Article

Discovery of the Unity Principle & Its Application to Theoretical Physics

Peter Kohut*

ABSTRACT

The fundamental discovery of the Unity Principle derived on the base of dialectical logic is presented illustrating the exact mechanism how the physical Universe may work at its macro and micro levels. New fundamentals of theoretical physics are built.

Keywords: Universe, unity principle, dialectical logic, quantum dipole, energy, spacetime, gravity, elementary particle.

1. Introduction

Contemporary theoretical physics enters a deep crisis resulting from its positivistic and post-positivistic approach, which assumes that reality is mechanical and atomistic made of point-like particles or one-dimensional strings where the essence of matter, energy, space and time, gravity and other forces are undetectable mysteries. However, within this paper I will endeavour to show that the Universe (reality) is dialectical (relational) and is thus accessible by dialectical logic.

Dialectical logic has reached its apex in Hegel´s rational idealistic philosophy dealing with such basic notions and categories as the unity of opposites, relations "being-nothing", "whole-part", "one-many", "repulsion-attraction" "continuity-discontinuity", "quantity-quantum-quality-measure", "finitude-infinity", "subject-object", etc. [1]. However, Hegelian revolution in philosophy and dialectical logic has been unfinished. Hegel did not come to the ultimate solution – revealing the exact mechanism of the Unity Principle, whose discovery enables us not only to complete dialectical logic, but also to build new fundamentals of theoretical physics and cosmology. Derivation of the Unity Principle based on dialectical logic is presented in my several publications ([2], [3], [4]).

2. Definition of the Unity Principle

The basis of the Unity Principle, attained through dialectical logic is as follows: The entire "Being", including its physical reality, is built of elementary bipolar relations of counterparts (quantum dipoles, quantum connections (+/-)), where every positive pole "+" creates relations to all negative poles "-" of the Universe (and this relation is reciprocal).

That is, each quantum dipole is connected to the entire Universe and every object created from quantum dipoles is connected to all other objects in the Universe due to direct quantum

* Correspondence: Peter Kohut, Ph.D., Maly Saris 478, 080 01 Presov, Slovakia. Email: pekohut@gmail.com

connections (+/-). An elementary quantum dipole (connection) is an elementary quantum of space. Therefore, the volume of space is dictated by the number of elementary quantum connections.

Opposite poles of the quantum dipole (+/-) attract and repel each other, manifested as vibration - oscillation. Repulsion and attraction are two opposite forces, through which both counterparts are in mutual motion. This motion is the energy of the quantum dipole. Therefore, energy is a measure of mutual attraction and repulsion of counterparts.

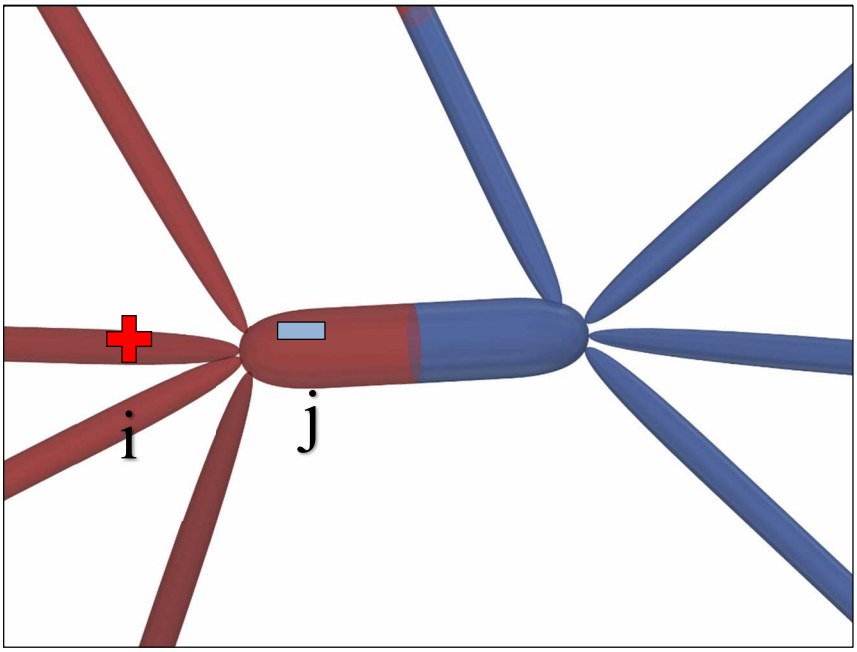


Fig. 1: Bipolar connections +/- or (**ij**) representing elementary quantum connections (dipoles) from which the whole reality (the Universe) is created. Note that the image is not a literal representation but captures the essence of the quantum dipole connections.

3. The Photon: An elementary quantum dipole (+/-)

Strangely, even a photon as an elementary quantum of light is a mystery known as "wave-particle" dualism. A photon is both a particle and a wave. How is this possible? What is the solution? The photon as the elementary quantum of free energy clearly shows the bipolar nature of the whole Being.

Consider the motion of the classical harmonic spring oscillator, which creates a sinusoidal wave as a result of two forces with opposite orientation – attraction (tension) and repulsion (compression). This sinusoidal wave is the result of both forces acting through the harmonic oscillator. The photon forms a sinusoidal wave during its flight. This means that it must be a quantum oscillator that oscillates due to the internal bipolarity of two opposite forces – attraction

and repulsion. Therefore, the photon is the quintessence of the dialectical bipolar nature of reality.

The big mistake of theoretical physics is the idea that the elementary "building blocks" must be point-like entities without any internal structure and zero volume. Even a photon as the simplest particle cannot be a point-like entity without an internal structure. A photon is a simple quantum dipole consisting of two counterparts (opposite poles) and consequently a carrier of the elementary quantum of space and energy. It is an elementary particle that, due to attraction and repulsion of its counterparts, oscillates during its flight and creates a perpetual sinusoidal wave, which in relation to the measuring apparatus, manifests itself as an electromagnetic wave.

The photon γ (+/-) as an elementary oscillating quantum dipole is the simplest particle:

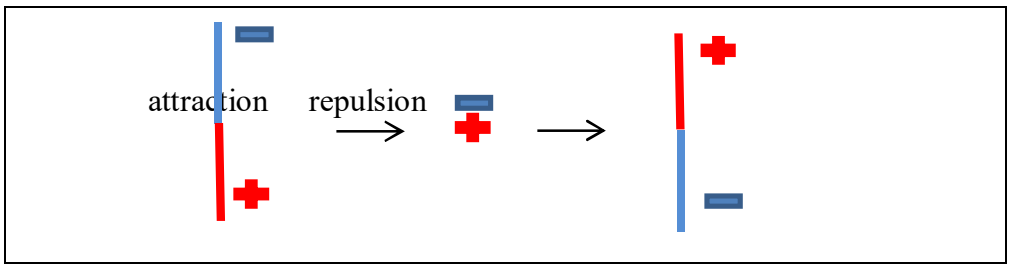


Fig. 2: Oscillations of the photon

The photon as a quantum of radiation (light) is a free quantum dipole (+/-) which, due to mutual attraction and repulsions of its opposite poles, performs permanent oscillation (vibration, pulsation) manifesting externally in flight as an electromagnetic wave. This is a real and factual explanation of the "wave-particle" duality of light, because only the bipolar dynamic unity of counterparts can lead to the oscillation (motion, energy) of the photon.

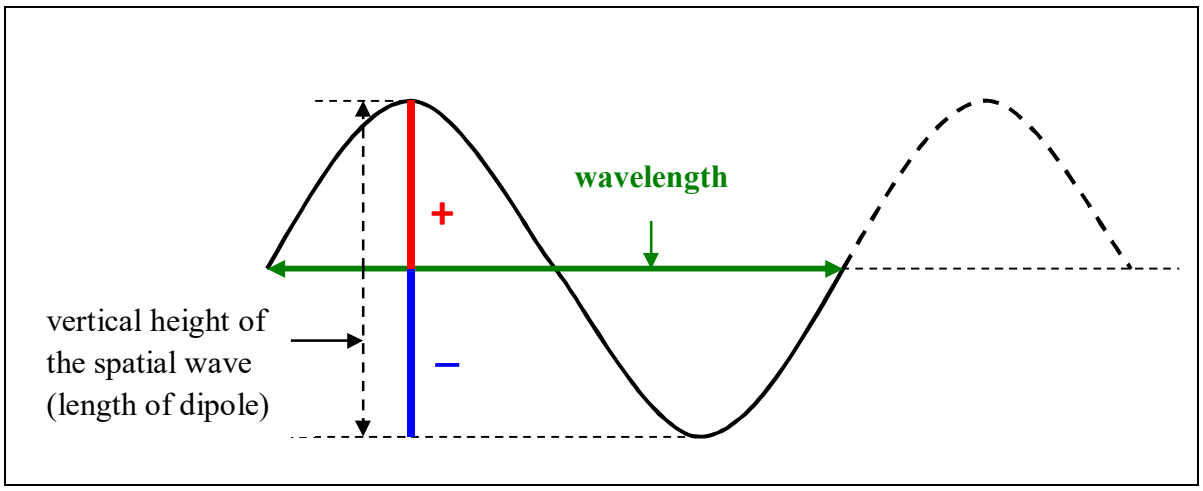


Fig. 3: Sinusoidal wave as a result of the photon oscillations

If photon´s oscillation is expressed as a rotation, its length is given by the diameter of the rotating quantum dipole. The rotation projected to the perpendicular plane looks like oscillation. It is irrelevant whether we are talking about rotation or oscillation (pulsation, vibration), as these motions are manifested externally in the same way when measured. A photon is a carrier of an

elementary quantum of energy. The essence of energy is therefore not known in contemporary "status-quo" physics. The energy of a photon e_{ij} as a measure of its motion (vibration frequency f_{ij}) can only be the result of the mutual attraction and repulsion of its counterparts. Planck´s equation $e_{ij} = hf_{ij}$ indicates that the energy of a photon is given by its vibration rate (frequency).

The photon performs two types of motion: horizontal and vertical. Horizontal motion is its flight as a result of dragging by cosmic expansion. Vertical motion is manifested by its oscillation (rotation) due to the mutual attraction and repulsion of its opposite poles. Photons do not move "in" free space (vacuum), but, thanks to their external quantum connections, they move "towards" all other parts of the Universe. The **s**implicity of the photon allows its perfect oscillation (vibration) in the plane perpendicular to the direction of its flight. As it is the simplest free quantum, it cannot resist its dragging by the expanding Universe, so it has no resting mass and its speed represents the rate of cosmic expansion. This is the nature of the speed of light which has not considered thus far within contemporary physics.

4. Quantum dipole characteristics

Knowing the essence of light makes it possible to understand the essence of existence. There is no space and energy outside of quantum connections. They alone create the whole reality. Quantum connections (dipoles) are not located in space, but create it. They represent elementary quanta of space with an elementary volume $v=3,87.10^{-45}\ m^3$ as follows from my analysis [2]. Although the elementary quantum dipoles are indistinguishable in their spatial volume, they differ from each other by the energy content e_{ij} and the length d_{ij}, so the following basic constant δ_t is valid in the current quantum state of the Universe [2]:

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

where h – Planck´s constant, α - fine structure constant, c - speed of light.

Very short quantum dipoles form the structure of the subatomic particles (photons, electrons and protons), while long quantum dipoles form their mutual connections. Very long quantum dipoles connecting the celestial bodies to each other at their quantum level create a cosmic vacuum, so they can be called vacuum quantum connections.

The value $\delta_t = e_{ij}d_{ij}$ is a constant, which is same for each quantum dipole (connection) and represents the fundamental cosmic law, which implies other very important laws, e.g. Newton´s and Coulomb´s laws. This means that the shorter the quantum dipole, the higher its energy. The longer it is, the lower its energy. Energy of the very long quantum dipoles that connect celestial bodies to each other and create a cosmic vacuum is very small, but their numbers are huge. Vacuum is made of the quantum connections (which are carriers of energy) connecting physical bodies together.

Since everything is made up of elementary quantum dipoles (connections), which, as we have said, are photons, we can say that everything comes from light (energy), which can exist in the form of free-flying photons or bound in the form of basic particles (protons and electrons) as well as in the form of vacuum.

5. Localism versus non-localism

Contemporary physics divides the whole reality into its parts. Mechanical separation of parts from the whole means the destruction of their interrelations so that these parts can only interact with one another by local contacts. Localism dominates in contemporary theoretical physics, where the interactions between "point-like" particles are presented as a result of mutual exchange of virtual bosons moving at a limited speed of light. Strangely, such a naïve mechanical interpretation of particle interactions has been incorporated into the Standard Model, despite the observed fact that non-locality results directly from quantum mechanics.

Space is the basic attribute of each physical entity with its quantitative measure of volume. There are no entities without spatial volume. Point-like particles or one-dimensional strings are not suitable at the quantum level, even as mathematical idealisations, because they fatally distort reality. Space is not only a basic feature of everything, but it also separates things from one another and connects them simultaneously.

The internal structure of any thing is made up of the same basic components as the connections through which things are interconnected. All things and their interconnections are made up of the same components – elementary quantum connections (dipoles). Objects move towards each other only because of their quantum interconnections, which create free space – the vacuum.

There are only two basic interactions – non-local and local. Non-local interactions manifest themselves through attraction and repulsion of opposite poles of quantum dipoles, while local interactions are always repulsive forces acting by local contact pressures between adjacent elementary dipoles that press against each other with their spaces. The attractive force is always non-local, while the repulsive force may be non-local or local. Local force is always repulsive:

The above figure shows two quantum dipoles acting locally by their mutual repulsive pressures. Elementary quantum connections (dipoles) represent elementary quanta of space, but differ in lengths and energies. Here, the left one is shorter, stronger with more energy and the right one is weaker, longer with less energy.

Since all experienced interactions affect our human senses locally through tactile interactions, theoretical physics has difficulty to accept "invisible" non-local connections, although they result directly from dialectical logic and quantum mechanics. Their manifestations are confirmed experimentally, even having practical usage.

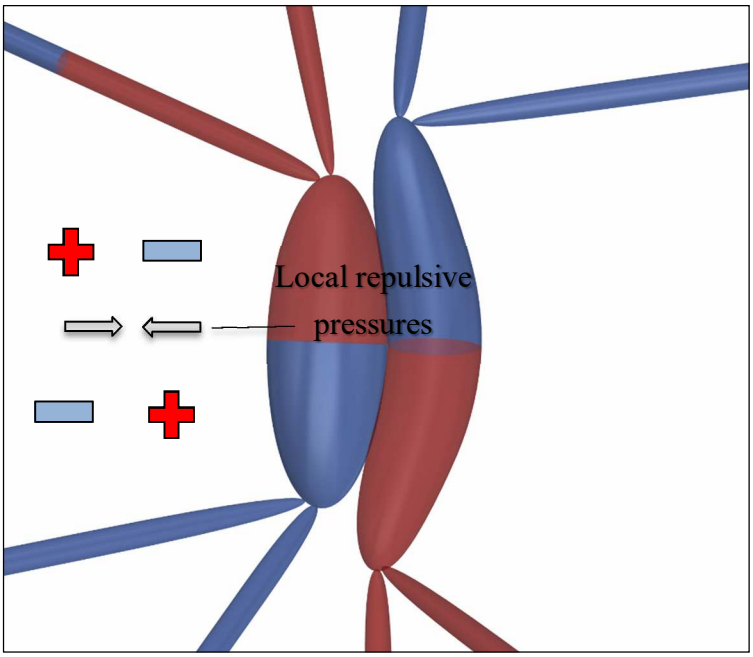


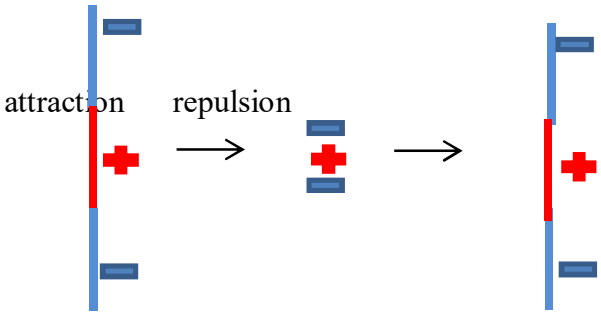
Fig. 4: Two quantum dipoles that press against each other with their spaces (fixed volumes)

So, there are only two basic forces – attraction and repulsion and two basic interactions – local and non-local. All known interactions according to contemporary physics: mechanical, electromagnetic, strong, weak, nuclear and gravitational, are just their manifestations. The two basic forces – attraction and repulsion are always in a dynamic balance with each other at all levels of the hierarchy.

6. Basic particles and their interactions

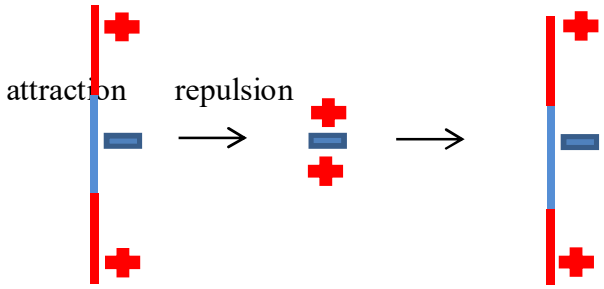
The basic interactions oscillate not only photons, but all particles, although their oscillation is more complex.

Electron e^- (+/2-) consists of two quantum dipoles:

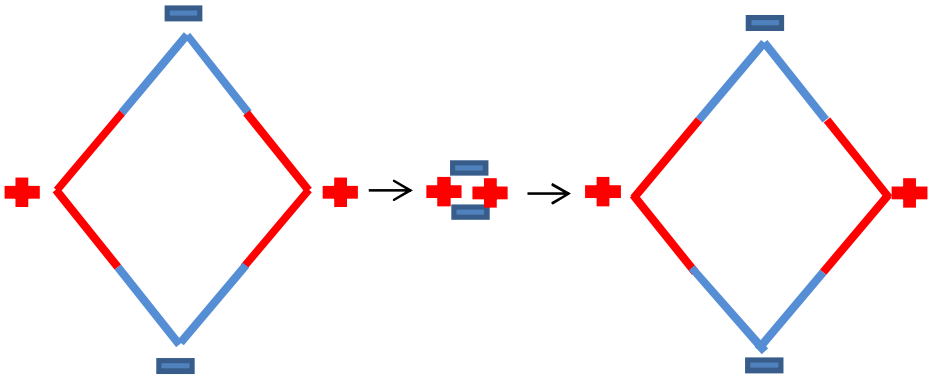


Muon and **Tau** have the same structure as the electron, except they are much more energetic and shorter. They are unstable and turn into electrons by transferring their energies to their surroundings.

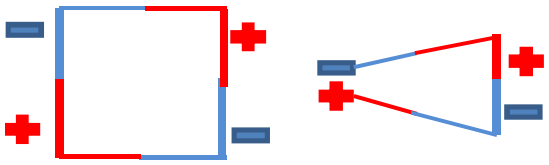
Positron e^+ (2+/-) consists of two quantum dipoles:



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



If the neutrino really exists, it represents a double-photon structure with a specific internal motion. Neutrino is its own antiparticle, so neutrino and anti-neutrino represent the same particle. As the neutrino oscillates in one plane, it does not resist its dragging by cosmic expansion and therefore has no rest mass and its speed is *c (as is the case with photons)*. Other structures may have the same quantum dipole structure as neutrino, e.g. double photon, mesons, neutral pions, but their internal motion is not so simple, so they do not represent stable structures. For example:

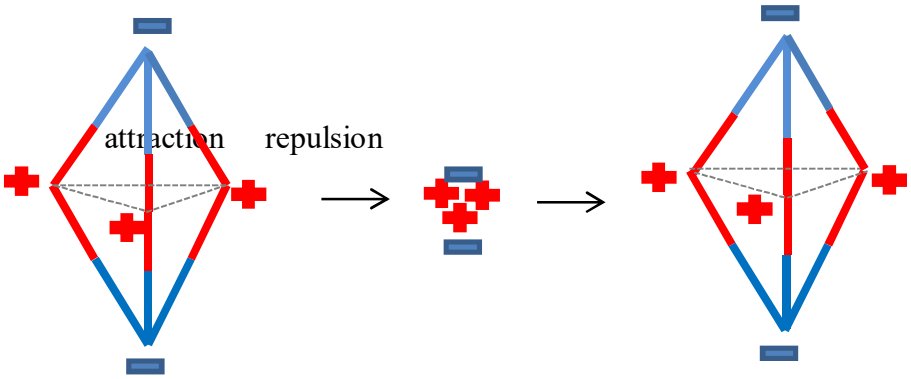


This double photon structure has two different oscillation centres with different phases.

A photon can associate with any particle without disturbing its internal structure, thus bringing it into the excited state. It can also associate with itself without forming a new particle. Its spin j=1 means that the transient state known as positronium, formed after an electron-positron collision,

can decay into two or three photons. The photon in relation to the magnetic field may deflect to the north or south magnetic pole or remain without deflection. That is, the dipole is right-handed or left-handed, or both, simultaneously, meaning that it exists as a double-dipole, where one dipole is a right-handed and the other a left-handed and thus its motion remains unaffected by electromagnetic fields.

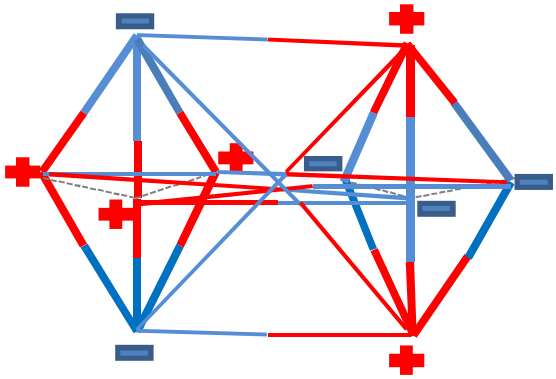
Proton p^+ (3+/2-) consists of six elementary quantum dipoles:



All stable structures (particles) oscillate in one line (axis of oscillation) to one common centre during attraction. The dipoles which make up the total proton are short and strong (energetic). These energetic forces make the proton the most stable composite structure, as they are able to overcome the mutual repulsive pressures between dipoles. The proton has three positive poles which form a triangle. It is because of these positive poles that in electron-proton scattering experiments, the electrons scatter from three points inside the proton. This is not due to the quark structure, but due to the bipolar nature of the proton.

More complex structures have mutual pressures which destroy their compositions at the moment of their formation (the so-called resonances).

Proton – antiproton annihilation (p^+p^-) – protonium:



A proton can only be destroyed by annihilation with an antiproton. The proton and antiproton are mirror images of each other, so they attract each other very strongly and create a temporary high energy composite structure called protonium **(5+/5-)**, which completely destroys the original proton and antiproton structures due to the huge local repulsive pressures of the dipole spaces. In

this annihilation at least 5 free photons **γ** are released. However, more released photons are possible, due to excitation of initial particles before their annihilation.

In the "protonium" structure **(5+/5-)** or **(6+/6-),** if excited by a single photon, we see some other substructures that correspond to mesons, which we can interpret as the following:

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

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

mega meson **ω** decays as follows: $\omega \rightarrow \pi^0 + \gamma$

Annihilation in low energy collisions of the proton and antiproton can be noted as follows:

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

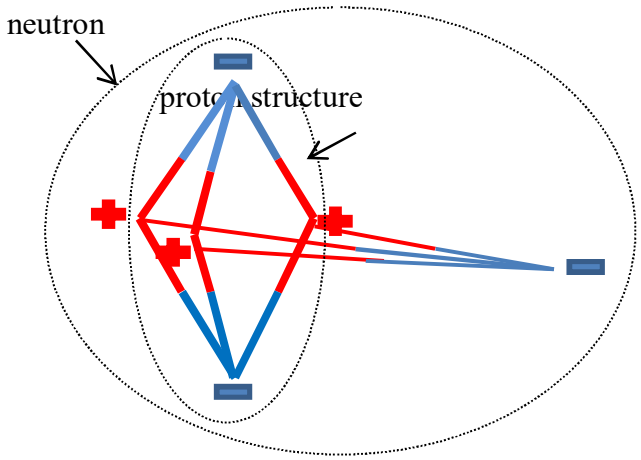
Contemporary theoretical physics assumes that protons, neutrons and unstable baryons consist of three quarks, while mesons of quark-antiquark pairs interacting by gluons. The quark model was invented to simplify the situation with a large number of hadrons (baryons and mesons). While this may help in the classifying of these particles, the true nature of the micro-world is misinterpreted. The problems of the quark model are quite clear. Quarks cannot exist as separate entities, cannot be detected directly, have an incredible so-called "asymptotic freedom" and no one can explain what is the cause of their different "colours", "flavours" and other "special" characteristics.

Consider how the quark model explains the decay of the neutral pion π^0: "The π^0 (neutral pion) is a quark – antiquark meson, which can annihilate, producing two photons." This illustrates how the quark model complicates a simple situation: we know that the pion decays into two photons. Why do we also need the quark-antiquark annihilation? Why don´t we accept pion as a coupled state of two photons? Why are photons, as elementary quanta of free energy, not considered to be the basic components of all physical structures (particles and interactions)? Why don´t we try to understand and detect the true nature of the photon, but create new absurd components (quarks)? Why do we complicate the situation so much if the truth is simple?

We now know that the neutral pion π^0 **(2+/2-)** represents the coupled state of two photons, so its internal structure consists of four interconnected quantum dipoles. We do not need any mystical undetectable quarks as we have real photons. Nothing is hidden and there are no secrets in the physical Universe. Everything is clear and simple.

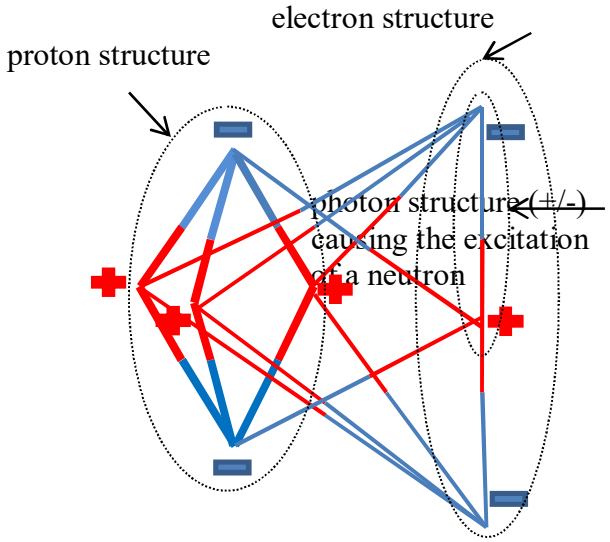
6.1. Weak nuclear interaction - neutron beta decay

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



Inside the neutron we see a proton structure (short and strong quantum dipoles). One negative pole is connected to three positive counterparts by much weaker and longer connections, which can be released from this structure during beta decay.

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



We see that the excited neutron (4+/4-) with sixteen elementary quantum dipoles represents the bound state of the proton (3+/2-) with six elementary quantum dipoles and an electron (1+/2-) with two quantum dipoles. The eight quantum dipoles represent the mutual quantum connection between the proton and electron structure. These are also part of the inner neutron structure. Neutrons consist of a proton and an electron, as well as their eight quantum interconnections (dipoles). When a proton and an electron are separate particles (e.g. in a hydrogen atom structure), their interconnections (which are much longer and weaker) are external and represent their mutual vacuum or electromagnetic field. Thus, the atomic vacuum is formed from the interconnections between nucleons and electrons in the structure of the atom. In 1920, Ernest Rutherford quite correctly assumed the existence of a neutral particle, which is a strongly bound

state of proton and electron, but this nice and clear idea was rejected and the absurd electroweak theory was postulated.

Neutrons cannot be as stable as protons because their structure and internal motions are more complicated and neutrons have more than one centre of oscillation. A neutron, after excitation by a single photon, decays into a proton and an electron. Their interconnections, which are originally constituents of the neutron, are now the external connections between the proton and the electron. This decay is called beta decay (β^- decay), because outgoing electrons represent beta (β^-) radiation and can be expressed as follows:

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

$(n + \gamma)$ represents the excited neutron

Contemporary theoretical physics considers this decay as a manifestation of the so-called weak interaction illustrated by the following scheme:

$$n \rightarrow p^+ + e^- + (\nu_e)?$$

In addition to the proton and the electron, the neutrino (antineutrino) ν_e is also included. It is missing in our scheme. We do not deny the possible existence of neutrinos. The term "(ν_e)?" merely means that we cannot accept that it is a product of β^- decay as is presented in contemporary theories. It can only be a product if the neutron is bound in a heavy nucleus, where nuclear forces and mutual repulsive pressures are strong enough to form a neutrino consisting of four strong, short and energetic quantum dipoles.

Although neutrinos cannot be detected during β^- decay, their hypothetical existence has been predicted because some energy seemed to be lacking and the conservation of linear and angular momentum seemed to be violated. The emitted electrons have a continuous kinetic energy spectrum, ranging from 0 to the maximum available energy of several tens of MeV. A typical value is about 1 MeV. This continuous spectrum looks strange in terms of quantum theory. However, the continuous spectra of the kinetic energy of electrons can be easily explained by accepting that neutrons, before their decay, are excited by photons with any value of the energy of continuous spectra, so that the resulting electrons also have the kinetic energy of the continuous spectra.

We do not deny the possible presence of an electron antineutrino (for us there is no difference between neutrino and antineutrino) in beta decay. However, we must accept the excitation of the neutron bound in the heavy nucleus by three photons, which, after capturing the negative pole "-" from the neutron and converting it into a proton, subsequently form one electron and one neutrino according to the following scheme:

$$n + 3\gamma \rightarrow p^+ + e^- + \nu_e$$

According to the Standard Model, there can be three types of neutrino (electron, muon and tau) with completely different energies (flavours) and can vary from one another. We do not deny that

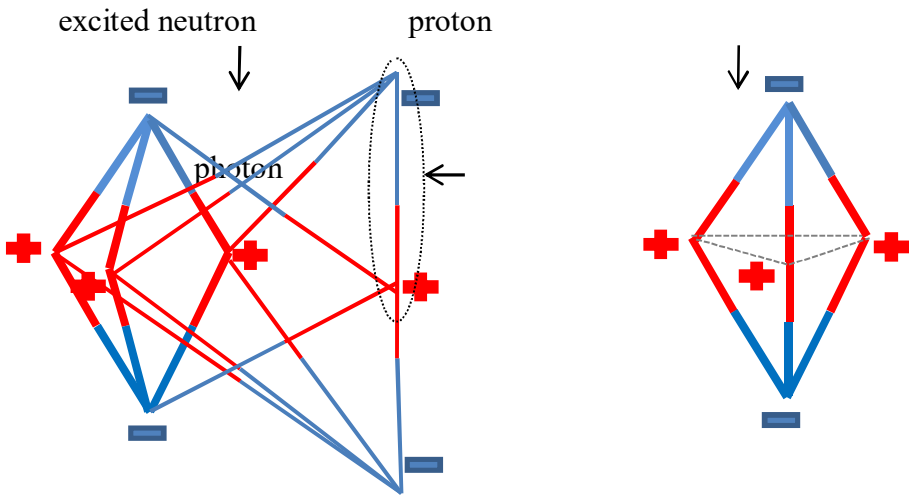
neutrinos can exist in different energy states, but the only steady state is the electron neutrino, the other states are unstable and turn into electron neutrinos. If we want to accept the interpretation of the Standard Model that the muon μ^- and tau τ^- decay into electrons, neutrino and antineutrino, this means that they must consist of these structural components before decay. But it is much more likely that the muon μ^- and tau τ^- are only higher energy, unstable versions of the electrons e^- and after a very short time, are converted into electrons by transferring their internal energies to their external vacuum quantum connections. Of course, electrons as well as muon and tau can be excited by photons.

As stated earlier, pions represent more complex structures, so they decay. A pion π^0 **(2+/2-)** decays into two photons 2γ. Pion π^- **(3+/4-)** can decay into one muon μ^- **(+/2-)** and neutrino ν **(2+/2-)**. The muon μ^- is than changed to the electron e^-. Pion π^+ **(4+/3-)** can decay to one muon μ^+ **(2+/-)** and neutrino ν **(2+/2-)**. Muon μ^+ is then changed to positron e^+ which annihilates with the nearest electron. Pions have structures analogous to those of excited protons $(p^+ + \gamma)$ (antiprotons). However, whereas protons are very stable, the pions decay. Positive pions are less energetic than protons (about seven times less), so their quantum dipoles are not strong enough to maintain the structure from its immediate decay. However, there is indirect evidence for the similarity between proton and positive pion due to their similar momenta. The structure of the proton is (3+/2) while the excited (4+/3-) is analogous to the structure of the positive pion π^+ **(4+/3-)**. While the proton is very stable, the pion decays immediately to muon μ^+ and neutrino ν**.** Since neutrinos can only be detected indirectly, their role in beta decays is still unclear. In any case, if we interpret all components of beta decay as structures consisting of elementary quantum dipoles, the image becomes very simple. The so-called "electroweak theory" makes this situation unnecessarily complicated.

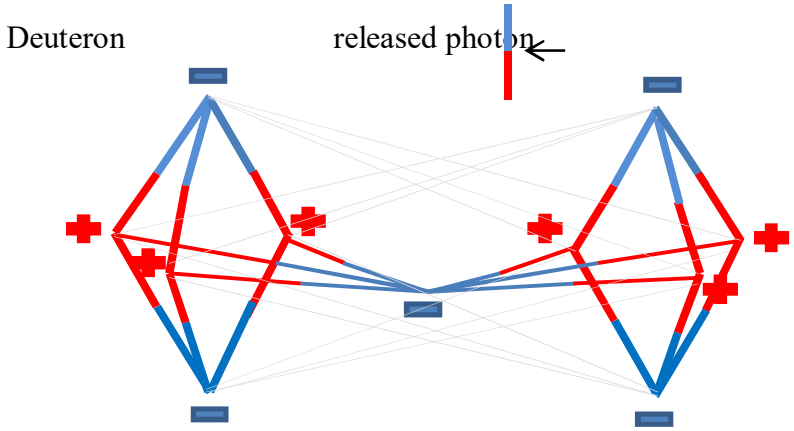
6.2. Nuclear power

The nuclear power is an attractive force between two or more nucleons (neutrons and protons) that bind them to atomic nuclei. The masses of the light nuclei are less than the total mass of the protons and neutrons that form them. According to the current quark model the nuclear power is a residual effect of much more powerful strong force (interaction) that bind quarks by gluons. Before the quark model was created, it was assumed that the nuclear power is transmitted by the neutral pion π^0.

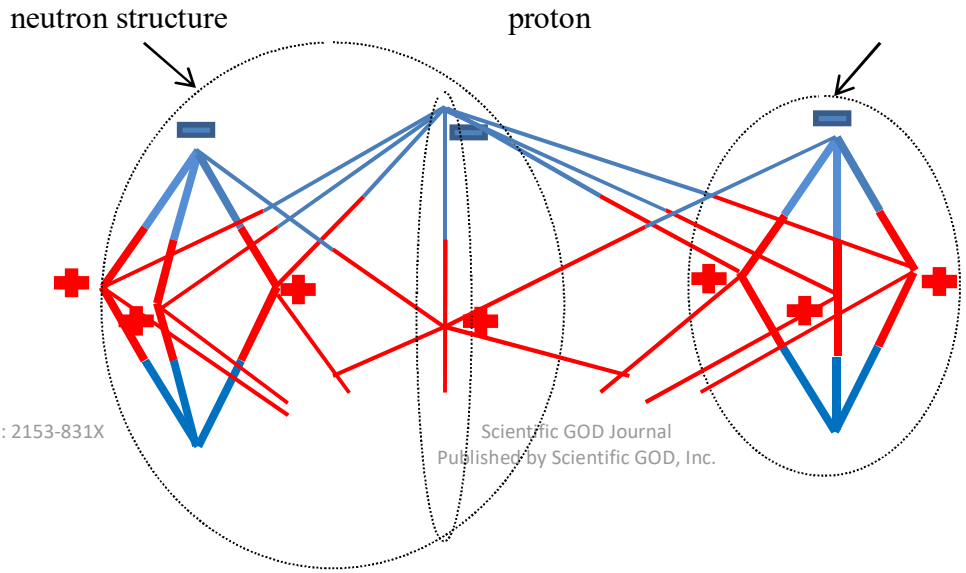
The most suitable system for studying the nuclear power is the bound state of one proton and one neutron called deuteron, which is the nucleus of a deuterium atom called heavy hydrogen.

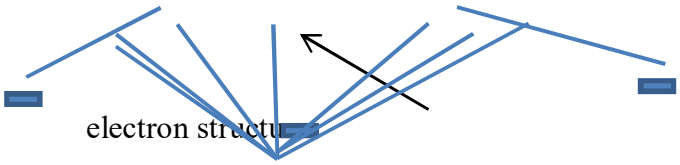


After the proton and neutron synthesis, the photon is released, carrying the so-called binding energy:



In the bound nucleus state, it is irrelevant which of the components is the neutron and which is the proton, since the negative pole is common to both nucleons. The composite state of one proton and one neutron in deuteron (6+/5-) consists of 30 elementary quantum connections. If the photon is not released, the excited deuteron (7+/6-) consists of 42 elementary quantum dipoles. In fact, this structure represents the bound state of two protons and one electron:





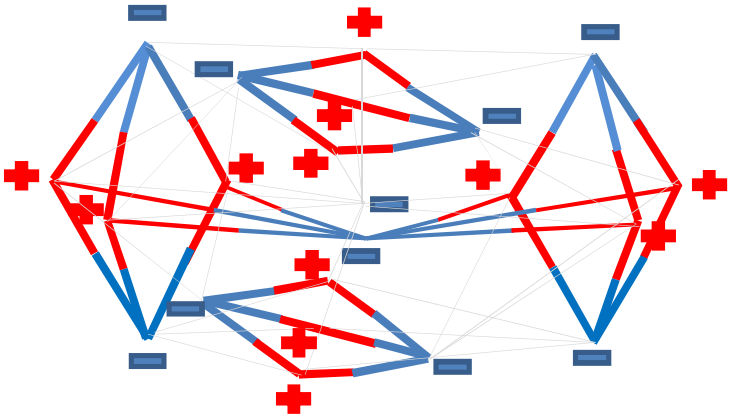
In this structure we can see the substructures of a neutron, proton and electron. However, the deuteron is made up not only of these structures, but also of their quantum interconnections, which are internal components of deuteron. It is a clear manifestation of the holistic principle according to which deuteron is not a simple sum of its structural components (protons and electron), but represents a higher quality defined also by their mutual quantum connections. Deuteron compositions (7+/6-) exist in heavier atoms, with higher atomic numbers being the source of γ - rays during radioactive decay. This is evidenced by the fact that the fusion of two nuclei of less weight than iron generally *releases* energy, while the fusion of heavier nuclei than iron *absorbs* energy. Thus, no photon is released, but new free photons are absorbed into the structure of heavier nuclei.

The opposite is true for the reverse process, nuclear fission. This means that fusion usually only occurs for lighter elements and fission only for heavier elements. Thus, only extreme astrophysical events can lead to short periods of fusion with heavier nuclei. This is the process that leads to nucleosythesis, the formation of heavy elements during events such as supernovae. The synthesis of heavier nuclei is only possible at extreme energies that allow the immense compression of nuclei, so that the quantum interconnections are short and strong enough to overcome their repulsive pressures. The assertion that the binding energy of nucleons in the nucleus is given by the energy that must be released during their synthesis is limited to lighter nuclei and therefore cannot be dogma, because the actual binding energy of nucleons in the nuclei is the energy of their quantum interconnections (dipoles). Creating the required conditions for fusion on Earth is very difficult.

The dipoles forming the internal structures of both nucleons (protons and neutrons) are very energetic (short and strong), so they represent strong forces, while the quantum dipoles between two or more nucleons are weaker and represent the nuclear power connecting nucleons to the nucleus. Although nuclear power is much weaker than strong force, it is strong enough (sufficiently short connections) to overcome local repulsive pressures between quantum dipoles. We now see that nuclear power is not the residual effect of a strong force that binds quarks by gluons, but is formed from elementary quantum dipoles, albeit much longer and weaker.

The nucleus of the helium atom $_2\mathbf{He}^4$, called $\boldsymbol{\alpha}$ – particle, represents the bound state of 2 protons and 2 neutrons (12+/10-) consisting of 120 elementary quantum dipoles. The inner dipoles of the nuclei are very short and strong (strong interaction) but their interconnections are much weaker and may have different lengths and energies (nuclear interaction).

α – particle (nucleus of a helium atom $_2He^4$):



Note that not all 120 mutual quantum dipoles (+/-) are depicted in the figure, but we can see the difference between the quantum dipoles forming the inner structure of 4 nucleons (strong interactions) and their nuclear interactions.

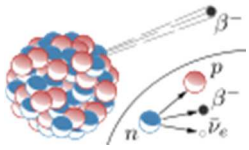
The more nucleons are in the nuclei, the heavier and less stable the atoms are. This instability is due to the number of quantum interconnections increasing dramatically with the consequent increase in their repulsive pressures. Atoms with a huge number of nucleons (protons and neutrons) in the nucleus are unstable and can decay. This so-called "radioactive decay" is a stochastic (random) process with a few driving factors. The internal motion of quantum dipoles, they mutual pressures as well as impulses from outside can disrupt the balance of attractive and repulsive forces and cause spontaneous atomic decays. In these decays, large amounts of nuclear forces are released by emitting particles (**α** – particles, **β** – particles, **γ** – rays and others) which carry high energy. Radioactive decay transforms the initial nucleus into another nucleus, or into a lower energy state. The chain of decays continues until a stable nucleus is reached. An example of **α** – decay of uranium:

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

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

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

$$_{90}Th^{234} \rightarrow {}_{91}Pa^{234} + e^-$$



β^- decay generally occurs in neutron rich nuclei.

In a nucleus with a large number of nucleons, the local repulsive pressures of an enormous number of quantum dipoles between nucleons (protons and neutrons) are so high that the balance between the attractive nuclear forces of quantum dipoles and their repulsive pressures is very fragile and a small impulse is sufficient to allow radioactive decay. This small impulse could be due to excitation of the nucleus by a photon (or neutrino?), so the number of quantum interconnections in the whole structure of the nucleus increases with the consequent increase in local repulsive pressures causing radioactive decay. If the impulse is strong due to interaction with energy neutrons, the internal structure of the radioactive uranium nucleus increases the number and amount of repulsive pressures of quantum dipoles so dramatically that the nucleus is divided into two nuclei with the release of high energy particles such as **α**, **β**, **γ,** and neutrons that can again cause nuclear fission of other uranium nuclei and thus generate a so-called "chain reaction". On this principle, atomic bombs as well as nuclear reactor are designed. In nuclear power plants the chain reaction is controlled.

All forces are nothing but the attraction and repulsion of quantum dipoles. Very short quantum dipoles create the strong attractive forces inside hadrons (proton/neutron) and leptons (electron/neutrino). Nuclear forces are formed from short and strong quantum dipoles between nucleons. Electrostatic forces are formed from weaker and longer quantum dipoles. Other forces between atoms and molecules are weaker than electrostatic ones, and the weakest are the gravitational forces between massive objects, which manifest themselves through long mutual quantum connections representing a cosmic vacuum.

Attraction and repulsion are always in balance with each other. Shortening and increasing the mutual quantum dipoles between the nuclei during their fusions is accompanied by increase in their mutual repulsive pressures, the overcoming of which is essential for a successful fusion. The dynamic balance of opposing forces (attraction and repulsion) within atoms and particles is manifested by internal motions (oscillations, vibrations, etc.).

7. Electrostatic force

Particles or any physical objects with a prevalence of positive poles are positively charged. Particles with a prevalence of negative poles are negatively charged. The minimum amount of prevalence is the elementary charge. The proton is the most known particle with a positive charge. The electron is the most known particle with a negative charge. Particles with a balance of positive and negative poles are neutral.

Long quantum dipoles representing interconnections 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 an overall attractive force between them.

Let d is the average distance between two neutral mass objects. The first object contains k_1 positive and k_1 negative poles, and the second one contains - k_2 positive and k_2 negative ones. The total number of elementary quantum connections between the two objects is $2k_1k_2$. The whole attractive force f_a between the two objects is the sum of the attractive forces of all their quantum interconnections with the average length d. The next relation is valid ([2], [3], [4]):

$$f_a = (\alpha hc/2\pi)2k_1k_2 /d^2 = (\alpha hc/\pi)k_1k_2 /d^2$$

where h – is Planck´s constant, α - is the fine structure constant, c - is the speed of light.

This relation expresses the total attractive force f_a between two electrically neutral objects, proportional to the number of quantum dipoles connecting them. However, as we know, there is no attractive electrostatic force between electrically neutral objects. This force can only be identified if these objects are electrically charged and proportional to the product of their charges. Indeed, this force affects all quantum dipoles connecting two material objects, but is completely compensated by the repulsive spatial pressures of quantum connections, so it seems that there is no attractive force. If two objects are oppositely charged with charges q_1 and q_2, the attractive forces affecting their direct quantum interconnections are not fully compensated by the repulsive spatial pressures of outgoing external quantum dipoles, and therefore their uncompensated mutual attractive force is directly proportional to the product of their charges. If two objects have like charges, the missing interconnections between them cause the repulsive spatial pressures of external quantum connections to prevail over the attractive force of the quantum dipoles interconnecting these objects, which manifests as an electrostatic repulsive force directly proportional to the product of their like charges.

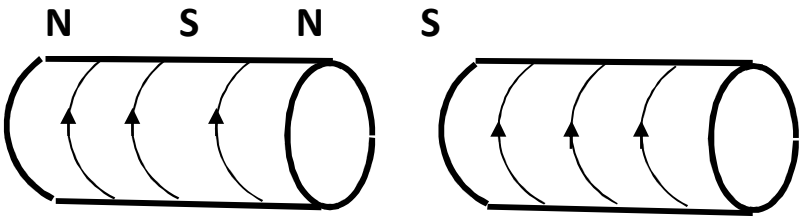
Although Coulomb´s law is the same for expressing attractive and repulsive electrostatic forces, their reasons are different. The attractive electrostatic force is due to the non-local attraction between the opposite poles of the quantum dipoles. The repulsive electrostatic force is caused by the prevalence of local repulsive pressures of quantum dipoles due to the lack of mutual non-local quantum connections.

8. Magnetic force

Magnetic force is the result of mutually coordinated internal motions (oscillations) of quantum dipoles in atoms of magnetic materials (mostly metals), which can interact with other materials with magnetic properties through their external quantum interconnections. Magnetic materials are materials that can create mutually coordinated synchronized motions (oscillations, rotations) of quantum dipoles in their atoms (atomic dipoles) in terms of their same orientations. The magnetic field of a magnet is formed by its external quantum dipoles

connecting the magnet to the entire universe. The motion of its external quantum connections reflects the internal coordinated motions of its internal dipoles in such a way as to cause mutual attraction between opposite magnetic poles and repulsion between the same poles or magnetization of magnetic materials.

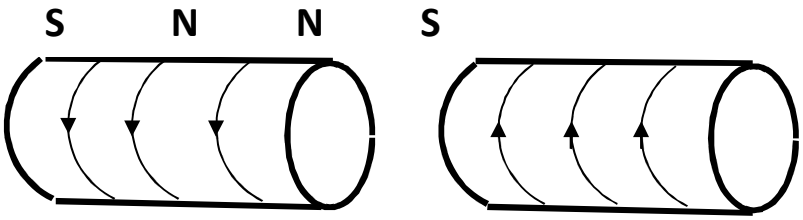
The mutual attraction of opposite magnetic poles is due to synchronized coordinated oscillations (rotations) of quantum dipoles within the magnets, as shown in the following figure:



Attraction

In the above figure we see two permanent magnets, where the arrows indicate the same direction of synchronized oscillations (rotations) of the atomic dipoles inside the magnets. External quantum connections emanating from both permanent magnets reflect these synchronized motions so that their motions are also synchronized (same orientation), resulting in a reduction of their local repulsive pressures, so that the attractive force between the opposing magnetic poles of the two magnets prevails - the magnets attract each other . The figure shows why the north pole (N) is always on the left side, while the south pole (S) on the right side, regardless of how many parts the magnet is divided into.

Thus, we have explained why magnets always have two magnetic poles and why one pole cannot exist without the other, because both magnetic poles are the result of synchronous coordinated motions of their inner atomic dipoles. The mutual synchronized oscillations of the atomic dipoles inside the magnet are the result of their mutual quantum connections, because only through them the atomic dipoles can synchronize their motions. Virtual photons as supposed mediators of magnetic interactions cannot in any way explain this phenomenon. Magnetic attraction is merely a manifestation of quantum entanglement (nonlocal connections) through which the spins or magnetic moments of particles are coordinated



Repulsion

On the other hand (above figure), if the same magnetic poles are placed face to face, their inner atomic dipoles oscillate (rotate) in opposite directions, causing opposite movements of their

external quantum connections emanating from both magnets, leading to an increase in their relative local repulsive pressures, which in turn prevail over their non-local attraction forces, so that the same magnetic poles of the permanent magnets repel each other.

Magnetic and electrostatic forces are mediated immediately through non-local quantum interconnections, not through virtual photons moving at a limited speed. A photon is considered to be a quantum of the electromagnetic field. Indeed, a photon exhibits its electrostatic properties because it is an elementary quantum dipole that unites two opposite poles (charges) as well as magnetic properties through its internal motion – oscillation/rotation. Electromagnetic interaction is a direct instantaneous non-local interaction.

9. Cosmic expansion

The Universe evolves gradually, step by step, forming and ejecting new positive "+" and negative poles "-". The ongoing internal structuring and differentiation of the Universe means its cosmic expansion. The Universe is an expanding network of quantum dipoles (connections) moving from one quantum state to the next.

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

Fig. 5: The table of increasing cosmic network of quantum dipoles during cosmic expansion

At the beginning of expansion, the Universe is just a simple quantum dipole **(+/-).** It then ejects, suppose, first one positive pole **(+)** and another negative one **(-)**, so after two elementary quantum jumps the Universe represents the structure **(2+/2-)**.

To simplify our analysis, we only consider and calculate quantum transitions between the symmetric quantum states when two new poles are ejected (formed) one by one. In the first quantum state the structure of the Universe is **(+/-)**, in the second symmetric quantum state it is **(2+/2-)**, in the third quantum state it is **(3+/3-)**… In the *k*-th symmetric quantum state, it has a structure **(k+/k-)** and consists of $V_k = k^2$ elementary quantum dipoles (connections). The value $V_k = k^2$ represents the volume of space given by the number of elementary quantum dipoles. The value *k* represents the number of positive or negative poles, as well as the serial number of the symmetric quantum state of the Universe, which represents the cosmic time (i.e. the number of elementary quantum double-jumps of the Universe since the beginning of its expansion).

The Universe jumps from its one quantum state *k* to the next *k+1,* forming (ejecting) new positive + and negative – poles with *2k+1* new quantum dipoles +/-. The inner structuring of the Universe that causes its cosmic expansion can be easily described using the following basic quantum space-time equation:

$$V_k = k^2$$

This equation reflects the internal division and structuration of the Universe, creating its own expanding space and flowing time. The Universe is quantized because its energy and space are localised in its elementary quantum connections and its time is given by its elementary quantum jumps.

Elementary quantum jumps represent the elementary changes of the Universe, its elementary quanta of motion (time), to which all other changes (motions, times) can be related. These elementary quantum jumps define the cosmic time. Time is not a mystery, but a manifestation of motion of the Universe. Time is a measure of motion. Every local motion can be compared to a universal cosmic motion. As stated in [2], the current one second corresponds to $(3/4)/(\pi c^5/2\kappa\hbar\alpha)^{1/2} = 8{,}144.10^{43}$ elementary quantum jumps of the Universe between two symmetric quantum states, so we can assign time $\Delta t = (4/3)(2\kappa\hbar\alpha/\pi c^5)^{1/2} = 1{,}128.10^{-44}\ sec$ to one quantum jump (κ - gravitational constant). However, this does not mean that the quantum jump has its duration. Time does not define the duration of an elementary quantum jump, but on the contrary, time is defined by the number of elementary quantum cosmic jumps. Each process (motion) and its duration can be compared with universal time. Cosmic time is a universal base through which all local processes (motions, times) can be expressed. Space and time are therefore quantized and their quantitative characteristics can be numbered and expressed in integers. If we associate Δt sec to one quantum jump, then the time of cosmic expansion is:

$$t = k\Delta t$$

The basic space-time equation of the Universe, where the volume *V* is expressed in m^3, takes the following form:

$$V = z\,t^2, \quad where:\ z = (d^2V/dt^2)/2$$
$$dV/dt = (d^2V/dt^2)\,t$$
$$(dV/dt)^2 = 2\,V\,d^2V/dt^2$$

This is the basic equation of the spatial dynamics of the Universe expressed in real dimensional units, where the spatial volume of the Universe is directly proportional to the square of the cosmic time. In this form, space and time are presented as continuous values, but we must remember that in fact they are quantized and can only be correctly expressed by integers. So, if we want to explore space and time in terms of cosmology, we can use them as continuous values, but such an approximation at the quantum level is inappropriate.

The expansion rate of the spatial volume dV/dt is directly proportional to the time of cosmic expansion. The acceleration d^2V/dt^2 is constant throughout the evolution of the Universe.

The three-dimensional space is self-closed, so it can be viewed as the ideal three-dimensional surface of a four-dimensional sphere, for which the following formula is valid:

$$V = 2\pi^2 r^3$$

where r - radius of spatial curvature of the four dimensional sphere.

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

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

The relations between spatial circumference o and time t are:

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

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

These equations show that the spatial circumference o increases by time, but its velocity do/dt decreases. Acceleration is negative. This means that the rate of cosmic expansion is slowing down (or "decelerating").

The length of the longest quantum dipoles, representing the highest possible distances and connecting the two opposite sides of the Universe, is equal to half the circumference of the Universe $o/2$. The rate of its increase due to cosmic expansion is the highest possible speed – the speed of light c:

$$c = (do/dt)/2 = o/3t$$
$$o/2 = \pi r = (3/2)\, ct$$

The speed of light represents the speed of cosmic expansion. As the cosmic expansion rate decreases, the speed of light also decreases. Theoretical physics now incorrectly accepts the positive acceleration of cosmic expansion, and the 2011 Nobel Prize was also awarded for this "discovery". In fact the positive acceleration of cosmic expansion is merely an apparent phenomenon based on a false dogma that the speed of light must always be equal in relation to the observer. This error has fatal consequences for contemporary cosmological theories, as they seek mysterious dark energy as a source of accelerated cosmic expansion. This acceleration was deduced from observations showing that very distant supernovas appear fainter and therefore

more distant than they should be with a constant or slowing cosmic expansion. However, this interpretation is incorrect and is based on the misleading dogma that light always moves towards us at a constant speed *c*.

The real situation is completely different, because the greater the distance from which the light comes, the slower its speed towards us, as its true speed *c* must be reduced by the speed *v* of extending this distance due to cosmic expansion. If the light approaches us from a point at a distance *d* from us, then this point, due to cosmic expansion, moves away from as at the speed *v:*

$$v = Hd$$

where: H – Hubble constant, d – the actual distance of the light beam from us (observer**).**

Then the light from distance *d* approaches us at speed:

$$c\text{-}v = c\text{-}Hd$$

We do not need dark energy to positively accelerate cosmic expansion, because this acceleration is nonsense based on the wrong dogma. The time and trajectory through which the light comes to us are much greater than they would be at a constant speed of light *c* approaching us. The greater the distance between us and the light, the slower its speed towards us. Therefore, cosmic objects (supernovae) appear to be much more distant and fainter than would be if *c* were constant.

Another reason why accelerating cosmic expansion is an illusion is the slowing of the speed light during cosmic expansion. The speed of light is the speed of cosmic expansion, so slowing the cosmic expansion simultaneously means slowing the speed of light.

The "discovery" of accelerating cosmic expansion due to misunderstanding of the speed of light leads to the postulation of non-existent dark energy as a source of acceleration. Dark energy supporters are trying to find its source in a vacuum. Of course, vast energy is contained in a vacuum consisting of a huge number of elementary quantum dipoles that connect all visible material objects to one another. The higher the number of material objects included in the system, the greater the number of elementary quantum interconnections between them and the higher the total energy of the system. The multi-object system has much more energy than is contained in the visible mass due to vacuum interconnections. As we know, celestial bodies rotate and their rotations interact with each other through non-local quantum interconnections. The rotational motions of celestial bodies in cosmology are the result of oscillations (rotations) of elementary quantum dipoles. These rotational motions are the source of the magnetic fields of the rotating bodies.

In addition to dark energy, it is time to reject other mysteries of theoretical physics such as virtual bosons, quarks, strings, hidden dimensions, multiverse, black holes, worm holes, imaginary time, false vacuum, etc.

10. Gravitational Force

The internal structuring of the Universe caused by its repulsive force is manifested as a cosmic expansion. Part of the total value of the repulsive forces of the Universe that causes cosmic expansion is [2]:

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

where: c – speed of light, κ – gravitational constant

So we know the exact value of the force of cosmic expansion. Since attraction and repulsion are two opposite forces in dynamic equilibrium with each other, the force of cosmic expansion has its own counterbalance in the cosmic gravitational force *G:*

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

Gravity is a direct consequence and evidence of cosmic expansion. Attraction and repulsion are always in dynamic equilibrium at the level of elementary quantum dipole, as well as the entire Universe. Cosmic gravity affects all objects and is a global cosmic phenomenon as a direct result of cosmic expansion. Since the gravitational force between celestial bodies is mediated by their mutual vacuum quantum connections, it is a non-local instantaneous interaction.

Newton´s theory of gravity is correct because it is a relational theory where gravity is the result of immediate non-local interactions (relations) between physical objects, while Einstein´s theory of gravity is a local non-relational theory. Newton´s theory needs only a small supplement: that the vacuum density, proportional to the gravitational potential, causes a slowing of processes in objects (time dilation), which is correctly accepted in Einstein´s theory. However, Einstein´s gravity cannot naturally explain why the galaxy´s rotations are faster than they should be calculated by the masses of the stars in them, so it is assumed that there is a mysterious invisible dark matter. Dark matter can be easily explained by Newton´s theory if it is recognised that galaxies, in addition to celestial bodies, also contain their non-local vacuum quantum interconnections, so that the galaxy is held together despite its rapid rotation. The mass of Galaxy is, of course, much greater than the total mass of its celestial bodies, because the vast amount of energy (matter) is found in the non-local quantum interconnections forming the cosmic vacuum.

11. Conclusion

It is not possible to have a simpler relation than attraction and repulsion of counterparts (+/-) from which the whole reality is created, where every "+" is connected to all "-", and reciprocally. The Unity Principle is the clearest manifestation of Occam´s razor and follows directly from dialectical logic reflecting the dialectic of existence. The highest complexity of the Universe is created from the utmost simplicity of bipolar relations (+/-). We do not need speculative theories such as a "Theory of Everything" or "Theory of Unified Field". We need to understand the precise (and simple) mechanism of the Unity Principle. In terms of dialectical logic,

contemporary theoretical physics has failed. The discovery of the Unity Principle means that new science and philosophy can now be built on a true foundation.

> *Someday we'll understand the whole thing as one single marvellous vision that will seem so overwhelmingly simple and beautiful that we may say to each other: 'Oh, how could we have been so stupid for so long? How could it have been otherwise!* J. A. Wheeler

References

[1] HEGEL, G.W.F., 2010. Science of Logic, translated by George di Giovani, Cambridge University Press

[2] KOHUT, P., 2011. God and the Universe, VDM Verlag Dr. Muller, Saarbrucken, ISBN: 978-3-639-33104-2

[3] KOHUT, P., 2014. Crisis of Contemporary Theoretical Physics and the Truth in the Mirror of Dialectical Logic, Syntropy 2014(1), ISSN 1825-7968, In: http://www.lifeenergyscience.it/english/2014-eng-1-01.pdf

[4] KOHUT, P., 2013. Unity Principle: The Truth in the Mirror of Dialectical Logic, Scientific GOD Journal, Volume 5 Issue 1, January 2013, ISBN: 1495487369, In: www.createspace.com/4661404

[5] KOHUT, P., 2013. The Unity Principle, Syntropy 2013 (2), ISSN 1825-7968, In: http://www.lifeenergyscience.it/english/2013-eng-2-17.pdf

[6] KOHUT, P., 2012. The Physical Universe as a Divine Quantum Information Structure, Scientific GOD Journal, Volume 3 Issue 3, March 2012, ISBN: 1475134649, In: http://scigod.com/index.php/sgj/article/view/176/216

[7] KOHUT, P., 2012, Social and Spiritual Development of Mankind – The Way to Freedom, Scientific GOD Journal, Volume 3 Issue 11, December 2012, ISBN: 1481893637, In: http://scigod.com/index.php/sgj/article/viewFile/239/275