Exploration

Basic Forces & Interactions According to Dialectical Logic (Part I)

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ABSTRACT

On the base of dialectical logic, basic forces & interactions are explored. Part I of this two-part article includes: Introduction, Space-Time, Photon as Elementary Quantum of Existence, Force and Energy; Electrostatic Force; Magnetic Force; Gravitational Force; Three Forms of Mass; Weak Interaction; and Strong Interaction.

Key Words: truth, theoretical physics, mystery, crisis, dialectical logic, quantum dipole, force, energy, electrostatic, magnetic, gravitational, weak force, strong force.

Introduction

Stephen Hawking said that we cannot ask if a model corresponds to reality, because we have no independent test of what reality is and all we can ask is whether the predictions of the model are confirmed by observation. It is a typical positivistic and post-positivistic attitude leading to the wrong conclusion that the reality is unknowable and meaningless.

Can we know the truth and the nature of our Universe? Yes, we can. Already G.W.F. Hegel showed in his rational philosophy 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 our rational thinking and dialectical logic. It is possible to come to the knowledge of truth if we apply critical thinking and logical reasoning as well as knowledge from quantum mechanics which shows a quantum character and mutual interconnectedness of reality.

It is very sad that dialectical logic, as the most effective instrument of search for correct answers to ontological questions, had been diminished, thanks to philosophy of positivism, from the scene already in the 19th century and replaced by formal logic. Consequently the development of dialectical logic was abruptly stopped. Needless to say, formal logic is necessary for scientific research, but insufficient with respect to ontological questions. Positivism with its pragmatism and empiricism became a basis of scientific methodology. It has limited scientific research to only what is accessible by our senses and instruments. Positivism replaced Hegelian dialectical rationalism in which classical philosophy had achieved its apex. Positivism tried to create scientific principles based on the rules of formal logic and experiment, where axiomatic approach became a starting point.

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However, the whole reality (universe) is dialectical, so it is accessible by our rational dialectical thinking. If quantum physicists were familiar with Hegelian dialectical logic, they could solve all interpretational problems and seeming mysteries of quantum physics as well as made the greatest contribution to rational philosophy detecting the essence of existence. Certainly, quantum mechanics represents a great achievement of theoretical physics in the 20-th century with many practical and useful results, but it could also represent the greatest achievement of human mind, if theorists knew dialectical logic and were not limited by philosophical positivism.

Space and Time

Space remains a mystery so far. It is very strange, because simple but critical thinking and reasoning is sufficient to disclose all mysteries of our existence. The Universe is rational and knowable. We can apply correctly the rules of formal logic by our deductions, but we have a big problem to think, contemplate, ruminate and study the things in their significant mutual relations. Therefore my main aim now is to demonstrate the truth by many ways and from various viewpoints, step by step, as simply as possible and so give a basic lesson of critical dialectical thinking. Truth must appear with its beauty if attacked by correct logic.

Now philosophical and theoretical problems are not grasped at the fundamental level, but replaced by inappropriate idealisations, illogical assumptions and consequent deductions following from the rules of formal logic and mathematics. As assumptions and axioms represent incorrect idealisations, the results must be also incorrect, even irrational and mysterious like the Standard Model of particle physics, where elementary particles are interpreted mistakenly as point-like entities. String theories have replaced these zero dimensional entities by one dimensional strings vibrating through hypothetical eleven-dimensional space-time and this nonsense is presented as a great achievement of human thinking. But they know neither why do strings vibrate nor what are the basic structural constituents of space-time. Their realities are hidden within Planck´s scales. If they knew that Plank´s scales just indicate that the whole reality is quantized and structured and therefore consists of elementary quanta they would understand there is no way to hide something there. The question is: what are the basic elementary quanta of reality? How is the reality built of these elementary structural constituents?

Certainly, no physical entity can be zero-dimensional or one-dimensional, as no physical object can exist without its spatial manifestation having zero volume. Such idealisations are inappropriate at the quantum level. If we do not understand how space and time are quantized and structured at the basic quantum level, we cannot explain their essence as well as the essence of gravity and other interactions. Why do theorists, unknowing the essence of space, try to put together Einstein´s theories with quantum mechanics? Einstein theory of gravity is local while quantum mechanics is non-local, it means, non-locality is its basic feature confirmed by experiments. Why don´t they try to find the essence of non-locality? Having found it they could see the fundamental defectiveness of Einstein´s theory of gravity. Even, his theory denies the existence of gravitational force replacing it by mathematical space-time curvature. The attempts to unite Einstein´s gravity (general relativity) and quantum theory result in mysteries where solutions are searched at the level of absent mysterious black holes.

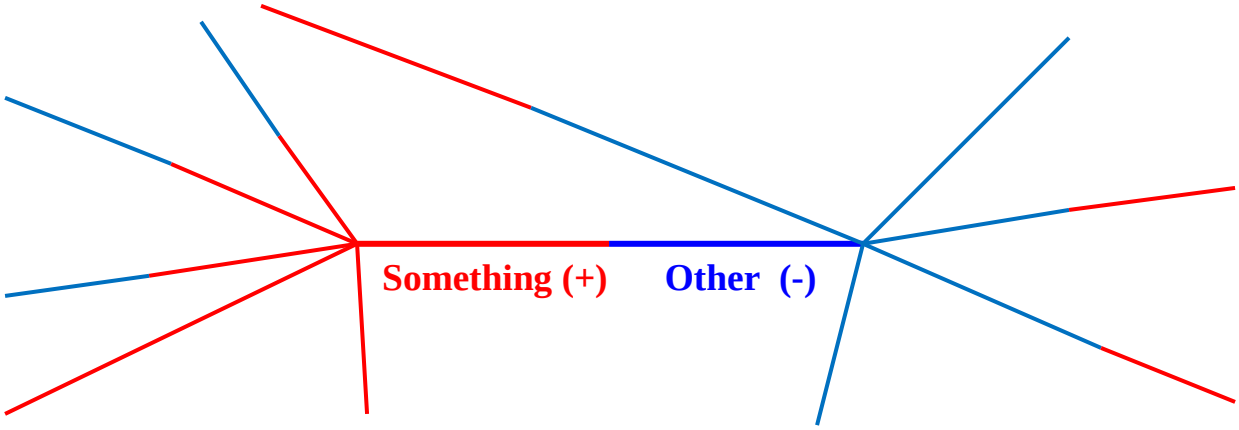
Let us apply a simple logic by our reasoning regarding space. If we look at the reality (existence) or the Universe as a whole, we can see that it is not a pure continuum, but it is structured. A pure unstructured continuum is nothing. So the whole Universe as space is structured and, at the same time, 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 represent just 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 that both sides. In dialectical logic they are named opposites and their mutual relation - the unity of opposites.

Schematically it looks like:

Something (+) **Other (-)**
(one side) (other side)

Even if we start our consideration at the highest level of abstraction we can see 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 only two sides (opposites) of the same "one". It is irrelevant what side is "something" or "other" as 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. Thus we have a clear definition of energy as 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 Universe is physical - spatial and material (energetic). Matter is spatial and space is material. 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 reality is spatial and represents a network of elementary quantum connections where every something (+) is connected to all others (-) and reciprocally, which results naturally from dialectic relations "whole-part" and "one-many" as will be shown later.



There is no space and no energy outside quantum connections (dipoles) as only they create the whole reality. Quantum connections are not placed in space, but create it.

Contemporary theories separate matter from space, supposing space to be only an empty or unstructured surrounding in which 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. As Einstein´s theories have no idea about internal structuration and quantization of physical reality (space and time), they cannot lead to the true knowledge. It is very strange and absurd that theorists having not found how space and time are quantized try to unite Einstein´s local theories with quantum non-local theory. It is like trying to put together water and fire. One excludes the other. As a result string theories become the greatest accumulator of illogical nonsenses ever.

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 nonsenses 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 elementary quanta of space.

The Standard Model presents huge number of different point-like particles (fermions and bosons) placed in the vacuum, which essence is unknown. How are point-like particles connected to the

vacuum? 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. All these virtual mysteries are undetectable and hidden under the Plank scale. If we do not know the essence of the vacuum we can use it as a magic wand to solve all our theoretical problems. We will show later that 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 nonsensical electroweak theory. In cosmological theories space is only a surrounding where bodies move, while in particle physics it is a fluctuating vacuum with undetectable virtual fluctuations.

As elementary quantum dipoles (connections) represent elementary quanta of space of which every object is made and through which it is connected to the whole reality, it is impossible for any object to become a singularity like a black hole. Black holes represent nonsense which, in order to exist, must destroy the whole internal structure of previous star and change it into pure singularity without any internal structure, but with infinite density. Black hole dreamers do not see the force that can stop the gravitational collapse as they do not know elementary constituents of which every object is made. As every elementary structural constituent represents an elementary quantum of space, its space cannot be destroyed. Analysing the dialectical relations "continuity-discontinuity and locality-non-locality" we will show that elementary quanta of space act not only non-locally but also push locally each other by their spaces.

The stronger they are pressed together by gravity the bigger are their mutual repulsive pressures that stop gravitational collapse so that the Schwarzschild radius cannot be attained [4]. Black holes are mysterious not only form the viewpoint of space, but also time which, hidden under the Schwarzschild sphere, represents an imaginary mathematical value (square root of a negative number) having no real sense. The real physical meaning of time is to be a measure for speeds of processes or motions measured through given standard cyclical processes like Earth rotation or atomic oscillations. At the Schwarzschild sphere time must stop, it means all processes must stop and freeze.

Can black hole theorists explain the physical meaning of imaginary time in relation to physical processes or motions? Of course they cannot, so they say it is a mystery that we must accept as it follows from their mathematical models where imaginary time flows perpendicularly to our ordinary time. Thus, time in their models is not a real physical phenomenon but only pure mathematical coordinate. Neither space nor time has real physical meaning, both they are only mathematical symbols.

The question is - does the elementary motion exist as universal measure of all processes? We will show later that the whole Universe transits from its one quantum state to the following by elementary quantum jumps which define cosmic time for the whole Universe as a basic measure to which all local physical processes can be related.

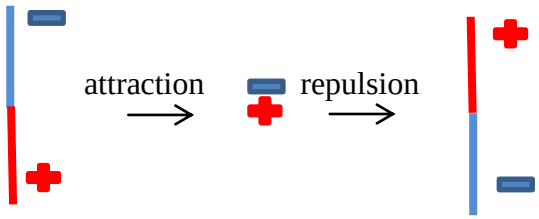
Photon as Elementary Quantum of Existence

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 is a direct to the essence of whole reality. 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 thus 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.

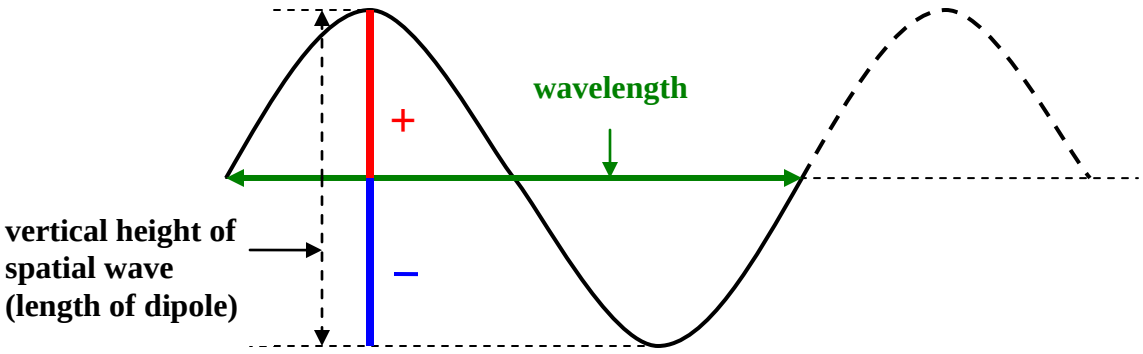
The greatest mistake of theoretical physics is the idea that elementary particles must be point-like entities without any internal structure and with zero volume. Even a photon as the simplest particle cannot be a point-like entity without internal structure. The photon is a simple quantum dipole consisting 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.

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.

Photon = Free Oscillating Quantum Dipole (+/-)



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 as a measure of its motion (frequency of vibrations) can only result from mutual attraction and repulsion of its opposites.

Planck´s equation $\mathbf{e_i = h\nu_i}$

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 until now. It is due to inappropriate idealisation of elementary particle as a point-like entity with its mysterious "particle-wave" dualism resulting in impenetrable and undetectable virtual realities.

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 an 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 [7].

Photon´s oscillations can be presented as rotations of a quantum dipole with a circumferential velocity **v**:

$$\mathbf{v = 2\pi r_i / T_{ot} = \pi d_i \nu_i}$$

T_{ot} – time of one rotation of a quantum dipole,
ν_i - $1/T_{ot}$ – frequency of quantum dipole oscillation,
r_i - radius of dipole (half of its length),
d_i - length of dipole.

$$\mathbf{e_i d_i = hv/\pi}$$

Later we will show from the viewpoint of dialectical logic that the value $e_i d_i$ 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.

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, 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 $\mathbf{f_i}$ of a quantum dipole is:

$$\mathbf{f_i = f_{ia} + f_{ir}}\,, \qquad \mathbf{f_{ia} = f_{ir}}\,,$$

where: $\mathbf{f_{ia}}$ - attractive force between opposites of quantum dipole **i**,
$\mathbf{f_{ir}}$ - repulsive force of quantum dipole **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:

$$\mathbf{e_i = f_i.d_i}$$

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:

$$\mathbf{e_{ia} = e_{ir}}$$
$$\mathbf{e_i = e_{ia} + e_{ir} = 2e_{ia} = 2e_{ir}}$$

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

$$\delta_t = \mathbf{e_i d_i} = \mathbf{2e_{ia} d_i}$$

we can derive the following relation:

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

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

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

q – elementary electric charge,
ε – dielectric capacitance

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

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

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

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

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

$$\delta_t = \mathbf{e_i d_i = \alpha hc/\pi}$$

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

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

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

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

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 $\mathbf{d_i}$. This force is indirectly proportional to the square of its length.

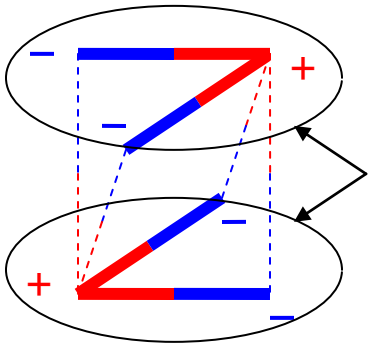
Electrostatic Force

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 $\mathbf{k_1}$ positive and $\mathbf{k_1}$ negative poles and the second one - $\mathbf{k_2}$ positive and $\mathbf{k_2}$ negative ones. The whole number of elementary quantum connections between two objects is $\mathbf{2k_1k_2}$. So the whole attractive force $\mathbf{f_a}$ 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:

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

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 $\mathbf{q_1}$ and $\mathbf{q_2}$, 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.

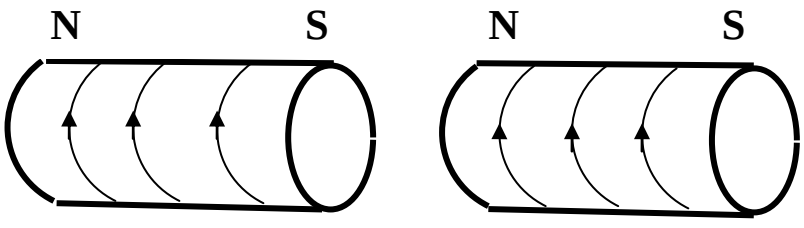
Magnetic Force

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.

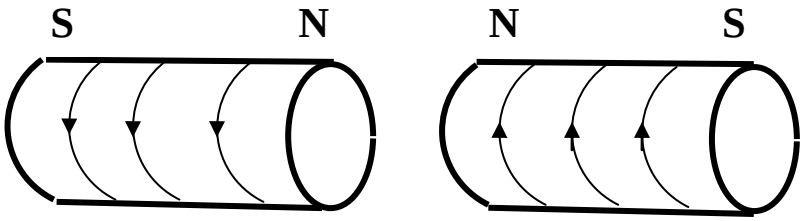
Mutual attraction of opposite magnetic poles is a consequence of synchronized coordinated oscillations (rotations) of quantum dipoles inside magnets as shown by the following picture:



Attraction

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.



Repulsion

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] :

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

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:

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

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 $\mathbf{f_a = (\alpha hc/2\pi)2k_1.k_2/d^2}$ 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 $\mathbf{f_g}$ of attractive force $\mathbf{f_a}$ is not compensated $\mathbf{f_g = \beta f_a}$ and represents the **attractive gravitational force $\mathbf{f_g}$ of bodies.**

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

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 $\mathbf{F_e = 7{,}566.10^{42}\ N}$ 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.

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 then 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:

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

$$\mathbf{dV/dt = (d^2V/dt^2).t},$$
$$\mathbf{(dV/dt)^2 = 2\ V.d^2V/dt^2}$$

The quantity $\mathbf{d^2V/dt^2}$ 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 $\mathbf{d^2V/dt^2}$ 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:

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

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

$$\mathbf{(do/dt)^2 = -2o.d^2o/dt^2}$$

The relations between spatial circumference **o** and time **t** are:

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

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

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

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

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

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

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

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 **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 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 (k_1+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 $2k_1k_2$ 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 $\mathbf{m_g}$, internal $\mathbf{m_e}$ and inertial $\mathbf{m_i}$ masses of massive body can be expressed by the following relation:

$$\mathbf{m_g^2 = m_e.m_i}$$

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

$$\mathbf{m_g = m_e = m_i}$$

If body increases its speed towards the vacuum, its gravitational mass $\mathbf{m_g}$ remains unchanged, but its inertial mass $\mathbf{m_i}$ increases according to Lorentz relation, and its internal mass (energy) $\mathbf{m_e}$ 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 $\mathbf{m_e}$ multiplied by the square of speed of light. It is a famous law $\mathbf{E=m_ec^2}$ 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

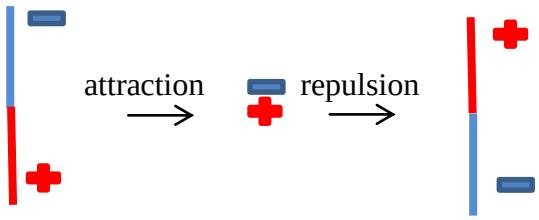
structures. The other is the situation, if we take into account a system of celestial bodies. The sum of opposite poles is the same whether we analyse the system as a whole or as a sum of its parts. But if we study the internal or inertial mass of the system, we must take into account, except of internal 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 mater and the vacuum and erroneous understanding of the equivalence principle between inertial and gravitational masses.

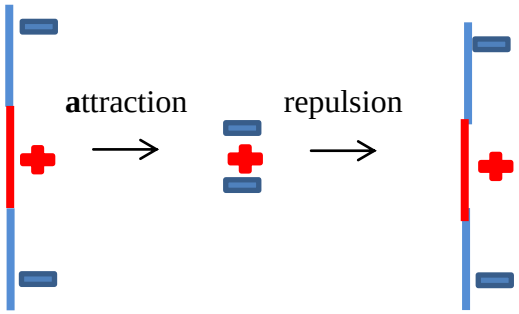
Strong Interaction

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:

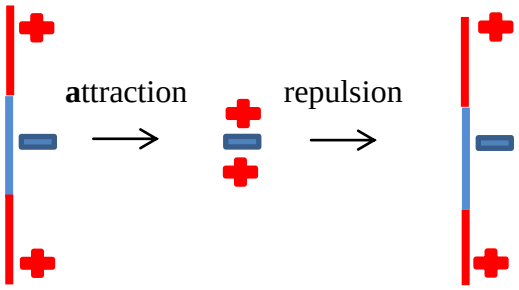


Electron e^- (+/2-) created by two quantum dipoles:

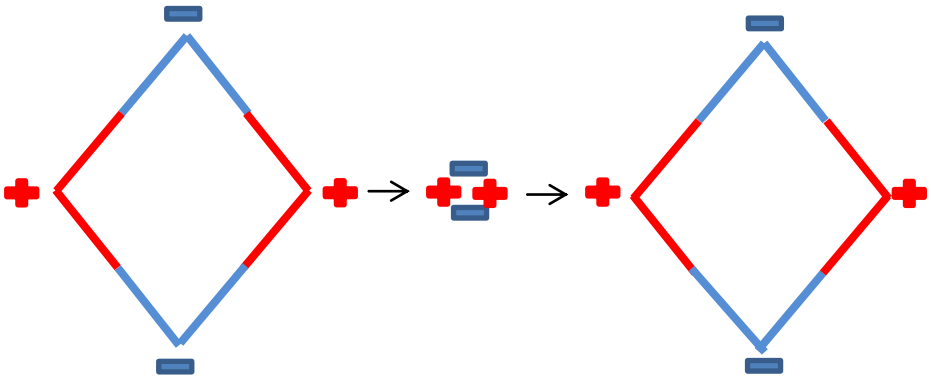


Muon and **Tau** have the same structure as an electron, only they are much more energetic and so shorter. They are unstable and change into electrons by transferring their energies into surroundings.

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

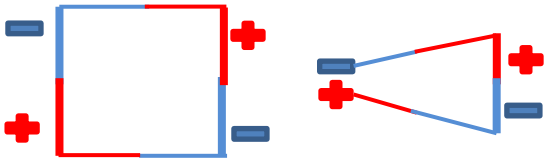


Neutrino ν_e (2+/2-) made of four quantum dipoles:

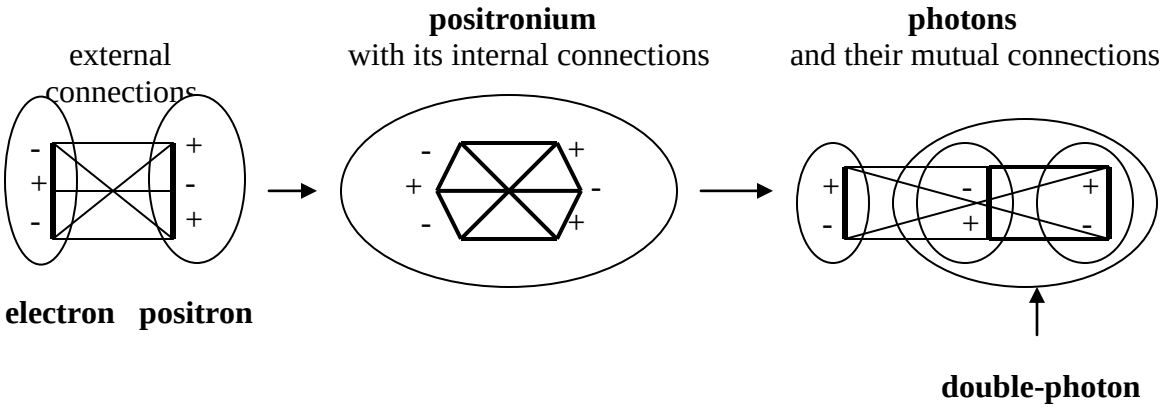


If neutrino really exists, it represents a double-photon structure with specific internal motion. The neutrino is its own antiparticle, so neutrino and anti-neutrino represent the same particle with above structure and motion. As the neutrino oscillates in one plane as well as a photon, it does not resist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

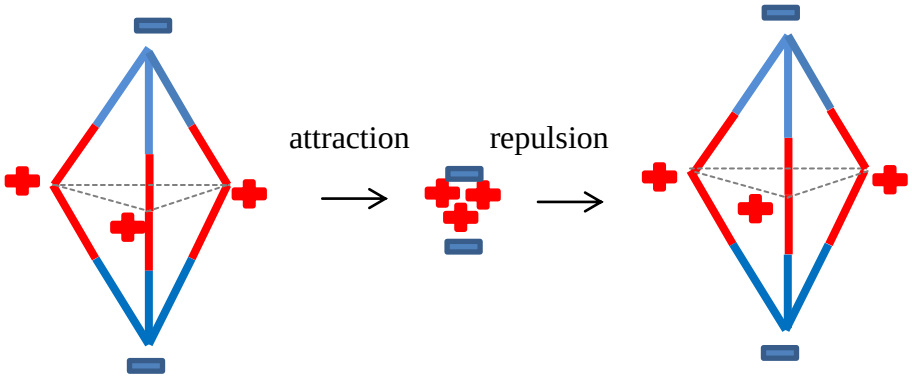
photon, mesons, neutral pions, but their internal motion is not so simple, so they do not represent the stable structures. For example:



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:



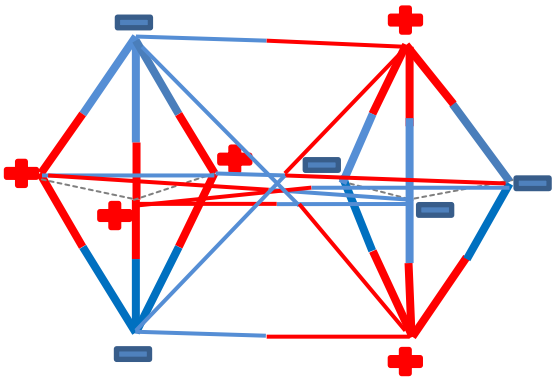
Proton p^+ (3+/2-) made of six elementary quantum dipoles:



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:

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

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. $\mathbf{p^+ + p^- \rightarrow \pi^0 + \pi^0 + \pi^0 \rightarrow \gamma + \gamma + \gamma + \gamma + \gamma + \gamma}$

3. $\mathbf{p^+ + p^- \rightarrow \pi^0 + \pi^0 + \eta \rightarrow \gamma + \gamma + \gamma + \gamma + \gamma + \gamma}$

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 $\boldsymbol{\pi^0}$:
"The $\boldsymbol{\pi^0}$ (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 $\boldsymbol{\pi^0}$ **(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 II; List of References at end of Part II)