# THE UNITY PRINCIPLE
## AND ITS CONSEQUENCES FOR EINSTEIN´S THEORIES

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## Abstract

The exact mechanism of the Unity principle and the basic constituent of the physical Universe are disclosed with their consequences for theoretical physics. It is shown briefly how the Universe works at its micro and macro levels.

## Introduction

The great desire of Man is to find the sense of his life and the true knowledge about the objective physical world. The reality looks like disintegrated into many different and independent spheres, but we feel that the great variety of existing forms should have the common basis.

Many philosophers and scientists have correctly expressed the **Unity principle** by the sentence: **"Everything is connected with everything else"**, but nobody has discovered the exact mechanism of this unity as well as the basic elementary constituent of the physical Universe so far. For example, Leibnitz´s monads represent parts reflecting the whole Being. In monotheistic religions there is only one personal GOD uniting all existence in Him.

Not only philosophy, but also physics is looking for the principle of unity of the objective physical world and its basic building block. The study of system science – cybernetics, showed me that information is constructed of two states represented by two digits 0 and 1. In order to construct a composite structure, the necessary and sufficient condition is to have two different states. The search for the substance of the Universe (matter, energy, space) forced me also to pay attention to philosophy. Hegel´s dialectic philosophy and his "Science of Logic" helped me to discover the dialectic bipolar essence of matter. By in-depth study of this philosophy I was able to gradually find the answers to the basic questions of physics. Hegel made the most successful attempt to detect the mechanism of the unity of existence. Only insufficient scientific knowledge in his period prevented him to find the definite solution.

### Crisis of Contemporary Theoretical Physics

Contemporary crisis of thinking and knowledge [2] is a consequence of **positivism** and its various branches leading to the extinction of philosophy and refusing to deal with the basic philosophical questions. Positivism became the basis for scientific knowledge replacing **Hegelian dialectical rationalism**, in which the classical philosophy had achieved its apex. Positivism tried to create the principles for scientific research based on the rules of formal logic and experiment, where the axiomatic approach became a starting point for finding the useful scientific results. The range of knowledge was limited to the **phenomenological level** of reality.

Mathematics and physics are considered to be the most suitable instruments for describing Nature. Looking for the truth is inserted into the simple schemes of statement logic, which can be expressed by the following scheme: If the statement **A** is valid, then the statement **B** is valid also **(A=>B)**. This means, if starting assumptions (axioms) **A** are valid, then all results **B** are valid too, if obtained by the rules of formal logic and correct mathematical procedures.

Then we test whether some results **B** can be confirmed by experiment. If yes, we suppose that starting axioms **A** are valid and the theory, based on them, is correct. But we can never be sure whether axiomatic theory is the only one, as the results **B** can also be derived from other theories with different initial axioms **A**.

The typical example of a positivistic axiomatic theory is Einstein´s **Special Relativity Theory (SRT)** based on two axiomatic assumptions:
1. Speed of light **c** is the same towards all uniformly moving systems.
2. All uniformly moving systems are equivalent from the viewpoint of physical laws.

SRT is mathematically consistent but unphysical theory as it does not consider the fact that objects move with respect to the physical environment - vacuum and **time dilation (deceleration of processes)** can only be the consequence of increasing intensity of interaction (mutual local pressure) of moving objects with the **physical vacuum**. Time (speed of processes) decelerates in objects moving with high speeds towards the physical vacuum as they local interaction (pressure) with the vacuum is more intensive comparing to the others with smaller speeds. Also bodies in places with different gravitational potentials have different interaction with their surrounding space (vacuum). This is the reason why, according to the **General Relativity Theory (GRT)**, the processes slow (time dilation) in places with higher gravitational potential (higher density of the vacuum). The reason for time dilation must be the same. It cannot be different in SRT (as a consequence of mutual symmetry of systems) in comparison with GRT (consequence of mutual asymmetry of systems). The higher is the velocity or the greater the gravitational potential, the greater is the interaction of a body with surroundings and the slower are the processes (time dilation).

Time dilation (deceleration) really exists but not as a consequence of SRT. Other effects like length contraction and relativity of simultaneity do not exist in reality and have never been verified experimentally.

The attempt to unify Einstein´s theory of relativity with quantum mechanics can lead only to irrational theories having nothing in common with the reality. String theories are now the most popular and widespread fundamental physical theories trying to unify Einstein´s theory of gravity (general relativity) with quantum physics and so create the so-called "theory of everything". But they stand on mistaken philosophical fundamentals and so cannot be successful.


## Matter in Contemporary Physical Understanding

The most general forms of matter accepted by contemporary physics in its Standard model are:
- **material** (made of basic building blocks – fermions: leptons and quarks),
- **fields** (made of basic interactions with their carriers – bosons: photons, gluons, intermediate bosons $W^{\pm}$ a $Z^0$ and gravitons),
- **vacuum** (space without particles).

According to the **Standard model**, elementary particles are dimensionless point-like entities without any internal structure. Such understanding is quite naive. These particles dispose of many properties (charge, mass, energy content, spin, ability to interact with other particles) thanks to which they differ from one another, so they possess various qualities, manifesting outwards. The deep internal reason for this miscellaneous qualitative manifestation of these quasi-elementary particles is hidden in their different internal structures that cannot be detected by contemporary particle accelerators but can only be explained by the deep logical insight.

Understanding the interaction as an exchange of virtual bosons between fermions is a consequence of mechanical approach to theoretical physics. For example, the electric attraction and repulsion between charged particles are represented by the mutual exchange of **virtual photons**. As the electrostatic force is a long distance one, every electron must exchange photons with an enormous number of protons and electrons in the Universe. It is strange that this absurd picture is more acceptable than much more logical picture of the direct connections (relations) between charged particles. The acceptation of particle interactions as direct relations between them is rather complicated for theoretical physic, because of Einstein´s refusal to accept the non-local actions. But the **non-locality** as a direct communication between distant particles is a fundamental consequence of quantum physics, known as **entanglement** or **EPR non-locality**. If theoretical physics were not blocked by erroneous dogmas, it could have detected much earlier, that the vacuum is not empty space between point-like particles, but is created by direct connections between them. All particles and interactions are space-creating and space-carrying direct connections and not point-like dimensionless entities without any internal structure.


## The Bipolar Nature of Space, Matter and Energy

If we start our consideration at the highest level of abstraction, we can only state that something "is". This "something" remains undefined existence until we say that there is "something else" towards which "something" defines itself as a difference. "Something" and "something else" are not two independent existences but two opposites (anti-poles) of the same "one". The relation of anti-poles is not static but dynamic as only their mutual activity can create the relations. The simplest form of mutual activity of anti-poles, that creates the essence of matter, is their attraction and repulsion manifested as pulsation – vibration – oscillation.

"Something" excludes its opposite pole – "something else" by repulsion. But at the same time the opposites remain connected together thanks to their attraction. Thanks to repulsion and attraction, the opposite poles remain in a unity (mutual relation) that cannot be broken. The bipolar "one" is a self-repulsion and self-attraction of its opposite poles that can be symbolically marked as "+" and "-". This bipolar "one" represents the **elementary quantum connection (relation)** of its opposites, so we name it **quantum dipole (+/-)**. It is in permanent motion, pulsation, oscillation, approaching and merging (attraction) and receding (repulsion). This self-motion of quantum dipole is the mutual motion of its anti-poles. Repulsion and attraction are two faces of the coin. One predicts the other. Such is the dialectical logic of "one" that is bipolar and represents both - the basic building block of matter (space, energy) and its basic principle. There is no difference between matter (energy) and space. The unity of matter (energy) and space means that matter is spatial and space is material, so both matter and space must be built of the same basic building units (blocks). But this clear fact is not accepted by physics until now.


## The Whole and the Part

Moving objects are mutually moving parts of space. Their mutual motion is possible only thanks to their mutual connections. These connections are also parts of space. If the part is separated from the whole, it does not leave this whole, but remains jointed with it by its universal connection which allows the part to obtain its relative independence for its relative motion and remain connected with the whole Universe at the same time.
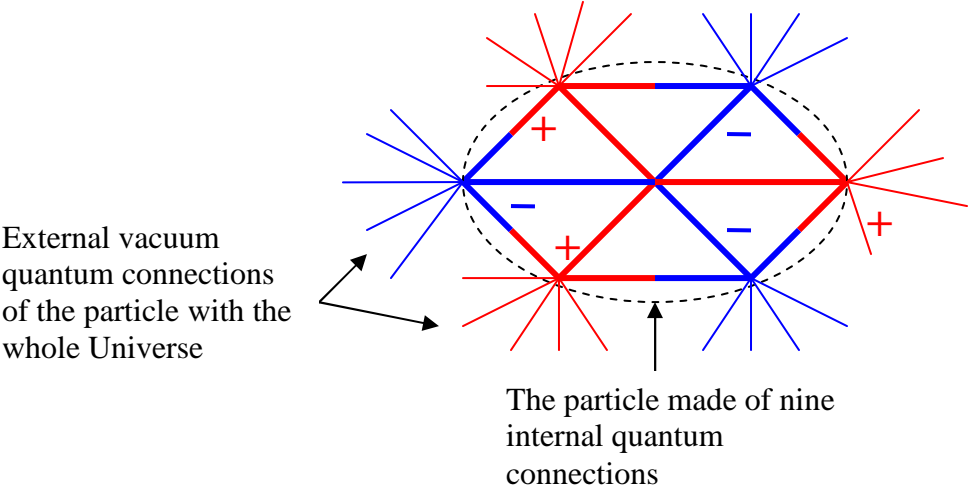
The whole – "one" thanks to its intrinsic contradiction differs and divides itself into parts (many "ones") in such a way that every part is connected with the whole, what means that every part is connected with all rest parts of the whole. As all connections of these parts are also parts so all parts are connections – relations, quantum dipole networks, too. Every connection is a part of space and every part of space is a network of elementary connections. The dialectical separation of the part out of the whole (space, universe) means its separation out of every part of the whole. Such separation means the creation of its connections with every part of the whole and it is possible only if the whole and every part consist of elementary bipolar connections (quantum dipoles (+/–)). The quantum dipole (+/–) so represents the elementary structural unit of the Universe (space, matter, energy). Every "+" pole is connected with all "–" poles of the Universe and reciprocally. So, **everything is connected to everything.** Every separated part is connected with all parts of the Universe. The principle of universal connection of everything with everything creates the general Unity of the physical Universe. This **Unity principle** is basic for the whole Universe following from its internal dialectics.

**A quantum dipole consisted of two opposite poles represents both - the part and the connection (relation) at the same time. The attraction and repulsion of opposite poles is the simplest possible relation that forms the material aspect of the Universe.**
**Every elementary connection +/- (quantum dipole) represents the individual elementary quantum of matter-energy-space.**

Schematic representation of quantum dipole:
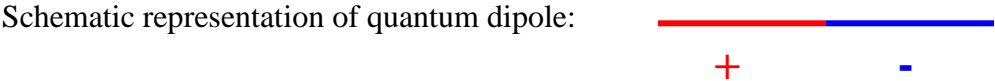


Scheme of a particle (neutron) compound of three '+' and three '-' poles with nine internal connections (quantum dipoles) and indication of external connections:



External vacuum quantum connections of the particle with the whole Universe

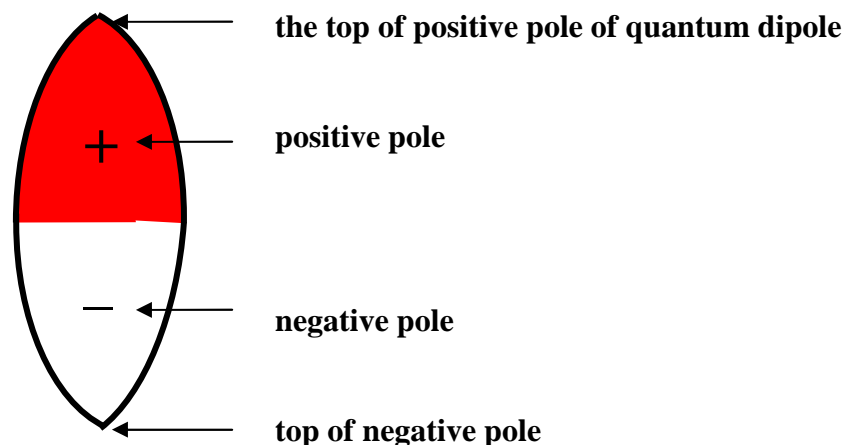The particle made of nine internal quantum connections

As we can see, any particle or physical object is defined by quantum dipoles creating its internal structure as well as external quantum dipoles connecting the particle (object) with the whole Universe. Some quantum physicists say that it looks like the elementary particle ranges the whole universe. They are really right, only they cannot say the reason - why?

Every elementary quantum dipole is a holder of elementary quantum of space, so the volume of space is given by the number of elementary quantum dipoles. Visually the

quantum dipole can be imagined as a balloon representing its space in which two charges of anti-poles are melted:

**QUANTUM DIPOLE**

**the top of positive pole of quantum dipole**

**positive pole**

+

**negative pole**

−

**top of negative pole**

The illustration of a pole and its relations to all opposite poles of the Universe through the quantum connections (dipoles):

**The top of positive poles of quantum dipoles connected with all tops of negative poles of all quantum dipoles of the Universe**
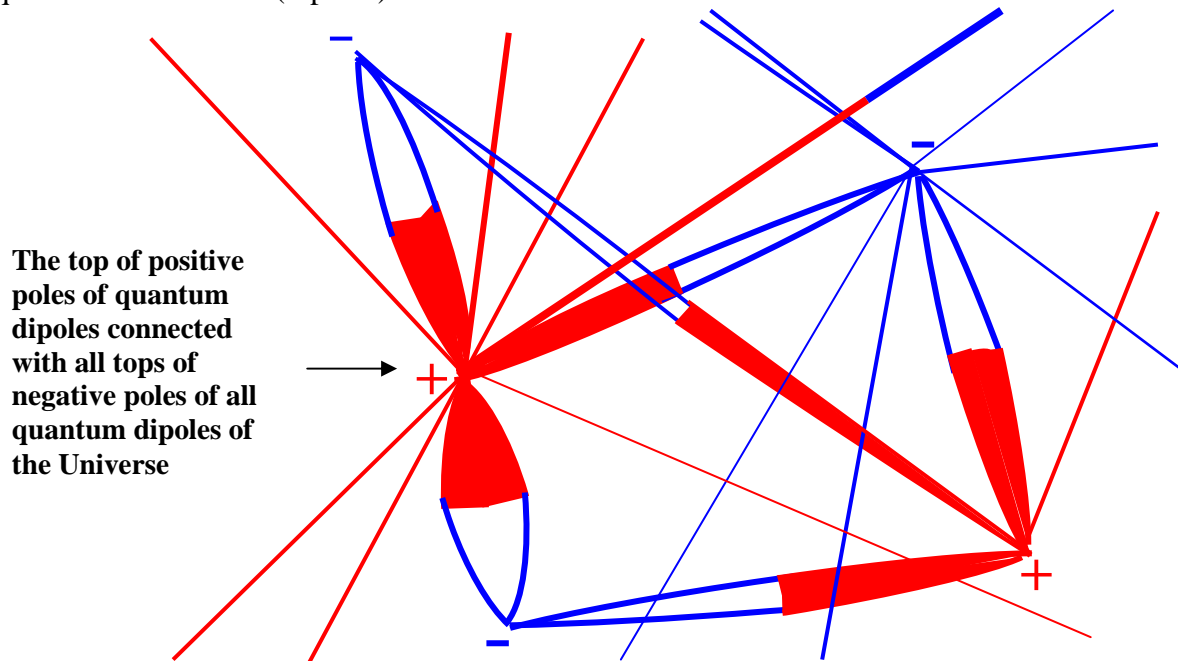
**The Universe is a network of non-local connections** and "perceives" all of its part**.** On the other hand every elementary quantum "perceives" the whole Universe. These non-local connections are in radical contradiction with Einstein´s theory of relativity. They not only exist but represent the substance of the Universe. It means that the Universe is always universally interconnected. Thus, the principle of universal simultaneity is valid. What is simultaneous in one system is automatically simultaneous in all others.

A particle cannot have a precise position in space as it is not a point of space but it is a part of space and, as a space-holder, it moves in relation to rest space. The coordinate systems used in physical theories are only auxiliary abstractions in order to make the precise description of motion. Quantum mechanics refuses the precise and allows only the probable particle behaviour influenced by the dynamics of particle internal as well as external connections with the whole Universe.

The following picture shows two quantum dipoles acting locally by their mutual pressures. They are holders of elementary quanta of space but differ by their lengths. The left one is shorter, stronger and more energetic and the right one is weaker, longer and less energetic:

**(length x energy = constant)**



Mutual local repulsive pressure
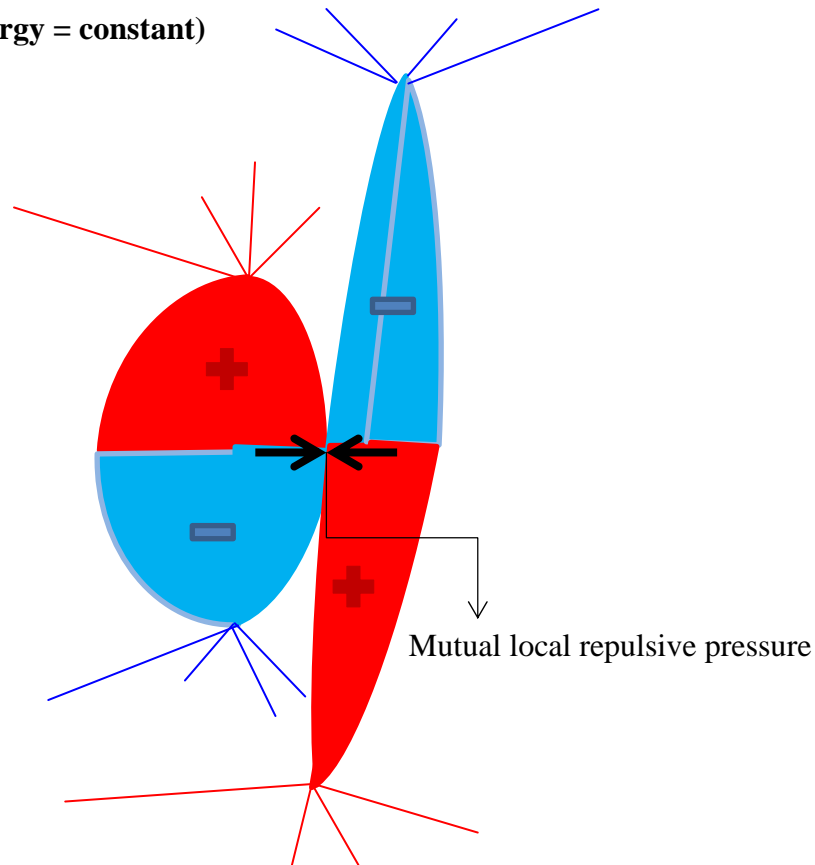
The more energetic and shorter the dipoles are the higher is their mutual local pressure.

The balloon model shows how the individual dipoles (balloons) of particle act on each other by their spaces. Now it is clear why some particles are stable but the others are short-lived. Thanks to huge energy we can mutually approach quantum dipoles (balloons) and create a composite particle but the mutual repulsive pressures of spaces of its separate balloons (dipoles) cause its decay into particles with smaller mutual pressures of these spaces. In a stable particle, the mutual repulsive pressures of dipole spaces are compensated by attractive forces of dipoles, so the particle does not decay. Stability of a particle depends on equilibrium of its forces. In less stable particles their internal motions or negligible external impulses can cause such a spatial unbalance of internal forces that particles decay.

Nucleons consist of very short quantum dipoles (balloons) with very strong attraction of anti-poles able to compensate for the strong mutual internal pressures of dipole spaces. The conception of a quantum dipole as a balloon consisting of two anti-poles, all connections of which go out, shows how this dipole reflects this world and is reflected in it. It alone, like a three-dimensional entity, locally acts on the neighbouring dipoles by their mutual pressures. But on the other hand, it is connected directly with the whole Universe. Such is the dialectics of local and non-local actions. Einstein denied non-local connections but they follow from quantum physics. Local actions of quantum dipoles manifest themselves by repulsive pressures and resistances as reactions to these pressures. The local character of mutual mechanical actions of objects looks like if non-local connections of everything with everything do not exist.

Quantum dipole is an elementary structural unit (building block) of space and represents its volume etalon, so it seems that quantum dipoles do not differ from one another. Nevertheless, they differ quantitatively. Energy, as a measure of intrinsic motion (or potential for motion) of their anti-poles, is a characteristic that allows their distinguishing. Their differentiation by this characteristic needs other characteristic as a counterbalance to return this differentiation into the unity. This characteristic is a length $\mathbf{d_i}$ which in conjunction with energy $\mathbf{e_i}$ gives the same value for every elementary quantum dipole $\mathbf{i}$:

$$\delta_t = e_{i.}\, d_i\,, \qquad \text{where} \qquad E = \sum_{i=1}^{k^2} e_i \qquad (1)$$

This value represents the universal law giving the energetic and length (geometric) characteristics of the Universe into the mutual relation. From this basic simple law Coulomb´s and Newton´s laws follow just directly as shown in detail in my monograph "God and the Universe" [1] and [6].

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 are in mutual exchanging of 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 the case of free quantum dipoles like photons, the relation between attractive and repulsive parts is manifested by oscillation. Quantum dipole, bound in a composite structure, cannot oscillate freely and so presses on neighbours by its space, so its repulsive part of energy is manifested by its local pressure, which is at equilibrium with its attractive part between its opposite poles. Then this attractive part of energy of a quantum dipole has a form of potential energy as it cannot cause the motion of quantum dipole because of local repulsive pressures of neighbour dipoles. As attraction is at equilibrium with repulsion, so the attractive part of energy of quantum dipole is equal to its repulsive one. The following relations are valid:

$$e_{ia} = e_{ir} \qquad (2)$$
$$e_i = e_{ia} + e_{ir} = 2e_{ia} = 2e_{ir}$$

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

From the basic cosmic relation between energy and length of elementary quantum dipole $\delta_t = e_i d_i = 2e_{ia}d_i$ we can derive the following relation:

$$e_{ia} = \delta_t / 2d_i \qquad (3)$$

As we can see it is a classical Coulomb´s relation between potential energy of a dipole with elementary charges and its length:

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

$\mathbf{q}$ – elementary electric charge,
$\mathbf{\varepsilon}$ – dielectric capacitance

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

$$e_{ia} = \alpha h c/(2\pi d_i) , \tag{5}$$

where: $\alpha$ - fine structure constant, $h$ – Planck constant, $c$ - speed of light

Then: $\qquad e_i d_i = \alpha h c/\pi. \tag{6}$

Coulomb´s relation $e_{ia} = \alpha h c/(2\pi d_i)$ is a manifestation of a universal cosmic law: $\delta_t = e_i d_i = \alpha h c/\pi$, expressing the dialectical relation between energy and length of elementary quantum dipoles.

## The Relationship between Force and Energy

Force of attraction and repulsion $f_i$ acting between anti-poles through the entire length $d_i$ of a quantum dipole creates, in conjunction with its length, the whole energy $e_i$ of a quantum dipole:

$$e_i = f_i.d_i \tag{7}$$

From the dialectical relation between internal energy and length of a quantum dipole

$$\delta_t = e_i d_i = \alpha h c/\pi \quad \text{we get the relation:} \qquad f_i = \delta_t /d_i^2 = \alpha h c/(\pi d_i^2) \tag{8}$$

For the attractive force $f_{ia}$ of a quantum dipole which corresponds to its potential energy $e_{ia}=e_i /2$ the next relation is valid:

$$f_{ia} = \alpha h c/(2\pi d_i^2) \tag{9}$$

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. The minimal possible quantity of prevalence is the **elementary charge.** The electron is the most well-known particle with a **negative charge**, proton – 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 material 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:

$$\mathbf{f_a = (\alpha hc/2\pi).2k_1.k_2 /d^2 = (\alpha hc/\pi).k_1.k_2 /d^2} \tag{10}$$

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 conjunction 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 **q₁** and **q₂**, 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 the conjunction 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 the conjunction 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 caused by non-local mutual attraction between opposite poles of quantum dipoles. The repulsive electrostatic force is caused by prevalence of local repulsive pressures of quantum dipoles 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. So electrons are not point-like particles, but structures consisting of 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. The bound state of two electrons creating a Cooper´s pair can be pictured:



Cooper´s pair
of electrons
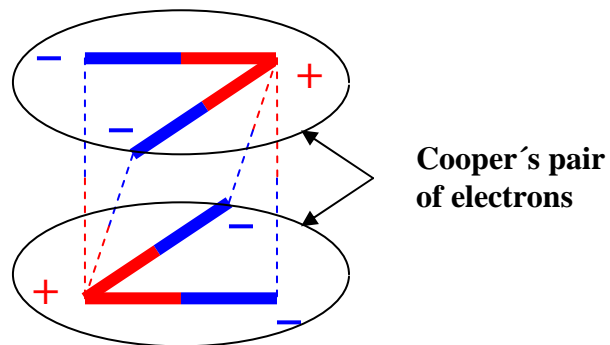
**Casimir´s phenomenon** is another evidence for existence of attractive electrostatic force between two neutral conducting plates. If approach them closely, the mutual attraction, known as Casimir´s attractive force, starts to act. This effect means that attractive forces between quantum dipoles, connecting 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 created 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, 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 are changed after collision into elementary quantum dipoles – photons - carriers of electromagnetic energy.

It is remarkable that contemporary theoretical physics explains any form of interaction as an exchange of virtual particles moving by limited speed through the vacuum. But the nature of the vacuum is not explained. It is only a background for moving virtual particles which are at the same time carriers of field quanta. Relations between discrete virtual particles, continual force fields and vacuum are full of paradoxes. However this situation is quite simply explained, if accept, that all force fields and the vacuum are made of elementary bipolar quantum connections through which all interactions are directly mediated. So we need no any background arena for all interactions. The vacuum does not create virtual particles and antiparticles consequently annihilating them. It is just a network of direct quantum connections mediating all known interactions between physical objects (particles, atoms, molecules, celestial bodies).

We distinguish the vacuum in atoms, molecules and interstellar spaces. The vacuum consists of external quantum connections that are much longer than inner connections in objects. It depends on the point of view which quantum connections (dipoles) are external (vacuum) and which ones are internal (particles, bodies,…). In an atom, the internal quantum dipoles create the particles (proton, neutron and electron) and their mutual quantum connections create the **atomic vacuum**. In a molecule, the internal quantum dipoles create the atoms and the mutual quantum connections between atoms create the **molecule vacuum**. The long quantum dipoles connecting celestial bodies create the **cosmic vacuum**. A considerable part of cosmic energy is concentrated in these vacuum connections (cosmic vacuum). It is the so-called "dark matter". Contemporary physics does not realize that the nature of the vacuum is the same as the essence of any other form of matter. The length of a quantum dipole defines whether it is a part of a material form (particles, atoms, bodies) or a vacuum. Every elementary quantum dipole is a holder of elementary quantum of space.

The vacuum made of long quantum dipoles represents the external quantum field that can be manifested in various forms. If it represents the connections between electrically charged particles, it creates the electrostatic field. If it connects celestial bodies, it represents the gravitational field. If it connects the particles in atomic nucleons, it represents the field of strong and weak nuclear interactions.

Matter and energy, space and vacuum, force fields and interactions (electromagnetic, strong, weak and gravitational) – all they are only bipolar relations, attraction and repulsion of opposite poles. Contemporary theoretical physics, standing on totally wrong fundamentals, separates space (vacuum) form matter, interactions (force fields) from elementary particles. The space-mater unity is replaced by their duality, where matter is interpreted by motion of point-like objects in space represented by mathematical coordinate systems. Both basic theories - Einstein´s relativity and quantum physics suffer from this wrong dualism. Einstein´s special relativity deals with uniform motions of mathematical coordinate systems having nothing in common with the real situation where moving material objects interact locally with the physical vacuum towards which they move. The vacuum as well as moving objects are made of the same constituents (quantum dipoles). Einstein´s general relativity is also

insufficient not knowing the true unity of mater (energy) and space where gravity is mediated instantaneously by direct mutual vacuum quantum connections between celestial bodies. Study of motion of point-like particles in coordinate systems at the quantum level does not correspond to the real situation and causes all interpretation problems of quantum physics. We can only study mutual interactions - bipolar relations between quantum structures (objects) made also of bipolar connections.

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 the stable equilibrium of these forces is achieved, the new microstructure (particle) does not decay. But if this equilibrium is temporary installed by the action of external energies, the repulsion of internal pressures of particle corrupts this equilibrium and particle decays immediately after its creation. This 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.

Elementary particles are not compact corpuscles without internal structure but they are formations with more or less composite structure of their internal quantum connections (dipoles). Moreover, an elementary quantum dipole – photon - is the simplest structure made of the simple connection of anti-poles.


## The Nature of Light

Light as a **quantum of radiation (photon)** represents the elementary particle consisting of bipolar connection of opposites ”+/-“, which, thanks to their mutual attraction and repulsions, perform 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 light.  The photon as an oscillating elementary quantum dipole or a beam of pulsating quanta is not a point-like particle, but represents the elementary quantum of space, which, through its external relations, is connected with all other parts of the Universe (its positive pole “+” is connected with all negative ones “-“ of the Universe and its negative pole “-“ with all positive ones “+”).

The photon is an **oscillator**, which oscillation is a consequence of mutual attraction and repulsion of its opposite poles.
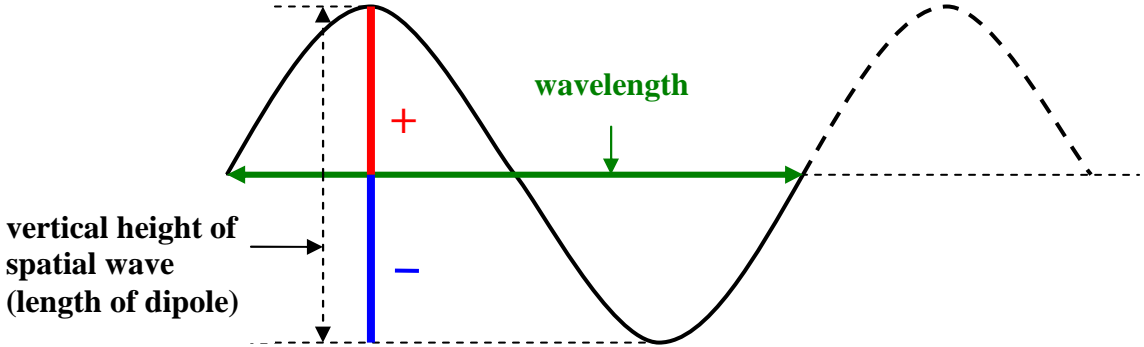


If we express its pulsation, vibration, oscillation as rotation, its length is represented by a diameter of rotating quantum dipole. Rotation projected to the perpendicular plane looks like

oscillation. It does not matter if talking about rotation or oscillation (pulsation, vibration) as these motions manifest outwards by the same way.

Photons do not move "in" a free space-like vacuum, but thanks to their external connections, they move "towards" all other parts of the Universe. The simplicity of a photon allows its perfect oscillation (vibration) in a plane perpendicular to the direction of its flight. As it is a free quantum, it cannot resist its dragging by the expanding Universe in a direction perpendicular to its oscillation and so it has no rest mass and its speed expresses the speed of cosmic expansion. Such is the nature of the speed of light as one of the basic physical constants, unknown until now.

# The structure of basic particles

Particles differ by their internal structures made of elementary quantum dipoles [3].

Basic stable particles oscillate in one main axis (line) with common centre of oscillation, where all tops of anti-poles come together during the phase of mutual attraction (contraction).

**Photon γ (+/-)** made of one oscillating quantum dipole:
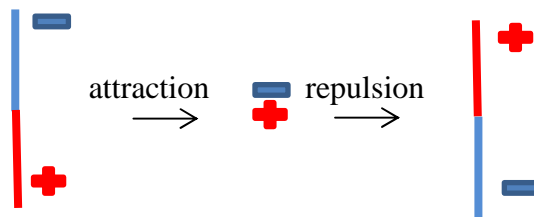


**Electron e⁻ (+/2-)** made of two quantum dipoles:
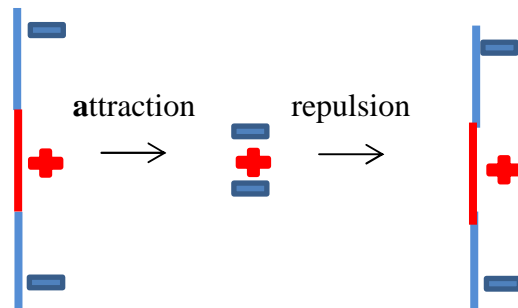


**Muon** and **Tau** have the same structure as an electron. They are much more energetic and so shorter and excited by photons at the same time. They are unstable and change into electrons by releasing the photons as well as transferring their energies into surroundings.

**Positron e⁺ (2+/-)** made of two quantum dipoles:
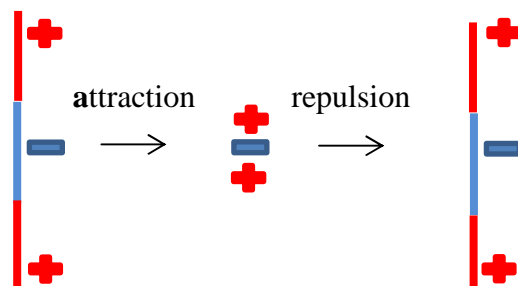
**Proton p$^+$ (3+/2-)** made of six elementary quantum dipoles:
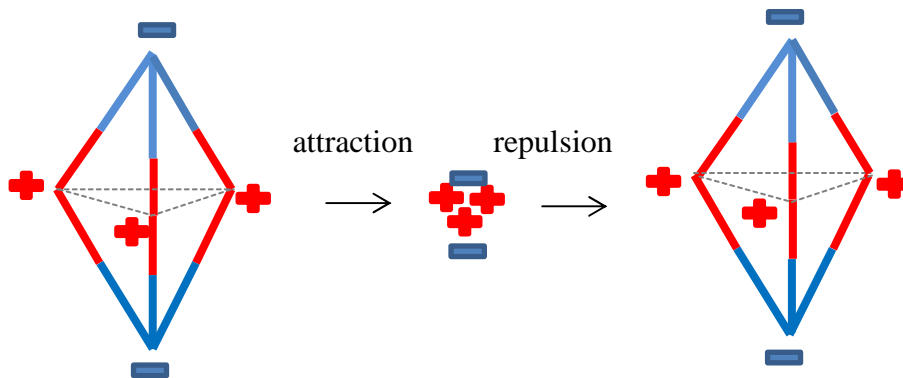


All very stable structures (particles) oscillate in one line (axis of oscillation) to the one common centre (during attraction). All dipoles of a proton are very energetic (short and strong) so their forces of mutual attraction and repulsion can compensate mutual local repulsive pressures of spaces of 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 it is evident why experiments in electron-proton scattering found that electrons were scattering off three points inside the proton. It is not because of quark structure but bipolar essence of a proton. The proton can be destroyed only by its annihilation with an antiproton.

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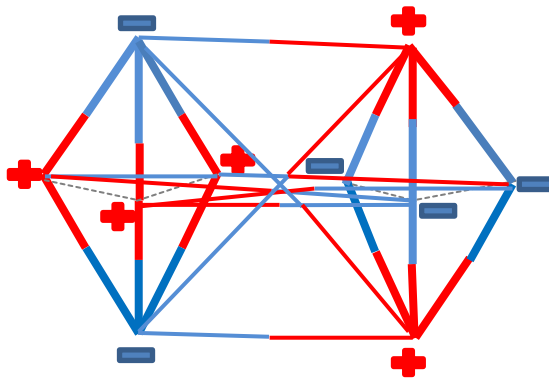


Proton and antiproton represent the mutual mirror images so they very strong mutual attraction creates the temporary high energetic composite structure of protonium (5+/5-), which, thanks to huge local repulsive pressures of dipole spaces, completely destroys the original structures of a proton and antiproton 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.

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.

**Neutron n** (3+/3-) in its basic state (not excited) is made of nine quantum dipoles:
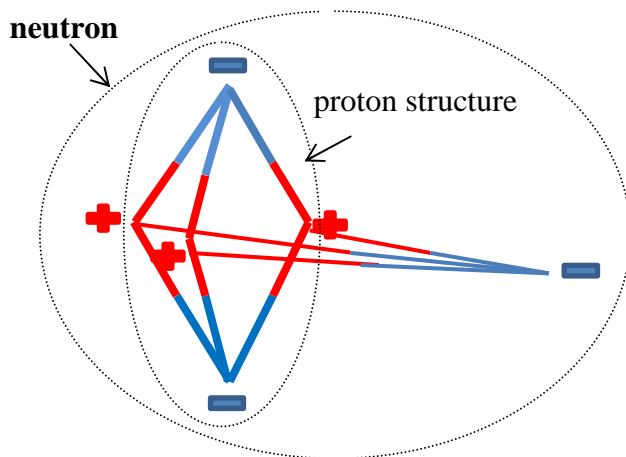


Inside a neutron we see can the structure of a proton with very short end strong quantum dipoles. One negative pole is connected with three positive anti-poles by much weaker and longer connections, so it can be released from this structure during beta decay.

Photons are able to join with elementary particles (e.g. protons, electrons, neutrons and others) and take them into excited states. So particles can be in their basic states as well as excited ones.

**Neutron n** (4+/4-) in its excited state is made of sixteen quantum dipoles:
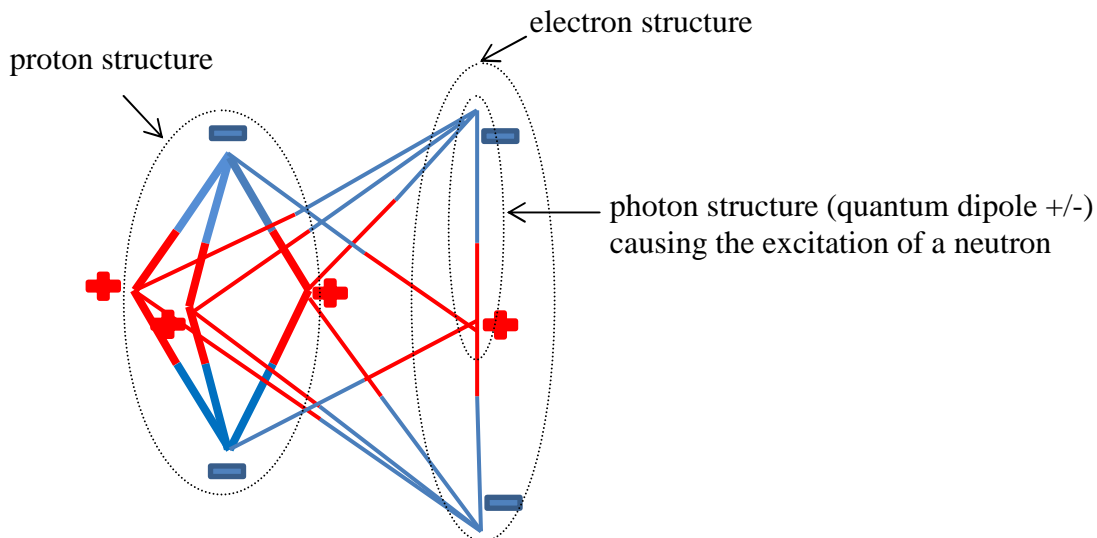


We can see that the neutron (4+/4-) in its excited state with sixteen elementary quantum dipoles represents the bound state of a proton (3+/2) with six elementary quantum dipoles and an electron (+/2-) with two quantum dipoles. Eight quantum dipoles represent the mutual quantum connections between the proton end electron structures. They are, at the same time, the constituents of the internal neutron structure. It is not quite correct to say that the neutron consists of a proton and an electron, because it consists also of their eight mutual quantum connections (dipoles) which are the internal constituents of a neutron structure. If the proton and electron represent separate particles (e.g. in the structure of a hydrogen atom), their mutual connections (being much longer and weaker) are external and represent their mutual vacuum or their electromagnetic field. So the atomic vacuum is created by mutual connections between nucleons and electrons in the structure of atom. In 1920 Rutherford quite

correctly supposed the existence of a neutral particle being a strong bound state of a proton and an electron, but this nice and clear idea was refused and the monstrous electroweak theory was postulated.

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

$\beta^-$ decay of a neutron where flying electrons represent beta ($\beta^-$) radiation can be expressed:

$$n + \gamma \rightarrow p^+ + e^-$$
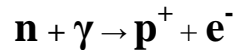
where "$n + \gamma$" represents the excited state of a neutron

Contemporary theoretical physics represents this decay, considering it to be a manifestation of the so-called weak interaction, by the following form:

$$n \rightarrow p^+ + e^- + (\nu_e)?$$
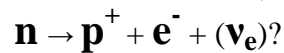
In addition to a proton and an electron the neutrino (antineutrino) $\nu_e$ is involved. In our structural scheme the neutrino is missing. We do not deny the possible existence of a neutrino. The expression "$(\nu_e)?$" only means that we cannot accept it to be a product of $\beta^-$ decay in the presented form. It could be a product only if a neutron is bound in heavy nuclei where nuclear forces and mutual repulsive pressures are strong enough to form a neutrino consisting of four strong, short and energetic quantum dipoles.

## The Nuclear Force

The **nuclear force** is an attractive one between two or more nucleons (neutrons and protons) binding them into atomic nuclei. The masses of light nuclei are less than the total mass of protons and neutrons forming them. According to contemporary quark model the nuclear force is a residual effect of much more powerful strong force (interaction) binding quarks by gluons.

The most appropriate system for studying the nuclear force is a bound state of one proton and one neutron named deuteron being the nucleus of deuterium atom named heavy hydrogen



Neutron (excited)        proton        ←photon

15
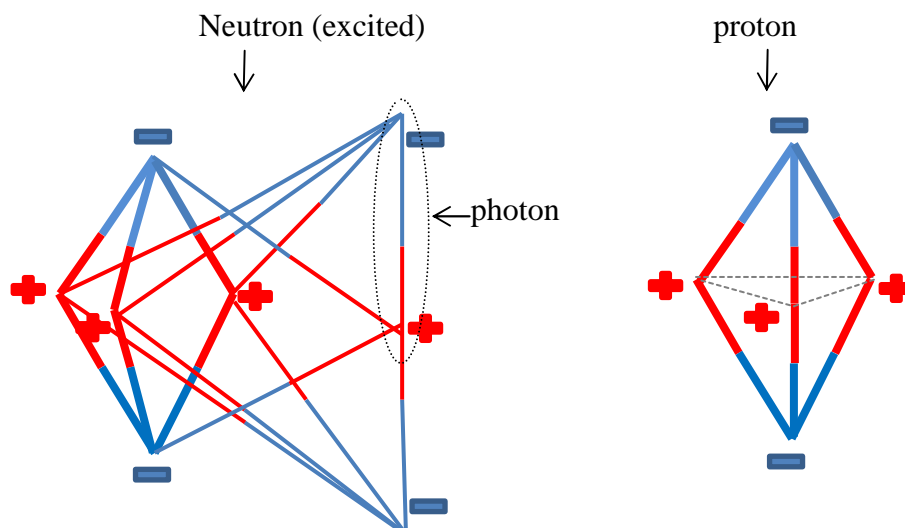
After synthesis of a proton and a neutron the photon is released taking out the so-called binding energy:



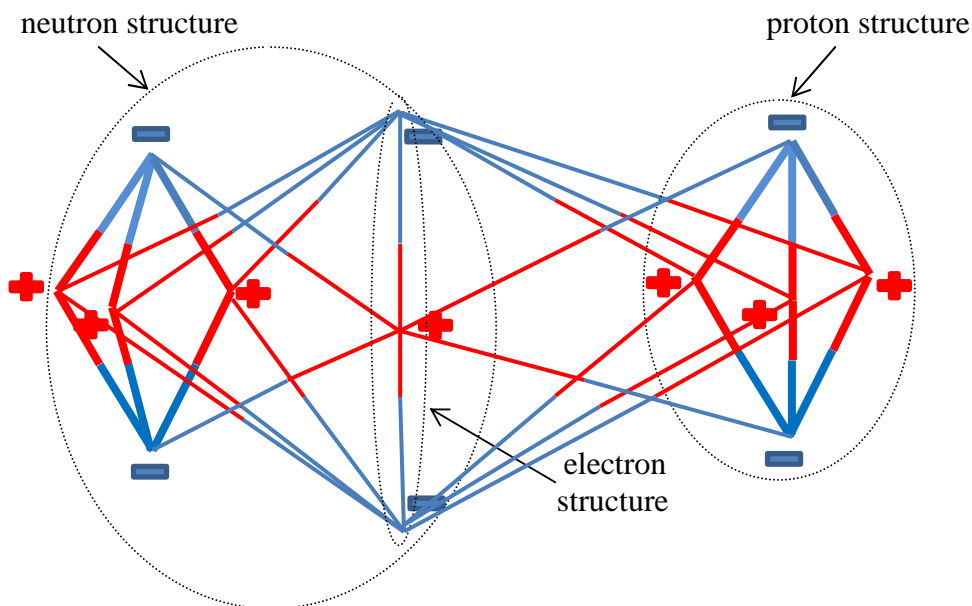**Deuteron**

released photon carrying the binding energy
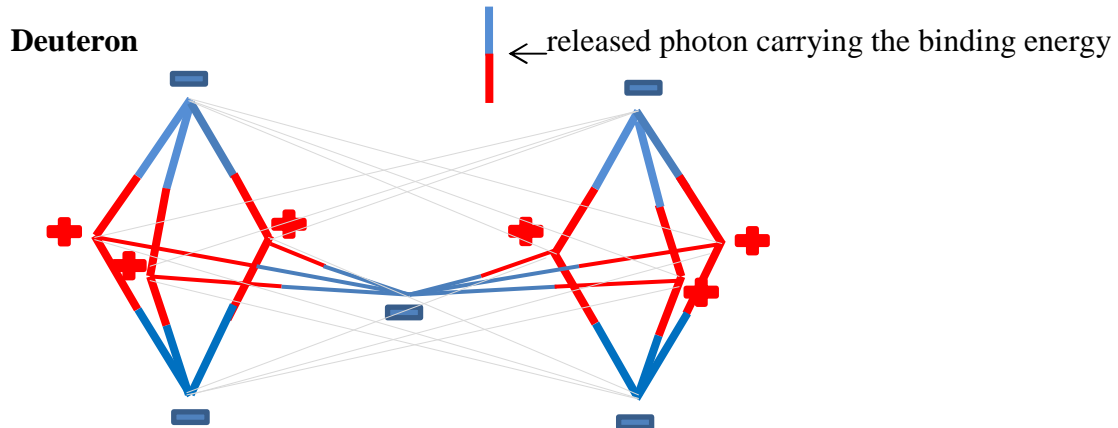
In above bound state it is not clear which of components is a neutron and which a proton as the negative pole is common for both nucleons. The compound state of one proton and one neutron in a deuteron (6+/5-) consists of 30 elementary quantum dipoles. If the photon is not released, the bound state of one proton and one neutron (7+/6-) consists of 42 elementary quantum dipoles. This structure represents factually the bound state of two protons and one electron:



neutron structure

proton structure

electron structure

This structure clearly manifests the holistic principle according to which the deuteron is not a simple sum of its structural components (protons and electron) but represents a higher quality defined by their mutual quantum connections being the basic structural constituents of a deuteron.

The nucleus of a helium atom $_2He^4$, named $\alpha$ – particle, represents the bound state of 2 protons and 2 neutrons (12+/10-) consisting of 120 elementary quantum dipoles. The internal dipoles of nuclei are very short and strong (strong interaction) but their mutual connections are much weaker and can have different lengths and energies (nuclear interaction).

$\boldsymbol{\alpha}$ – particle (nucleus of a helium atom $_2He^4$):
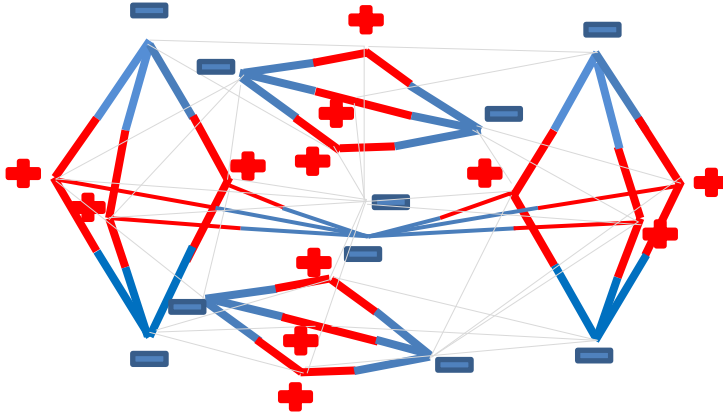


We can see the difference between quantum dipoles creating the internal structure of 4 nucleons (strong interactions) and their mutual nuclear interactions.

The more nucleons are in nuclei, the heavier and less stable are the atoms as the number of mutual quantum connections dramatically increases with a consequent increase of their repulsive pressures. Atoms with a huge number of nucleons (protons and neutrons) are unstable and can decay. This so-called radioactive decay is a stochastic (random) process. The internal motion of quantum dipoles and they mutual pressures as well as impulses from outside can disrupt the equilibrium of attractive and repulsive forces and cause the atom spontaneously decays, where the huge nuclear forces are released with emitting particles ($\boldsymbol{\alpha}$ – particles, $\boldsymbol{\beta}$ – particles, $\boldsymbol{\gamma}$ – rays and others) carrying out high energies.

## The Nature of Gravity

After 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.**

$$\mathbf{f_g = \beta f_a = \beta(\alpha hc/2\pi)2k_1.k_2 /d^2} \qquad\qquad (11)$$

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 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. Then the whole quantity of gravitational force $\mathbf{G}$ of the Universe acting between celestial bodies is equal to the quantity of the cosmic expansive force $\mathbf{F_e}$ as its counterbalance:

$$\mathbf{G = F_e} \qquad\qquad (12)$$

Attraction and repulsion are two opposite forces in a mutual dynamic equilibrium. Gravity as an attractive force is a counterbalance of cosmic expansion as a repulsive force. Gravity is just the direct evidence of cosmic expansion. Many critics of Einstein theories as well as 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 quantum dipole as well as the Universe as a whole. All known forces are nothing more than manifestations of these two basic forces.


## Cosmic Dynamics

Bipolar essence of space causes its structural changes in such a way that space (the Universe) constantly detaches its new and new-elementary quanta (**expansion phase**) or incorporates them into itself **(contraction phase).** The Universe so passes from one quantum state to the next one through **quantum transition (jump)** representing its elementary motion – **elementary quantum of time**.

**The Universe is a dipole** performing its harmonic oscillations (pulsations) thanks to repulsion and attraction of its anti-poles. Repulsion of anti-poles is responsible for division of the whole into relatively separate parts (internal differentiation) causing the successive cosmic expansion. The attraction of opposite poles is responsible for successive deceleration of cosmic expansion and its consecutive reverse to the cosmic contraction. Contemporary cosmological theories cannot explain the origin of cosmic expansion – the Big Bang - and the way out of singularity. Singularity as undifferentiated existence (totality) is nothing. Anything cannot appear from nothing. Singularity does not have its own source for plurality. It is only a pure "one". But only the "ONE" as a dialectical relation of opposite poles contains the source for **plurality generation – cosmic expansion**.

The Universe as a whole is a dialectical unity of finality and infinity. It is finite as it is closed and infinite as it has no end and no limit.

**The Universe as space is a three-dimensional surface of a four-dimensional sphere.**

If the Universe is represented by a three-dimensional surface of a perfect four-dimensional sphere with a radius **r**, the formula for its volume is: $\mathbf{V = 2\pi^2 r^3}$

The Universe is pulsating, expanding and contracting finitude without any limit.


## Cosmic Expansion

At the starting point of cosmic expansion, the Universe exists only as a sole quantum of energy-space, as a single connection of anti-poles + and - (quantum dipole (+/-)). Then the mutual repulsion and attraction of anti-poles are maximal. During cosmic expansion, the repulsive force is in its active stage, and the attractive force, as a reaction to the repulsive one, is in a passive stage and manifests itself as global cosmic gravity. Both these forces are equal but with mutually opposite orientation. When the repulsive force will exhaust itself in its active stage, the stage of cosmic expansion ends, and the attractive force starts cosmic contraction. Then repulsive force passes to its passive stage and, as a reaction to attractive force (being now in active stage), manifests itself as global cosmic antigravity. During cosmic contraction, the Universe gradually incorporates its quantum dipoles into itself, until it becomes only a sole quantum dipole and starts again another stage of cosmic expansion. The Universe, as internally bipolar whole, permanently pulsates.

As a sole quantum dipole (+/-), the Universe is in its initial quantum state. Cosmic transition to the second state is accompanied by expelling and creation of a new pair "+/-" in such a way, that every "+" is connected with all "-". So, in the second state, we have four quantum connections **(+/-).**

1.  The first quantum state of the Universe:      +                         -

2.  The second quantum state of the Universe:   +                      -

Expelling a new pair (+/-) represents the transition of the Universe from one quantum state to the next. In reality, the Universe expels firstly one pole and then the other opposite one. The Universe alternates its symmetric states, when the numbers of positive and negative poles are equal, with its asymmetric states, when the number of ones poles is greater than opposite ones. This asymmetry in the first stages of cosmic expansion could be the reason for prevalence of matter over antimatter.

In order to simplify our analysis, we take into account only quantum transitions between symmetrical quantum states, when two new poles are created.

The Universe in its symmetric quantum state **k** consists of **k** positive and **k** negative poles with $k^2$ connections – elementary quantum dipoles.

**Space is created by elementary quantum connections – dipoles so their number defines the volume of space.**

The dynamic network of quantum dipoles represents the unitary field which Einstein was unsuccessfully finding in his theory of unified field. This network can be easy described by the matrix in which the lines represent the positive poles, and the columns – the negative ones. Points of intersections represent the elementary quantum dipoles as connections of anti-poles. Cosmic quantum transition (jump) from one symmetric quantum state to the next, during cosmic expansion, can be described by addition of a new line and column. New points of intersections represent the new quantum dipoles which are created during elementary quantum cosmic transition (jump).

**The table of increasing cosmic network of quantum dipoles**

| Quantum state | | 1 | 2 | | k-1 | k | k+1 | | n |
|---|---|---|---|---|---|---|---|---|---|
| | Poles | - | - | .............. | - | - | - | ............. | - |
| 1 | + | | | | | | +/- | | |
| 2 | + | | | | | | +/- | | |
| | | | | | | | +/- | | |
| k-1 | + | | | | | | +/- | | |
| k | + | | | | | | +/- | | |
| k+1 | + | +/- | +/- | +/- | +/- | +/- | +/- | | |
| | | | | | | | | | |
| n | + | | | | | | | | |

*The cosmic transition between two symmetric quantum states **k** and **k+1** is accompanied by creation of a new pair (+/-), marked with a red colour, together with creation of new quantum dipoles in a new line and column belonging to the symmetric quantum state **k+1** (**yellow colour**). We can see that during the transition from the state **k** to **k+1**, the new **2k+1** quantum dipoles appear. Symmetric quantum state **k** is represented by $k^2$ quantum dipoles (+/-).*

## The Basic Quantum Space-Time Equation of the Universe

The elementary quantum connection (dipole) represents the elementary quantum of space, its volume etalon. Quantum transition from one quantum state to the next is the elementary cosmic motion and represents the elementary quantum of time – time etalon. One quantum transition (jump) of the Universe is the smallest possible cosmic change – motion, which the elementary quantum of time is connected with. So, the time of cosmic expansion is given by the number of quantum jumps $k$ and the volume of space is defined by the number of elementary quantum dipoles. The following relation is valid:

$$V_k = k^2, \qquad\qquad\qquad k = 1,2, ….. , n \qquad\qquad (13)$$

This relation represents the **basic quantum space-time equation of the Universe**, where:
$k$ - quantum state of the Universe – the number of elementary quantum transitions, between
   symmetrical quantum states, from the beginning of cosmic expansion until now. It also
   represents the number of positive (or negative) poles.
$V_k$ – the number of elementary spatial quanta of the Universe at a quantum state $k$,
$n$ - the number of quantum transitions from the beginning to the end of cosmic expansion.

As we can see the volume and time of the Universe are discrete quantities, but we can transform the basic quantum equation of the Universe $V_k = k^2$ approximately to the form where space and time are expressed by continuous quantities $V$, $t$ with real dimensional units like meter and second:

$$V = z.t^2, \qquad\qquad\qquad\qquad\qquad (14)$$

where $z = (d^2V/dt^2)/2$ is the gear ratio between the units of volume and time.

**This is the basic equation for spatial dynamics of the Universe, expressed by real dimensional quantities, where the spatial volume of the Universe is directly proportional to the square of time of cosmic expansion.**

The detail analysis of this basic cosmic equation leads to many interesting and important consequences analysed in detail in [1], [4], [5].

## Consequences of Einstein´s dogmas

Einstein is accepted as a god of theoretical physics by academic science, so the wrong dogmas following from his relativity theories have fatal consequences.
Only the clear understanding the nature of the Universe and the detail analysis of its unity principle can lead human mind out of crisis represented by contemporary monstrous mainstream physical theories having nothing in common with the reality. SRT is nonsense, where the motion of physical objects towards the physical vacuum is replaced by the mathematical game of mutual uniform motion of coordinate systems based on two wrong postulates (axioms). The Universe is mutually interconnected network of elementary quantum connections, so the universal simultaneity is valid. The speed of light is constant only towards the real surrounding (vacuum), which is made of mutual quantum connections between

celestial bodies. Every celestial body drugs its vacuum (connections to all celestial bodies of the Universe) with itself by its motion. Only the speed of objects towards the real vacuum as well as the increased density (higher gravitational potential) of the vacuum can cause the deceleration of processes in moving objects (the so-called time dilation) as a result of their increased local pressure with the real physical vacuum. I have shown in my paper [10] presented at 19-th NPA Conference that using the SRT for solving the practical tasks leads to the violation of causality and other logical contradictions. Suppose two rockets starting at the same time towards each other. As they are all the time in a mutual motion, from the viewpoint of any rocket time slows in the other one, what leads to impossible results at the moment of their mutual meeting.

Einstein´s "localism" and refusal of direct communication at a distance (spooky action-at-a-distance) caused the schizophrenic situation in quantum physics. Although non-locality and entanglement are experimentally verified consequences of quantum physics, physicists, in order to accept Einstein´s dogmas, represent the basic physical interactions (electromagnetic, strong, week and gravitational) as an exchange of virtual point-like bosons by a limited speed of light instead of accepting much more logical direct connections as mediators of all interactions. Gravity is a direct communication between celestial bodies thanks to their mutual vacuum quantum connections and so it is not mediated by supposed but non-existent gravitational waves or gravitons, which never will be detected. I can see one positive result in Einstein´s theory of gravity (General Relativity Theory) that time dilation is a function of a gravitational potential. Really, the higher is the gravitational potential, the higher is the density of the vacuum and so the higher is the intensity of local interaction of a body with the vacuum leading to the deceleration of processes in a body (time dilation).

Einstein´s dogma about light speed constancy, according to which the light always moves towards us by the constant speed $c$, has fatal consequences leading to absolutely wrong conclusion that cosmic expansion accelerates thanks to mysterious dark energy [13]. The last Nobel prize for physics was awarded just for this erroneous "discovery" based on observations showing that very distant supernovas look fainter and therefore, more distant than they should by constant or decelerating cosmic expansion.

The real situation is quite different: 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. So if the light approaches us from a point at a distance $d$, then this point moves away by the speed $v$ thanks to cosmic expansion: $v = H.d$ , where: $H$ – Hubble´s constant, $d$ – the actual distance of the light ray from us. Then the light approaches us from the distance $d$ 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 should. Another reason, why the 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 search for dark energy is destined to be unsuccessful.

As shown in my paper [11] presented at the 19-th NPA conference, Einstein´s derivation of the famous formula $E=mc^2$ is invalid and is not a consequence of his relativity theory, but it is a formula of classical physics known already before Einstein as a direct consequence of Maxwell´s theory of electromagnetism.

## Conclusion

The Universe is a miraculous dance of quanta of its energy, mutually interconnected into the **dynamic network of elementary quantum connections**, creating one unique whole in a permanent motion at its macro and micro levels. The knowledge of the unity principle and the elementary constituent of the Universe allowed me to create the basic buildings for cosmology [4], [5] as well as particle physics [3].

Contemporary mainstream physical theories suffer from total irrationalism. Nobel Prizes and other major scientific awards are given for absent virtual unobservable mysteries like virtual undetectable quarks and gluons with asymptotic freedom of quarks, black holes with imaginary time, electroweak theory with monstrous and undetectable massive virtual bosons, seeming acceleration of cosmic expansion, etc. Mysteries like unobservable strings, eleven-dimensional space-time, evaporating black holes, worm holes, dark energy and parallel universes are now the basic products of contemporary academic theories leading human mind not to the higher level of rationality, clarity and knowledge, but just to the darkness of scientific dogmatism and irrationalism. Quite new technologies are blocked because they contradict contemporary physical understanding although they are in accordance with the true knowledge. I hope this situation should be changed in a short time, because of impotence of contemporary theoretical physics to solve any real problem and to give the clear answers to the basic questions of existence.

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