

Article

Unity Principle: The Truth in the Mirror of Dialectical Logic (Part III)

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ABSTRACT

Deeper truth of our existence might have evaded detection by the materialistic science. The reality seems to have disintegrated into many different and independent spheres, but we feel intuitively that a great variety of existing forms should have a common basis. How can we come to the true knowledge about our existence? A great desire of man is to find a true meaning of our life and the essence of being. Many philosophers and scientists have expressed the Unity Principle by saying “everything is connected to everything else”, but few have detected its essence. On the base of dialectical logic, the Unity Principle is discovered which illustrate not only the exact mechanism how the physical universe may work, but also the essence of consciousness and subsequently personal God representing the whole self-aware and self-creating reality of the highest complexity.

Part III of this series of articles includes Appendix - Basic Forces & Interactions (I): Force and Energy; Electrostatic Force; Magnetic Force; Gravitational Force; Three Forms of Mass; Strong Interaction; and Strong Interaction.

Key Words: truth, theoretical physics, mystery, crisis, unity principle, dialectical logic, quantum dipole, God, consciousness, syntropy, evolution.

Appendix: Basic Forces & Interactions (I)

Force and Energy

There are only two basic forces – attraction and repulsion and two basic interactions – local and non-local. All known interactions: mechanical, electromagnetic, strong, weak, 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

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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 \mathbf{f}_i of a quantum dipole is:

$$\mathbf{f}_i = \mathbf{f}_{ia} + \mathbf{f}_{ir}, \quad \mathbf{f}_{ia} = \mathbf{f}_{ir},$$

where: \mathbf{f}_{ia} - attractive force between opposites of quantum dipole \mathbf{i} ,
 \mathbf{f}_{ir} - repulsive force of quantum dipole \mathbf{i} .

Energy \mathbf{e}_i of a quantum dipole is a consequence of its attraction and repulsion. Force of attraction and repulsion \mathbf{f}_i acting between opposites through the entire length \mathbf{d}_i of a quantum dipole creates, by multiplication with its length, the whole energy \mathbf{e}_i of a quantum dipole:

$$\mathbf{e}_i = \mathbf{f}_i \cdot \mathbf{d}_i$$

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 permanent mutual motion. The whole internal energy of a quantum dipole \mathbf{e}_i consists of its two parts: attractive \mathbf{e}_{ia} and repulsive \mathbf{e}_{ir} 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 relation between attractive and repulsive parts is manifested by oscillation. Quantum dipoles, 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 at 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:

$$\mathbf{e}_{ia} = \mathbf{e}_{ir}$$
$$\mathbf{e}_i = \mathbf{e}_{ia} + \mathbf{e}_{ir} = 2\mathbf{e}_{ia} = 2\mathbf{e}_{ir}$$

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 same 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

$$\delta_t = \mathbf{e}_i \mathbf{d}_i = 2\mathbf{e}_{ia} \mathbf{d}_i$$

we can derive the following relation:

$$e_{ia} = \delta_t / 2d_i$$

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

$$e_{ia} = (q^2 / 4\pi\epsilon) / d_i, \text{ where: } \delta_t = q^2 / 2\pi\epsilon$$

q – elementary electric charge,
 ϵ – dielectric capacitance

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

$$e_{ia} = \alpha hc / (2\pi d_i),$$

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

Then: $e_i d_i = \alpha hc / \pi.$

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

$$\delta_t = e_i d_i = \alpha hc / \pi$$

as a dialectical relation between energy and length of elementary quantum dipoles.

From this relation we obtain:

$$f_i = \delta_t / d_i^2 = \alpha hc / (\pi d_i^2)$$

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

$$f_{ia} = \alpha hc / (2\pi d_i^2)$$

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_i . This force is indirectly proportional to the square of its length.

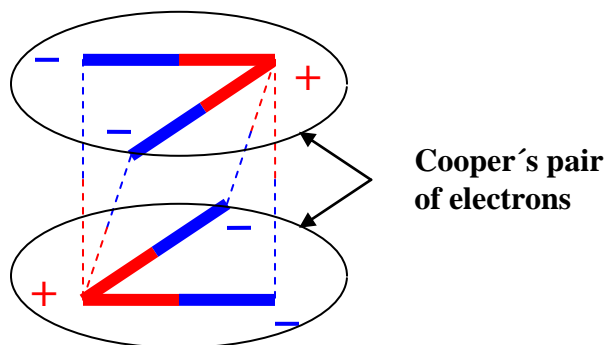
Electrostatic Force

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 the 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, as 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:

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

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 positive and 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 can be pictured:



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.

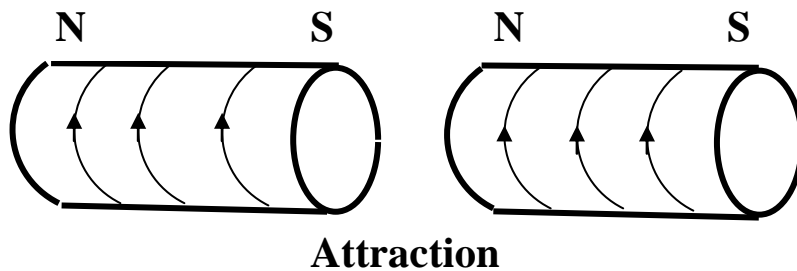
Magnetic Force

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.

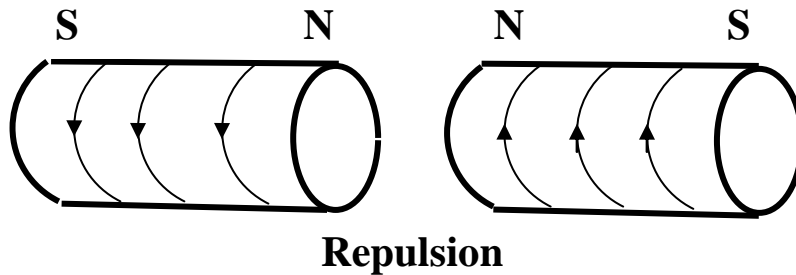
Magnetic are materials where it is possible to create mutually coordinated synchronized motions (oscillation) of quantum dipoles in their atoms (atomic dipoles) in the sense of their like orientations.

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 by the following picture:



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 how many parts is the magnet divided into. 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 (above picture), if like 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 way that they 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 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. Some aspects we have just explained, others are also accessible from the viewpoint of knowledge of the Unity Principle.

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 in [8] :

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

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. Many critics of Einstein theories and the standard cosmological model deny the cosmic expansion claiming that the cosmic redshift and microwave cosmic background can be explained by different ways. We can accept their arguments, but gravity as a counterbalance of cosmic expansion is just its direct evidence. 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 $F_e = 7,566.10^{42} \text{ N}$ 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.

Gravitational force between celestial bodies is mediated by their mutual vacuum quantum connections, so it is 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 may be wrong, if it is a local non-relational theory not accepting that gravity is a non-local instantaneous interaction between celestial bodies. 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.

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:

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

From the relation for the circumference of the Universe $o = 2\pi r$ and previous relations we obtain:

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

The relations between spatial circumference o and time t are:

$$o = u.t^{2/3} \\ do/dt = (2/3)u.t^{-1/3} \\ d^2o^2/dt^2 = -(2/9)u.t^{-4/3},$$

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

These equations show that the spatial circumference \mathbf{o} increases in time but its speed $\mathbf{do/dt}$ decreases. So, 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 $\mathbf{o}/2$ and the speed of its increase, thanks to cosmic expansion, represents the highest possible speed of light \mathbf{c} :

$$\mathbf{c} = (\mathbf{do/dt}) / 2 = \mathbf{o}/3t$$

$$\mathbf{o}/2 = \pi r = (3/2) ct$$

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 \mathbf{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 \mathbf{c} must be reduced by the speed \mathbf{v} of extension of this distance thanks to cosmic expansion. If the light approaches us from the point of distance \mathbf{d} , then this point moves away with the speed \mathbf{v} thanks to cosmic expansion:

$\mathbf{v} = \mathbf{H.d}$, where:

\mathbf{H} – Hubble’s constant,

\mathbf{d} – actual distance of the light ray from us (observer),

then the light from the distance \mathbf{d} approaches us by the speed $(\mathbf{c-v}) = (\mathbf{c-Hd})$.

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 \mathbf{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 \mathbf{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 as accelerator of cosmic expansion 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.

So a 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 of 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 A.E. Akimov and G.I. 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 by mainstream established theorists, although declared as developed on the base of Einstein-Cartan field theory. But, in reality, their torsion fields can be correctly interpreted only saying that they are mediated through 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 irrational physical theories.

Three Forms of Mass

It seems that every material object manifests itself only through one mass. But it is not true. The reason is evident. While the **internal mass** m_e of a body is defined by energy of all its quantum dipoles, its **gravitational mass** m_g is defined by the number of its positive and negative poles, from which all external quantum dipoles come out and connect it with all other objects of the Universe. Every material object is dead defined by the number of positive and negative poles, whose elementary quantum connections create its inner structure. If two objects have the same number of positive and negative poles, they have the same gravitational mass. Let us have two neutral objects (structures). The first has k_1 positive and k_1 negative poles, the second – k_2 positive (or negative) ones. The first object has k_1^2 quantum dipoles, the second k_2^2 . The system consisted of both objects have $(k_1+k_2)^2$ quantum dipoles, so it contains $2k_1k_2$ quantum dipoles in addition, that mutually connect both objects. Its external gravitational mass is proportional to the

sum of positive and negative poles ($\mathbf{k}_1+\mathbf{k}_2$). The internal mass and energy is the sum of energies of all quantum dipoles. If two objects are connected into one object, their external mutual $2\mathbf{k}_1\mathbf{k}_2$ connections transform to the internal connections of the new object. These connections become much shorter and energetic. Increase of their energy must be compensated by energy weakening of others internal quantum dipoles, so that the total internal mass of a new object is equal to the sum of masses of both previously separated objects and so the **balance between the internal mass m_e and external gravitational mass m_g is maintained**. This balance is a consequence of equilibrium between attraction and repulsion of matter created by stable material structures of atoms and molecules.

The increase of repulsive pressures of quantum dipoles connecting two previously separate structures must be compensated by the decrease of energy of quantum dipoles in previous structures. The mutual equilibrium of attraction and repulsion as a condition for existence of stable material structures is possible only if internal energy (mass) is proportional to the number of its positive and negative poles. Then the **internal mass m_e of a body is the same as its external gravitational mass m_g** . By the synthesis of atomic nuclei, a part of energy is released even in a form of particles flying away and carrying the energy of quantum connections being before parts of components entering to the synthesis. This is the way how to make stable the new material structure. Released energy is known as binding energy.

If body moves, it manifests itself through its **inertial mass m_i** , expressing its motional relation towards the surrounding. This body manifests its resistance against acceleration or deceleration. If the massive body is at rest, all three masses – **internal, gravitational and inertial** – are in a mutual equilibrium and have the same value. If the body does not change its internal structure and the number of positive and negative poles is the same, then its gravitational mass m_g remains unchanged. But its internal energy (mass), as well as inertial mass, changes during its motion. If body accelerates, its resistance against next acceleration increases what causes the increase of its inertial mass m_i . But its internal mass (energy) m_e decreases whereby the resistance of the environment (vacuum) is compensated. The decrease of internal energy of moving body means the deceleration of all its internal processes what is manifested as time dilation. This is the reason of real relativity. **Time dilation** means the deceleration of all internal processes inside a moving body and consequently the **decrease of its internal energy and mass m_e** .

The relation between gravitational m_g , internal m_e and inertial m_i masses of massive body can be expressed by the following relation:

$$m_g^2 = m_e \cdot m_i$$

If a body is at rest towards the nearest vacuum, all these masses equal each other:

$$m_g = m_e = m_i$$

If body increases its speed towards the vacuum, its gravitational mass m_g remains unchanged, but its inertial mass m_i increases according to Lorentz relation, and its internal mass (energy) m_e decreases (deceleration of internal processes = time dilation)

Historically the mass of bodies was firstly defined by their resistance towards acceleration (**inertial mass**) and by mutual gravitational attraction between Earth and material objects (**gravitational mass**). The Newtonian gravitational law established the relation between gravitational masses of bodies and their mutual gravitational attractive forces. From the discovery that bodies with different inertial masses fall towards Earth with the same gravitational acceleration followed: the greater the inertial mass, the higher the gravitational one. So the principle of equivalence between inertial and gravitational masses was postulated. But the validity of this principle is limited and vanishes by speeds close to the speed of light. Later it was discovered that mass bodies contain enormous internal energy proportional to their internal mass m_e multiplied by the square of speed of light. It is a famous law $E=m_e c^2$ of equivalence between energy and mass, which unifies the internal mass with internal energy.

Einstein built his theory of gravity by assumption of equivalence between inertial and gravitational masses. This equivalence is valid only by slow motions. It loses its validity by great speeds and also by elementary particles, mainly by particles with zero rest mass (photons, neutrinos) but with their gravitational mass given by the number of their positive and negative poles. They act gravitationally with other objects.

The equilibrium between internal and gravitational masses is valid only if material body is at rest towards near surroundings or move with relatively small speed. Moreover, at the level of elementary particles both masses can be quite different. For example, photons as simple quantum dipoles consist of two opposite poles. They can have various internal masses (energies), but their gravitational mass is always the same, as it is proportional to the number of opposite poles. It means the gravitational force between mass body and the photon is always the same independently of photon's internal mass (energy). **Gravitational mass corresponding to one pole creates its gravitational charge.**

In bodies the equilibrium between internal and gravitational mass is maintained thanks to compensation of increasing binding energies by the release of internal energies of initial structures. The other is the situation, if we take into account a system of celestial bodies. The sum of opposite poles is the same whether we analyse the system as a whole or as a sum of its parts. But if we study the internal or inertial mass of the system, we must take into account, except of internal and inertial masses of all bodies, also masses of their mutual quantum connections. If the number of celestial bodies in a given system is small, energy and internal mass of the whole system only slightly differs from the sum of internal masses of separate bodies. It is because energy of mutual quantum connections is negligible thanks to their great lengths. But if the number of celestial bodies in the system is huge, for example, galaxies or the whole Universe, the number of mutual quantum connections creating the cosmic vacuum is enormous and important with respect to the whole mass. Their energy (mass) creates energy of cosmic vacuum inside the galaxy or the whole Universe. Increase of three forms of masses (internal, inertial and gravitational) of the whole system is considerable if the number of celestial bodies inside is huge. But the number of opposite poles is always the same independently of

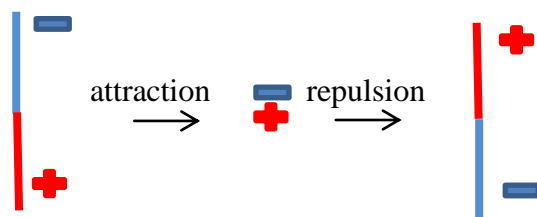
whether we consider the sum of separate celestial bodies or the whole system. Increase of gravitational mass of the whole system comparing to the sum of masses of its bodies means, that the gravitational charge of one pole is much lesser if we analyse the gravity between two bodies than if we analyse the whole system.

Contemporary theories suppose gravitational attraction to be caused only by objects with non-zero rest inertial mass and do not accept gravitational attraction of particles with zero rest mass. If we take into account all photons and neutrinos of the observed system as well as mass of mutual quantum connections between objects of a system (galaxy), we can see that no mass is missing in the observed system, e.g. galaxy. No dark matter and dark energy is needed to understand the gravitational behaviour of cosmic structures, e.g. galaxies. The problem of dark matter is only the consequence of misunderstanding of the real essence of matter and the vacuum and erroneous understanding of the equivalence principle between inertial and gravitational masses.

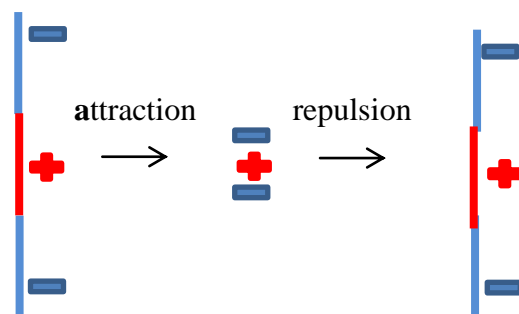
Strong Interaction

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).

Photon γ (+/-) created by one oscillating quantum dipole:

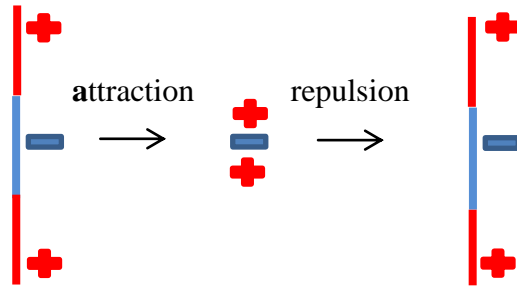


Electron e^- (+/2-) created by two quantum dipoles:

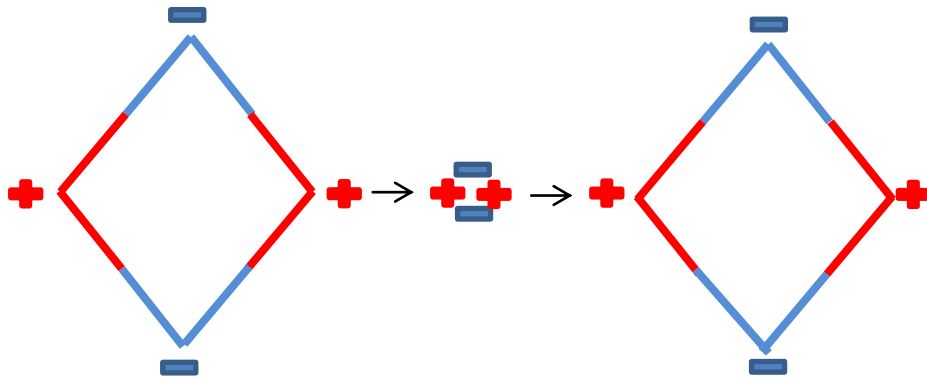


Muon and **Tau** have the same structure as an electron, only they are much more energetic and so shorter. They are unstable and change into electrons by transferring their energies into surroundings.

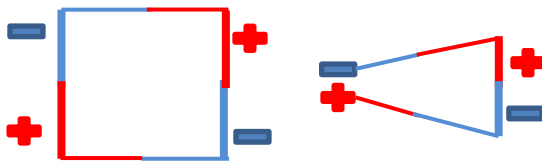
Positron e^+ (2+/-) made of two quantum dipoles:



Neutrino ν_e (2+/2-) made of four quantum dipoles:



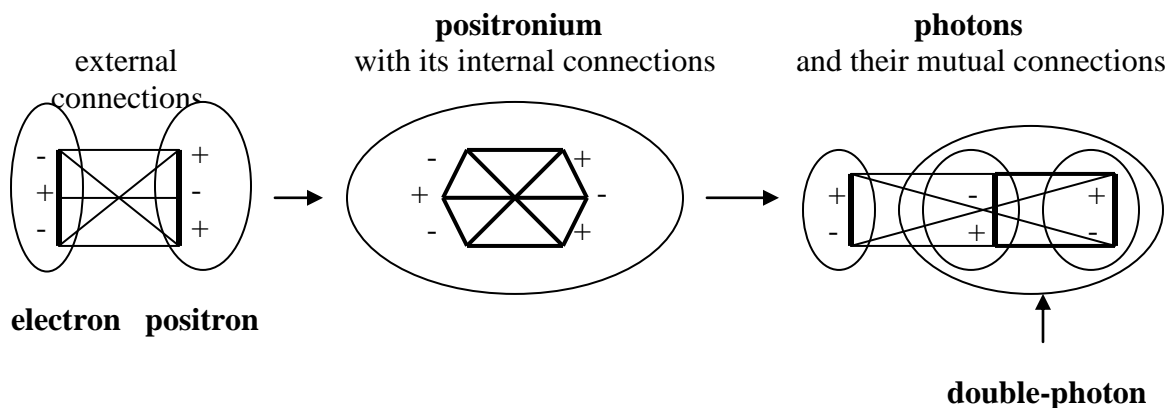
If neutrino really exists, it represents a double-photon structure with specific internal motion. The neutrino is its own antiparticle, so neutrino and anti-neutrino represent the same particle with above structure and motion. As the neutrino oscillates in one plane as well as a photon, it does not resist its dragging by cosmic expansion and so 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. For example:



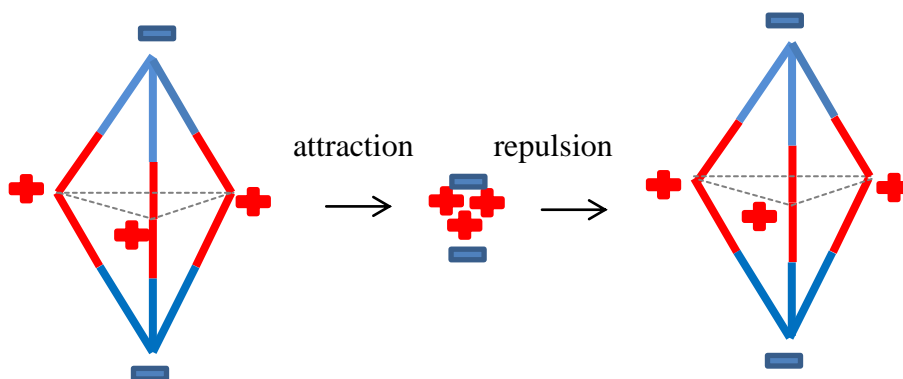
This structure of a double photon has two different centres of oscillation with different phases.

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 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, can be illustrated by the following scheme:



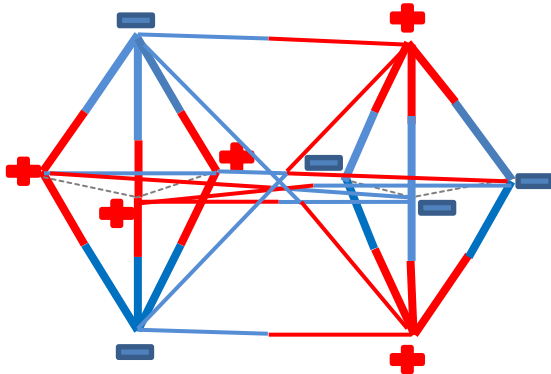
Proton p^+ (3+/2-) made of six elementary quantum dipoles:



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 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.

Proton – Antiproton Annihilation ($p^+ p^-$) – protonium:



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 follows:

As unstable neutral pions π^0 , as well as eta mesons η , represent the bound states of two photons, both they decay into two photons 2γ :

$$\begin{aligned} \pi^0 &\rightarrow \gamma + \gamma \\ \eta &\rightarrow \gamma + \gamma \end{aligned}$$

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

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

1. $p^+ + p^- \rightarrow \omega + \pi^0 \rightarrow \pi^0 + \gamma + \pi^0 \rightarrow \gamma + \gamma + \gamma + \gamma + \gamma$
2. $p^+ + p^- \rightarrow \pi^0 + \pi^0 + \pi^0 \rightarrow \gamma + \gamma + \gamma + \gamma + \gamma + \gamma$
3. $p^+ + p^- \rightarrow \pi^0 + \pi^0 + \eta \rightarrow \gamma + \gamma + \gamma + \gamma + \gamma + \gamma$

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 totally wrong by explanation of the real essence of micro-world. The greatest 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 qualities.

Let us 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.

(Continued on Part VI; List of References at end of Part IV)