary quantum connections (dipoles) of which the whole reality (Universe) is made explained clearly in Figure 2.

Contemporary theories separate matter from space, supposing space to be only an empty or unstructured surrounding where material objects (entities) move. Space and time in Einstein´s relativity theories is a pure mathematical "space-time" continuum. Before, space was as an empty continuum in which all material bodies moved. In Einstein´s special relativity it was replaced by empty unstructured four-dimensional space-time continuum which was curved in general relativity thanks to presence of matter and energy. But this mathematical idealisation says nothing about the real quantum essence of space and time. Einstein´s space-time is not structured and quantized. It is a pure mathematical continuum. It is very strange that theorists having not found how space and time are quantized try to unite Einstein´s local theories with non-local quantum mechanics, although they mutually exclude each other. As a result string theories produce a huge number of absurd mysteries. Space is a basic attribute of every physical entity with its quantitative measure – volume. There are no entities without spatial volume. Point-like particles or one-dimensional strings are inappropriate at the quantum level even as mathematical idealisations because they deform the reality fatally. Space is not only a basic feature of everything, but at the same time it separates things from each other in the sense that it connects them together. Things can be mutually separated only if they are mutually interconnected. The internal structure of any thing is made of the same basic constituents as are connections through which things are interconnected. All things and their mutual connections are made of the same constituents – elementary quantum connections (dipoles). They are at the same time elementary quanta of space. Nothing exists in space as everything creates space. Objects do not move in space, they only move to each other thanks to their mutual quantum connections. Free space – vacuum – is made of their mutual connections. The Standard Model presents huge number of different point-like particles (fermions and bosons) placed in the vacuum, which essence is unknown. Vacuum is a mystery that can be arbitrarily used to solve all miracles of the Standard Model. For example, it gives enormous energy for very massive virtual gauge bosons in order to mediate a weak interaction in electroweak theory. In reality the vacuum is made of long and weak quantum connections comparing to the short and strong connections of which particles are made. So the vacuum cannot be a source of enormous energy needed for electroweak theory in particle physics in the sense of fluctuating vacuum producing undetectable virtual fluctuations.

Localism *versus* Non-Localism

There are only two basic interactions – non-local and local. Non-local interactions are manifested through mutual attraction and

Figure 2: Bipolar connections representing the elementary quantum connections.
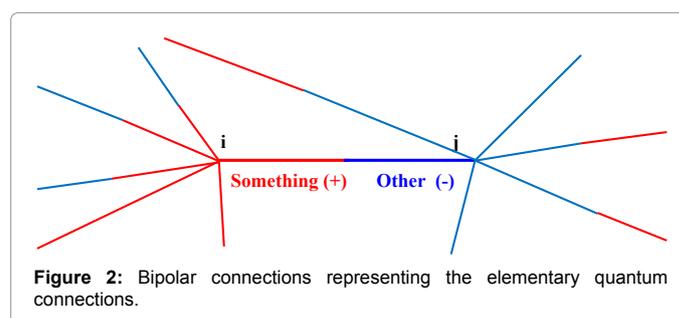
repulsion of opposite poles of quantum dipoles, while local interactions represent always repulsive forces acting through mutual local touch pressures between neighbouring elementary dipoles that push each other by their spaces. Attractive force is always non-local, while repulsive force can be non-local (e.g. in a photon) or local. Local force is always repulsive. Figure 3 shows two quantum dipoles acting locally by their mutual repulsive pressures. Elementary quantum connections (dipoles) represent elementary quanta of space, but differ by their lengths and energies. The left one is shorter, stronger having more energy and the right one is weaker, longer with less energy. As all flows coming from outside act to our basic senses (sight, hearing, touch, smell, taste) locally through touch interactions theoretical physics has a problem to accept "invisible" non-local connections although they result just directly from rational dialectical logic and quantum mechanics being confirmed experimentally and having a practical usage.

Photon as an Elementary Quantum of Existence

It is very strange that even a photon as an elementary quantum of light represents a mystery known as "wave-particle" dualism. Photon is a particle as well as a wave. How is it possible? What is the solution? Photon as an elementary quantum of free energy manifests clearly the bipolar essence of the whole being, but it has been a mystery so far. All we know that the motion of a classical harmonic spring oscillator creates a sinusoidal wave as a result of two forces with opposite orientation - attraction and repulsion. Sinusoidal wave is a consequence of both forces acting through harmonic oscillator. Photon creates sinusoidal wave during its flight. It means it must be a quantum oscillator which oscillations result from internal bipolarity of two opposite forces – attraction and repulsion. Photon is a quintessence of dialectical bipolar nature of reality. The greatest mistake of theoretical physics is the idea that elementary particles must be point-like entities without any internal structure and with zero volume. Even a photon as the simplest particle cannot be a point-like entity without internal structure. The photon is a simple quantum dipole consisting of two opposites (opposite poles) and consequently a holder of elementary quantum of space and energy. It is an elementary particle which, thanks to attraction and repulsion of its opposites, oscillates creating perpetually the sinusoidal wave during its flight which is manifested outside as an electromagnetic wave in relation to a measuring apparatus. Figure 4 explains the Photon γ (+/-) as elementary oscillating quantum dipole is the simplest particle. Photon as a quantum of radiation (light) is a free elementary quantum dipole +/- which, thanks to mutual attraction and repulsions of its opposite poles, performs a permanent oscillation (vibration, pulsation) manifesting outwards as an electromagnetic wave during a flight. This fact is a consistent and factual explanation of the "wave-particle" duality of the light as only a bipolar dynamic unity of opposites can result in oscillation (motion, energy) of a photon (Figure 5).

The photon is an elementary quantum oscillator. If we express its oscillation as rotation, its length is given by a diameter of rotating quantum dipole. Rotation projected to the perpendicular plane looks like oscillation. It is irrelevant if talking about rotation or oscillation (pulsation, vibration), as these motions are manifested outwards in the same way. Photon is an elementary quantum of energy. The essence of energy is also unknown for contemporary physics. Energy of a photon e_{ij} as a measure of its motion (frequency of vibrations ν_{ij}) can result only from mutual attraction and repulsion of its opposites.

Planck's equation $e_{ij}=h\nu_{ij}$

Shows that energy of a photon is given by the speed of its vibrations (frequency). It is hardly believable that the essence of photon's vibrations has not been detected so far. It is due to inappropriate idealisation of elementary particle as a point-like entity with its mysterious "particle-wave" dualism.

Photon performs two types of motion: horizontal and vertical. Horizontal motion represents its flight as a consequence of its dragging by cosmic expansion. Vertical motion is manifested by its oscillation (rotation) thanks to mutual attraction and repulsion of its opposite poles. Photon does not move "in" a free space-like vacuum, but thanks to its external quantum connections, it moves "towards" all other parts of the Universe. Simplicity of a photon allows its perfect oscillation (vibration) in a plane of its flight. As it is the simplest free quantum, it cannot resist its dragging by the expanding Universe, so it has no rest mass and its speed expresses the speed of cosmic expansion. Such is the nature of the speed of light as one of the basic physical constants unknown until now. The knowledge of the essence of Light is the way to understanding the essence of existence. There is no space and energy outside quantum connections as only they create the whole reality.
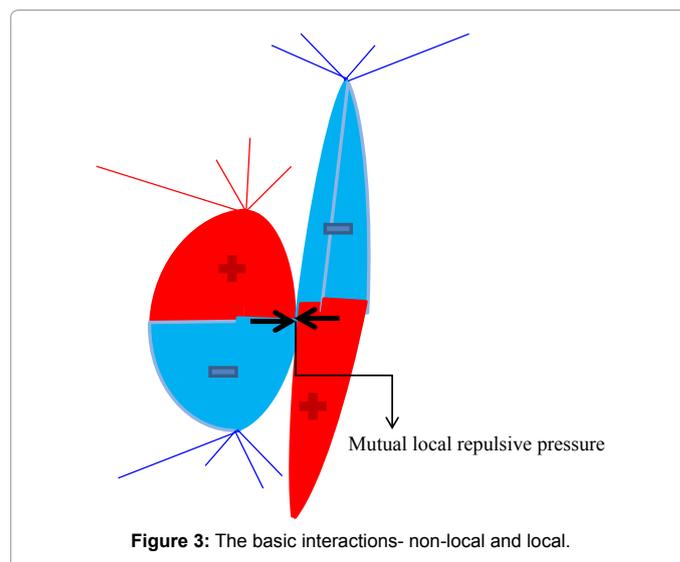

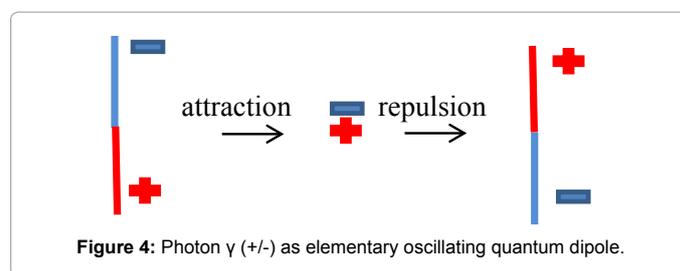**Figure 3:** The basic interactions- non-local and local.

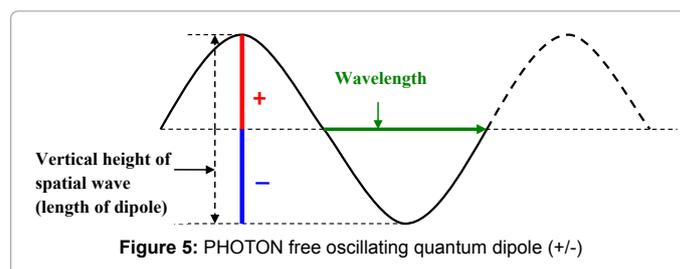**Figure 4:** Photon γ (+/-) as elementary oscillating quantum dipole.

Figure 5: PHOTON free oscillating quantum dipole (+/-)

Quantum connections (dipoles) are not placed in space, but create it. They represent the elementary quanta of space with the elementary volume $v = 3,87.10^{-45} \text{ m}^3$ as follows from my analysis explained by Kohut in [2]. Though elementary quantum dipoles are indistinguishable by their spatial volume characteristics, they differ from one another by energy e_{ij} and length d_{ij}, so that the following basic constant δ_t is valid [3] at the actual quantum state of the Universe:

$$\delta_t = e_{ij} d_{ij} = \alpha h c / \pi = 4,61.10^{-28} \text{ kg.m}^3 \text{s}^{-2}$$

Where h: Planck´s constant, α: fine structure constant, c: speed of light. Very short quantum dipoles create the structure of basic particles (photons, electrons and protons), while long quantum dipoles create their mutual connections. Very long quantum dipoles connecting celestial bodies mutually create cosmic vacuum, so we name them vacuum quantum connections. The length of vibrating quantum dipoles like photons is given by the amplitude of vibration (oscillation). Photon´s oscillations can be presented as rotations of a quantum dipole with a circumferential velocity v:

$$v = 2\pi r_{ij} / T_{ot} = \pi d_{ij} \nu_{ij}$$

T_{ot}: time of one rotation of a quantum dipole,

ν_{ij}: $1/T_{ot}$: frequency of quantum dipole oscillation,

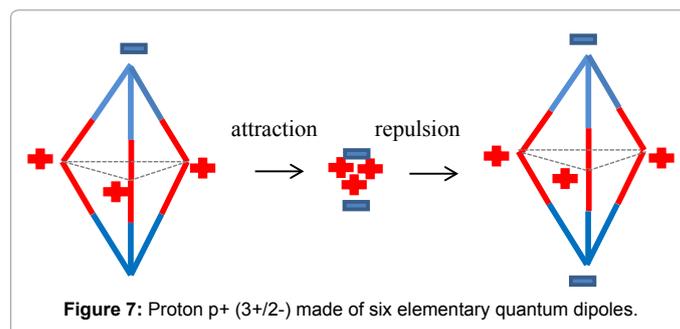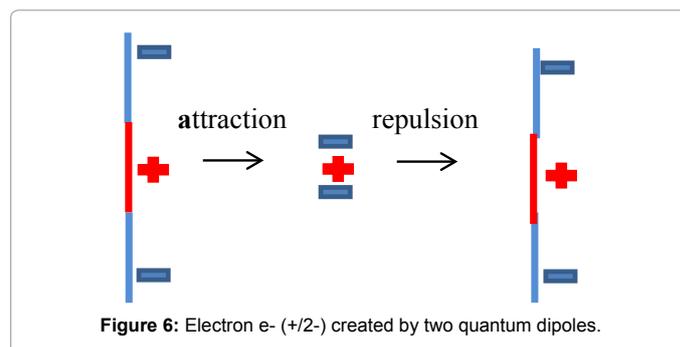r_{ij}: radius of dipole (half of its length),

d_{ij}: length of dipole.

$$\delta_t = e_{ij} d_{ij} = h \nu / \pi = \alpha h c / \pi = 4,61.10^{-28} \text{ kg.m}^3 \text{s}^{-2}$$

The value $\delta_t = e_i d_i$ is the same (constant) for every quantum dipole (connection) and represents the basic cosmic law from which other very important laws follow, e.g. Newton´s and Coulomb´s laws. It means the shorter the quantum dipole, the higher its energy. The longer it is, the lower its energy. Energy of very long quantum dipoles, connecting celestial bodies mutually and creating the cosmic vacuum, is very small, but their quantity is enormous. The vacuum is a holder of energy of quantum connections (dipoles) connecting physical objects mutually. Photon represents an elementary quantum dipole. As everything is made of elementary quantum dipoles (connections), we can say that everything is made of light (energy), which can exists in a form of free flying photons, or be bound in a form of basic particles (protons and electrons) as well as the vacuum. Not only the photon, but all particles oscillate, though their oscillations are more complicated Electron e- (+/2-) created by two quantum dipoles shown in Figure 6 and Proton p+ (3+/2-) made of six elementary quantum dipoles explained in Figure 7. All stable structures (particles) oscillate in one line (axis of oscillation) to the one common centre during attraction. All dipoles of a proton are very energetic (short and strong) so their forces of mutual attraction and repulsion are so strong that can compensate the mutual local repulsive pressures of spaces of quantum dipoles in such a way that the proton is the most stable composite structure. If structures are more complicated and composite, the mutual local pressures of dipole spaces destroy their compositions at the moment of their creation (so-called resonances). From the structure of a proton with three tops of positive poles is evident why the experiments in electron-proton scattering found that electrons scattered off three points inside the proton. It is not because of the quark structure but the bipolar essence of a proton.

One and Many

"One" is nothing without the other. "One" as a whole can create its relation to itself only if it divides itself into many ones. "One" creates its relation to itself through its relations to others. Through them

it reflects itself into itself (self-reflection). "One" as a whole divides itself into many ones in such a way that they create the unity of the "One" in the sense that every "one" is connected to all other "ones". Through many ones the whole One is structured and quantized. Internal structuration means that the "One" repels from itself many ones by repulsion and, at the same time, holds them in a unity thanks to attraction. As the whole "One" represents a bipolar relation "something (+) – other (-)", its internal differentiation means that it gradually repeals from itself both opposites after one another. One as a whole comes from its unity to its diversity by internal structuration and at the same time it again and again reflects itself into its unity and so performs its self-reflection. "Many" as a negation of "One" is overcome by its return to its unity – negation of negation. Negation of negation is a self-reflection, meaning the One represents always the Unity which can exist only through its internal structuration, where everything is reflected in everything else, everything is connected to everything else and everything communicates with everything. This communication of everything with everything is an information process (software) based on physical processes at the quantum level of reality. "One" represents the self-creating and self-reflecting Unity of the highest complexity where everything communicates with everything else. Self-reflection of self-closed system of high complexity means the Life and Consciousness. Therefore the Universe as a whole is a self-closed, self-creating, self-knowing and self-aware system of the highest complexity and so represents the highest Consciousness manifesting itself as a "subject-object" relation. If we study the internal structuration and differentiation of the Universe without looking at its self-reflecting subjective unity, we see the whole reality as an expanding physical Universe, which differentiates itself in such a way that it expels gradually, step by step, new positive "+" and "-" negative poles "-" after one another. Continuing internal differentiation of the Universe, its plurality generation and structuration, means its cosmic expansion. The Universe is an expanding network of quantum dipoles (connections) transiting from its one quantum state to the following. At the beginning of expansion the Universe is only a simple quantum

Figure 6: Electron e- (+/2-) created by two quantum dipoles.

Figure 7: Proton p+ (3+/2-) made of six elementary quantum dipoles.

dipole (+/-), then he repels suppose firstly one positive pole (+) and next its negative one (-), so that after two elementary quantum jumps the Universe represents the structure (2+/2-). For simplification of our analysis we consider and number only quantum transitions between symmetric quantum states, when two new poles are expelled after one another. At the first quantum state the structure of the Universe is (+/-), at the second symmetric quantum states it is (2+/2-), at the third quantum state it is (3+/3-)…, at the k symmetric quantum state its structure is (k+/k-) and is created of $V_k=k^2$ elementary quantum dipoles (connections). The value $V_k=k^2$ represents the volume of space given by the number of elementary quantum dipoles (Table 1).

k: the number of positive respectively negative poles, as well as serial number of actual symmetric quantum state of the Universe representing cosmic time given by the number of elementary quantum jumps of the Universe from the beginning of its expansion. The Universe jumps from its one quantum state k to the following k+1 creating (expelling) new positive + and negative – poles with 2k+1 new quantum dipoles +/-. The internal structuration of the Universe resulting into its cosmic expansion can be easily described by the following basic quantum space-time equation:

$$V_k=k^2$$

This equation reflects the internal division and structuration of the Universe creating thus its own expanding space and flowing time. The Universe is quantized as its energy and space are localised in its elementary quantum connections and its time is given by its elementary quantum jumps. Elementary quantum jumps represent elementary changes of the Universe, its elementary quanta of motion (time) to which all other changes (motions, times) can be related. These elementary quantum jumps define cosmic time. Time is not a mystery but a manifestation of motion of the Universe. Time is a measure of motion. Every local motion can be compared to the universal cosmic motion. As explained by kohut in [4] contemporary one second corresponds to $(3/4)/(\pi c^5/2\kappa h\alpha)^{1/2}=8,144.10^{43}$ elementary quantum jumps of the Universe between two symmetrical quantum states, so we can allocate the time $\Delta t=(4/3)(2\kappa h\alpha/\pi c^5)^{1/2}=1,128.10^{-44}$ sec to one quantum jump ($\mathcal{K}$- gravitational constant). But it does not mean that the quantum jump has its duration. Time does not define the duration of elementary quantum jump, but just contrariwise, time is defined by the number of elementary quantum cosmic jumps. Every process (motion) and its duration can be compared to universal time. If some process takes one second, it means that it corresponds to $8,144.10^{43}$ elementary quantum jumps of the Universe. If the same process is dilated to two seconds (time dilation) because of high speed or strong gravity (big gravitational potential), it corresponds to $2x8,144.10^{43}$ elementary quantum jumps of the Universe. Cosmic time represents the

universal base through which all local processes (motions, times) can be expressed. Both space and time are quantized and their quantitative characteristics can be numbered and expressed by integers.

If we allocate Δt sec to one quantum jump then the time of cosmic expansion is:

$$t=k. \Delta t$$

and the basic space-time equation of the Universe, where the volume V is expressed by m³, obtains the following form:

$$V=z.t^2, \text{ where } z=(d^2V/dt^2)/2$$

This is the basic equation of spatial dynamics of the Universe expressed by real dimensional units, where the spatial volume of the Universe is directly proportional to the square of time of cosmic expansion. In that form space and time are presented as continuous values, but we must remember that in reality they are quantized and can be truly expressed only by integers. Thus, if we want to study space and time from the viewpoint of cosmology, we can use them as continuous values, but such an approximation is inappropriate at the quantum level. Except of space-time characteristics the whole Universe is defined at the actual quantum state k also by the matrixes e_{ijk} or d_{ijk}, where i – number of positive pole, j – number of negative pole and ij – quantum dipole with energy e_{ijk} and length d_{ijk} at the contemporary quantum state k of cosmic expansion. For the basic space-time equation of the Universe, derived from the mechanism of its internal structuration, the next relations are valid:

$$V=z.t^2, \text{ where: } z=(d^2V/dt^2)/2$$

$$dV/dt=(d^2V/dt^2).t,$$

$$(dV/dt)^2=2 V.d^2V/dt^2$$

The quantity d^2V/dt^2 is a fixed constant during the whole evolution of the Universe. All these equations express the space-time unity of the Universe. The speed of expansion of spatial volume dV/dt is directly proportional to the time of expansion. It accelerates unceasingly and this acceleration d^2V/dt^2 is constant. Three-dimensional space is self-closed therefore it can be imagined as an ideal three-dimensional surface of a four-dimensional sphere, for which the following formula is valid:

$$V=2\pi^2 r^3 \text{ where r is a radius of spatial curvature.}$$

From the relation for the circumference of the Universe o=2πr and previous relations we obtain:

$$(do/dt)^2=-2o.d^2o/dt^2$$

The relations between spatial circumference o and time t are:

$$o=u.t^{2/3}$$

$$do/dt=(2/3)u.t^{-1/3}$$

$$d^2o/dt^2=-(2/9)u.t^{-4/3},$$

$$\text{where: } u=(2\pi d^2V/dt^2)^{1/3}$$

These equations show that the spatial circumference o increases in time but its speed do/dt decreases. The acceleration is negative. It means that the speed of cosmic expansion decelerates. The length of the longest quantum dipoles, representing the highest possible distances and connecting two opposite sides of the Universe, equals the half of circumference of the Universe o/2 and the speed of its increase, thanks to cosmic expansion, represents the highest possible speed of light c:

Quantum state	j	1	2		k-1	k	k+1		n
i	Poles	-	-	....	-	-	-	....	-
1	+						+/-		
2	+						+/-		
							+/-		
k-1	+						+/-		
k	+						+/-		
k+1	+	+/-	+/-	+/-	+/-	+/-	+/-		
n	+								

Table 1: The table of increasing cosmic network of quantum dipoles during cosmic expansion.

$c_-(do/dt)/2=o/3t$

$o/2=\pi r=(3/2)\, ct$

Speed of light represents the speed of cosmic expansion therefore it is the escaping speed for the whole Universe. As the speed of cosmic expansion decreases, so the speed of light decreases, too. But now theoretical physics accepts erroneously cosmic expansion to be accelerating and even Nobel Prize 2011 was awarded for this "discovery", although in reality acceleration of cosmic expansion is only a seeming phenomenon based on wrong dogma that the speed of light must be always the same in relation to the observer. This mistake has fatal consequences for contemporary cosmological theories as they postulate and search for mysterious dark energy as a source of accelerated cosmic expansion. This acceleration was deduced from observations showing that very distant supernovas look fainter and therefore, more distant than they should be by constant or decelerating cosmic expansion. But this interpretation is wrong and based on the misleading dogma that the light always moves towards us by a constant speed c.

The real situation is quite different, because the larger the distance from which the light travels, the slower is its speed towards us, as its actual speed c must be reduced by the speed v of extension of this distance thanks to cosmic expansion. If the light approaches us from the point of distance d, then this point moves away with the speed v thanks to cosmic expansion:

v=H.d, where:

H: Hubble´s constant,

d: actual distance of the light ray from us (observer),

then the light from the distance d approaches us by the speed (c-v)=(c-Hd).

We need no dark energy to accelerate cosmic expansion as this acceleration is nonsense based on the wrong dogma. Time and trajectory, through which the light travels to us, are much greater than they would be by the constant light speed c approaching us. The larger the distance between us and the light, the slower is its speed towards us. So the cosmic objects (supernovae) seem to be much more distant and fainter than they are expected by a constant c.

Another reason why accelerating cosmic expansion is only an illusion is the deceleration of light speed during cosmic expansion. The speed of light expresses the speed of cosmic expansion, so the deceleration of cosmic expansion means at the same time the deceleration of the speed of light.

The "discovery" of accelerating cosmic expansion as a consequence of erroneous understanding of the speed of light leads to postulation of non-existent dark energy as a source of acceleration. Supporters of dark energy try to find its source in the vacuum. Of course, huge energy is contained in a vacuum consisting of an enormous number of elementary quantum dipoles, connecting mutually all visible material objects. The higher the number of material objects taken into the system, the more the number of mutual elementary quantum connections between them and the higher the whole energy of the system. The system with many objects has, thanks to their mutual vacuum connections, much more energy than is contained in visible matter. But it is not dark energy causing fictional acceleration of cosmic expansion. Even, dark energy together with dark matter is declared to carry about 96% of the whole energy (mass) of the Universe. Except of mysteries like virtual bosons, quarks, strings, hidden dimensions, multiverse, black holes, warm holes, imaginary time, false vacuum, etc., other great mysteries like dark matter and dark energy are included in "science". As we know celestial bodies rotate and their rotations also influence motions of other objects through non-local external quantum connections. Rotational motions of celestial bodies in cosmology result from oscillations (rotations) of elementary quantum dipoles. These rotational motions are sources of magnetic fields of rotating bodies.

The impact of rotational motions of torsion generators on other objects is studied deeply in theories of torsion fields of Russian physicists Akimov and Shipov and confirmed by many experiments including that by which the structure of molten metals is changed significantly by torsion (rotational) fields generated by electro-torsion generators. Certainly, their theories are strongly criticised. But, in reality, their torsion fields can be correctly interpreted only saying that they are mediated by direct non-local external quantum connections of rotating generators. Torsion fields are other significant evidence that non-locality and non-local instantaneous interactions represent a fundamental feature of reality removed from contemporary physical theories.

The Unity Principle and Occam´S Razor

We need to know the simple truth

It is impossible to have a simpler relation than attraction and repulsion of opposites (+/-) which the whole reality is made of, where every "+" is connected to all "-", and reciprocally. The Unity Principle is the clearest manifestation of Occam´s razor and results directly from dialectical logic of thinking reflecting the dialectics of existence. The highest complexity of the Universe is created of the highest simplicity of bipolar relations (+/-). Only direct non-local connections of everything to everything can allow the existence of life as a self-reflection (consciousness) of very complex self-closed structures - subjects. As everything is reflected in everything else, the whole Universe as a Unity represents a self-reflecting, self-mirroring, self-creating and self-aware system of the highest complexity – Consciousness. We do not need to create speculative theories like "Theory of Everything" or "Theory of Unified Field" but we need to understand deeply the exact and simple mechanism of the Unity Principle.

Basic Forces and Interactions

Energy and Force

There are only two basic forces – attraction and repulsion and two basic interactions – local and non-local. All known interactions: mechanical, electromagnetic, strong, week, nuclear and gravitational, are only their manifestations. Two basic forces – attraction and repulsion are always in a mutual dynamic equilibrium at all levels of hierarchy. At the level of elementary quantum dipole, attractive force of two opposites equals the repulsive force of quantum dipole, which can be manifested in two ways:

- repulsive force of opposites (non-local connection)
- local touch repulsive pressure of space of a quantum dipole on neighbour quantum dipoles.

In case of a photon (+/-), the dynamic equilibrium between two opposite forces is manifested as oscillation. In case of particles like proton, the high local repulsive force (pressure) between spaces of six elementary quantum dipoles, creating its structure (3+/2-), is compensated by strong attraction between opposites of quantum dipoles so that the whole structure of a proton is very stable.

The whole force of attraction and repulsion f_{ij} of a quantum dipole ij is:

$$f_{ij}=f_{ija}+f_{ijr}, \quad f_{ija}=f_{ijr},$$

where: f_{ija}: attractive force between opposites of a quantum dipole ij,

f_{ijr}: repulsive force of a quantum dipole ij.

Energy is a motion or potential for motion resulting from mutual attraction and repulsion of quantum dipoles. Forces of attraction f_{ija} and repulsion f_{ijr} acting through the entire length d_{ij} of a quantum dipole create, by multiplication with its length, the whole energy e_{ij} of a quantum dipole:

$$e_{ij}=f_{ij}.d_{ij}$$

$$e_{ij}=(f_{ija}+f_{ijr})d_{ij}.$$

If a quantum dipole changes its energetic level, it also changes its length. By losing a part of its energy it elongates, by its receiving it shortens. Quantum dipoles exchange mutually their energies as they are in a permanent mutual motion. The whole internal energy of a quantum dipole e_{ij} consists of its two parts: attractive e_{ija} and repulsive e_{ijr} which are always in a mutual equilibrium. While attractive part is manifested by attraction of opposite poles, the repulsive one by their repulsion or by the local pressure of a quantum dipole on the neighbours. In photons, the equilibrium between attractive and repulsive parts is manifested by oscillation. Quantum dipole, bound in a composite structures, cannot oscillate freely and so presses on neighbours, so its repulsive part of energy is manifested by its local pressure, which is in equilibrium with its attractive part between its opposite poles. In that case this attractive part of energy of a quantum dipole has a form of potential energy as it cannot cause the motion of quantum dipole because of local repulsive pressures of neighbour dipoles. As attraction is at equilibrium with repulsion, so the attractive part of energy of quantum dipole is equal to its repulsive one. The following relations are valid:

$$e_{ija}=e_{ijr}$$

$$e_{ij}=e_{ija}+e_{ijr}=2e_{ija}=2e_{ijr}$$

Any form of energy, e.g. kinetic or potential, is always energy of elementary quantum connections represented by the equilibrium of their two parts, attractive and repulsive, because attraction and repulsion are two sides of the coin, representing the dialectics of a quantum dipole as well as the whole Universe.

From the basic cosmic relation between energy and length of elementary quantum dipole

$$\delta_t=e_{ij}d_{ij}=2e_{ija}d_{ij}$$

we can derive the following relation:

$$e_{ija}=\delta_t/2d_{ij}$$

It is a classical Coulomb´s relation between potential energy of a dipole with elementary charges and its length:

$$e_{ija}=(q^2/4\pi\varepsilon)/d_{ij}, \text{ where: } \delta_t=q^2/2\pi\varepsilon$$

q: Elementary electric charge,

ε: Dielectric capacitance

From the relation for the fine structure constant $\alpha=q^2/(2\varepsilon hc)$ and Coulomb´s relation we get:

$$e_{ija}=\alpha hc/(2\pi d_{ij})$$

where: - fine structure constant, h: Planck constant, c: speed of light

This Coulomb´s relation $e_{ija}=\alpha hc/(2\pi d_i)$ manifests a universal cosmic law:

$$e_{ij}d_{ij}=\alpha hc/\pi$$

which represents a dialectical relation between energy and length of elementary quantum dipoles. From this relation we obtain:

$$f_{ij}=\delta_t/d_{ij}^2=\alpha hc/(\pi d_{ij}^2)$$

Attractive force f_{ija} of a quantum dipole which corresponds to its potential energy $e_{ija}=e_{ij}/2$ can be expressed as follows:

$$f_{ija}=\alpha hc/(2\pi d_{ij}^2)$$

It is a classical Coulomb´s law expressing the dependence of attractive force, acting between elementary electric charges, on their distance. It is at the same time the expression for the attractive force acting through the elementary quantum dipole with a length d_{ij}. This force is indirectly proportional to the square of its length.

Electrostatic Force

Particles or any physical objects with prevalence of positive poles are positively charged. Particles with prevalence of negative poles are negatively charged. Elementary charge is a minimal possible quantity of prevalence. Electron (+/2-) is the most well-known particle with a negative charge, proton (3+/2-) – with a positive one. Particles with a balance of positive and negative poles are neutral. Long quantum dipoles creating connections of material objects, are affected by attractive forces of their opposite poles. The sum of attractive forces of all quantum dipoles connecting two massive objects creates the whole attractive force between them. Let d is an average distance between two neutral objects. The first object contains k_1 positive and k_1 negative poles and the second one - k_2 positive and k_2 negative ones. The whole number of elementary quantum connections between two objects is $2k_1k_2$. So the whole attractive force f_a between both objects is a sum of attractive forces of all mutual quantum connections. If d is an average length of quantum dipoles, the next relation is valid:

$$f_a=(\alpha hc/2\pi).2k_1.k_2/d^2=(\alpha hc/\pi).k_1.k_2/d^2$$

This relation expresses the electrostatic attractive force between two electrically neutral objects and is directly proportional to the number of quantum dipoles connecting them. But, as we know, there is no attractive electrostatic force between electrically neutral objects. This force can be identified only if these objects are electrically charged and it is proportional to the multiplication of their charges. Indeed, this force affects all quantum dipoles connecting two material objects, but is fully compensated by repulsive spatial pressures of quantum dipoles coming out of these objects, so it looks like if there is no attractive force between them. If two objects are oppositely charged with charges q_1 and q_2, the attractive forces affecting their direct quantum connections are not fully compensated by pressures of outgoing external quantum dipoles, and so their uncompensated mutual attractive force is directly proportional to multiplication of their charges. If two objects have like charges, the missing mutual connections between them cause that the repulsive pressures of their external quantum dipoles prevail over the attractive forces of quantum dipoles connecting these objects, what is manifested as an electrostatic repulsive force directly proportional to multiplication of their like charges. Although Coulomb´s law is the same for expression of attractive and repulsive electrostatic forces, their

reasons are different. The attractive electrostatic force is a consequence of non-local mutual attraction between opposite poles of quantum dipoles, while repulsive electrostatic force is caused by prevalence of local repulsive pressures of quantum dipoles over attractive forces as a consequence of deficiency of mutual non-local quantum connections. The indirect evidence for this statement is a mutual attraction between like charged particles, e.g. electrons, which can be manifested by certain conditions, e.g. by very low temperatures. Electrons are not point-like particles, but structures consisting of two quantum dipoles with one positive and two negative poles. By low temperature, when kinetic motions are very slow, electrons can create the bound compositions known as Cooper´s pairs. Their ability for mutual attraction allows the existence of superconductivity. Electrons in their basic (not excited) states represent structures with one positive and two negative poles (+/2-). The bound state of two electrons creating a Cooper´s pair is explained in Figure 8. Casimir´s phenomenon is another evidence for existence of attractive electrostatic force between neutral objects. This force acts between two neutral conducting plates. If approach them closely, the mutual attraction, known as Casimir´s attractive force, starts to act. This effect means that attractive forces between quantum dipoles, connecting both closely approached plates, are greater than repulsive spatial pressures of quantum connections coming out of them. There is no principal difference between electromagnetic force and others like strong and weak nuclear. They differ only by their intensity. In stable particles, the strong and weak forces are mediated by very short and energetic elementary quantum connections which can effectively compensate the great repulsive pressures of their spaces. Electromagnetic interactions can be converted into the strong ones only, if the barrier of huge repulsive pressures is overreached by a close approach, where long connections are dramatically shortened and attractive forces increased. Analogical is the opposite process, where strong interactions inside protons and antiprotons can be changed, after their annihilation, into elementary quantum dipoles – photons - carriers of electromagnetic energy.

If two particles are mutually approached to the certain distance and exceed the barrier of electrostatic forces, all mutual external quantum connections of both particles become internal and create a new particle. The mutual attraction increases to the level able to balance repulsive pressures of spaces of their quantum dipoles. If a stable equilibrium of these forces is achieved, the new microstructure (particle, atom) does not decay. But if this equilibrium is temporary installed by huge external energies, the repulsion of internal pressures of particle corrupts this equilibrium and particle decays immediately after its creation. Such a microstructure cannot keep its internal equilibrium of forces without great external energies and so it decays. The unstable short-living structures (resonances) supposedly occur thanks to great energies in particle accelerators-colliders.

Magnetic Force

Magnetic force is a consequence of mutually coordinated internal motions (oscillations) of quantum dipoles in atoms of magnetic materials (mostly metals) that can act to other materials with magnetic properties through their mutual external quantum connections. Magnetic are materials that can create mutually coordinated synchronized motions (oscillation) of quantum dipoles in their atoms (atomic dipoles) in the sense of their like orientations. Magnetic field of a magnet is created of its external quantum dipoles connecting the magnet with the whole Universe. Its external quantum connections reflect the internal coordinated motions of its inner dipoles in such a way that they can cause the mutual attraction between opposite

magnetic poles, the repulsion between like poles and magnetisation of magnetic materials. Mutual attraction of opposite magnetic poles is a consequence of synchronized coordinated oscillations (rotations) of quantum dipoles inside magnets as shown in Figure 9. At the above picture we see two permanent magnets where the arrows show the same direction of synchronized oscillations (rotations) of atomic dipoles inside magnets. The external quantum connections coming out of both permanent magnets reflect these synchronized motions in the way that their motions become also synchronized (the same orientation) resulting in the decrease of their mutual local repulsive pressures so that the attractive force between opposite magnetic poles of both magnets prevails - magnets attract each other. From the above picture we see why the North Pole (N) is always at left side, while the South Pole (S) at right one independently of into how many parts is the magnet divided. Thus, we have disclosed why magnets have always two magnetic poles and why one pole cannot exist without the other as both magnetic poles result from the synchronic coordinated motions of their inner atomic dipoles. Mutual synchronized oscillations of atomic dipoles inside magnet are impossible without their mutual non-local quantum connections as just only through them atomic dipoles can synchronise their motions. Virtual photons as supposed mediators of magnetic interactions cannot explain this phenomenon in any case. This phenomenon is just a manifestation of quantum entanglement (non-local connections) through which the spins or magnetic moments of particles are coordinated. On the other hand Figure 10 illustrates, if like the magnetic poles are situated face-to-face, their internal atomic dipoles oscillate in mutually opposite directions what causes opposite orientation of motions of their external quantum connections coming out of both magnets resulting in the increase of their mutual local repulsive pressures which consequently prevail over their mutual non-local attractive forces so that like magnetic poles of permanent magnets repeal each other.

Magnetic force or field is mediated by non-local external quantum connections and so it is quantized in that sense. Coordinated synchronized oscillations of atomic quantum dipoles of magnet can influence, through mutual external quantum connections, internal motions of quantum dipoles in other magnetic materials in such a
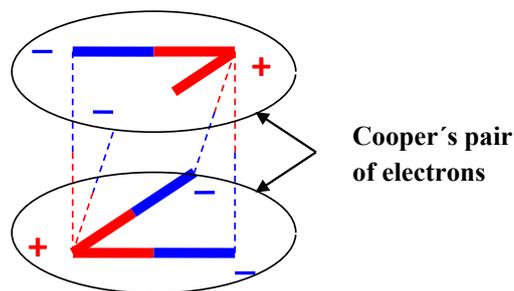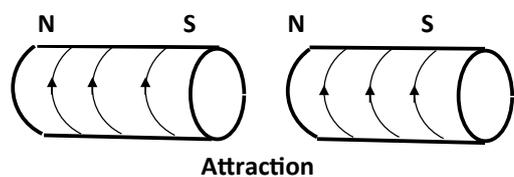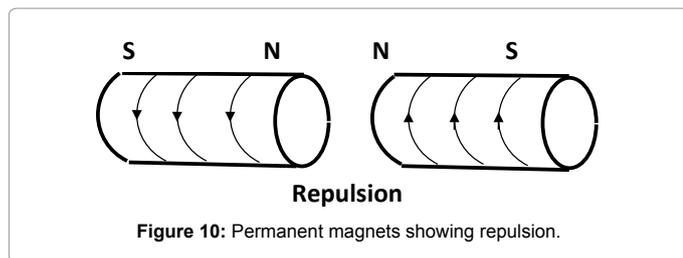

Figure 8: Issutation of Cooper´s pair.

Attraction

Figure 9: Permanent magnets showing attractions.

Figure 10: Permanent magnets showing repulsion.

way that these materials start to manifest their magnetic properties in the sense of coordinated oscillations of their internal atomic quantum dipoles. Magnetic as well as electrostatic forces are mediated instantaneously through non-local mutual quantum connections, but not through virtual photons moving with a limited speed.

Certainly, physicists do not know the essence of magnetic force or magnetic field as well as they do not know the essence of any force or field. They can describe their manifestations, but cannot interpret correctly the nature of these phenomena. All forces or fields are nothing more than mutual interactions between objects, e.g. particles, mediated by their mutual non-local quantum connections. Magnetic field (force) can be also produced by electric current as well as changing magnetic field can produce electric currents if applied to a conductor, but we are not going to analyse these electromagnetic phenomena now as they require a special individual approach. Theory of electromagnetism is well developed from the viewpoint of its phenomenology, but suffers from insufficient or wrong interpretation in the sense of ontology. It is declared that the photon is a quantum of electromagnetic field. Really, photon manifests its electrostatic properties because it is an elementary quantum dipole that unifies two opposite charges as well as magnetic properties through its internal motion-oscillation. Electromagnetic forces are mediated by elementary quantum dipoles, not in the sense of virtual photons moving with a limited speed of light, but of mutual non-local quantum connections. Electromagnetic interaction is a direct instantaneous non-local interaction.

Gravitational Force

Internal structuration of the Universe caused by its repulsive force is manifested by cosmic expansion. The certain part of the whole cosmic repulsive forces used for cosmic expansion is given by the relation derived [5]

$$F_e = c^4/(16\kappa) = 7,566.10^{42} \text{ N}$$

Where: c: speed of light

$\mathcal{K}$: gravitational constant

Thus, we know the exact value of the force of cosmic expansion. As attraction and repulsion are two opposite forces in a mutual dynamic equilibrium, so the force of cosmic expansion has its own counterbalance in a cosmic gravitational force G, where:

$$G = F_e = 7,566.10^{42} \text{ N}$$

Gravity is therefore a direct consequence and evidence of cosmic expansion. Attraction and repulsion are always in a mutual dynamic equilibrium at the level of every elementary quantum dipole as well as the whole Universe. Cosmic gravity affects all objects and all elementary quanta of space. It means that gravity, as a reaction to cosmic expansion, has a global as well as quantum character.

By derivation of Coulomb´s relation for the attractive force acting between two neutral massive objects $`f_a = (\alpha hc/2\pi)2k_1.k_2/d^2$ we have

mentioned that this force is compensated by the repulsive force of pressures of quantum dipoles coming out of both objects. However, this compensation is valid only relatively, a certain part f_g of attractive force f_a is not compensated $f_g = \beta f_a$ and represents the attractive gravitational force f_g of bodies.

$$f_g = \beta f_a = \beta(\alpha hc/2\pi)2k_1.k_2/d^2$$

Uncompensated part of attractive forces by repulsive pressures of quantum dipoles is a consequence of deficiency of repulsive forces of the Universe caused by the fact that a certain part of these forces $F_e = 7,566.10^{42}$ N is used for cosmic expansion. The total measure of this deficiency of repulsive forces and prevalence of attractive ones is manifested as gravity acting between bodies through their long mutual vacuum quantum connections. As gravitational force between celestial bodies is mediated by their mutual vacuum quantum connections, therefore it is a non-local instantaneous interaction in contrast with Einstein´s local theory, where gravity is a consequence of space-time curvature which local changes are propagated by gravitational waves with a limited speed of light. Newton´s theory of gravity is correct, because it is a relational theory, where gravity is a consequence of mutual instantaneous non-local interactions (relations) between physical objects, while Einstein´s theory of gravity is local non-relational theory. Newton´s theory needs only one small supplement: that the density of the vacuum, proportional the gravitational potential, causes the deceleration of processes in objects (time dilation), what is correctly accepted in Einstein´s theory. But Einstein´s gravity cannot explain naturally why rotations of galaxies are faster than they ought to be according to calculations of masses of the stars in them, so the existence of mysterious invisible dark matter is postulated. This phenomenon can be simply explained by Newton´s theory if we accept that galaxies, except of celestial bodies, contain also mutual non-local vacuum quantum dipoles connecting every object to all others in the galaxy, so that the galaxy is kept together despite its fast rotation. Of course, the mass of Galaxy is much bigger than the total mass of its celestial bodies, as a huge amount of energy (mass) is carried by mutual non-local vacuum quantum connections. Gravity is a global cosmic phenomenon as a direct consequence of cosmic expansion. Cosmic gravity acting between celestial bodies is a counterbalance compensating the repulsive force causing the cosmic expansion [6,7].

Strong Interaction

Before analysis of the strong interaction we will imagine the structures of all stable particles that oscillate in one main axis (line) with common centre of oscillation, where all tops of opposite poles come together during the phase of mutual attraction (contraction) shown in Figures 11 and 12. Muon and Tau have the same structure as an electron, only they are much more energetic and so shorter. They are unstable and change into electrons by transferring their energies into surroundings (Figures 13 and 14). If neutrino really exists, it represents a double-photon structure with specific internal motion. The neutrino is its own antiparticle, so neutrino and anti-neutrino represent the same particle. As the neutrino oscillates in one plane, it does not resist its dragging by cosmic expansion and therefore it has no rest mass and its speed is c. The same structure of quantum dipoles as a neutrino also other structures can have, e.g. double photon, mesons, neutral pions, but their internal motion is not so simple, so they do not represent the stable structures Illustrated in Figure 15. This structure of a double photon has two different centres of oscillation with different phases. A photon can associate with any particles without disturbing their internal structure and so bring them into excited states. It can also associate with itself without creating a new particle. Its spin j=1 means
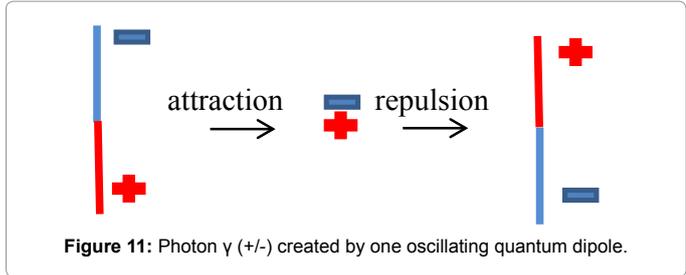
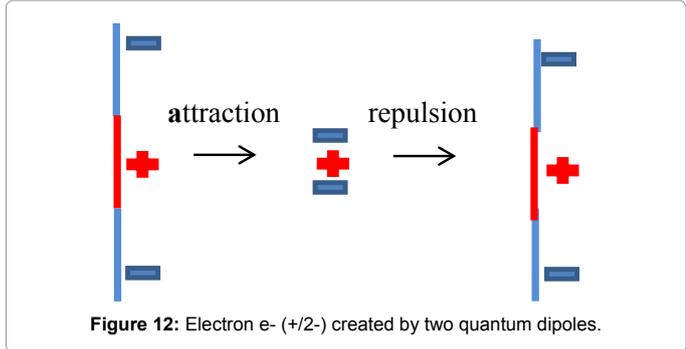**Figure 11:** Photon γ (+/-) created by one oscillating quantum dipole.

Figure 12: Electron e- (+/2-) created by two quantum dipoles.
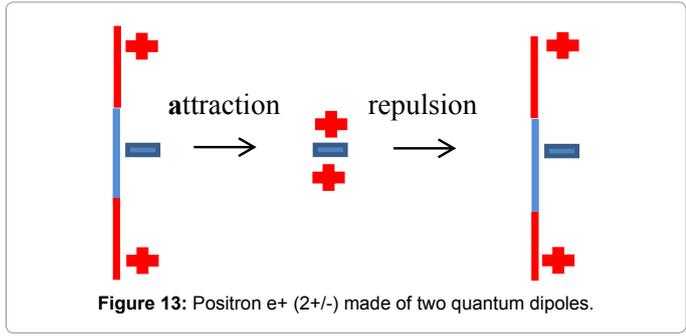

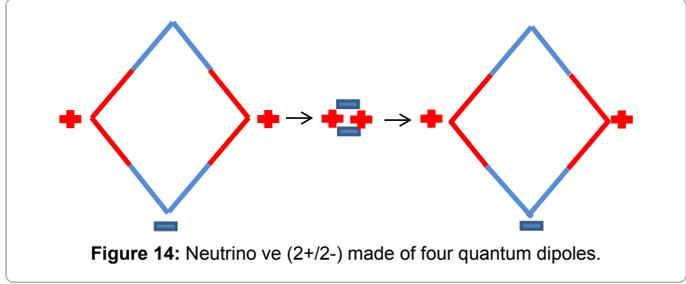**Figure 13:** Positron e+ (2+/-) made of two quantum dipoles.

Figure 14: Neutrino νe (2+/2-) made of four quantum dipoles.

that the intermediate state known as a positronium, created after electron-positron collision, can decay either into two or three photons. A photon in relation to a magnetic field can deflect to the north or south magnetic poles or stay without any deflection. This means that the dipole is right-handed or left-handed, or performs both these motions simultaneously, meaning that it exists as a double-dipole, where one dipole is right-handed and the other left-handed with a neutral manifestation towards a magnetic field. The annihilation of electron (+/2-) and positron (2+/-) after their collision and consequent decay of intermediate positronium into two or three photons, are illustrated in Figure 16.

All stable structures (particles) oscillate in one line (axis of oscillation) to the one common centre (during attraction) Figure 17. All

dipoles of a proton are very energetic (short and strong) so their forces of mutual attraction and repulsion are so strong that can compensate the mutual local repulsive pressures of spaces of quantum dipoles in such a way that the proton is the most stable composite structure. If structures are more complicated and composite, the mutual local pressures of dipole spaces destroy their compositions in the moment of their creation (so-called resonances). From the structure of a proton with three tops of positive poles is evident why the experiments in electron-proton scattering found that electrons scattered off three points inside the proton. It is not because of a quark structure but the bipolar essence of a proton. The proton can be destroyed only by its annihilation with an antiproton explained in Figure 18. Proton and antiproton represent the mutual mirror images so they attract each other very strongly creating the temporary high energetic composite structure of protonium (5+/5-), which, thanks to huge local repulsive pressures of dipole spaces, completely destroys the original structures of proton and antiproton with a definite release of 5 free photons γ at least. Of course, more photons are possible, because of excitation of initial particles before annihilation. In the structure of "protonium" (5+/5-) or (6+/6-), if excited by one photon, we can see some other substructures, which correspond to some mesons, so we can interpret the annihilation. As unstable neutral pions π⁰, as well as eta mesons η, represent the bound states of two photons, both they decay into two photons 2γ:

$$\pi^0 \to \gamma + \gamma$$

$$\eta \to \gamma + \gamma$$

mega meson ω decays by the next way: $\omega \to \pi^0 + \gamma$
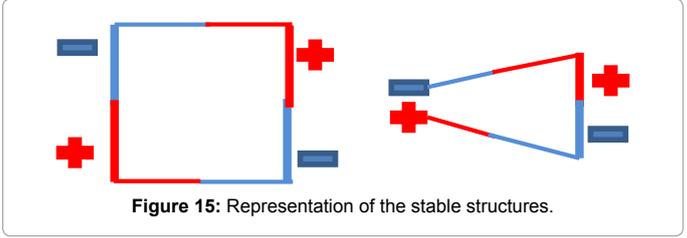

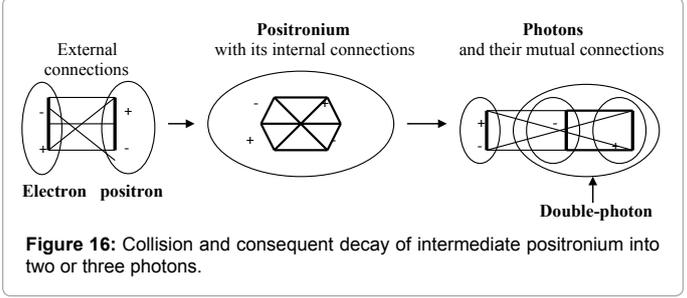**Figure 15:** Representation of the stable structures.

Figure 16: Collision and consequent decay of intermediate positronium into two or three photons.
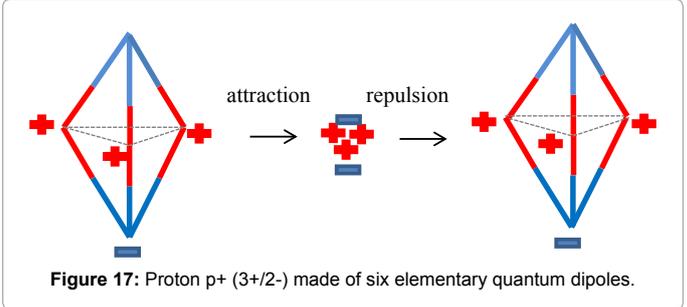

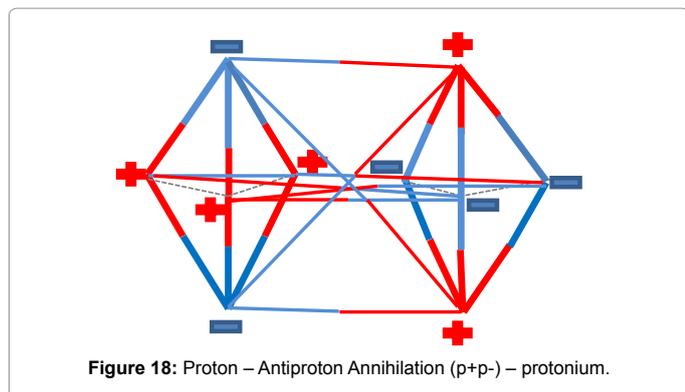**Figure 17:** Proton p+ (3+/2-) made of six elementary quantum dipoles.

Figure 18: Proton – Antiproton Annihilation (p+p-) – protonium.

The annihilations by low energy collisions of proton and antiproton can be:

$$p^+ + p^- \rightarrow \omega + \pi^0 \rightarrow \pi^0 + \gamma + \pi^0 \rightarrow \gamma + \gamma + \gamma + \gamma + \gamma$$

$$p^+ + p^- \rightarrow \pi^0 + \pi^0 + \pi^0 \rightarrow \gamma + \gamma + \gamma + \gamma + \gamma + \gamma$$

$$p^+ + p^- \rightarrow \pi^0 + \pi^0 + \eta \rightarrow \gamma + \gamma + \gamma + \gamma + \gamma + \gamma$$

Contemporary theoretical physics supposes protons, neutrons and unstable baryons to consist of three quarks, while mesons of quark-antiquark pairs interacting by gluons. The quark model was invented to simplify the situation with a huge number of hadrons (baryons and mesons). Although it can help a little with classifications of these particles, it is mistaken by explanation of the real essence of micro-world. The problems of quark model are quite clear. Quarks cannot exist as individual entities, cannot be detected directly, they have unbelievable so-called "asymptotic freedom" and nobody can explain what is the reason for their different colours, flavours and other very strange properties. Let us take a look at how the quark model explains the decay of a neutral pion π^0. "The π^0 (neutral pion) is a quark – antiquark meson. The quark and antiquark can annihilate; from the annihilation come two photons. This just shows how the quark model complicates the very simple situation: We know that the pion decays into two photons. Why do we need the quark-antiquark annihilation in addition? Why do we not accept the pion as a bound state of two photons? Why photons, as elementary quanta of free energy, are not considered to be the basic constituents of all physical structures (particles and interactions)? Why do we not try to understand and detect the real nature of a photon but create so absurd constituents - quarks? Why do we complicate the situation so much if the truth is very simple? Now we know definitely that the neutral pion π^0 (2+/2-) represents a bound state of two photons and so its internal structure consists of four mutually interconnected quantum dipoles. We do not need any mystical undetectable quarks as we have real photons. Nothing is hidden and there are no mysteries in the physical Universe. Everything is clear and simple.

Weak nuclear interaction - Neutron beta decay

Inside a neutron we see the structure of a proton with very short end strong quantum dipoles which is clearly illustrated in Figure 19. One negative pole is connected to three positive opposites by much weaker and longer connections, so it can be released from this structure during beta decay Figure 20. We can see that the neutron (4+/4-) in its excited state with sixteen elementary quantum dipoles represents a bound state of a proton (3+/2) with six elementary quantum dipoles and an electron (+/2-) with two quantum dipoles. Eight quantum dipoles represent mutual quantum connections between the proton

end electron structures. They are, at the same time, the constituents of the internal neutron structure. Neutron consists of a proton and an electron as well as their eight mutual quantum connections (dipoles) which are included into the neutron structure. If the proton and electron represent separate particles (e.g. in the structure of hydrogen atom), their mutual connections (being much longer and weaker) are external and represent their mutual vacuum or electromagnetic field. So the atomic vacuum is created by mutual connections between nucleons and electrons in the structure of atom. In 1920 Rutherford quite correctly supposed the existence of a neutral particle being a strong bound state of a proton and an electron, but this nice and clear idea was refused and the monstrous electroweak theory was postulated.

The neutron cannot be as stable as a proton as its structure and internal motion are more complicated and the neutron has more than one centre of oscillation. So the neutron (after its excitation by one photon) decays into a proton and an electron. Their mutual connections being before the constituents of neutron are now the external connections between a proton and an electron.

This decay is known as beta decay (β⁻ decay), because flying electrons represent beta (β⁻) radiation and can be expressed as follows:

$$n + \gamma \rightarrow p^+ + e^-$$

"n + γ" represents the excited state of a neutron

Contemporary theoretical physics represents this decay, considering it to be a manifestation of the so-called weak interaction, by the following scheme:
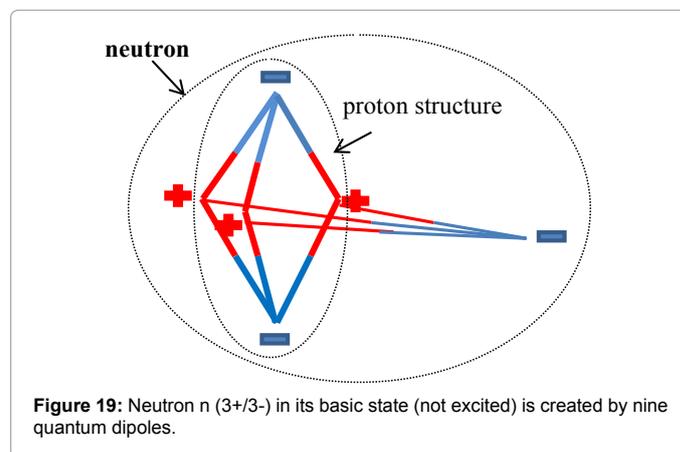
$$n \rightarrow p^+ + e^- + (v_e)?$$

Figure 19: Neutron n (3+/3-) in its basic state (not excited) is created by nine quantum dipoles.
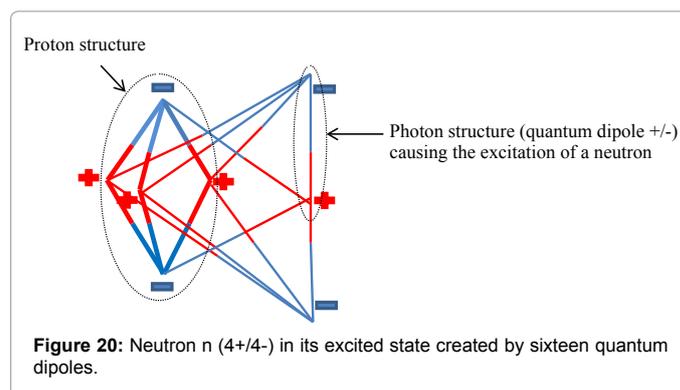

Figure 20: Neutron n (4+/4-) in its excited state created by sixteen quantum dipoles.

In addition to a proton and an electron the neutrino (antineutrino) ν_e is included. In our structural scheme the neutrino is missing. We do not deny the possible existence of a neutrino. The expression "(ν_e)?" only means that we cannot accept it to be a product of β^- decay in the presented form. It could be a product only if a neutron is bound in a heavy nuclei where nuclear forces and mutual repulsive pressures are enough strong to form a neutrino consisting of four strong, short and energetic quantum dipoles. Although a neutrino is not detectable during β^- decay its hypothetical existence was predicted as it seemed that some energy was missing and conservation of momentum, as well as angular momentum, was violated. Emitted electrons have a continuous kinetic energy spectrum, ranging from 0 to the maximal available energy of a few tens of MeV. A typical value is around 1 MeV. This continuous spectrum looks strange from the view-point of quantum theory. But continuous spectra of kinetic energy of electrons can be simply explained if accept that neutrons, before their decay, are excited by photons with any value of energy of continuous spectra, so the resulted electrons can also have kinetic energy of continuous spectra. We do not deny the possible presence of electron antineutrino (for us there is no difference between neutrino and antineutrino) in beta decay. We can only accept the excitation of a neutron, bound in a heavy nucleus, by three photons which, after catching a negative pole "-" from the neutron and changing it into a proton, consequently form one electron and one neutrino according to the following scheme:

$$n + 3\gamma \to p^+ + e^- + \nu_e$$
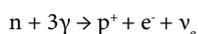
Our doubt about a neutrino as a product of beta decay without previous excitation of a neutron by photons follows also from the following consideration:

As emitted electrons have a continuous kinetic energy spectrum, if we want to receive the discontinuous energy spectrum, we must accept that energy carrying by a neutrino has also a continuous spectrum. But as the neutrino has no rest mass, we must accept the existence of neutrinos with internal energies of any value of continuous spectra, what means that their essence is analogical to that of photons, what can be possible as neutrinos represent bound states of two photons. Continuous spectra of photons exciting the structure of neutrons cause their decay by emitting electrons with energies of continuous spectra. The rule of the Standard Model that the lepton number must be conserved is wrong and artificial as we can see that the electron can be a substructure of an excited neutron. Only the charge number must be conserved as well as the number of nucleons (protons and neutrons), because proton is very stable and cannot be destroyed (except of annihilation). It can only be excited by an electron to the neutron, which can again decay into a proton and an electron.

It is supposed that the whole universe baths in a sea of neutrinos. In that case it looks much more likely that the decay of a neutron is caused by its previous excitation by a free neutrino, so the decay is as follows:

$$(n + \gamma) + \nu_e \to p^+ + e^- + \nu_e$$
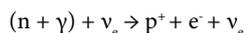
Neutrinos before and after decay have different energy and momentum. The above mentioned scheme of β^- decay shows that neutrinos can easy interact with matter by a weak force. This looks much more likely than supposed very rare interaction of neutrinos with rest matter. In this case neutrinos behave like photons exiting the initial neutrons before they decay. So we suppose that β^- decay of a neutron can exist in two forms. If a neutron is excited only by one photon then the neutrino cannot be a product of decay. Only if a neutron is excited by three photons (or one photon and one neutrino) then the neutrino can occur as a product of beta decay. This could be the reason why

the production of solar neutrinos is three times lower than predicted by the Standard Model. According to our understanding it looks very likely that only one of about three β^- decays produces a neutrino (in our understanding the double photon). So no neutrino oscillation is needed. According to the Standard Model three types of neutrino (electron, muon and tau) can exist with quite different energies (flavours) and they can mutually change into one another, so they oscillate. We do not deny that neutrinos can exist in different energetic states like photons can, but only an electron neutrino represents the stable state (like electron), other states are unstable and change into an electron neutrino. If we want to accept the Standard Model interpretation that the muon μ^- and tau τ^- decay into an electron, neutrino and antineutrino, it means they must consist of these structural constituents before decay. In that case neutrinos have the same property as photons to excite other particles. But much more real is that muon μ^- and tau τ^- are only more energetic versions of an electron e^-, they are unstable and convert into electrons after a very short time by transferring their internal energies into their external vacuum quantum connections. Of course, electron as well as muon and tau can be excited by photons.

Pions represent more complicated structures, so they decay. Pion π^0 (2+/2-) decays into two photons 2γ. Pion π^- (3+/4-) consequently can decay in one muon μ^- (+/2-) and neutrino ν (2+/2-). Muon μ^- consequently changes into an electron e^-. Pion π^+ (4+/3-) can decay into one muon μ^+ (2+/-) and a neutrino ν (2+/2-). Muon μ^+ then changes into a positron e^+ which annihilates with the nearest electron. Pions have structures analogical to those of excited protons ($p^+ + \gamma$) (antiprotons), but while protons are very stable, pions decay. The difference between positive pions and protons is in different mutual motions of their internal quantum dipoles and their different energy (mass). Positive pions are less energetic than protons (about seven times lesser) so their quantum dipoles are not enough strong to save the structure from its immediate decay. But the indirect evidence for the similarity between proton and positive pion structures is their similar momenta. The structures of a proton is (3+/2) while excited (4+/3-) is analogical to the structure of a positive pion π^+ (4+/3-). While proton is very stable, pion decays immediately into a muon μ^+ and a neutrino ν.

As neutrinos can be detected only indirectly, their role in beta decays is still opened and unclear. In any case, if we interpret all constituents of beta decay as structures of elementary quantum dipoles, the picture is becoming very clear and simple. But the so-called theory of electroweak interaction only complicates this situation very much.

Let us take a look at how the theory of electroweak interaction (TEWI) complicates the simple picture of neutron decay. As QED supposes virtual photon to be a mediator of electromagnetic interaction, so TEWI supposes that the weak interaction must also have a point-like mediator named W^- boson, which is very massive, but virtual at the same time. As it is almost 100 times as massive as the initial neutron - heavier than entire atoms of iron, it is supposed that W^- boson, for only a very short undetectable time, borrows high energy from the vacuum (this miracle is supposedly allowed by Heisenberg's uncertainty principle) and then, after making all needed miracles, returns it back to the vacuum. Another great miracle that W^- boson makes is the conversion of one down quark (charge of -1/3) of a neutron into the up quark (charge of +2/3) it means that a neutron consequently converts into the proton. This reversal of quarks is called "flavour change". After making this "important" conversion and returning borrowed energy to the vacuum, W^- boson subsequently decays. Feynman's diagram of β^- decay of a neutron according to the electroweak theory (Figure 21).

Although W^- boson is virtual during β^- decay and so undetectable,

its real existence is also supposed. From the structure of electron (+/2-) and neutrino (2+/2-), the compound structure (3+/4-) of W⁻ with 12 elementary quantum dipoles can be created by high energy collisions as a short living structure (resonance). The same is valid also for compound structure of positron (2+/-) and neutrino (2+/2-), it means the structure (4+/3-) of W⁺. But both these compound structures W⁻, W⁺ are not point-like bosons and appear only in very rare cases, in the high energy collisions. Electrons and unobserved electron neutrinos with enormous energy of about 40 GeV are supposed to be produced by decay of undetectable W⁻ bosons. It means that the neutrino with internal energy of only some MeV and zero rest mass must highly increase its internal energy to the value of 40 GeV. Using a monstrous 80 GeV boson to mediate low energy beta decay looks like killing the flies by atom bombs.
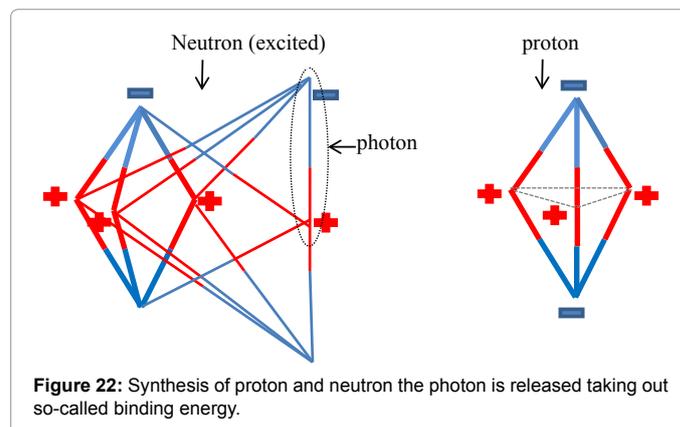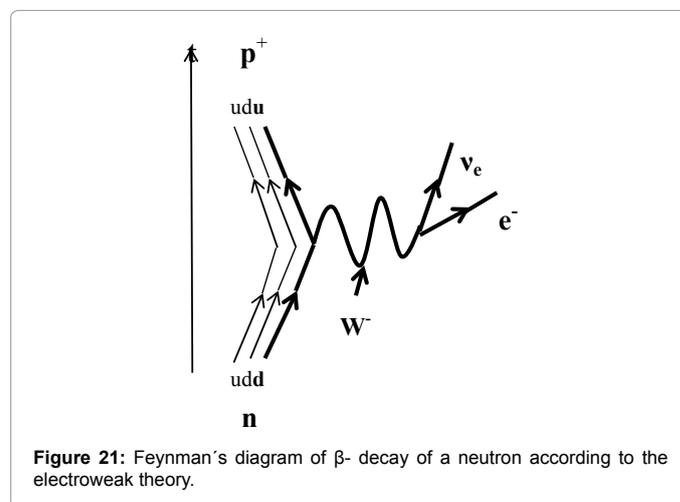
Insertion of virtual W⁻, W⁺ bosons into a simple picture of beta decay in order to create the electroweak theory is quite artificial and only complicates the simple situation. No virtual boson is needed, only real particles – neutron, proton, electron and maybe neutrino. No virtual processes are needed only real detectable interactions.
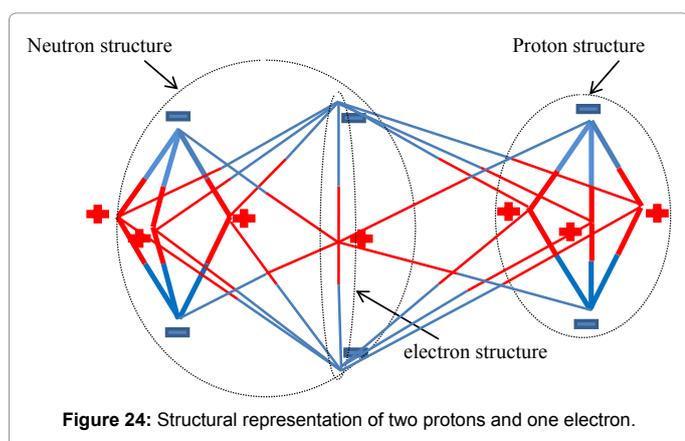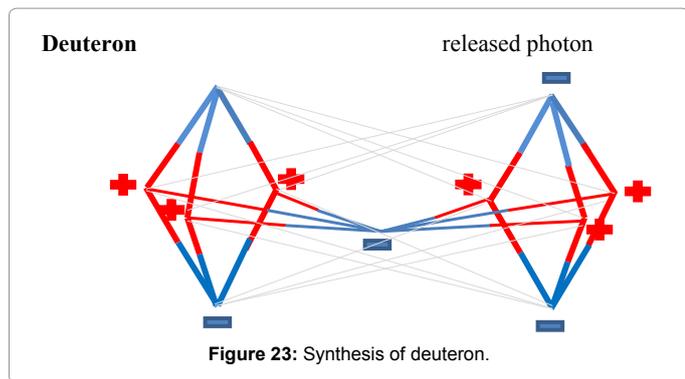
Theory of electroweak interaction tries to give together the electromagnetic interaction mediated by a virtual photon without rest mass with a weak interaction mediated by supposed very massive W⁻, W⁺ and Z bosons, so the so-called Higgs mechanism is required for breaking the electroweak symmetry and giving particles their rest mass. This hypothetical Higgs mechanism asks for the existence of very heavy Higgs boson which is declared to be found at LHC by energy of 125 GeV. If looking at the Higgs boson through one of its declared possible decay modes W⁻, W⁺, then it represents the basic structure (7+/7-), whicht same time represents the compound structure of electron, positron and two neutrinos. Only electron and positron are really detectable. Fictitious undetectable Higgs boson as a point-like particle is nonsense as well as mysterious Higgs field. Except for networks of elementary quantum connections (+/-) there are no other fields. Everything is made up of these connections. Photons as free elementary quantum dipoles (+/-) are the simplest particles having no rest mass. All other particles represent compound structures of two or more quantum dipoles with more complicated motions, so they local touch interactions with the vacuum (vacuum quantum connections) cause that they cannot be dragged by cosmic expansion and therefore they have rest mass as a measure of their resistance towards acceleration.

Another problem of Higgs boson is the conclusion that its "small" mass, although 126 times the mass of the proton, causes that the universe we live in is inherently unstable, it means that this mass is not enough to prevent the cosmic catastrophe. Unstable vacuum will result in cosmic cataclysm during transfer to the stable vacuum billions of years from now. If the Higgs mechanism breaks the symmetry between weak and electromagnetic interactions, what mechanism does break symmetries between strong and weak interactions and at what level of energy are all interactions united including gravity? If we are talking about symmetries the answer is very simple. The basic symmetry of all particles, interactions and fields means that all they are made of the same constituents-elementary quantum dipoles. We do not need huge accelerators and colliders in order to create such a big energy level, where all interactions ought to be unified, as the basic interaction is already known. Only real particles are detectable before and after high energy collisions, neither virtual bosons nor quarks. As all particles are made of elementary quantum dipoles, the picture of their mutual interactions is simple and clear without the necessity to include virtual undetectable realities there.

Nuclear Force

The nuclear force is an attractive one between two or more nucleons (neutrons and protons) binding them into atomic nuclei. Masses of light nuclei are less than the total mass of protons and neutrons which form them. According to contemporary quark model the nuclear force is a residual effect of much more powerful strong force (interaction) binding quarks by gluons. At the time before the quark model was created, the nuclear force was conceived to be transmitted by a neutral pion π^0. The most appropriate system for studying the nuclear force is a bound state of one proton and one neutron named deuteron being the nucleus of the deuterium atom named heavy hydrogen Figure 22. After synthesis of proton and neutron the photon is released taking out so-called binding energy Figure 23. In a bound state of nucleus it is not clear which of components is a neutron and which a proton as the negative pole is common for both nucleons. The compound state of one proton and one neutron in a deuteron (6+/5-) consists of 30 elementary quantum connections. If the photon is not released, the excited deuteron (7+/6-) consists of 42 elementary quantum dipoles. This structure represents factually the bound state of two protons and one electron Figure 24. In this structure we can see the substructures of neutron, proton, electron, but the deuteron is created not only of these structures but also of their mutual quantum connections being internal constituents of a deuteron. It is a clear manifestation of the holistic principle according to which the deuteron is not a simple sum of its structural components (protons and electron) but represents a higher quality defined also by their mutual quantum connections.

Figure 21: Feynman´s diagram of β- decay of a neutron according to the electroweak theory.

Figure 22: Synthesis of proton and neutron the photon is released taking out so-called binding energy.

Figure 23: Synthesis of deuteron.

Figure 24: Structural representation of two protons and one electron.

The deuteron compositions (7+/6-) exist in heavier atoms with higher atomic numbers being sources of γ-rays during a radioactive decay. The evidence is the fact that the fusion of two nuclei with lower masses than iron generally releases energy, while the fusion of nuclei heavier than iron absorbs energy. So not only no photon is released but new free photons are absorbed in the structure of heavier nuclei. The opposite is true for the reverse process, nuclear fission. This means that fusion generally occurs for lighter elements only, and likewise, that fission normally occurs only for heavier elements. So, only the extreme astrophysical events can lead to short periods of fusion with heavier nuclei. This is the process that gives rise to nucleosythesis, the creation of heavy elements during events like supernovas. Synthesis of heavier nuclei is possible only by extreme energies which allow to compress nuclei very close, so that the mutual quantum connections become very short and strong able to overcome their mutual repulsive pressures. The claim that binding energy of nucleons in nucleus is given by energy needed to be released during their synthesis is limited only for lighter nuclei and so cannot be a dogma, because real binding energy of nucleons in nuclei is energy of their mutual quantum connections (dipoles). Creation of the required conditions for fusion on Earth is very difficult. Dipoles creating the internal structures of both nucleons (protons and neutrons) are very short, strong and energetic so they represent the strong forces, while quantum dipoles between both or more nucleons are weaker and represent the nuclear force connecting nucleons into a nucleus. Although the nuclear force is much weaker than the strong one, it is enough strong and short (the shorter – the stronger) to overcome the mutual local repulsive pressures between quantum dipoles. Now we see that the nuclear force is not a residual effect of a strong force binding quarks by gluons, but it is created, as well as a strong force, of elementary quantum dipoles, although much longer and weaker. The nucleus of a helium atom $_2$He^4, named

α-particle, represents a bound state of 2 protons and 2 neutrons (12+/10-) consisting of 120 elementary quantum dipoles. The internal dipoles of nuclei are very short and strong (strong interaction) but their mutual connections are much weaker and can have different lengths and energies (nuclear interaction) Figure 25. Not all 120 mutual quantum dipoles (+/-) are imagined in the above picture, but we can see the difference between quantum dipoles creating the internal structure of 4 nucleons (strong interactions) and their mutual nuclear interactions.

The more nucleons are in nuclei, the heavier and less stable are the atoms as the number of mutual quantum connections dramatically increases with a consequent increase of their repulsive pressures. Atoms with a huge number of nucleons (protons and neutrons) in a nucleus are unstable and can decay. This so-called radioactive decay is a stochastic (random) process. The internal motion of quantum dipoles and they mutual pressures as well as impulses from outside can disrupt the equilibrium of attractive and repulsive forces and cause the atom spontaneously decays, where the huge amount of nuclear forces is released by emitting particles (α-particles, β-particles, γ-rays and others) which carry out high energies. The radioactive decay transforms the initial nucleus into another nucleus, or into a lower energy state. A chain of decays takes place until a stable nucleus is reached. An example of α-decay involves uranium (Figures 26 and 27):

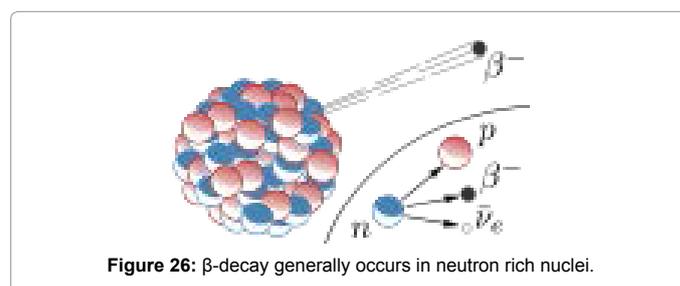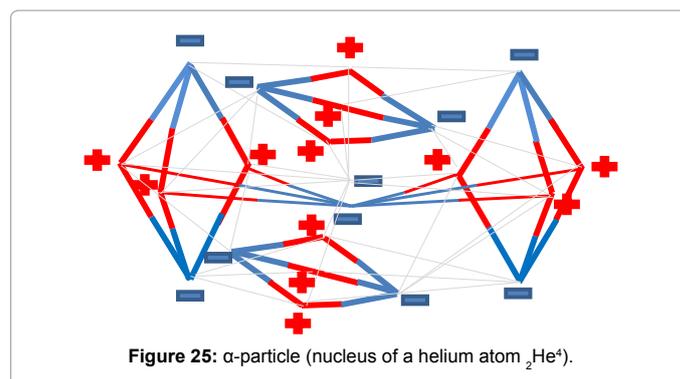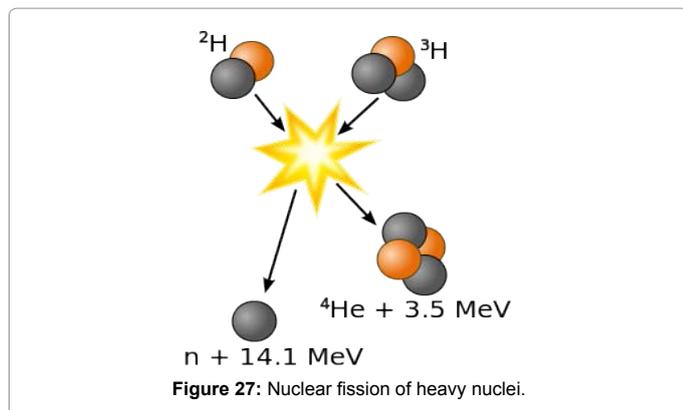$$_{92}U^{238} \rightarrow {}_{90}Th^{234} + {}_2He^4$$

The process of transforming one element (e.g. uranium) into another (thorium) is known as transmutation.

The electron or positron represents the beta particle in beta decay. If an electron is involved, the number of neutrons in the nucleus decreases by one and the number of protons increases by one. An example of such a process is:

$$_{90}Th^{234} \rightarrow {}_{91}Pa^{234} + e^-$$
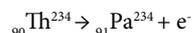
In the nucleus with a big number of nucleons the local repulsive pressures of enormous number of mutual nuclear quantum dipoles

Figure 25: α-particle (nucleus of a helium atom $_2$He^4).

Figure 26: β-decay generally occurs in neutron rich nuclei.

Figure 27: Nuclear fission of heavy nuclei.

between nucleons (protons and neutrons) is so high that the equilibrium between attractive nuclear forces of quantum dipoles and their repulsive pressures is very fragile and a small impulse is enough to cause the imbalance so that a radioactive decay can occur. This small impulse could be caused by excitation of the nucleus by a photon (or neutrino?), so that the number of mutual quantum connections in a whole structure of nucleus increases with a consequent increase of local repulsive pressures causing the radioactive decay. If the impulse is high, caused by interaction with energetic neutrons, the internal structure of radioactive nucleus of uranium increases the number and amount of repulsive pressures of quantum dipoles so dramatically that the nucleus is split in two nuclei with release of high energy particles like α, β, γ and neutrons, which can again cause the nuclear fission of other uranium nuclei and so generate the so-called chain reaction. On this principle the atom bombs are designed as well as nuclear reactors in nuclear power stations where the chain reaction is controlled. High energy can be released not only by nuclear fission of heavy nuclei, but also by synthesis (fusion) of light nuclei in thermonuclear reactions. At the picture taken from Wikipedia we can see the fusion of deuterium with tritium creating helium, freeing a neutron and releasing 17.59 MeV of energy. It takes considerable energy to force nuclei to fuse. Accelerated to high speeds (that is, heated to thermonuclear temperatures), they can overcome their local mutual repulsive pressures and get close enough for the attractive force to be sufficiently strong to achieve fusion. The fusion of lighter nuclei, which creates a heavier nucleus and often a free neutron or proton, generally releases more energy than it takes to force the nuclei together. Even when the final energy state is lower, there is a large barrier of mutual repulsive pressures that must be firstly overcome. It is called the Coulomb barrier. To achieve extreme conditions necessary for fusion, the initially cold fuel must be explosively compressed. Inertial confinement is used in the hydrogen bomb where the driver is x-rays created by a fission bomb. Long lasted research into developing controlled thermonuclear fusion is still unsuccessful.

All forces are nothing more than attraction and repulsion of quantum dipoles. Very short quantum dipoles create the strong attractive forces inside hadrons and leptons, nuclear forces are created by short and strong quantum dipoles between nucleons, electrostatic forces are formed by weaker and longer quantum dipoles, other forces between atoms and molecules are weaker than electrostatic ones, and the weakest are attractive forces of gravity between massive objects created by long mutual quantum dipoles representing a cosmic vacuum. Attraction and repulsion are always in a mutual equilibrium. Shortening and increasing of mutual quantum dipoles between nuclei during their fusions are at the same time accompanied by increasing of their mutual repulsive pressures, which overcoming is necessary for the successful fusion. The dynamic equilibrium of both opposite forces (attraction and repulsion) inside atoms and particles is manifested by internal motions (oscillations, vibrations, etc.)

Conclusion

From the viewpoint of dialectical logic contemporary theoretical physics failed. Now, when the Unity Principle is disclosed, new science can start its consecutive development on true fundamentals. The knowledge of the Unity Principle and its manifestations is a basis for new science including theoretical physics, biology, sociology, science of consciousness as well as philosophy. It represents a new scientific and philosophical paradigm and starting point of substantial great revolution in human knowledge giving true answers to all basic questions of our existence.

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