THE BIPOLAR STRUCTURE OF PARTICLES AND INTERACTIONS

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Abstract

The basic elementary constituent of the physical Universe is discovered. It is a **dynamic bipolar relation of opposites (+/-) as a basic elementary building unit of matter, energy, space and time.**

Energy being a motion has its basic manifestation in attraction and repulsion of opposites. Without acceptance of bipolarity principle of matter (space, energy) it is impossible to discover how matter and space are structured and constructed. As matter is spatial and space is material, so the elementary structural unit of space is at the same as the elementary building block of matter (energy). This simple fact has not been accepted by theoretical physic so far and the search for the essence of matter is far from the correct direction.

The Bipolar Essence of Matter, Space and Energy

If we start our consideration with existence 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 they are two opposites (anti-poles) of the same "one". The relation of anti-poles is not static but dynamic as only their mutual activity creates 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 anti-pole – "something else" by repulsion. But at the same time the anti-poles remain connected together thanks to their attraction. Thanks to repulsion and attraction, the anti-poles remain in a unity (mutual relation) that cannot be broken. The bipolar "one" is a self-repulsion and self-attraction of its anti-poles that can be symbolically marked as "+" and "-". This bipolar "one" represents an elementary quantum connection (relation) of anti-poles (opposites), so we name it the quantum dipole (+/-). It is the dynamics, motion, pulsation, oscillation, permanent 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.

Mathematics, which apparatus physics uses, is based on a formal logic. So physics is not capable to penetrate into the material essence, and studies separated parts acting only locally to each other. Einstein postulated the local action even as a universal principle and hardly struggled with the non-locality of quantum theory. Quantum theory accepts the non-local connections and entanglement of separate quantum systems, but does not know the essence.

The Whole and the Part

Analysing the dialectic relation of the whole and its parts we will confirm the quantum dipole (connection) as a basic building block of space.

It is easy to imagine the space (physical reality) as divided into its parts. But it is not easy to imagine the mutual motion of these parts to create space. They do not move in space but being parts of space, they perform mutual motion. Every selected part of space, however internally divided, is a holder of a certain part of space. In contemporary conception, every particle or material object moves in space. But the correct statement is that the space, dragged by a particle or any material object, moves towards the rest space. 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. The part obtains its relative independence only thanks to its universal connection which allows the part to obtain the possibility for its relative motion and to remain connected with the whole at the same time. The connection between parts is also a part of space. So there are no difference between part and connection. 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 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 consists 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 with everything, everything interacts with everything else.** 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 Universe. This **Unity principle** is basic for the whole Universe.

Every connection of anti-poles (+/-) represents the individual elementary quantum of matter-energy-space, the elementary quantum dipole symbolically marked as (+/-). It is the elementary building block of matter and the base for its structural composition in which everything is connected with everything.

Schematic representation of a quantum dipole:

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 to the Einstein 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.

The penetration into the deepest essence of matter is impossible without thinking at the highest level of abstraction. The ultimate – final and at the same time the first in matter, its basic building block, is something, everything of which emerges by its differentiation and arrangements into structures. The recovery of something first and finite in matter is the recovery of something that cannot be defined by something other but that which defines itself as something internally contradictory (bipolar). No more and no less.

The Nature of Light

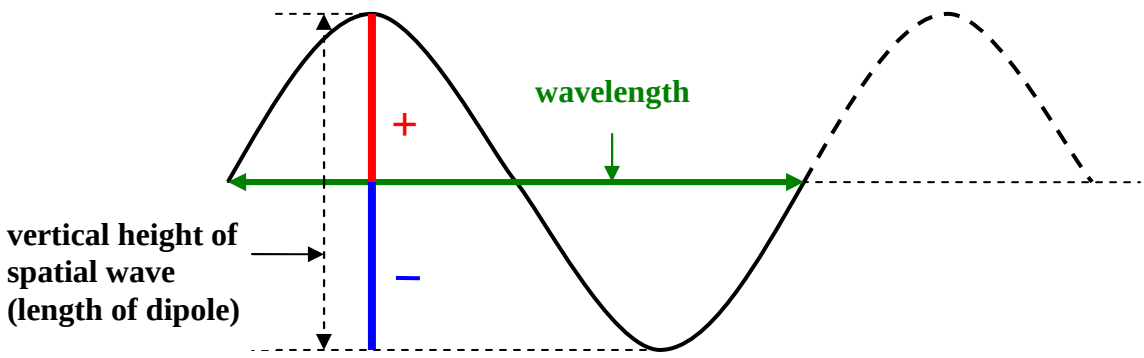
Light as a quantum of radiation (photon**)** represents an elementary particle consisting of bipolar connection of anti-poles ”+” and “-“, which thanks to their mutual attraction and repulsions perform a permanent oscillation (vibration, pulsation**)** manifesting outwards as an electromagnetic wave during a flight. This fact is a consistent and factual explanation of the “wave-particle” duality of light. The radiation, as a bipolar unity of anti-poles, manifests in the form of elementary particles (quanta, photons**),** but as a form of their mutual attraction and repulsion (oscillation**)** represents a wave of electromagnetic field. The photon as an elementary quantum of electromagnetic energy manifests outwards by its electric and magnetic characteristics being in a mutual dynamic unity which is a clear evidence of bipolarity of light. Only a bipolar dynamic unity of opposites can be the internal source of oscillation and energy of a photon.

The photon is an oscillating elementary quantum dipole or a beam of pulsating quanta. It 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 “+”**)**. Photons do not move “in” a free space-like a vacuum, but thanks to their external connections, they move “towards” all other parts of the Universe, which are also spatial holders (carriers**).** We do not need any background, such as an undefined vacuum in order to allow particles to move in it. All elementary particles, interactions, force fields, as well as the vacuum are only certain structures of elementary bipolar quantum connections directly and mutually interconnected. As everything is connected with everything else, so every part moves towards all others thanks to their mutual connections. The vacuum consists of elementary quantum connections between particles. The expression that something moves in space is only an approximation which is incorrect at the quantum level. This is the main reason for the huge interpretational problems of quantum theory which does not know the real essence of quantum reality, as it accepts moving particles as points independent of space (vacuum). All interpretational problems of quantum physics are a consequence of trying to describe the motion of elementary particles “in” space represented by coordinate system.

Quanta of electromagnetic radiation – photons, in comparison with other elementary particles, have some specific properties. A photon is an elementary connection of opposite poles + and – (quantum dipole) with spatial characteristics – volume and length. Just 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 an 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.

In more complicated structures (particles) with more quantum connections, it is impossible to guarantee the oscillation of all quantum dipoles simultaneously in one plane, and such particles resist their dragging by an expanding Universe, which is manifested by their rest mass.

A photon performs two types of motion: horizontal and vertical. Horizontal motion represents its flight as a consequence of its dragging by cosmic expansion. Vertical motion is manifested by its oscillation (rotation) thanks to mutual attraction and repulsion of its opposite poles.



As we can see, a photon manifests its characteristics not only by frequency or wavelength, but, being an elementary quantum of space, it represents the flying quantum of waving space with its vertical height (equal to its dipole length). As a moving, waving quantum of space, thanks to its external quantum connections, it manifests outwards like a moving, waving electromagnetic field. As a moving quantum of space, the light wave does not move "in" space, but "towards" other elementary spatial quanta, influencing them by its internal oscillation.

PHOTON = FREE OSCILLATING QUANTUM DIPOLE (+/-)

It is irrelevant, whether we interpret the internal motion of a photon as an oscillation, vibration or rotation, because the rotation projects to the perpendicular plane as an oscillation. The internal motion of a photon can be detected only through its action (by its external quantum connections) on its surroundings and is interpreted as an electromagnetic wave. This means that the internal motion of a photon manifests outwards as a changing intensity of its action on measuring instruments, what can be interpreted as a changing and pulsating electromagnetic field or wave.

A photon can oscillate in all possible directions perpendicular to the direction of its flight. If it oscillates in only one direction, it is polarized. Then we say that the vector of intensity of its electric (or magnetic) field oscillates in one direction.

Oscillation or rotation of a quantum dipole of photon clearly shows that it has a spin as an external manifestation of its internal structure and motion. But elementary particles are understood to be corpuscles without any internal structure. When an electron demonstrated its ability to deflect in an unexpected way, this property was named as the electron ambiguity, later as a spin, because similar properties were also demonstrated by other particles. Physicists do not know the real reason for spin and only accept it as a specific manifestation of matter, although spin is a clear evidence for the existence of internal structure of elementary particles. First idea, that the spin of electron is a manifestation of its rotation, was refused, because its circumferential velocity showed to be higher than the speed of light. The internal motion of a particle as a result of its internal structure was not accepted, although spin is only the external manifestation of its internal motion. The internal motion of elementary connections inside a particle also influences the motion of its external connections, through which the particle moves towards other objects. At the same time, the motions of external mutual connections between particles influence their internal motions. The various possible manifestations of a particle towards a magnetic field means, that the particle has various possibilities to perform its internal motion and manifest itself outwards. The so-called motion of a particle "in" a magnetic field is, in reality, the motion of mutual elementary quantum connections (dipoles) between particle and objects, creating the magnetic field.

A magnetic field is created by moving external connections coming from electrically charged objects.

It is unbelievable how blind is contemporary fundamental theoretical physics that cannot detect the following simple facts and truth:

1. Photon as a quantum of free energy is a particle because it represents a unity of two opposites which mutual attraction and repulsion cause its oscillation manifesting outside as a wave. Wave-particle duality of a photon is not a consequence of complementarity principle, but the dialectical unity of opposites. So we do not need unbelievably expensive colliders to understand the simple fact that the elementary structural unit of matter, space, energy is a bipolar relation of opposites – quantum dipole (+/-) and all forces (interactions) are nothing more than attraction and repulsion. It is evident that every wave, having sinusoidal interpretation, can only be the consequence of mutual dynamics of two opposite aspects of waving (oscillating) entity. For example, the harmonic oscillator manifests the mutual dynamics of its kinetic and potential energies. All forces (interactions) are nothing more than attraction and repulsion. We only need to find how these basic interactions can manifest in various forms.

2. All material objects represent bound forms of energy, so their basic constituents must be the mutually bounded quanta of energy = photons = quantum dipoles (+/-). The elementary particles cannot be the point-like units without any internal structure, as their different qualities (charge, spin, amount of mass and energy) can be only the consequence of their different structures of bipolar relations +/- .

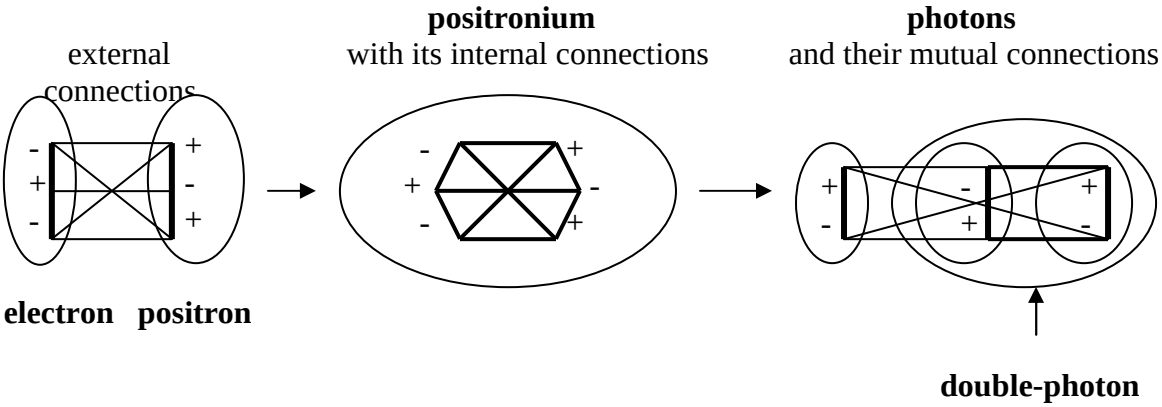
Contemporary fundamental theoretical physics, not knowing the simple truth about the object of its interest, is doomed to create mysterious science-fiction theories having nothing common with reality. For experimental testing of their “predictions”, e.g. looking for Higgs boson to save the Standard Model or heavy super-symmetric partners of known particles to confirm the string theories, the enormous amount of money and effort is needed, which could be used much more effectively for solving the important problems of people. It is time to stop this absurd madness by detecting the real truth of existence which is simple and evident. We do not need to create untestable axiomatic assumptions like eleven dimensional space-time or undetectable virtual bosons like gluons or intermediary bosons W^+, W^-, Z, gravitons as well as quarks. We need only the deep logical and dialectical thinking for clear understanding the deepest nature of reality. There is no interpretational problem like that in quantum theories. No reality is hidden for our understanding. Only positivism, post-positivism, instrumentalism and irrationalism of contemporary theories complicate the situation more and more.

Electron and Positron

As mentioned, a photon has a clear and simple structure. It is created of a single elementary quantum dipole. But it seems that sometimes it can exist in a form of interconnected double-dipole, which consists of four quantum dipoles. A photon can associate with any particles without disturbing their internal structure and so bring them into excited states. It can also associate with itself without creating a new particle. Its spin j=1 means that the intermediate state known as a positronium, created after an electron-positron collision, can decay either into two or three photons. A photon in relation to a magnetic field can deflect to the north or south magnetic poles or stay without any deflection. This means that the dipole is right-handed or left-handed, or performs both these motions simultaneously, meaning that it exists as a double-dipole, where one dipole is right-handed and the other left-handed with a neutral manifestation towards a magnetic field.

A photon can exist in a form of an elementary quantum dipole consisting of opposite poles "+" and "–" or as an associated composition of two "+" and two "–" poles. The basic structure of the electron is created of one positive and two negative poles (+/2-), so the electron consists of two quantum dipoles. Its structure can be excited by associated photons.

The collision between an electron (+/2-) and a positron (2+/-) and the consequent decay of an intermediate positronium into two or three photons, can be illustrated by the following scheme:



Vacuum

Apart from very short quantum connections (dipoles) responsible for material form of matter – particles like photons, electrons, protons and neutrons, as well as atoms, molecules, compounds, there are long and very long quantum connections that interconnect material objects and that are not available for the detection by our material instruments. They create a spatial vacuum and manifest themselves by gravity connecting the cosmic objects

We distinguish the vacuum in atoms, molecules and interstellar spaces. So a vacuum is a link of particles in atoms as well as celestial bodies. 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 know that the nature of the vacuum is the same as the essence of any other form of matter. The length of 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 an elementary quantum of space.

The vacuum created by long quantum dipoles represents the external quantum field that can manifest itself in various forms. If it represents the connections between electrically charged particles, it creates the electrostatic field. If it connects material bodies, it represents the gravitational field. If it connects the particles in atomic nucleons, it represents the field of strong and weak interactions.

Micro-world

Mutual connections between + and – poles permit the creation of their relative individual compositions like particles, atoms, molecules and higher material structures. At the same time they are the medium of all known interactions – electromagnetic, strong, weak and gravitational.

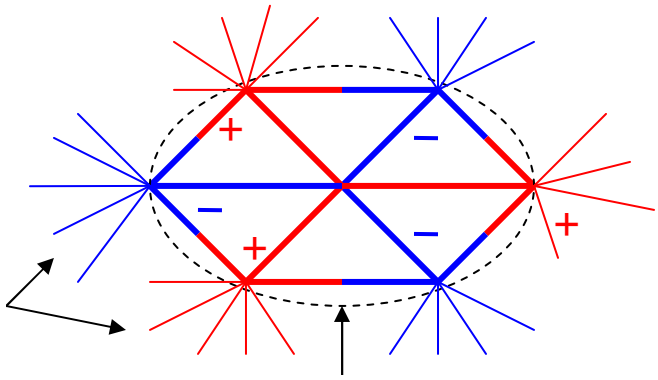
Dynamics of mutual action of quanta and their compositions cause some connections to weaken and become loose and others to intensify. In this manner, some particles can decay by the release of their intrinsic connections and others can join by intensification of their mutual connections. In these processes of aggregating and disintegration of relatively stable compositions, a repartitioning of positive and negative anti-poles can occur that positive poles prevail in some compositions (particles) and negative poles - in others. Particles 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. The basic elementary particle has only one connection between poles + and -. It is the elementary quantum of radiation – a photon. Its specific is the immediate mutual pulsation-oscillation of its anti-poles. The photon is a harmonic oscillator that during flight develops its oscillations into waves. The mutual connections of anti-poles in more composite particles make their motion more complicated.

Every particle is completely defined by the number of positive and negative poles and the intensity (energy) of their connections. This intensity defines their length and form of their mutual motion. These intrinsic properties of particles are manifested outwards as charge, mass, spin, magnetic momentum and so on.

The quantum dipole is an elementary discrete quantum of matter as well as the connection of anti-poles. So it represents discontinuity as well as continuity of matter.

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 created of nine internal quantum connections

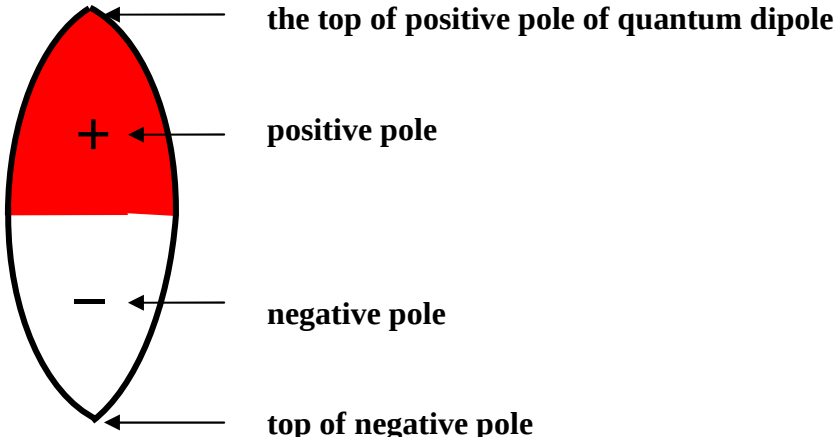
During the creation of more composite structures out of simple ones, for example the synthesis of nucleons into the atomic nucleus, not only a simple shortening of mutual external connections occurs but at the same time energy releases in a form of separated quantum dipoles. Energy drifted during synthesis by the leaving particles, for example photons, represents the difference between the energy of separate nucleons and the energy of created atomic nucleus and is named the binding energy of nucleus.

The contemporary world of discovered particles and interactions is huge and constantly increasing. Some particles as structures of quantum dipoles appear during collisions with a huge energy for only a very short time and decay in a moment. They are so-called resonances – particles with composite, high energetic and unstable intrinsic structure of quantum dipoles, which are doomed into immediate decay. The way of accretion of energy in accelerators does not lead to the detection of the essence of matter but only to production and detection of other short-living resonances. The deeper essence of matter than the elementary bipolar connection of anti-poles does not exist.

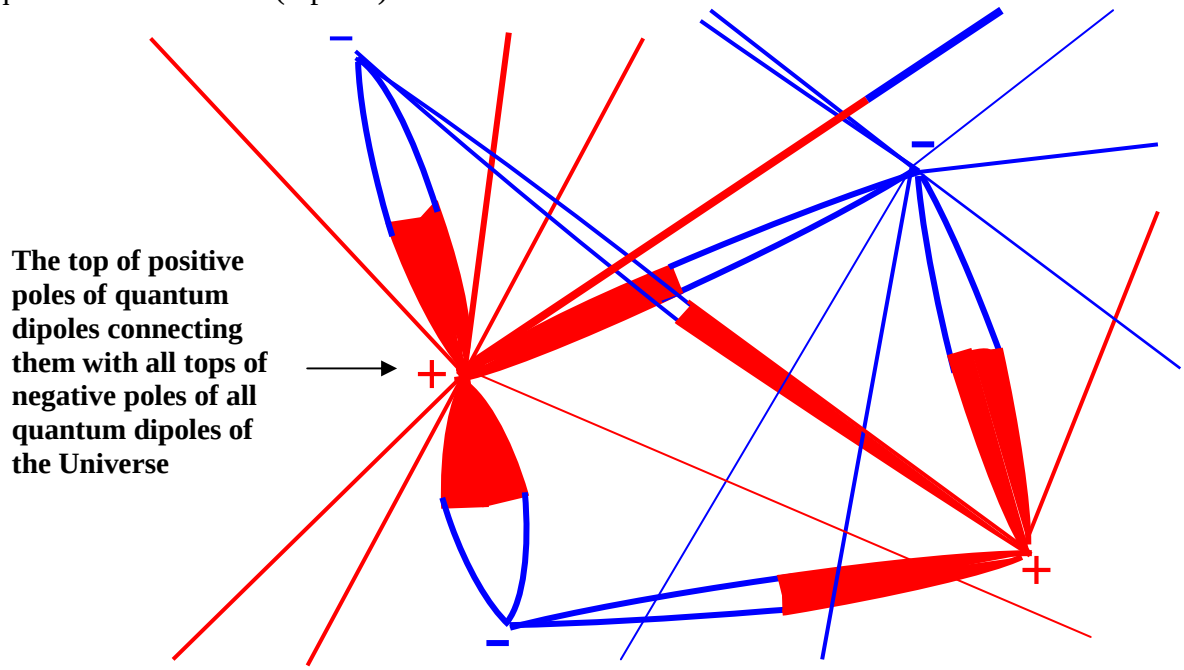
Let us analyse why particles with considerably composite structure of quantum connections of anti-poles are considered to be elementary particles. Such a particle cannot be simply divided into two or more elementary particles of which the initial particle consists. Particles rising after decay of the initial particle are not its simple sum. So, why do we pretend that the atom consists of protons, neutrons and electrons and is not an elementary particle but compound one? It is because in the structure of atom, we can distinguish the strong inner connections creating its parts - proton, neutron and electron, from weaker and longer external (vacuum) connections between these parts, differing and at the same time joining them. This separation of intensive (short) and weak (long) connections enables us to select and see relatively independent structures in the whole structure of the atom. Weaker and longer quantum connections create a vacuum in atomic structure. If such a separation cannot be accomplished, then considerably composite structures act as elementary particles although only a quantum dipole is a real elementary particle. Every material structure – particle represents the specific intrinsic composition of quantum dipoles with its own amount of energy, length and inner motion. As such a structure – quality – is universally connected with the whole Universe its inner nature manifests itself by its mutual interactions with all surroundings. So, this intrinsic nature completely manifests itself outwards. The universal unity of everything with everything does not allow the existence of something that can exceed this universal connection and remain an untouchable and unknowable Kant´s “thing-in-itself”. So, the deepest and the most hidden essence manifests itself outwards and becomes knowable.

Schematically we can express the quantum connection (dipole) as a connection of two points. But these two points are only the tops of anti-poles that are extended to their quantum connection.

QUANTUM DIPOLE



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

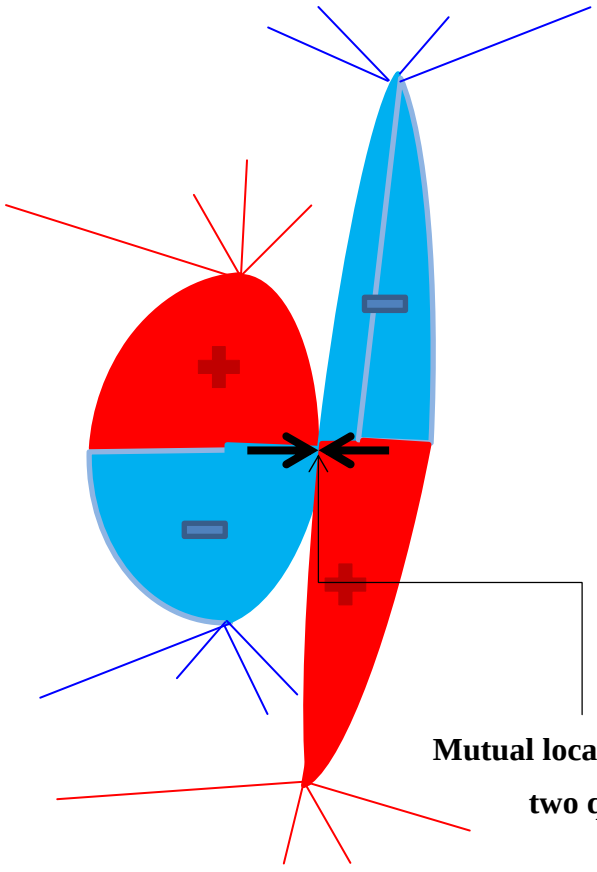


The electron is a particle with an elementary negative charge, the proton with a positive one. Immediately, the quarks with one-third or two-third charge come into mind by consideration of the elementary charge. What is the actual elementary charge – of the electron (proton) or quark? Nevertheless, the classic charge of the proton and electron is the actual elementary charge. Visually we can imagine the quantum dipole as a gassy balloon representing its space in which two charges of anti-poles are melted. If pressing such a balloons in some particles, their charges could look like divided into parts (quarks), but in reality, the real constituents of baryons (proton, neutron,…) and mesons are always the elementary quantum dipoles (+/-). The gassy balloon is the optimal visual aid for interpretation of the quantum dipole with constant volume independent of its extension or compression. The more energetic and shorter the dipole is, the higher pressure (force) of it space acts to the spaces of surrounding dipoles. Quarks cannot be selected into individual

existence, not because of their so-called asymptotic freedom, but because of their non-existence. The nucleons do not behave as compact particles by their bombardment with high-energetic electrons but as aggregations the so called partons. In spite of this, they are, as well as other particles, only specific structures consisting of internal elementary quantum connections (dipoles).

The balloon model shows how the individual dipoles (balloons) of particle act on each other by their spaces. It gives the clear answer to the question of why some particles are stable but the others are short-lived. Thanks to huge energy we can mutually approach the 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 the attractive forces of dipoles, so the particle does not decay. The stability of the particle depends on the measure of equilibrium of its forces. In less stable particles their internal motions or negligible external impulses can cause such spatial unbalance of internal forces that the particles decay. This decay looks like accidental and spontaneous but it is caused by internal motion of quantum dipoles as well as by the motion of external connections of particle with surroundings.

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.



Mutual local repulsive pressure between two quantum dipoles

Two quantum dipoles act locally by their mutual pressures, they are holders of elementary quanta of space but they differ by their lengths, the left one is shorter, stronger and more energetic, the right one is weaker, longer and less energetic (length x energy = constant).

The conception of quantum dipole like 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 directly connected with the whole Universe. Such is the dialectics of local and non-local acting. Einstein denied non-local connections but they follow from quantum physics. Local actions of quantum dipoles manifest themselves by the repulsive pressure, and the resistance as a reaction to the pressure. It is a mechanical action. The local character of mutual mechanical actions of objects looks like if non-local connections of everything with everything do not exist. It is a misery of physics that the mechanical principle of local action was transferred from classical physics to all physics and now it is a problem to explain the reason for the phenomena of non-local action in quantum physics.

Let us come back to the electrostatic fields around charged particles. We have to investigate the mutual relations between particles with equal and opposite charges. If two particles have equal charges, e.g. electrons, in which the number of negative poles exceed in one pole the number of positive anti-poles and if we imagine all connections going out of this prevailing pole to all positive anti-poles of the Universe, than the spaces of external connections of two electrons thanks to non-existence of one mutual connection, create the higher mutual resistance (repulsive pressure), the closer we push them together. The situation is contrary if particles have opposite charges, e.g. electron and proton. Then their mutual quantum connection between opposite charges attracts them the stronger the closer they are. But this approach can be made only to a certain distance where it is compensated by mutual repulsive pressure of spaces of others quantum connections going out of oppositely charged particles.

The energy needed for mutual approaching of particles with identical charges is indirectly proportional to the distance of their approach. The energy of coupling of two particles with opposite charges is likewise indirectly proportional to their mutual distance and represents the energy of quantum dipole which creates this connection of two particles with opposite elementary charges. Both energies, with almost equal value but different manifestations, represent the Coulomb potential energies.

If two particles are mutually approached to the certain distance and exceed the border 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 soon 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) occur only thanks to great energies in particle accelerators.

The weak or strong interactions are specific structures of quantum dipoles – particles, whose internal connections are much shorter and energetic than electrostatic ones. So they are able to compensate internal repulsive pressures of their spaces in stable particles. The medium of nuclear forces is represented by structures able to couple the nucleons mutually.

The material energy is either the potential for motion or the motion as such. The inner tension between anti-poles of quantum dipole is manifested by the motion of repulsion and attraction, so pulsation, rotation, vibration and oscillation. If imagine the cosmic network of quantum dipoles, where every positive pole "+" is connected with all negative anti-poles "-", we can see that it is impossible for all quantum dipoles to perform active and independent oscillation. Some dipoles provide free oscillations, others reflect a motion of oscillating neighbours, but cannot freely oscillate and only hold their potential for this motion which can be manifested by appropriate opportunity, for example, if they are selected as separate

quantum dipoles – flying oscillating photons. Motion and potential for motion of internal quantum dipoles in selected particle create its intrinsic energy that manifests itself as its internal mass. The external kinetic energy of moving particle is represented by changing of the length of its external connections with surroundings. Every quantum dipole disposes of its energy which can be manifested in two forms – in a form of tension to motion (potential energy as a consequence of attraction between anti-poles) and in a form of mutual motion of anti-poles (internal kinetic energy as a consequence of attraction and repulsion of anti-poles manifested by oscillation, rotation, vibration of elementary quantum).

Elementary quantum dipole as elementary holder of space quanta so represents the etalon of volume of space, because there is no more elementary part of the Universe. The volume of space is so defined by the number of elementary quantum relations (connections, dipoles) and increases proportionally to their number. Separate quantum dipoles nevertheless differ quantitatively from one another. The energy, as a measure of intrinsic motion of their anti-poles, is a characteristic that allows their distinguishing. Their differentiation in this characteristic needs other characteristic that as a counterbalance returns this differentiation into unity. This characteristic is the length $\mathbf{d_i}$ which in conjunction with energy $\mathbf{e_i}$ gives the same value for every elementary quantum dipole **i**:

$$\delta_t = e_{i.}\, d_i$$

This relation according to analysis made in my monograph „God and the Universe“[1] received the following form:

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

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

This value represents the universal law which gives the energetic and length (geometric) characteristics of the Universe into the mutual relation. This simple law is basic from which Coulomb´s and Newton´s laws follow as shown in my monograph [1] in detail.

If we talk about pulsating quantum dipole, which length continually changes, we bear in mind its maximum length occurring during pulsation. 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.

The Relationship between Force and Energy

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

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

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

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

we get the relation:

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

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

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

It is the classical Coulomb law expressing the dependence of attractive force, acting between elementary electric charges, on their distance. It is at the same time an expression of attractive force acting on an elementary quantum dipole with a length $\mathbf{d_i}$. This force is indirectly proportional to the square of its length.

The whole force $\mathbf{f_i}$ affecting a quantum dipole is a sum of attractive $\mathbf{f_{ia}}$ and repulsive $\mathbf{f_{ir}}$ forces:

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

and the whole energy $\mathbf{e_i}$ of a quantum dipole is a sum of its attractive $\mathbf{e_{ia}}$ and repulsive $\mathbf{e_{ia}}$ parts:

$$\mathbf{e_i = e_{ia} + e_{ir}} \text{ , where } \mathbf{e_{ia} = e_{ir}}$$

The relation of attractive and repulsive forces of a free quantum dipole, e.g. photon, is manifested by its oscillation. The repulsive force in a bound quantum dipole is expressed by the pressure of its space on neighbours as well. The negligible part of repulsive force of every quantum dipole is used for cosmic expansion by expelling of new elementary quantum connections during elementary quantum jumps of the Universe.

Electromagnetic Force

The long quantum dipoles, as connections of material objects, are affected by attractive forces of their anti-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 $\mathbf{k_1}$ positive and $\mathbf{k_1}$ negative poles and the second one - $\mathbf{k_2}$ positive and negative ones. The whole number of elementary

quantum connections between two objects is $\mathbf{2k_1k_2}$. So the whole attractive force $\mathbf{f_a}$ between both objects is a sum of attractive forces of all mutual quantum connections. If **d** is an average length of quantum dipoles**,** the next relation is valid:

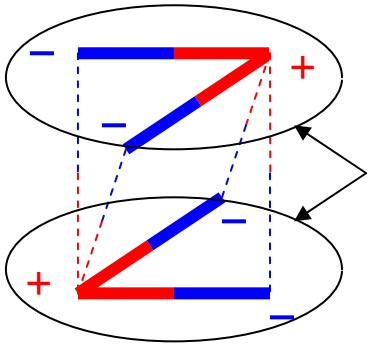
$$\mathbf{f_a = (\alpha hc/2\pi).2k_1.k_2\ /d^2 = (\alpha hc/\pi).k_1.k_2\ /d^2}$$

This relation expresses the electrostatic attractive force between two electrically neutral objects and is directly proportional to the number of quantum dipoles connecting them. But, as we know, there is no attractive electrostatic force between electrically neutral objects. This force can be identified only if these objects are electrically charged and it is proportional to the conjunction of their charges. Indeed, this force affects all quantum dipoles connecting two material objects, but is fully compensated by the repulsive spatial pressures of quantum dipoles coming out of these objects, so it looks like if there is no attractive force between them. If two objects are oppositely charged with charges $\mathbf{q_1}$ and $\mathbf{q_2}$, the attractive forces affecting their direct quantum connections are not fully compensated by pressures of outgoing external quantum dipoles, and so their 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 by electrostatic repulsive force directly proportional to the conjunction of their like charges. The fact, that the same Coulomb relation is valid for expression of attractive and repulsive forces, proves that the attractive force of quantum connections between opposite charges of charged objects is nowise compensated. It means that this force represents the full attraction of $\mathbf{q_1.q_2}$ elementary quantum dipoles and formula for the attractive force of elementary quantum dipole is the same as the relation for the attractive force between two bodies with elementary opposite electric charges. This statement will be clearer after the following explanation.

In oppositely charged objects with charges $\mathbf{q_1}$ and $\mathbf{q_2}$ the number $\mathbf{q_1.q_2}$ represents the prevalence of elementary quantum connections above their number between electrically neutral objects, where attractive forces are in equilibrium with repulsive ones. So the attractive force of $\mathbf{q_1.q_2}$ quantum connections represents the total attractive force between both oppositely charged objects. In objects with like charges $\mathbf{q_1}$ and $\mathbf{q_2}$ the number $\mathbf{q_1.q_2}$ represents the deficiency of elementary quantum connections in compare with their number between electrically neutral objects, where attractive forces are in equilibrium with repulsive ones. So the attractive force of $\mathbf{q_1.q_2}$ quantum connections represents its deficiency between both like charged objects and so it is equal to the total repulsive force between both like charged objects.

Although Coulomb´s law is the same for expression of attractive and repulsive electrostatic forces, their reasons are different. The reason for attractive electrostatic force lies in non-local mutual attraction between opposite poles of quantum dipoles. The repulsive electrostatic force is caused by local repulsive pressures of quantum dipoles as a consequence of deficiency of mutual non-local quantum connections.

The indirect evidence for this statement is an existence of 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 a structures consisting of quantum dipoles with positive and negative poles. By low temperature, when the kinetic motions are very slow, the 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 the structures with one positive and two negative poles. The bound state of two electrons creating a Cooper´s pair can be pictured:



The BCS theory, by explanation of superconductivity, supposes the existence of a hypothetical particle – phonon which mediates the attractive force between two electrons. Application of this non-existing particle is a consequence of unknowing the direct elementary quantum connections between electrons.

Cooper´s pair represents such a mutual configuration of two electrons (in quantum physics interpreted by their opposite spin**)** that the mutual attractive forces of opposite poles can compensate the repulsive mutual pressures of quantum connections coming out of negative poles.

Casimir´s phenomenon is another evidence for existence of attractive electrostatic force between neutral objects. This force acts between two neutral conducting plates. If approach them closely, the mutual attraction, known as Casimir´s attractive force, starts to act. Quantum physics try to explain its existence by vacuum fluctuation, when during permanent creation and extinction of virtual pairs of particles and antiparticles, the very small distance between two plates limits the possible wavelengths, what means, that the number of virtual particles and antiparticles in an internal vacuum between plates is less than in external one, so the external overpressure occurs and presses the plates together.

But in reality, this effect means, that the attractive forces between quantum dipoles, connecting both closely approached plates, are greater than repulsive spatial pressures of quantum connections, coming out of them.

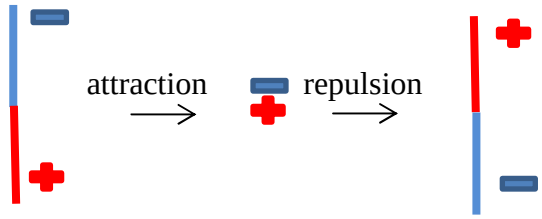
There is no principled difference between electromagnetic force and others like strong and weak. They differ only by their intensity. In stable particles, the strong and weak forces are created by very short and energetic elementary quantum connections which can effectively compensate the great repulsive pressures of their spaces. The electromagnetic interactions can be converted into the strong ones, if the barrier of huge repulsive pressures is overreached by a close approach, where the long connections are dramatically shortened and attractive forces increased.

It is remarkable that contemporary theoretical physics explains any form of interaction as an exchange of virtual particles moving by the limited speed through the vacuum. But the nature of vacuum is not explained. It is only a background for moving virtual particles which are at the same time the carriers of field quanta. But the 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 vacuum are created by elementary bipolar quantum connections through which all interactions are directly mediated. So we need no any background arena for all interactions. Vacuum does not create the virtual particles and antiparticles. It is just a network of direct elementary connections carrying all known interactions between physical objects.

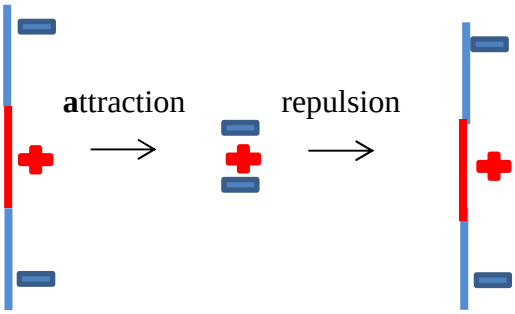
Strong Interaction

Before analysing the strong interaction we will imagine the structures of all stable particles, which 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 (+/-) created by one oscillating quantum dipole:

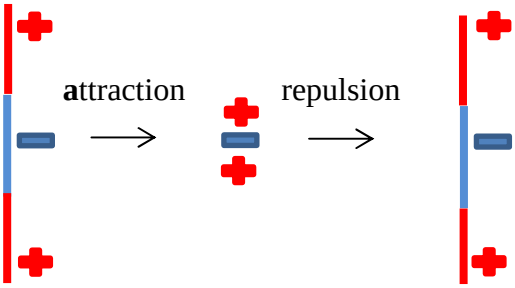


Electron e^- (+/2-) created by two quantum dipoles:

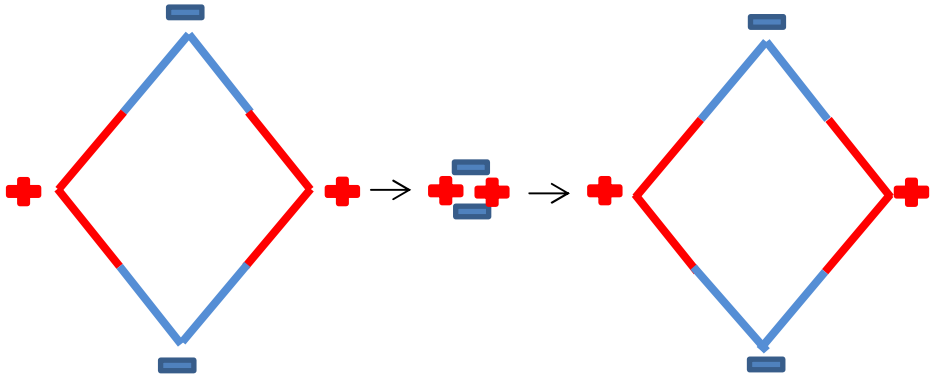


Muon and **Tau** have the same structure as an electron, only they are much more energetic and so shorter. They are unstable and change into electrons by transferring their energies into surroundings. As it will be explained later, they do not decay into an electron, neutrino and antineutrino as accepted in the Standard Model.

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

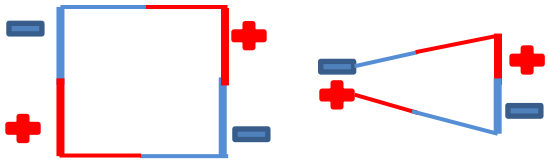


Neutrino ν_e (2+/2-) created by four quantum dipoles:



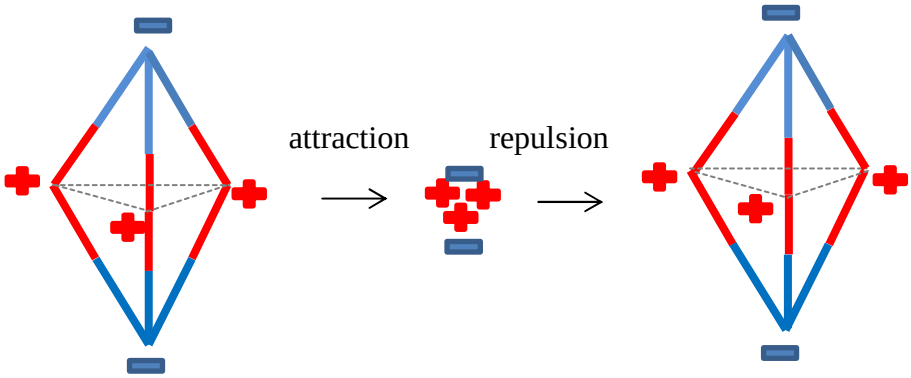
If a neutrino really exists, it represents the double-photon structure with a specific internal motion. From this scheme is evident that the neutrino is its own antiparticle, so neutrino and anti-neutrino represent the same particle with above structure and motion. As the neutrino oscillates in one plane as well as a photon, it does not resist its dragging by cosmic expansion and so it has no rest mass and its speed is **c**.

The same structure of quantum dipoles as neutrino also other structures can have, e.g. double photon, mesons, neutral pions, but their internal motion is not so simple, so they do not represent the stable structures. For example:



This structure has two different centres of oscillation with different phases.

Proton p^+ (3+/2-) created by six elementary quantum dipoles:

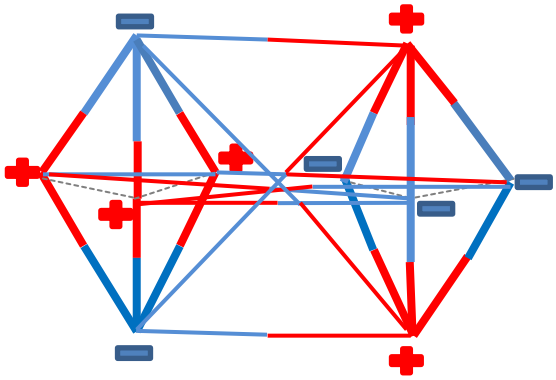


All very stable structures (particles) oscillate in one line (axis of oscillation) to the one common centre (during attraction). All dipoles of a proton are very energetic (short and strong) so their forces of mutual attraction and repulsion are so strong that can compensate the mutual local repulsive pressures of spaces of quantum dipoles in such a way that the proton is the most stable composite structure. If structures are more complicated and composite, the

mutual local pressures of dipole spaces destroy their compositions in the moment of their creation (so called resonances). From the structure of a proton with three tops of positive poles is evident why the experiments in electron-proton scattering found that electrons scattered off three points inside the proton. It is not because of a quark structure but the bipolar essence of a proton.

The proton can be destroyed only by its annihilation with an antiproton.

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



Proton and antiproton represent the mutual mirror images so they attract each other very strongly creating the temporary high energetic composite structure of protonium (5+/5-), which, thanks to huge local repulsive pressures of dipole spaces, completely destroys the original structures of proton and antiproton with a definite release of 5 free photons **γ** at least. Of course, more photons are possible, because of excitation of initial particles before annihilation.

In the structure of "protonium" **(5+/5-)** or **(6+/6-),** if excited by one photon, we can see some other substructures, which correspond to some mesons, so we can interpret the annihilation as follows:

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

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

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

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

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

Contemporary theoretical physics supposes protons, neutrons and unstable baryons to consist of three quarks, while mesons of quark-antiquark pairs interacting by gluons. The quark model was invented to simplify the situation with a huge number of hadrons (baryons

and mesons). Although it can help a little with classifications of these particles, it is totally wrong by explanation of the real essence of micro-world.

If idealisation of particles in electromagnetic theory QED by point-like entities with the virtual photons as intermediaries of electromagnetic interaction could be accepted with a certain criticism, the quark model of hadrons cannot be accepted at all.

The greatest problems of quark model are quite clear. Quarks cannot exist as individual entities, cannot be ever detected directly, they have unbelievable so-called "asymptotic freedom" and nobody can explain what is the reason for their different colours, flavours and other very strange qualities.

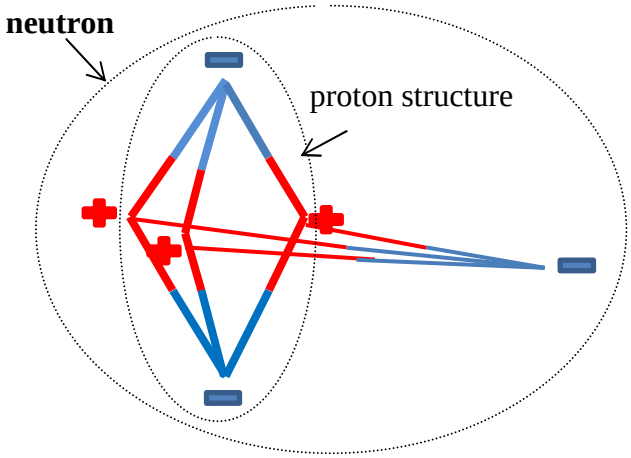
Let us look at how the quark model explains the decay of a neutral pion $\boldsymbol{\pi^0}$:
"The $\boldsymbol{\pi^0}$ (neutral pion) is a quark – antiquark meson. The quark and antiquark can annihilate; from the annihilation come two photons."

We can see clearly how the quark model complicates the very simple situation: We know that the pion decays into two photons. Why do we need the quark-antiquark annihilation in addition? Why do we not accept the pion as a bound state of two photons? Why photons, as elementary quanta of free energy, are not considered to be the basic constituents of all physical structures (particles and interactions)? Why do we not try to understand and detect the real nature of a photon but create so absurd constituents - quarks? Why do we complicate the situation so much if the truth is very simple?

Now we definitely know that the neutral pion $\boldsymbol{\pi^0}$ **(2+/2-)** represents the bound state of two photons and so its internal structure consists of four mutually interconnected quantum dipoles. We do not need any mystical undetectable quarks as we have real photons. Nothing is hidden for our understanding of the real world and no mysteries lie in the essence of the physical Universe, only a simple truth!

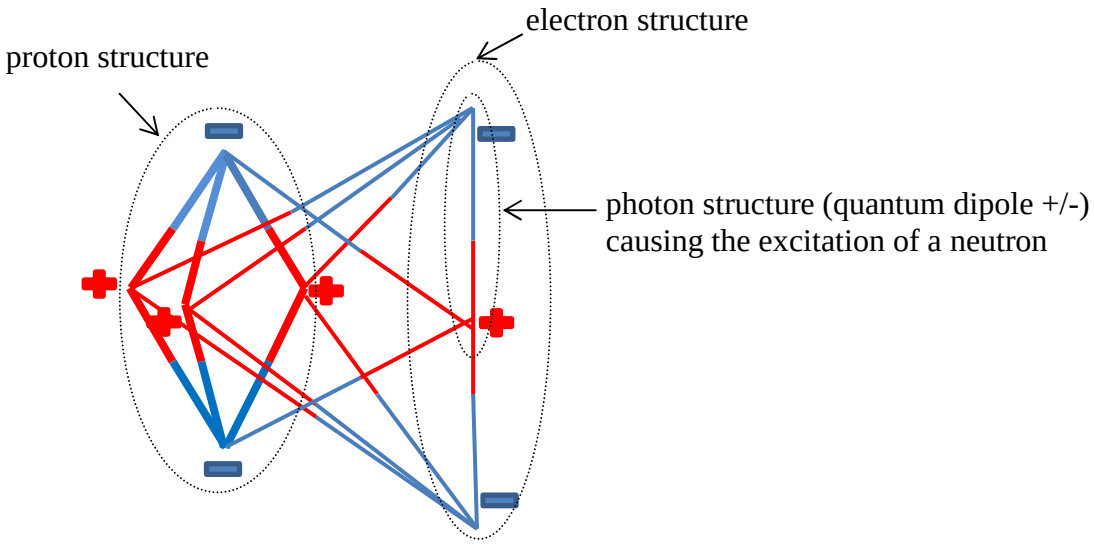
Weak Nuclear Interaction - Neutron Beta Decay

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



Inside the neutron we see 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.

Neutron n (4+/4-) in its excited state created by 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 neutron structure. If the proton

and electron represent separate particles (e.g. in the structure of hydrogen atom), their mutual connections (being much longer and weaker) are external and represent their mutual vacuum or 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.

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

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

"$n + \gamma$" 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:

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

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

Although a neutrino is not detectable during β^- decay its hypothetical existence was predicted as it seemed that some energy was missing and conservation of momentum, as well as angular momentum, was violated. Emitted electrons have a continuous kinetic energy spectrum, ranging from 0 to the maximal available energy of a few tens of MeV. A typical value is around 1 MeV. This continuous spectrum looks strange from the view-point of quantum theory. But continuous spectra of kinetic energy of electrons can be simply explained if accept that neutrons, before their decay, are excited by photons with any value of energy of continuous spectra, so the resulted electrons can also have kinetic energy of continuous spectra.

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

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

Our doubt about a neutrino as a product of beta decay without previous excitation of a neutron by photons follows also from the following consideration:

As emitted electrons have a continuous kinetic energy spectrum, if we want to receive the discontinuous energy spectrum, we must accept that energy carrying by a neutrino has also a continuous spectrum. But as the neutrino has no rest mass, we must accept the existence of neutrinos with internal energies of any value of continuous spectra, what means that their essence is analogical to that of photons, what is possible as neutrinos represent the bound states of two photons. Contemporary assumption of a neutrino having a negligible rest mass means that the quantum dipoles creating the structure of neutrino must be very long. But in that case the neutrino cannot have its unbelievable property of easy penetration through matter.

Continuous spectra of photons exciting the structure of neutrons cause their decay by emitting electrons with energies of continuous spectra. The rule of the Standard Model that the lepton number must be conserved is wrong and artificial as we can see clearly that the electron can be a substructure of an excited neutron. Only the charge number must be conserved as well as the number of nucleons (protons and neutrons), because proton is very stable and cannot be destroyed (except of annihilation), it can only be excited by an electron to the form of a neutron, which can again decay into a proton and an electron.

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

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

excited neutron

Neutrinos before and after decay have different energy and momentum. The above mentioned scheme of β^- decay shows that neutrinos can easy interact with matter by a weak force. This looks much more likely than supposed very rare interaction of neutrinos with rest matter. In this case neutrinos behave like photons exiting the initial neutrons before they decay. So we suppose that β^- decay of a neutron can exist in two forms. If a neutron is excited only by one photon then the neutrino cannot be a product of decay. Only if a neutron is excited by three photons (or one photon and one neutrino) then the neutrino can occur as a product of beta decay. This could be the reason why the production of solar neutrinos is three times lower than predicted by the Standard Model. According to our understanding it looks very likely that only one of about three β^- decays produces a neutrino (in our understanding the double photon). So no neutrino oscillation is needed.

According to the Standard Model three types of neutrino (electron, muon and tau) can exist with quite different energies (flavours) and they can mutually change into one another, so oscillate. We do not deny that neutrinos can exist in different energetic states like photons can, but only an electron neutrino represents the stable state (like electron), other states are unstable and change into an electron neutrino. We cannot accept the Standard Model interpretation that the muon and tau decay into an electron, neutrino and antineutrino. If some particle decays into others, they must represent structural constituents of initial particle before its decay. But the neutrino and antineutrino hardly could be structural constituents of muon and tau, which internal structures are very simple, like electron one. The **muon** μ^- and **tau** τ^- are only much more energetic versions of an **electron** e^-, they are unstable and after a very short time they convert into electrons by transferring their internal energies into their external quantum connections with their external surroundings (vacuum). Of course, electron can be excited by photons, so muon and tau can, being the excited states of an electron.

It is very strange that the Standard Model accepts neutrino oscillations, but does not accept the muon and tau to be only more energetic versions of an electron. So they do not decay, only change into one another. There are no muon and tau neutrinos as products of muon and tau decays. Only pions represent more complicated structures, so they decay. Pion $\boldsymbol{\pi^0}$ **(2+/2-)** decays into two photons $\mathbf{2\gamma}$. Pion $\boldsymbol{\pi^-}$ **(3+/4-)** consequently can decay in one muon $\boldsymbol{\mu^-}$ **(+/2-)** and neutrino $\boldsymbol{\nu}$ **(2+/2-)**. Muon $\boldsymbol{\mu^-}$ consequently changes into an electron $\boldsymbol{e^-}$. Pion $\boldsymbol{\pi^+}$ **(4+/3-)** can decay into one muon $\boldsymbol{\mu^+}$ **(2+/-)** and a neutrino $\boldsymbol{\nu}$ **(2+/2-)**. Muon $\boldsymbol{\mu^+}$ then changes into a positron $\boldsymbol{e^+}$ which annihilates with the nearest electron. Pions have structures analogical to these of excited protons $\boldsymbol{(p^+ + \gamma)}$ or antiprotons. We have shown why protons are such stable. The difference between positive pions and protons is in different mutual motions of their internal quantum dipoles and their different energetic contents. Positive pions are less energetic than protons (about seven times lesser) so their quantum dipoles are not enough strong to save the structure from its immediate decay. But the indirect evidence for the similarity between proton and positive pion structures is their similar momenta. The structures of a proton (3+/2) while excited (4+/3-) is analogical to the structure of a positive pion $\boldsymbol{\pi^+}$ (4+/3-). While proton is very stable, pion decays immediately into a muon $\boldsymbol{\mu^+}$ and a neutrino $\boldsymbol{\nu}$**.**

It is supposed that the universe bathes in a sea of neutrinos $\boldsymbol{\nu}$ **(2+/2-)**. If they can easily penetrate through matter they must consist of short and energetic quantum dipoles having no rest mass. They are searched in various detectors based on their indirect detection in the so called inverse processes.

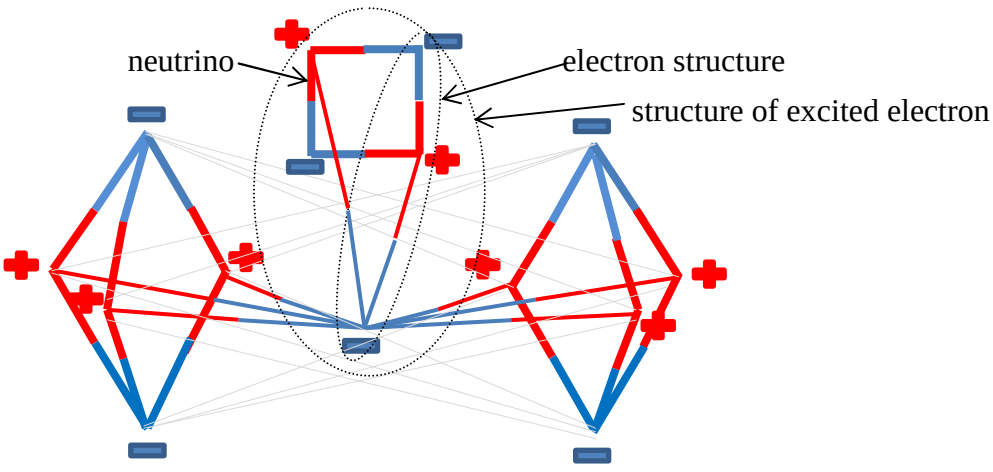
One of them is the Sudbury Neutrino Observatory (SNO) consisting of a 1000 metric ton bottle of heavy water suspended in a larger tank of light water. The apparatus is located in Sudbury, Ontario, Canada at a depth of about 2 km down in a nickel mine. A 18 m diameter geodesic array of 9,500 photomultiplier tubes surrounds the heavy water to detect Cherenkov radiation from the neutrino interaction which dissociates deuterium $\mathbf{d}$:

$$\boldsymbol{\nu_e + d \rightarrow p^+ + p^+ + e^-}$$

High speed electron produces Cherenkov radiation

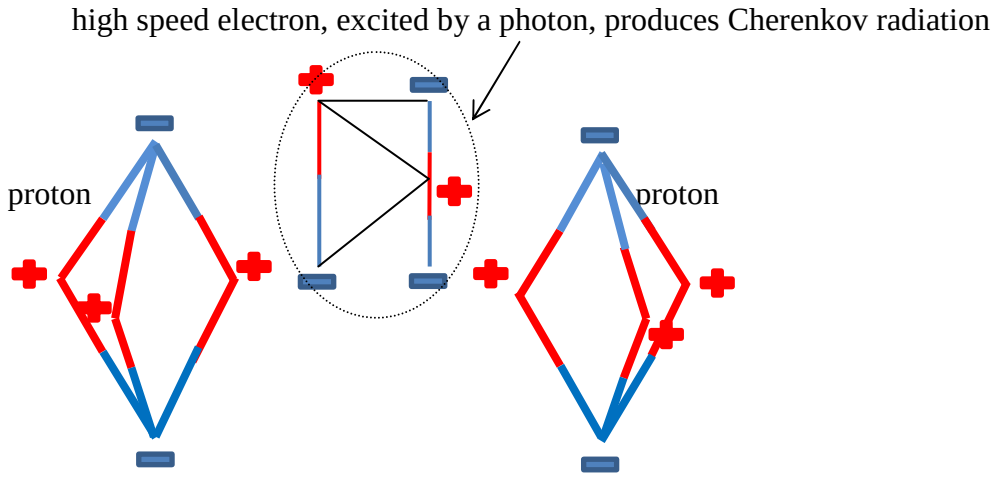
This interaction can be imagined:

Deuteron (6+/5-) – a nucleus of deuterium before dissociation:



According to this scheme the neutrino, by its interaction with a deuteron, catches one negative pole "-" from its structure destroying it into two protons and then flying away in a form of excited electron by a high speed causing Cherenkov radiation.

This result can be imagined:



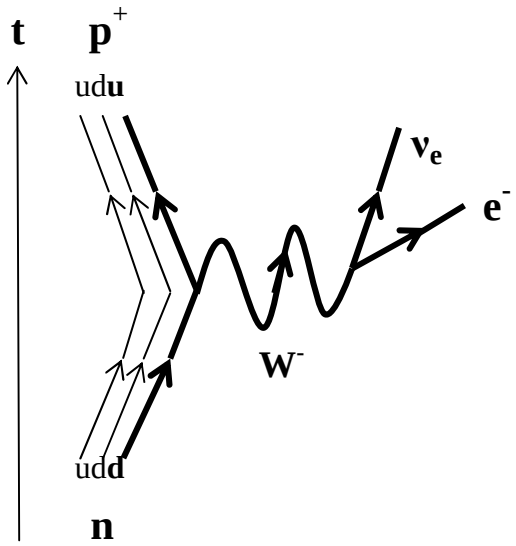
The internal quantum dipoles of a deuteron are transformed into mutual external quantum connections between two protons and one electron.

As neutrinos can be detected only indirectly, according to our opinion their role in beta decays is still opened and unclear. In any case, if we interpret all constituents of beta decay as structures of elementary quantum dipoles, the picture is very clear and simple.

But the so-called theory of electroweak interaction only complicates this situation very much. It looks that contemporary physical theories are produced not for making our understanding of reality more clear and deeper, but more unclear, complicated, incomprehensible and obscure.

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

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



Although W^- boson is virtual during β^- decay and so undetectable, its real existence is also supposed. From the structure of electron (+/2-) and neutrino (2+/2-), the compound structure (3+/4-) of W^- with 12 elementary quantum dipoles should be really possible, created by high energy collisions as a short living resonance. But W^- bosons have never been observed and are principally undetectable. Only in very rare cases, in the high energy collisions, the electrons and unobserved electron neutrinos with enormous energy of about 40 GeV are supposed to be produced by decay of undetectable W^- bosons. But it means that the neutrino with internal energy of only some MeV and zero rest mass must highly increase its internal energy to the value of 40 GeV. Introduction of monstrous principally undetectable W an Z bosons into the schemes of beta decays and their consequent search in real high energy collisions, where they are directly undetectable, represents the absurd madness of contemporary theoretical physics with its chase for pure chimeras. But this madness costs too much money and requires enormous resources. It is because of inability of a deep logical thinking, which is consequently replaced by construction of unbelievably complicated mathematical theories with infantile speculations (assumptions and axioms). Using of monstrous 80 GeV bosons to mediate low energy beta decays looks like killing the flies by atom bombs. But in contemporary theoretical physics all miracles and mysteries are possible in order not to doubt the accepted dogmas like the one that all interactions must be mediated by point-like virtual bosons!

Insertion of a virtual W^- boson into a simple picture of beta decay in order to create the electroweak theory is quite artificial and only complicates the simple situation. No virtual boson is needed, only real particles – neutron, proton, electron and maybe neutrino. No virtual processes are needed as they are principally undetectable. So, why do we need theories that predict the existence of virtual realities being principally undetectable? It is a great arrogance to claim that real detectable processes and particles manifested during decays, high energy collisions and annihilations are the evidence for existence of such principally undetectable entities like quarks, gluons and other virtual bosons, strings and others.

TEWI is one of many contemporary physical theories which are extremely speculative and only complicate the situation.

Theory of electroweak interactions tries to give together the electromagnetic interaction mediated by a virtual photon without rest mass with a weak interaction mediated by supposed

very massive W^-, W^+ and Z bosons, so the so-called Higgs mechanism is required for breaking the electroweak symmetry and giving particles their rest mass. This hypothetical Higgs mechanism requires the existence of very heavy hypothetical Higgs boson which is now searched intensively inside extremely expensive and high energy colliders like Tevatron, Fermilab or LHC. This madness should result in creation of conditions, by which all interactions become identical to the electromagnetic one represented by a photon.

We do not need any collider to explain the simple fact, that all particles and interactions represent structures of simple bipolar relations of opposite poles - quantum dipoles (+/-) manifested by real quanta of energy – photons. Knowing the nature of a photon we know at the same time the nature of all physical interactions and particles.

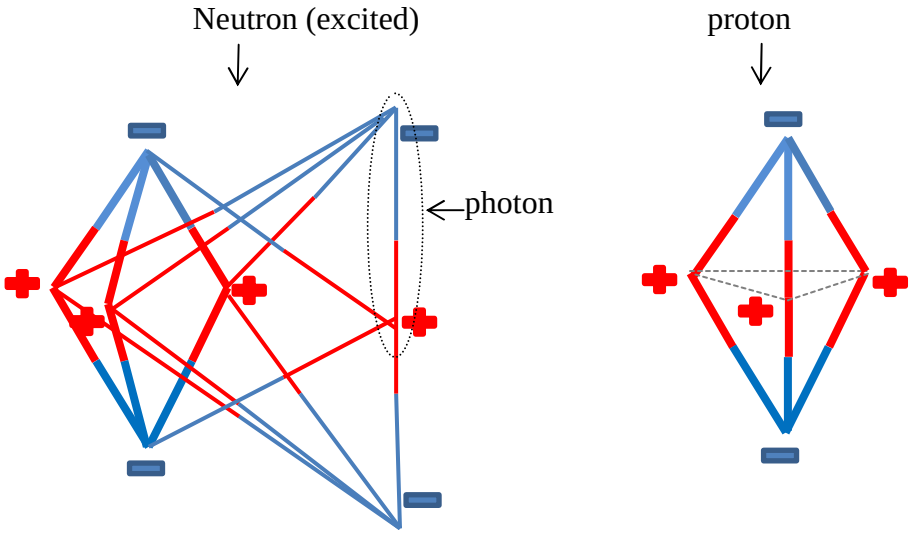
The Nuclear Force

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 which form them.

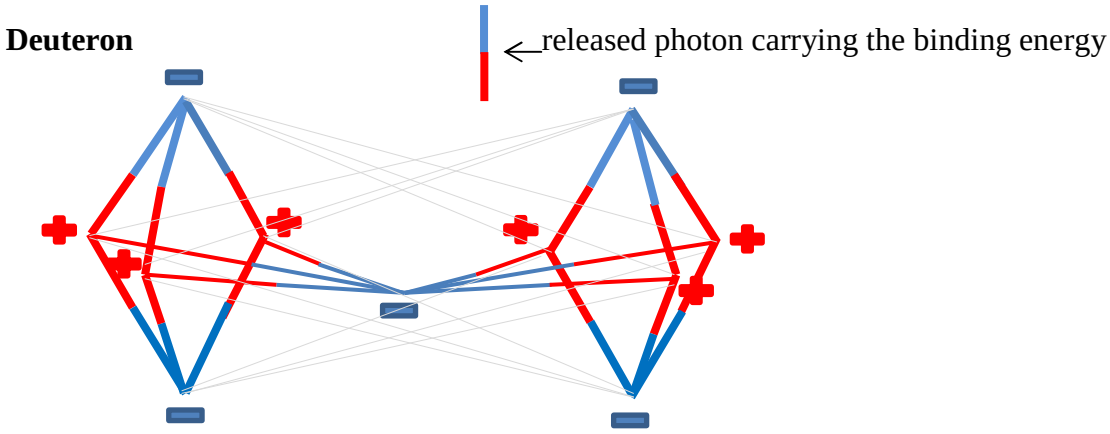
According to the contemporary quark model the nuclear force is understood to be a residual effect of the much more powerful strong force (interaction) binding quarks by gluons.

At the time before the quark model was created, the nuclear force was conceived to be transmitted by a neutral pion $\boldsymbol{\pi^0}$.

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

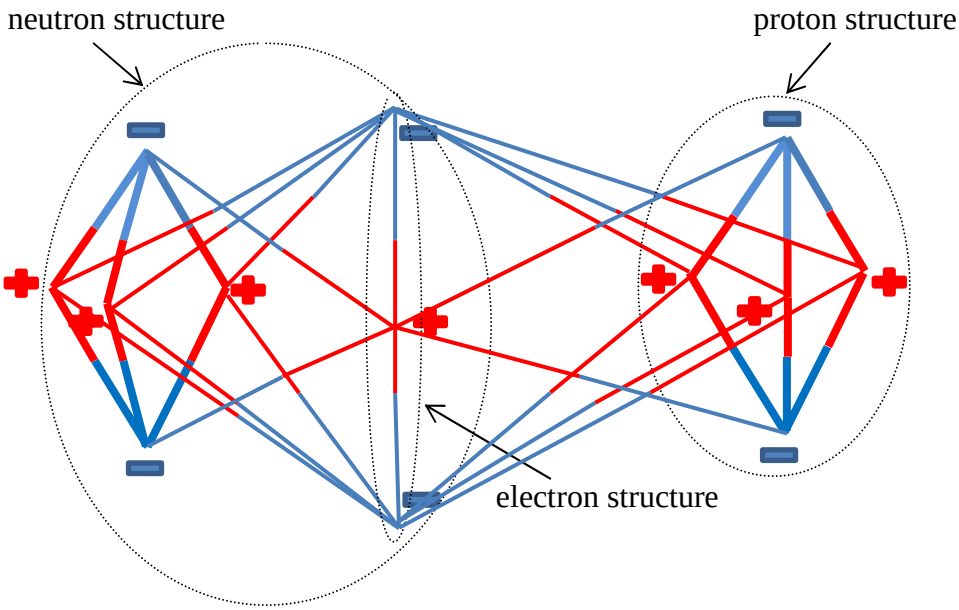


After synthesis of a proton and a neutron the photon is released taking out the so-called binding energy:



In a bound state inside a nucleus it is not clear which of components is a neutron and which a proton as the negative pole is common for both nucleons. The compound state of one proton and one neutron in a deuteron (6+/5-) consists of 30 elementary quantum connections

(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:



This excited deuteron structure (7+/6-) consists of 42 quantum connections (dipoles) - not all are imagined in the above scheme. In this structure we can see the substructures of neutron, proton, electron, but the deuteron is created not only of these structures but mainly by their mutual quantum connections being internal constituents of a deuteron. But after dissociation they become the mutual external quantum connection between two protons and one electron.

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 deuteron compositions (7+/6-) exist in heavier atoms with higher atomic numbers being sources of γ - rays during a radioactive decay. The clear evidence for this is the fact that the fusion of two nuclei with lower masses than iron generally ***releases*** energy, while the fusion of nuclei heavier than iron ***absorbs*** energy. So not only no photon is released but new free photons are absorbed in the structure of heavier nuclei.

The opposite is true for the reverse process, nuclear fission. This means that fusion generally occurs for lighter elements only, and likewise, that fission normally occurs only for heavier elements. So, only the extreme astrophysical events can lead to short periods of fusion with heavier nuclei. This is the process that gives rise to nucleosythesis, the creation of heavy elements during events like supernovas. Synthesis of heavier nuclei is possible only by extreme energies which allow to compress nuclei very close, so that the mutual quantum connections become very short and strong able to overcome their mutual repulsive pressures. The claim that binding energy of nucleons in nucleus is given by energy needed to be released during their synthesis is limited only for lighter nuclei and so cannot be a dogma, because the real binding energy of nucleons in nuclei is the energy of their mutual quantum connections (dipoles).

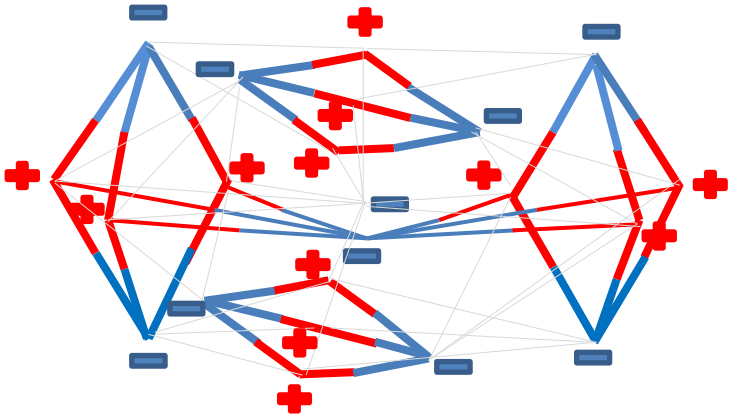
Creating the required conditions for fusion on Earth is very difficult.

The dipoles creating the internal structures of both nucleons (protons and neutrons) are very short, strong and energetic so they represent the strong forces, the quantum dipoles between both or more nucleons are weaker and represent the nuclear force connecting nucleons into a nucleus. Although the nuclear force is much weaker than the strong one, it is enough strong and short (the shorter – the stronger) to overcome the mutual local repulsive pressures between quantum dipoles.

Now we see that the nuclear force is not a residual effect of a strong force binding quarks by gluons, but it is created, as well as a strong force, of elementary quantum dipoles, the difference is only in their length and energy, where energy of a quantum dipole is inversely proportional to its length (the shorter – the stronger and more energetic).

The nucleus of a helium atom $_2\mathbf{He}^4$, named **α** – 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).

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



Not all 120 mutual quantum dipoles (+/-) are imagined in the above picture, but we can see the difference between quantum dipoles creating the internal structure of 4 nucleons (strong interactions) and their mutual nuclear interactions.

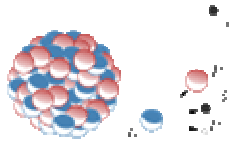
The more nucleons are in nuclei, the heavier and less stable are the atoms as the number of mutual quantum connections dramatically increases with a consequent increase of their repulsive pressures. Atoms with a huge number of nucleons (protons and neutrons) in a nucleus are unstable and can decay. This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

$$_{92}\mathbf{U}^{238} \rightarrow {}_{90}\mathbf{Th}^{234} + {}_{2}\mathbf{He}^{4}$$

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

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

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



$\boldsymbol{\beta}^{-}$ decay generally occurs in neutron rich nuclei.

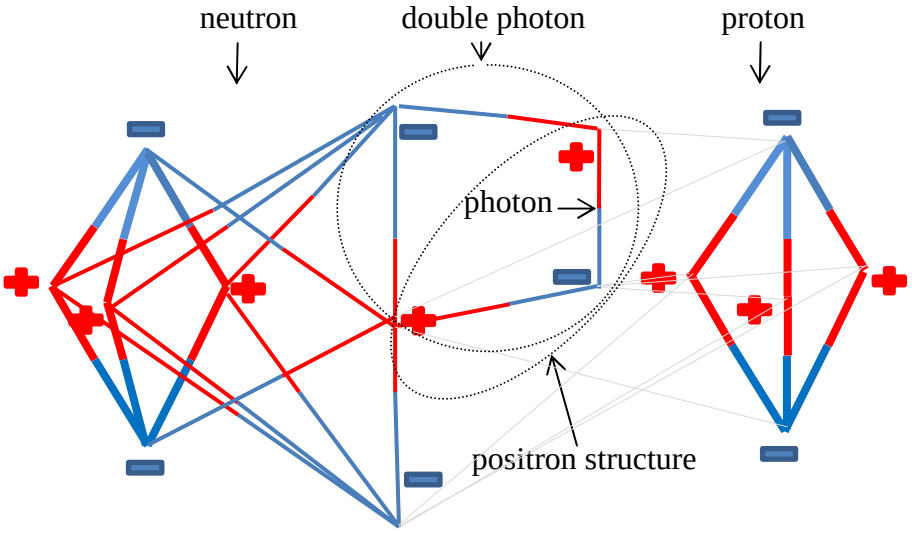
We also suppose that beta decay with a neutrino is possible only in heavier nuclei, in which the pressures are enough to create energetic neutrinos with stronger and shorter quantum dipoles than these in electrons. The decays of free neutrons run without neutrino production.

If a positron $\mathbf{e}^{+}$ is involved (**β+** decay), the number of neutrons in the nucleus increases by one and the number of protons decreases by one:

$$\textbf{energy } (\gamma\textbf{-photons}) + \mathbf{p}^{+} \rightarrow \mathbf{n} + \mathbf{e}^{+} + (\boldsymbol{\nu}_{\mathbf{e}})?$$

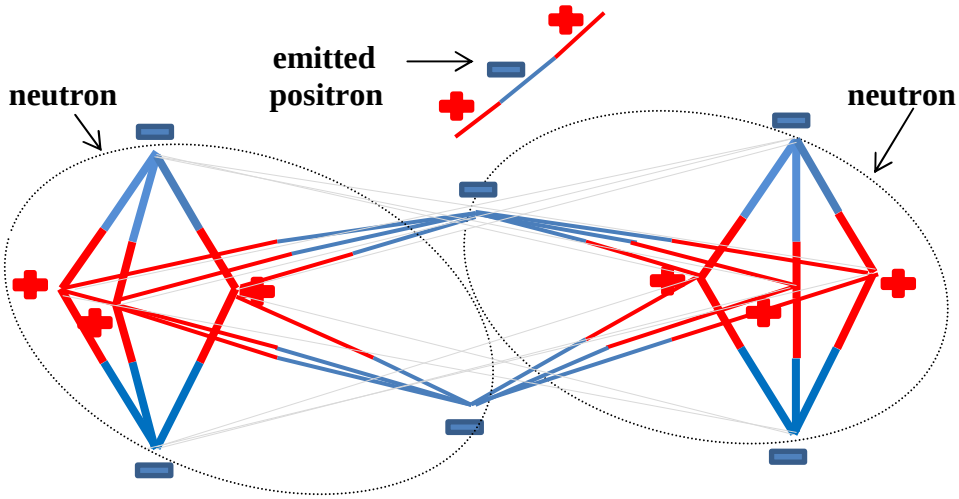
Energy is used to convert a proton $\mathbf{p}^{+}$ into a neutron **n**, while emitting a positron $\mathbf{e}^{+}$ and a hypothetical electron neutrino $\boldsymbol{\nu}_{\mathbf{e}}$. So, unlike β−, β+ decay cannot occur in isolation, because it requires energy, the mass of the neutron being greater than the mass of the proton.

The bound state of a neutron and a proton excited by one double-photon in a heavier nucleus before β+ decay:



This bound state (8+/7-) consists of 56 quantum dipoles (only some are imagined).

The result after emission of a positron e^+ in β+ decay:



The resulting bound state of two neutrons (6+/6-) in a nucleus consists of 36 quantum dipoles.

The positron quickly finds an electron annihilating each other. The above **β+ decay** is basic, having the following form:

$$2\gamma \quad + \quad p^+ \rightarrow n + e^+$$

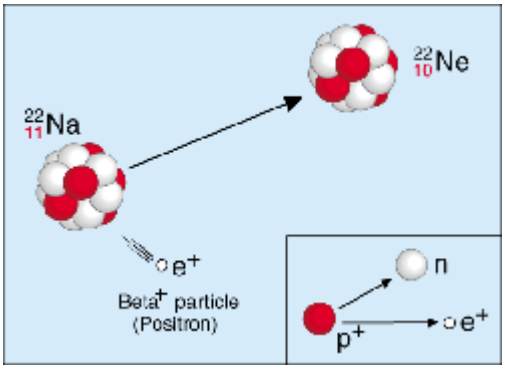
double photon

Supposed, but very unlike, neutrino production in **β+** decay is possible only if the initial bound state of a proton and a neutron is excited by 2 energetic double-photons (or neutrinos?), then:

$$4\gamma + p^+ \rightarrow n + e^+ + \nu_e$$

Of course, **β+** decay is possible only if the initial bound state of a neutron and a proton is a part of a heavier nucleus. **β+** decay usually occurs during artificial radioactivity among radioactive isotopes. For example, the excited unstable radioactive sodium **Na-22** decays into a stable neon **Ne** and a positron e^+:

$$(_{11}Na^{22} + 2\gamma) \rightarrow {}_{10}Ne^{22} + e^+$$



A process, in which a proton-rich nuclide absorbs an inner atomic electron, changing a nuclear proton into a neutron and simultaneously emitting a photon or neutrino, is known as **electron capture**:

$$\mathbf{p^+ + e^+ \rightarrow n + \gamma}$$

or (if a proton or an electron are excited by one photon):

$$\mathbf{p^+ + (e^+ + \gamma) \rightarrow n + \nu_e}$$

excited electron

Electron capture can run also without emitting any particle, so the resulting neutron is excited:

$$\mathbf{p^+ + e^+ \rightarrow (n + \gamma)}$$

excited neutron

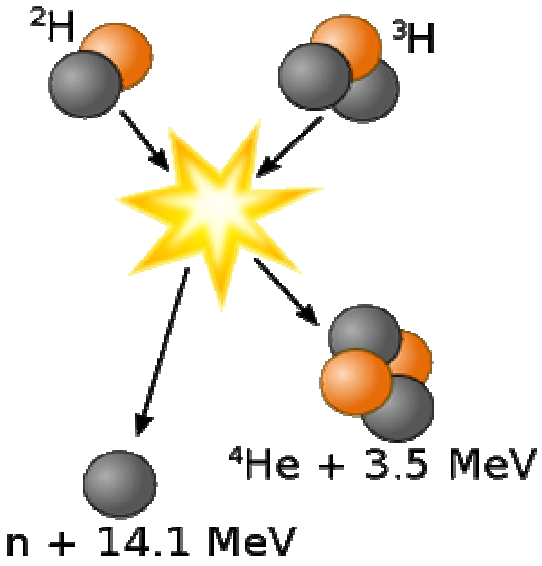
By changing the number of protons, electron capture transforms the nuclide into a new element, e.g.:

$$\mathbf{{}_{13}Al^{26} + e^+ \rightarrow {}_{12}Mg^{26}}$$
$$\mathbf{{}_{28}Ni^{59} + e^+ \rightarrow {}_{27}Co^{59}}$$

We have seen how simple is **β+** decay with emitting one positron $\mathbf{e^+}$ and changing one proton into a neutron and how extremely complicated it is according to the theory of electroweak interaction, where undetectable virtual W^+ boson borrows enormous energy from the vacuum for a very short time in order to change one up quark (charge of +2/3) of a proton into a down quark (charge of -1/3) and so converting the proton into a neutron. After making this conversion W^- boson returns borrowed energy to the vacuum and then decays into a positron and a neutrino.

In the nucleus with a big number of nucleons the local repulsive pressures of enormous number of mutual nuclear quantum dipoles between nucleons (protons and neutrons) is so high that the equilibrium between attractive nuclear forces of quantum dipoles and their repulsive pressures is very fragile and a small impulse is enough to cause the imbalance so that a radioactive decay can occur. This small impulse could be caused by excitation of the nucleus by a photon (or neutrino?), so that the number of mutual quantum connections in a whole structure of nucleus increases with a consequent increase of local repulsive pressures which overcome a little the summary attractive nuclear force causing the radioactive decay.

If the impulse is high, caused by interaction with energetic neutrons, the internal structure of radioactive nucleus of uranium increases the number and amount of repulsive pressures of quantum dipoles so dramatically that the nucleus is split in two nuclei with release of high energy particles like **α**, **β**, **γ** and neutrons, which can again cause the nuclear fission of other uranium nuclei and so generate the so-called chain reaction. On this principle the atom bombs are designed as well as nuclear reactors in nuclear power stations where the chain reaction is controlled.



The high energy can be released not only by nuclear fission of heavy nuclei, but also by synthesis (fusion) of light nuclei in thermonuclear reactions. At the picture taken from Wikipedia we can see the fusion of deuterium with tritium creating helium, freeing a neutron and releasing 17.59 MeV of energy. It takes considerable energy to force nuclei to fuse. Accelerated to high speeds (that is, heated to thermonuclear temperatures), they can overcome their local mutual repulsive pressures and get close enough for the attractive force to be sufficiently strong to achieve fusion. The fusion of lighter nuclei, which creates a heavier nucleus and often a free neutron or proton, generally releases more energy than it takes to force the nuclei together. Even when the final energy state is lower, there is a large barrier of mutual repulsive pressures that must be firstly overcome. It is called the Coulomb barrier.

To achieve extreme conditions necessary for fusion, the initially cold fuel must be explosively compressed. Inertial confinement is used in the hydrogen bomb where the driver is x-rays created by a fission bomb. Long lasted research into developing controlled thermonuclear fusion is still unsuccessful.

Thermonuclear Fusions in the Core of the Sun

The fusion of light atoms of hydrogen $^{1}H_{1}$ into heavier atoms or nuclei until atoms or nuclei of helium $^{4}H_{2}$ are produced is supposed to be generated in the core of the Sun producing at the same time high energetic photons and neutrinos.

In the process of fusion not only protons p^{+} of hydrogen atom $^{1}H_{1}$ but also their electrons e^{-} are involved. So if present the atom of hydrogen as $^{1}H_{1} = (p^{+} + e^{-})$ and the atom of deuterium as $^{2}D_{1} = (p^{+} + n + e^{-})$, then the processes of nuclear fusion are as follows:

1. $(p^{+}{}_{(3+/2-)} + e^{-}{}_{(+/2-)}) + (p^{+}{}_{(3+/2-)} + e^{-}{}_{(+/2-)}) \rightarrow (p^{+}{}_{(3+/2-)} + n_{(3+/3-)} + e^{-}{}_{(+/2-)}) + \gamma_{(+/-)}$

   $^{1}H_{1} + {}^{1}H_{1} \rightarrow {}^{2}D_{1} + \gamma$

   In the above fusion only atoms of deuterium and photons are produced.

2. $(p^{+}{}_{(3+/2-)} + n_{(3+/3-)} + e^{-}{}_{(+/2-)}) + (p^{+}{}_{(3+/2-)} + e^{-}{}_{(+/2-)}) \rightarrow (p^{+}{}_{(3+/2-)} + 2n_{(6+/6-)} + e^{-}{}_{(+/2-)}) + \gamma_{(+/-)}$

   $^{2}D_{1} + {}^{1}H_{1} \rightarrow {}^{3}T_{1} + \gamma$

   Fusion of a deuterium with a hydrogen results in the atom of tritium and a free photon.

3. $(p^{+}{}_{(3+/2-)} + n_{(3+/3-)} + e^{-}{}_{(+/2-)}) + (p^{+}{}_{(3+/2-)} + e^{-}{}_{(+/2-)}) \rightarrow (2p^{+}{}_{(3+/2-)} + n_{(3+/3-)} + 2e^{-}{}_{(2+/4-)})$

   $^{2}D_{1} + {}^{1}H_{1} \rightarrow {}^{3}He_{2}$

   Fusion of a deuterium with hydrogen can give also the helium isotope $^{3}He_{2}$

4. $2(p^{+}{}_{(3+/2-)} + n_{(3+/3-)} + e^{-}{}_{(+/2-)}) \rightarrow (2p^{+}{}_{(3+/2-)} + 2n_{(3+/3-)} + 2e^{-}{}_{(+/2-)})$

   $^{2}D_{1} + {}^{2}D_{1} \rightarrow {}^{4}He_{2}$

   Fusion of two atoms of a deuterium gives the helium atom $^{4}He_{2}$

Also other variations of fusion can run until the atom of helium is produced, e.g. tritium plus deuterium, hydrogen plus tritium, hydrogen plus proton, etc.

In the above mentioned fusions no neutrinos appear in the core of the Sun. They can appear only if some of initial components (atoms) are excited by photons, e.g.:

1. $(p^{+}{}_{(4+/3-)} + e^{-}{}_{(+/2-)}) + (p^{+}{}_{(3+/2-)} + e^{-}{}_{(+/2-)}) \rightarrow (p^{+}{}_{(3+/2-)} + n_{(3+/3-)} + e^{-}{}_{(+/2-)}) + \nu_{e(2+/2-)}$

   $^{1}H_{1\text{excited}} + {}^{1}H_{1} \rightarrow {}^{2}D_{1} + \nu_{e}$

2. $(p^{+}{}_{(4+/3-)} + n_{(3+/3-)} + e^{-}{}_{(+/2-)}) + (p^{+}{}_{(3+/2-)} + e^{-}{}_{(+/2-)}) \rightarrow (p^{+}{}_{(3+/2-)} + 2n_{(6+/6-)} + e^{-}{}_{(+/2-)}) + \nu_{e(2+/2-)}$

   $^{2}D_{1\text{excited}} + {}^{1}H_{1} \rightarrow {}^{3}T_{1} + \nu_{e}$

3. $(p^{+}{}_{(4+/3-)} + n_{(3+/3-)} + e^{-}{}_{(+/2-)}) + (p^{+}{}_{(4+/3-)} + e^{-}{}_{(+/2-)}) \rightarrow (2p^{+}{}_{(3+/2-)} + n_{(3+/3-)} + 2e^{-}{}_{(+/2-)}) + \nu_{e(2+/2-)}$

   $^{2}D_{1\text{ excited}} + {}^{1}H_{1\text{excited}} \rightarrow {}^{3}He_{2} + \nu_{e}$

Analogical are situations where not the whole atoms are involved in a fusion, but only free particles like protons, neutrons, electrons or nuclei (plasma state), where the neutrino production is possible only if initial constituents of fusion are excited by photons, e.g.:

$$(\mathbf{p}^{+}_{(4+/3-)}+\mathbf{n}_{(3+/3-)}) \; + \; \mathbf{p}^{+}_{(4+/3-)} \; \rightarrow \; (\mathbf{p}^{+}_{(3+/2-)}+2\mathbf{n}_{(3+/3-)}) \; + \; \boldsymbol{\nu}_{\mathbf{e}(2+/2-)}$$

Deuteron (excited) + $\mathbf{p}^{+}$(excited) $\rightarrow$ **Tritium nucleon** + $\boldsymbol{\nu}_{\mathbf{e}}$

Production of positrons is possible by the following scheme:

$$\mathbf{p}^{+}_{(3+/2-)} + 2\boldsymbol{\gamma}_{(+/-)} \; \rightarrow \; \mathbf{n}_{(3+/3-)} + \mathbf{e}^{+}_{(2+/-)}$$

where the positron consequently annihilates with the nearest free electron into three elementary photons and neutron, which, excited by one photon, decays again into one proton and one electron, so we have the same state as before the fusion. As production of positrons is followed by reversible process so it does not influence the fusions in the Sun very much.

Much more important is the process of creating deuterons from protons and electrons, where $\boldsymbol{\gamma}$ rays (photons) are released:

$$\mathbf{p}^{+}_{(3+/2-)} + \mathbf{e}^{-}_{(+/2-)} + \mathbf{p}^{+}_{(3+/2-)} \; \rightarrow \; (\mathbf{p}^{+}_{(3+/2-)}+\mathbf{n}_{(3+/3-)}) \; + \; \boldsymbol{\gamma}_{(+/-)}$$

proton + electron + proton $\rightarrow$ deuteron + photon

Two protons catch one negative pole from the electron creating the deuteron and converting electron into a photon. From this basic scheme we can see that the number of nucleons (protons and neutrons) is conserved, but the number of leptons cannot be conserved as the electron is converted into a photon in this fusion. So the rule of contemporary particle physics, that the number of leptons is conserved during weak interactions, is false and artificial having no serious justification. Of course, during the electromagnetic interactions the number of electrons does not change, but during nuclear interactions electrons can be destroyed as their two dipoles are much weaker and longer than dipoles creating the protons. So the rules of QED cannot be devolved automatically upon particle physics dealing with strong and nuclear interactions.

The production of hypothetical neutrinos is possible only if free photons, produced in basic fusions, are involved in the process of nuclear fusion by excitation of initial components. Now we can see the clear reason for missing solar neutrinos. No oscillation theories are needed. For production of neutrinos, no $\boldsymbol{\beta}$ decays are sufficient, only great forces compressing two elementary quantum dipoles (+/-) into a short, strong end energetic structure of a neutrino $\boldsymbol{\nu}_{\mathbf{e}}(2+/2-)$, e.g. by the following scheme:

$$\mathbf{p}^{+}_{(3+/2-)} + \mathbf{e}^{-}_{(+/2-)} + \mathbf{p}^{+}_{(3+/2-)} \; + \; \boldsymbol{\gamma}_{(+/-)} \; \rightarrow \; (\mathbf{p}^{+}_{(3+/2-)}+\mathbf{n}_{(3+/3-)}) + \boldsymbol{\nu}_{\mathbf{e}}(2+/2-)$$

proton + electron + proton + photon $\rightarrow$ deuteron + neutrino

The electroweak theory is a fictional scientific illusion that only complicates the situation leading to the wrong conclusions. Neutrinos cannot be produced in the so called weak interactions because their production requires strong pressures of nuclear forces. Only

electrons interact weakly inside the structure of a neutron, so they are released from the excited neutron during β^- decay.

In more massive stars than the Sun not only atoms and nuclei of helium but also heavier atoms are produced because of much higher pressures and temperatures. The production of new elements via nuclear fusions is called nucleosynthesis. A star's mass determines what other type of nucleosynthesis occurs in its core (or during explosive changes in its life cycle).

Massive stars greater than five times the mass of the Sun, when their hydrogen becomes depleted, convert helium atoms into the carbon and oxygen, followed by the fusion of carbon and oxygen into neon, sodium, magnesium, sulfur and silicon. Later reactions transform these elements into calcium, iron, nickel, chromium, copper and others. When these old, large stars with depleted cores supernova, they create heavy elements (all the natural elements heavier than iron) and spew them into space, forming the basic constituents for life.

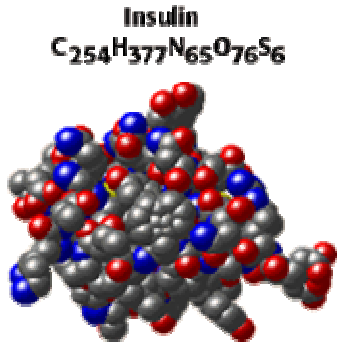
Weak Attractive Forces between Atoms and Molecules (Chemical Bonds)

A molecule is two or more atoms linked by a so called chemical bond. Molecules can contain different types of bonds. If atoms are sharing electrons, then the bond between them is covalent. If an atom gives up an electron to another atom, then they have an ionic bond.

Ions are produced when atoms can obtain a stable number of electrons by giving up or gaining electrons. For example Na (sodium) can donate an electron to Cl (chlorine) generating Na^+ and Cl^-. The ion pair is held together by strong electrostatic attractions.

Except of electrostatic attractions between atoms in a molecule there are found also other weak forces like Van der Waals bonds which are short range attractive forces between chemical groups in contact or hydrophobic attractions causing non-polar groups such as hydrocarbon chains to associate with each other in an aqueous environment, etc.

As everything interacts with everything else, there is enormous number of mutual weak quantum connections (dipoles +/-) between atoms of molecule. As attractive forces overcome a little repulsive pressures of quantum dipoles, so atoms are attracted to each other creating very complicated and composed molecules like insulin:



Insulin is a complicated molecule called a protein. Proteins are molecules necessary for life.

The intermolecular attraction between like-molecules is known as **cohesion**.

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

Quantitative Characteristics of some Particles and Interactions

According to basic cosmic characteristics derived in my monograph "God and the Universe" [1] the volume of elementary quantum dipole is:

$$\mathbf{v = V/k^2 = 4{,}99.10^{78}/1{,}29.10^{123} = 3{,}87.10^{-45}\ m^3}$$

where: **V** – contemporary volume of cosmic space
k^2 - contemporary number of elementary quantum dipoles in the Universe

Then the volume $\mathbf{Vp^+}$ of a proton $\mathbf{p^+}$ **(3+/2-)** consisting of six elementary quantum dipoles is:

$$\mathbf{Vp^+ = 6\ .\ 3{,}87.10^{-45}\ m^3 = 23.10^{-45}\ m^3}$$

The radius of a proton, if imagined by an ideal sphere, is: $\mathbf{r = (3V/(4\pi))^{1/3} = 1{,}76.10^{-15}\ m}$

The accuracy of this result is given by the accuracy of Hubble´s constant used in expressions for the volume and the number of quantum dipoles of the Universe.

This result is very close to the value of the proton's charge radius of $\mathbf{0{,}88.10^{-15}\ m}$ presented in contemporary literature**.**

Mass of a proton is $\mathbf{m = 1{,}67.10^{-27}\ kg}$. From the relation $\mathbf{e=mc^2}$ the internal energy of a proton is $\mathbf{e_p = 1{,}67.10^{-27}.9.10^{16} = 1{,}5.10^{-10}\ J}$. As proton consists of six equal quantum dipoles, the energy of one quantum dipole of a proton is $\mathbf{e_{ip} = e/6 = 2{,}5.10^{-11}\ J.}$ From the basic relation between energy and length of quantum dipole $\mathbf{e_i d_i = \alpha hc/\pi}$, we can receive its length:

$$\mathbf{d_{ip} = \alpha hc/(\pi e_{ip})}\ ,$$

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

Then the length of elementary quantum dipole of a proton is:

$$\mathbf{d_{ip} = 0{,}007297.6{,}626.10^{-34}.3.10^8/(3{,}14.2{,}5.10^{-11}) = 0{,}0185.10^{-15}\ m}$$

The strong force $\mathbf{f_{ip}}$ of one proton quantum dipole is:

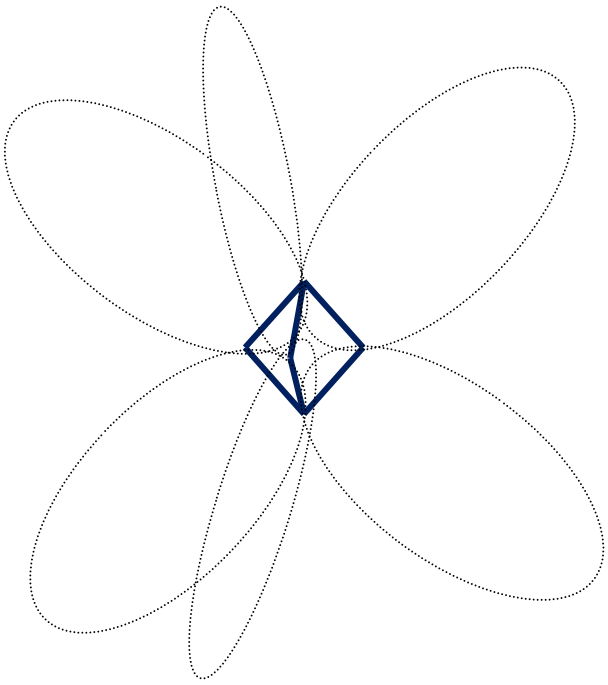
$$\mathbf{f_{ip} = e_{ip}/d_{ip} = 1{,}35.10^6\ N}$$

So the total strong force creating the structure of a proton consisting of six equal quantum dipoles is $\mathbf{8{,}1.10^6\ N.}$

If space of elementary quantum dipole of a volume $\mathbf{v = 3{,}87.10^{-45}\ m^3}$ is imagined by an ideal sphere, than its diameter is:

$$\mathbf{d = (6v/\pi)^{1/3} = 1{,}73.10^{-15}\ m}$$

We can see that the length of a proton quantum dipole is almost 100 times lower than the diameter of an ideal sphere of elementary quantum dipole. As a volume of elementary quantum dipole is $\mathbf{v = 3{,}87.10^{-45}\ m^3}$ then the quantum dipoles of a proton are very close to each other so their spaces are pushed out as imagined in the following scheme:



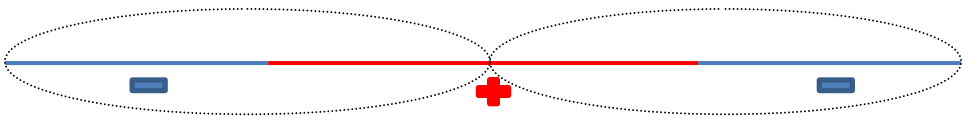
These six spaces of proton quantum dipoles, being pushed out, do not enable anything to come close to the core of a proton and so limit the distance to which other particles can come close and eventually interact with a proton by mutual nuclear or electromagnetic connections (forces). This is the reason why nuclear connections (nuclear interactions between nucleons) are much weaker than very strong connections (quantum dipoles) creating the structure of a proton.

The above image clearly shows why the structure of a proton looks like composed of partons or quarks.

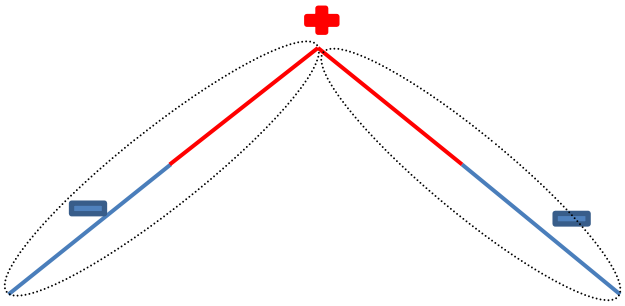
The proton mass (internal energy) is 1836 higher than the one of an electron. As the proton consists of six quantum dipoles, while electron of two, the energy of electron quantum dipole is 612 times lower than of proton one, so the length of an electron quantum dipole $\mathbf{d_{ie}}$ is 612 times the length of a proton quantum dipole $\mathbf{d_{ip}}$:

$$\mathbf{d_{ie} = 612\ d_{ip} = \ 11{,}3.10^{-15}\ m}$$

This length is 6,5 times the length of an ideal dipole sphere, so the spaces of electron looks like this:



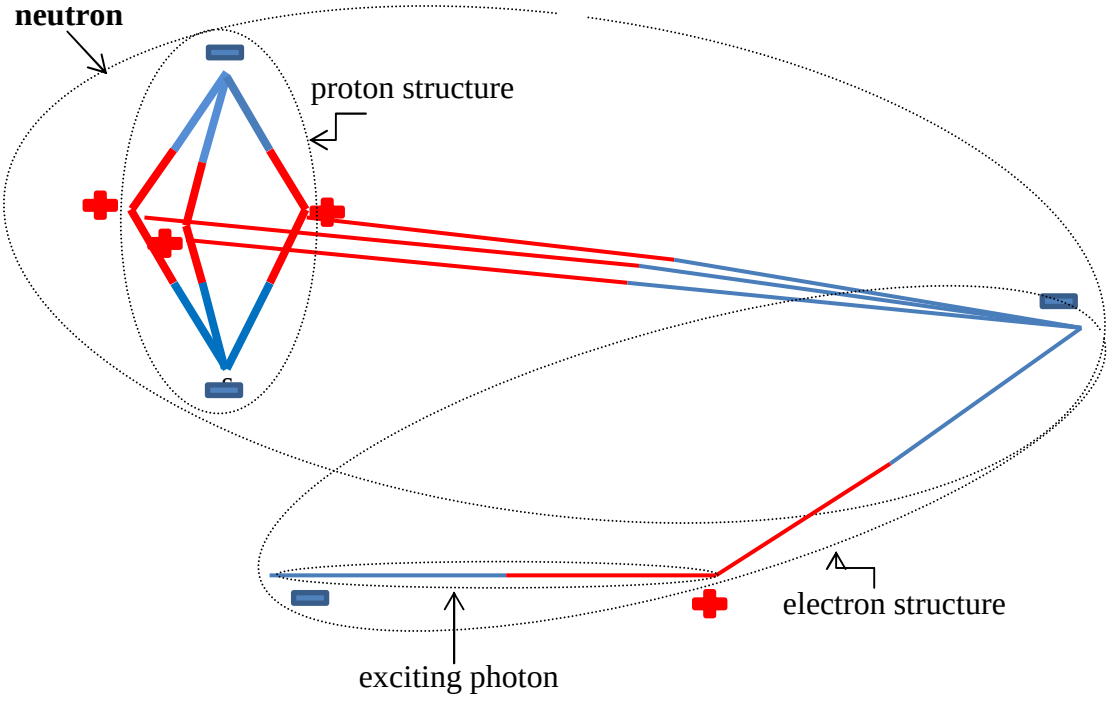
or like this:



The neutron is created of a proton by addition of one distant "-" pole which is connected with three positive poles of a proton creating three new long quantum dipoles +/-. The inner energy (mass) of these three quantum dipoles (mass of neutron – mass of proton = 939.566 MeV - 938.272 MeV = 1.293 MeV) is 938.272/1.293 = 725,66 times lower than the energy of six quantum dipoles creating the structure of a proton, what means that energy of one long quantum dipole is 362,83 times lower than energy of one proton quantum dipole, so the length of long quantum dipoles is 362,83 times the length of quantum dipoles creating a proton. The weak force $\mathbf{f_{iw}}$ of one of three long quantum dipoles connecting the distant "-" pole with three "+" poles of a proton structure is:

$$\mathbf{f_{iw} = e_{iw}/d_{iw} = 1,35.10^6 /362,83^2 = 1,35.10^6 /131646 = 10,25\ N}$$

So the strong force, creating the structure of a proton, is more than 10^5 times the weak nuclear force, by which the "-" poles is connected with the structure of a proton creating the structure of a neutron from which it is released during β^- decay.



Now we can see the real reason why the neutron is unstable. The added distant new pole "-", compared to the structure of a proton, creates three new quantum dipoles which are 363 times weaker and longer than quantum dipoles creating the structure of a proton. So if the structure of a neutron is excited by one photon, this can easy catch the distant "-" pole from the structure of a neutron and consequently create the structure of an electron by changing the neutron into a proton. It is absurd to include the virtual W^- bosons in this simple scheme of β^- decay of a neutron and suppose its energy to be very high because of very short diameter of a weak force, about 100 times shorter than the diameter of a strong interaction! But according to our analysis, on the contrary, the diameter of a weak nuclear interaction (force) is 363 times lower than that of a strong interaction inside a proton. So β^- decay belongs to the category of nuclear interactions. Really, it is humorous to say that a "weak" interaction is mediated by a monstrous W^- boson which internal energy (mass) is almost 100 times the energy (mass) of a proton (or neutron) created of strong forces! Why does theoretical physics accept such nonsenses which should be indicators of its wrong way? Is it because of necessity to accept existing dogmas like that the mediators of all interactions (forces) are point-like virtual bosons moving with a limited speed, appearing and disappearing in the vacuum, although being principally undetectable? Theoretical physics knows nothing about the nature of a vacuum but uses it to perform all miracles, which are principally undetectable but required by contemporary irrational speculative unphysical physical theories.

Conclusion

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

References

[1] P. Kohut, God and the Universe, VDM Verlag Dr. Muller, Saarbrucken 2011.
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