Article

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

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ABSTRACT

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

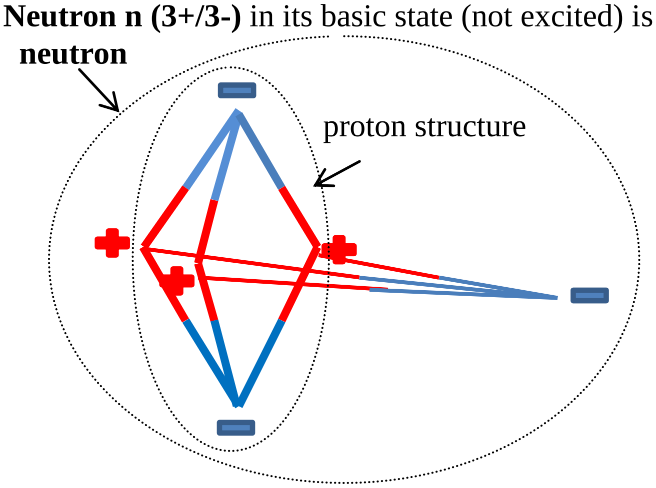
Part IV of this series of articles includes Appendix - Basic Forces & Interactions (II): Weak Nuclear Interaction - Neutron Beta Decay; Quantitative Characteristics of Basic Particles and Interactions; Nuclear Force; Thermonuclear Fusions in the Core of the Sun; Weak Attractive Forces between Atoms and Molecules (Chemical Bonds); and References.

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

Appendix: Basic Forces & Interactions (II)

Weak Nuclear Interaction - Neutron Beta Decay

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



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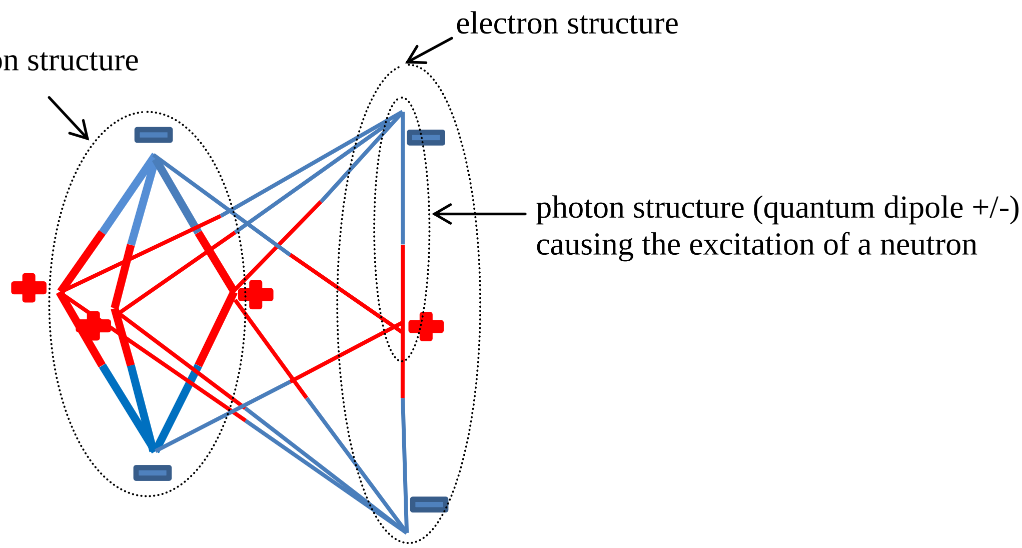
Inside a neutron we see the structure of a proton with very short end strong quantum dipoles. One negative pole is connected to three positive opposites by much weaker and longer connections, so it can be released from this structure during beta decay.

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 a bound state of a proton (3+/2) with six elementary quantum dipoles and an electron (+/2-) with two quantum dipoles. Eight quantum dipoles represent mutual quantum connections between the proton end electron structures. They are, at the same time, the constituents of the internal neutron structure. Neutron consists of a proton and an electron as well as their eight mutual quantum connections (dipoles) which are included into the 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 neutron are now the external connections between a proton and an electron.
This decay is known as beta decay ($\boldsymbol{\beta}^-$ decay), because flying electrons represent beta ($\boldsymbol{\beta}^-$) radiation and can be expressed as follows:

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

"$\mathbf{n} + \boldsymbol{\gamma}$" 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 scheme:

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

In addition to a proton and an electron the neutrino (antineutrino) $\boldsymbol{\nu}_{\mathbf{e}}$ is included. In our structural scheme the neutrino is missing. We do not deny the possible existence of a neutrino. The expression "($\boldsymbol{\nu}_{\mathbf{e}}$)?" only means that we cannot accept it to be a product of $\boldsymbol{\beta}^{-}$ 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 $\boldsymbol{\beta}^{-}$ 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:

$$\mathbf{n} + \mathbf{3}\boldsymbol{\gamma} \rightarrow \mathbf{p}^{+} + \mathbf{e}^{-} + \boldsymbol{\nu}_{\mathbf{e}}$$

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 can be possible as neutrinos represent bound states of two photons. 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 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 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 that 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:

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

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. If we want to accept the Standard Model interpretation that the **muon μ^-** and **tau τ^-** decay into an electron, neutrino and antineutrino, it means they must consist of these structural constituents before decay. In that case neutrinos have the same property as photons to excite other particles. But much more real is that **muon μ^-** and **tau τ^-** are only 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 vacuum quantum connections. Of course, electron as well as muon and tau can be excited by photons.

Pions represent more complicated structures, so they decay. Pion π^0 **(2+/2-)** decays into two photons **2γ**. Pion π^- **(3+/4-)** consequently can decay in one muon μ^- **(+/2-)** and neutrino ν **(2+/2-)**. Muon μ^- consequently changes into an electron e^-. Pion π^+ **(4+/3-)** can decay into one muon μ^+ **(2+/-)** and a neutrino ν **(2+/2-)**. Muon μ^+ then changes into a positron e^+ which annihilates with the nearest electron. Pions have structures analogical to those of excited protons $(p^+ + \gamma)$ (antiprotons), but while protons are very stable, pions degay. The difference between positive pions and protons is in different mutual motions of their internal quantum dipoles and their different energy (mass). 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 π^+ (4+/3-). While proton is very stable, pion decays immediately into a muon μ^+ and a neutrino ν**.**

It is supposed that the universe bathes in a sea of neutrinos **ν (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. 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 **d**:

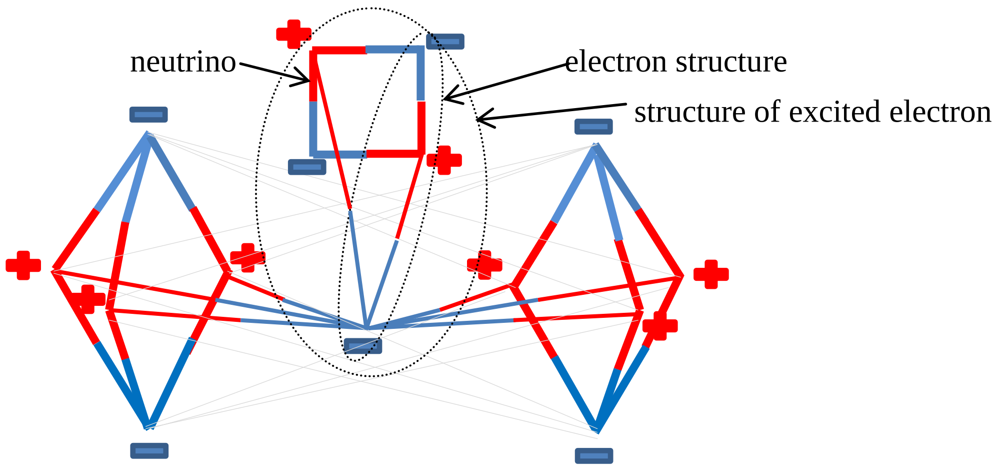
$$\nu_e + \mathbf{d} \rightarrow \mathbf{p}^+ + \mathbf{p}^+ + \mathbf{e}^-$$

↑

High speed electron produces Cherenkov radiation

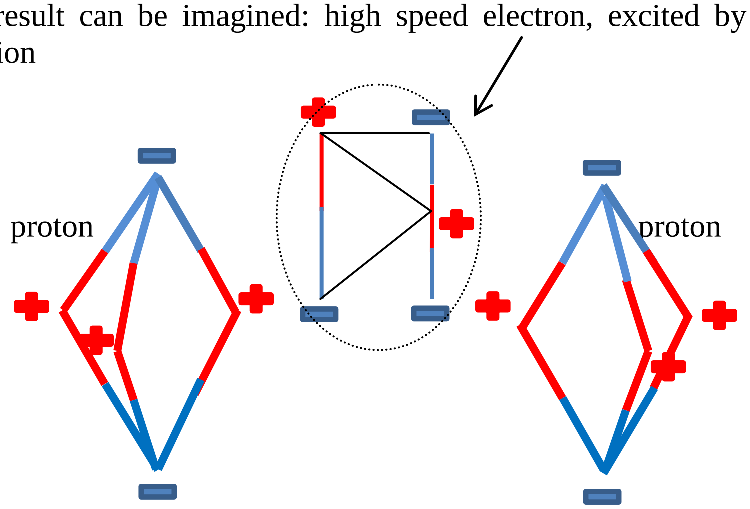
This interaction can be imagined:

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: high speed electron, excited by a photon, produces Cherenkov radiation

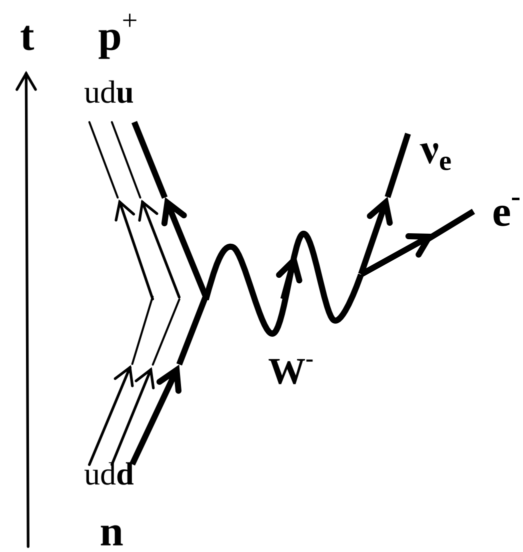


Internal quantum dipoles of a deuteron are transformed into mutual external quantum connections between two protons and one electron.

As neutrinos can be detected only indirectly, 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 becoming very clear and simple. But the so-called theory of electroweak interaction only complicates this situation very much.

Let us look how the theory of electroweak interaction (TEWI) complicates the simple picture of neutron decay. As QED supposes virtual photon to be a mediator of electromagnetic interaction, so TEWI supposes that the weak interaction must also have a point-like mediator named W^- boson, which is very massive, but virtual at the same time. As it is almost 100 times as massive as the initial neutron - heavier than entire atoms of iron, it is supposed that W^- boson, for only a very short undetectable time, 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 that W^- boson makes is the conversion of one down quark (charge of -1/3) of a neutron into the up quark (charge of +2/3) it means that a neutron consequently converts into the 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.

Feynman´s diagram of $\boldsymbol{\beta^-}$ decay of a neutron according to the electroweak theory:



Although W^- boson is virtual during $\boldsymbol{\beta^-}$ 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 can be created by high energy collisions as a short living structure (resonance). The same is valid also for compound structure of positron (2+/-) and neutrino (2+/2-), it means the structure (4+/3-) of W^+. But both these compound structures W^-, W^+ are not point-like bosons and appear only in very rare cases, in the high energy collisions. Electrons and unobserved electron neutrinos with enormous energy of about 40 GeV are supposed to be produced by decay of undetectable W^- bosons. 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.

Insertion of virtual W^-, W^+ bosons 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. It is a great arrogance to claim that real detectable processes and particles manifested during decays, high energy collisions and annihilations prove the existence of principally undetectable entities like quarks, gluons, virtual bosons and others. TEWI is one of many contemporary physical theories which are extremely speculative and only complicate the simple situation.

Theory of electroweak interaction 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 asks for the existence of very heavy Higgs boson which is declared to be found at LHC by energy of 125 GeV. If looking at the Higgs boson through one of its declared possible decay modes W^-, W^+ , then it represents the basic structure (7+/7-), which at same time represents the compound structure of electron, positron and two neutrinos.

Only electron and positron are really detectable. Fictitious undetectable Higgs boson as a point-like particle is nonsense as well as mysterious Higgs field. Except for networks of elementary quantum connections (+/-) there are no other fields. Everything is made up of these connections. Photons as free elementary quantum dipoles (+/-) are the simplest particles having no rest mass as they vibrate in a plane of their dragging by expanding Universe. All other particles represent compound structures of two or more quantum dipoles with more complicated motions, so they local touch interactions with the vacuum (vacuum quantum connections) cause that they cannot be dragged by cosmic expansion and therefore they have rest mass as a measure of their resistance towards acceleration.

Another possible nonsense concerning fictitious Higgs boson is the conclusion that its “small” mass, although 126 times the mass of the proton, causes that the universe we live in is inherently unstable, it means that this mass is not enough to prevent the cosmic catastrophe.

If we are talking about symmetries the answer is very simple. The basic symmetry of all particles, interactions and fields means that all they are made of the same constituents – elementary quantum dipoles. We do not need huge accelerators and colliders in order to create such a big energy level, where all interactions ought to be unified, as the basic interaction is already known. Only real particles are detectable before and after high energy collisions, neither bosons nor quarks. Including them into the simple scheme of interactions is quite artificial and speculative. As all particles are made of elementary quantum dipoles, the picture of their mutual interactions is simple and clear without the necessity to include virtual undetectable realities there.

Quantitative Characteristics of Basic Particles and Interactions

According to 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 **Vp^+** of a proton **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: **$r = (3V/(4\pi))^{1/3} = 1{,}76.10^{-15}$ m**
The accuracy of this result is depends on accuracy of Hubble´s constant used in expressions for calculation of the volume and the number of quantum dipoles of the Universe. This result is close to the value of proton's charge radius **$0{,}88.10^{-15}$ m** presented in contemporary literature**.** Mass of a proton is **$m = 1{,}67.10^{-27}$ kg**. From the relation **$e=mc^2$** internal energy of a proton is **$e_p = 1{,}67.10^{-27}.9.10^{16} = 1{,}5.10^{-10}$ J**. As proton consists of six equal quantum dipoles, energy of one quantum dipole of a proton is **$e_{ip} = e/6 = 2{,}5.10^{-11}$ J.** From the basic relation between energy and length of quantum dipole **$e_i d_i = \alpha hc/\pi$** we can receive its length:

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

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

The strong force **f_{ip}** of one proton´s quantum dipole is:

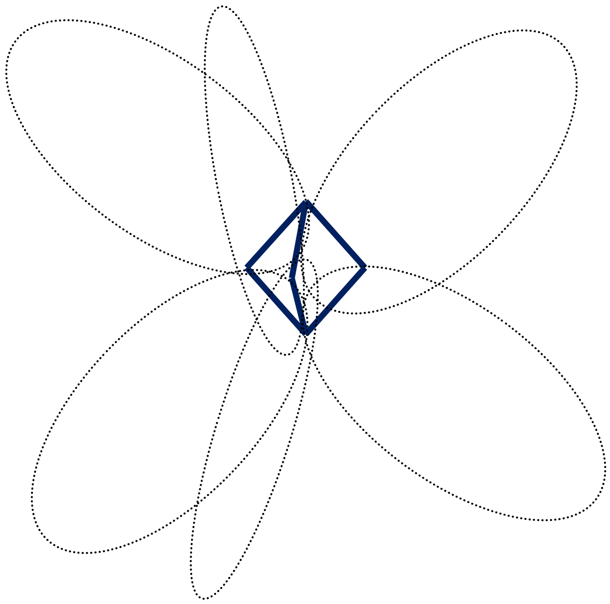
$$\mathbf{f_{ip}} = \mathbf{e_{ip}/d_{ip}} = \mathbf{1{,}35.10^6\ N}$$

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

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

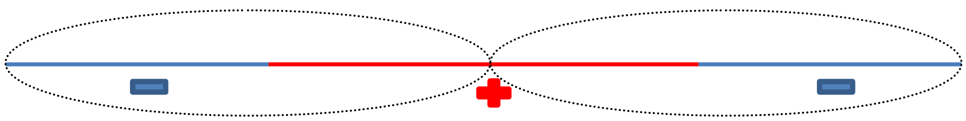


These six spaces of proton´s quantum dipoles, being pushed out, do not enable anything to come close to the core of a proton and so limit the distance to which other particles can come close and eventually interact with a proton by mutual nuclear or electromagnetic connections (forces). This is the reason 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 shows why the structure of a proton looks like composed of partons or quarks, although it is made of six quantum dipoles.

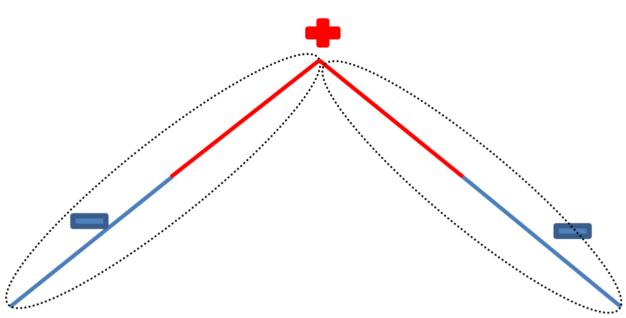
The proton mass (internal energy) is 1836 higher than the electron. As the proton consists of six quantum dipoles, while electron of two, energy of electron quantum dipole is 612 times lower than of proton one, so the length of an electron quantum dipole $\mathbf{d_{ie}}$ is 612 times the length of a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



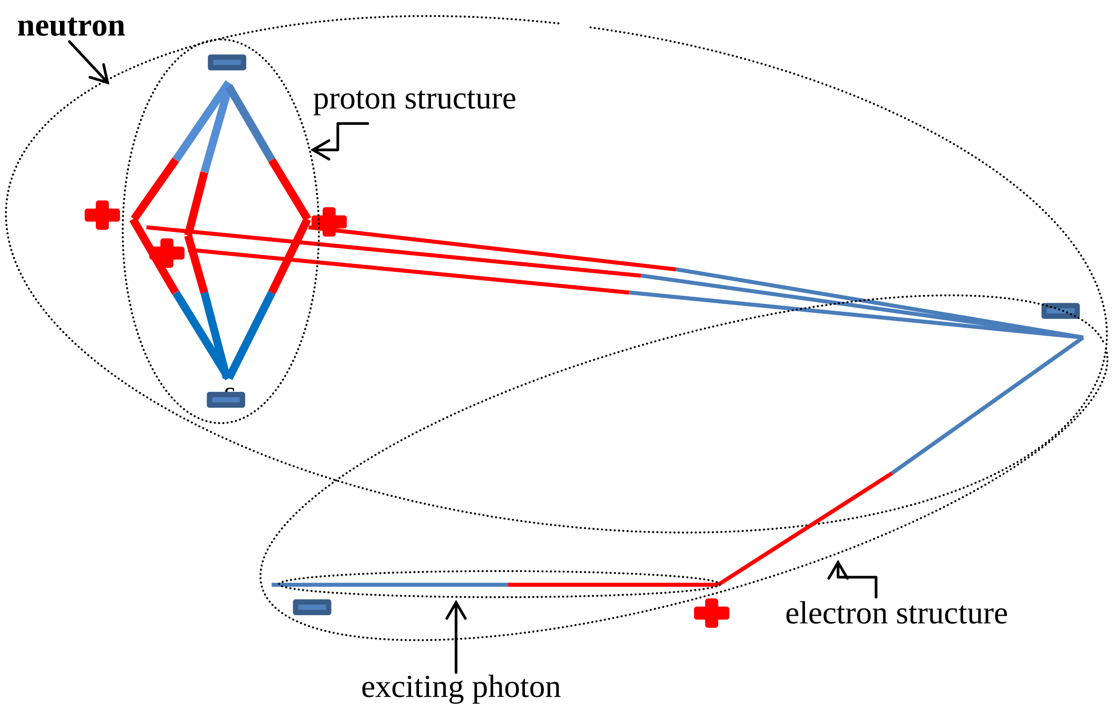
or like this:



The neutron is created of a proton by addition of one distant "-" pole that is connected to three positive poles of a proton creating three new long quantum dipoles (+/-). 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 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 to three "+" poles of a proton structure is:

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

Thus the strong force, creating the structure of a proton, is more than 10^5 times stronger than the weak nuclear force, by which the "-" pole is connected to the structure of a proton and so creating the structure of a neutron from which it is released during $\boldsymbol{\beta}^-$ decay.



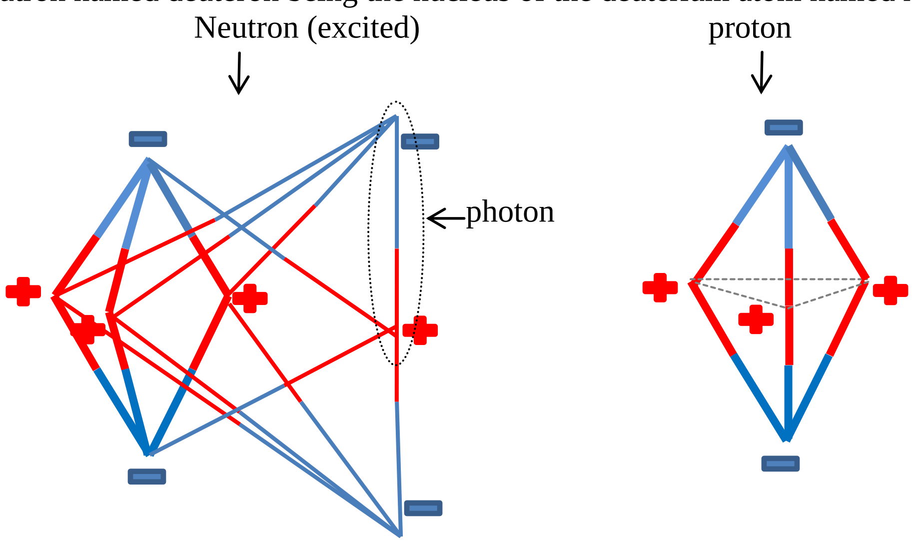
Now we can see real reason why the neutron is unstable. The distant new pole "-", added to the structure of a proton, creates three new quantum dipoles which are 363 times weaker and longer than quantum dipoles creating the structure of a proton. So if the structure of a neutron is excited by one photon, this can easily catch the distant "-" pole from the structure of a neutron and consequently create the structure of an electron by changing a neutron into a proton. It is absurd to include virtual W^- bosons in that simple scheme of $\boldsymbol{\beta}^-$ 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 $\boldsymbol{\beta}^-$ decay belongs to category of nuclear interactions. Really, it is fanny to say that a "weak" interaction is mediated by a monstrous W^- boson which energy (mass) is almost

100 times the energy (mass) of a proton (or neutron) created of strong forces! Why does theoretical physics produce such nonsenses? Because according to accepted dogmas undetectable point-like virtual bosons, appearing and disappearing in the vacuum, mediate all interactions. Theoretical physics knows nothing about the nature of the vacuum, but uses it to perform all its miracles.

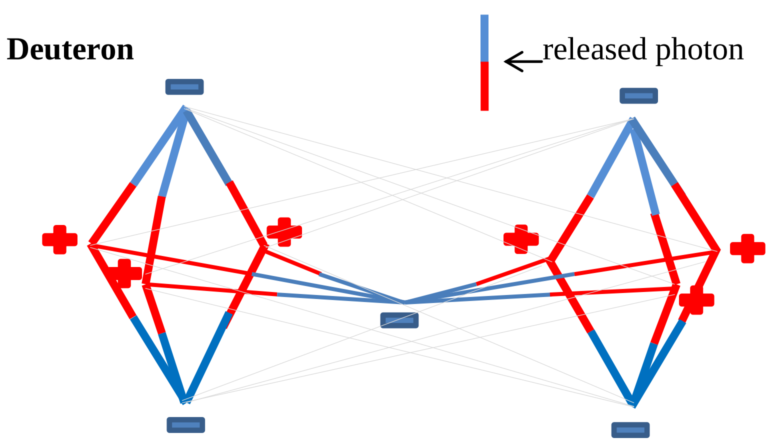
Nuclear Force

The **nuclear force** is an attractive one between two or more nucleons (neutrons and protons) binding them into atomic nuclei. Masses of light nuclei are less than the total mass of protons and neutrons which form them. According to contemporary quark model the nuclear force is a residual effect of 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 $\boldsymbol{\pi^0}$.

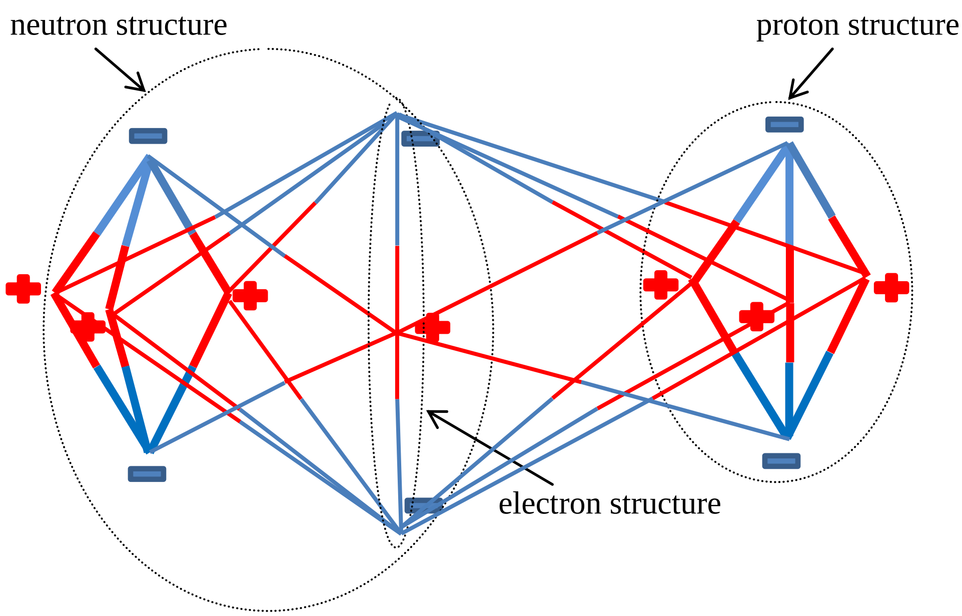
The most appropriate system for studying the nuclear force is a bound state of one proton and one neutron named deuteron being the nucleus of the deuterium atom named heavy hydrogen.



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



In a bound state of 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. If the photon is not released, the excited deuteron (7+/6-) consists of 42 elementary quantum dipoles. This structure represents factually the bound state of two protons and one electron:



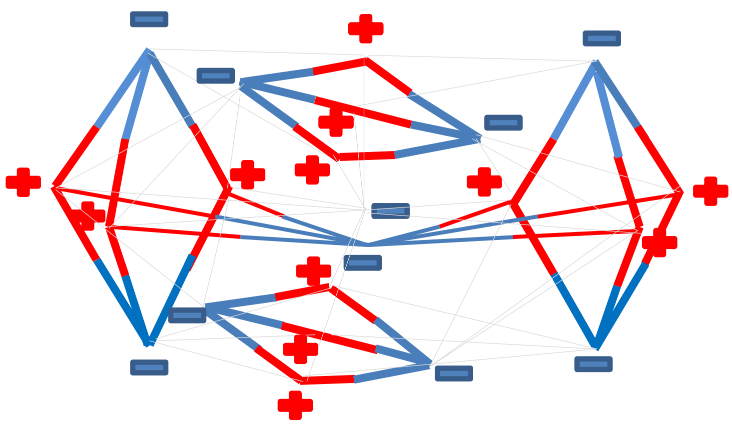
In this structure we can see the substructures of neutron, proton, electron, but the deuteron is created not only of these structures but also of their mutual quantum connections being internal constituents of a deuteron. It is a clear manifestation of the holistic principle according to which the deuteron is not a simple sum of its structural components (protons and electron) but represents a higher quality defined also by their mutual quantum connections. The deuteron compositions (7+/6-) exist in heavier atoms with higher atomic numbers being sources of γ -rays during a radioactive decay. The evidence 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 real binding energy of nucleons in nuclei is energy of their mutual quantum connections (dipoles). Creation of the required conditions for fusion on Earth is very difficult.

Dipoles creating the internal structures of both nucleons (protons and neutrons) are very short, strong and energetic so they represent the strong forces, while 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, although much longer and weaker.

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

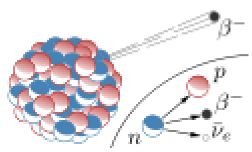
The more nucleons are in nuclei, the heavier and less stable are the atoms as the number of mutual quantum connections dramatically increases with a consequent increase of their repulsive pressures. Atoms with a huge number of nucleons (protons and neutrons) in a nucleus are unstable and can decay. This 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:

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



β^{-} decay generally occurs in neutron rich nuclei.

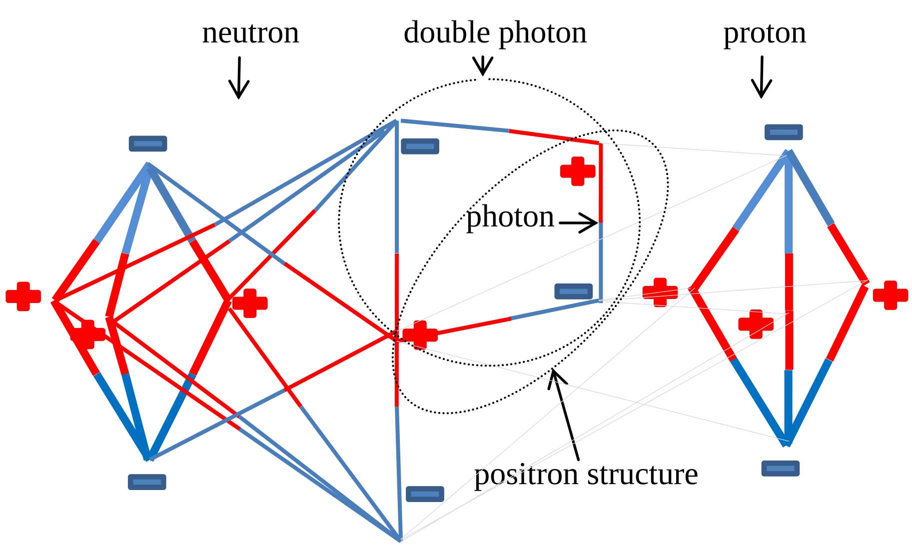
We also suppose that beta decay with a neutrino is possible only in heavier nuclei, in which the pressures are enough to create energetic neutrinos with stronger and shorter quantum dipoles than those in electrons. The decays of free neutrons run without neutrino production.

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:

$$\mathbf{energy\ (\gamma\text{-}photons) + p^{+} \rightarrow n + e^{+} + (\nu_e)?}$$

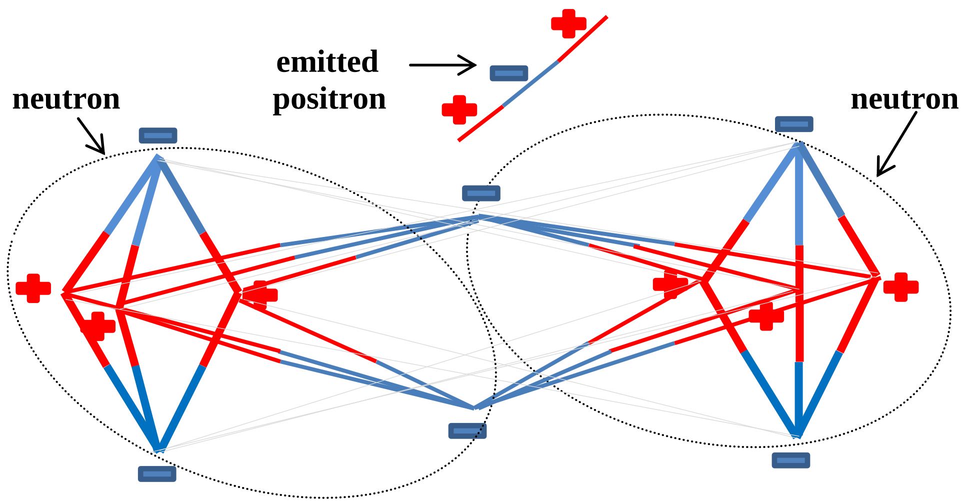
Energy is used to convert a proton $\mathbf{p}^{+}$ into a neutron **n**, while emitting a positron $\mathbf{e}^{+}$ and a hypothetical electron neutrino $\boldsymbol{\nu}_{\mathbf{e}}$. So, unlike β–, β+ decay cannot occur in isolation, because it requires energy, the mass of the neutron being greater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

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

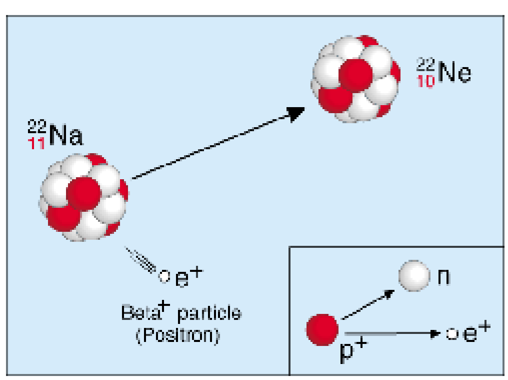
double photon

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:

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

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 $\mathbf{e}^+$:

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



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

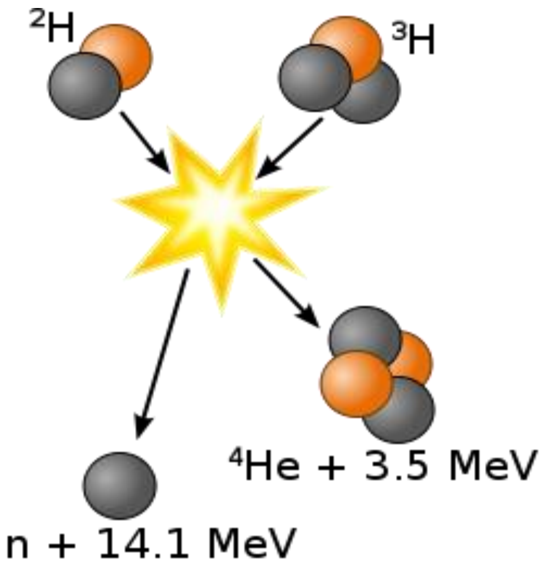
By changing the number of protons, electron capture transforms the nuclide into a new element, e.g.:

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

We have seen how simple is **β+** decay 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.

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 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.

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 ${}^{1}\mathbf{H_1}$ into heavier atoms or nuclei until atoms or nuclei of helium ${}^{4}\mathbf{H_2}$ 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 $\mathbf{p}^{+}$ of hydrogen atom ${}^{1}\mathbf{H_1}$ but also their electrons $\mathbf{e}^{-}$ are involved. So if present the atom of hydrogen as ${}^{1}\mathbf{H_1} = (\mathbf{p}^{+} + \mathbf{e}^{-})$ and the atom of deuterium as ${}^{2}\mathbf{D_1} = (\mathbf{p}^{+} + \mathbf{n} + \mathbf{e}^{-})$, then the processes of nuclear fusion are as follows:

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

$${}^{1}\mathbf{H_1} \quad + \quad {}^{1}\mathbf{H_1} \quad \rightarrow \quad {}^{2}\mathbf{D_1} \quad + \quad \gamma$$

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

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

$${}^{2}\mathbf{D_1} \quad + \quad {}^{1}\mathbf{H_1} \quad \rightarrow \quad {}^{3}\mathbf{T_1} \quad + \quad \gamma$$

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

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

$${}^{2}\mathbf{D_1} \quad + \quad {}^{1}\mathbf{H_1} \quad \rightarrow \quad {}^{3}\mathbf{He_2}$$

Fusion of a deuterium with hydrogen can give also the helium isotope ${}^{3}\mathbf{He_2}$

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.:

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

Deuteron (excited) + p^{+}(excited) $\rightarrow$ **Tritium nucleon** + ν_{e}

Production of positrons is possible by the following scheme:

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

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 γ rays (photons) are released:

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

proton + electron + proton → 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. Certainly, 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. Thus, 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 **β** decays are sufficient, only great forces compressing two elementary quantum dipoles (+/-) into a short, strong end energetic structure of a neutrino $\boldsymbol{\nu_e}$(2+/2-), e.g. by the following scheme:

$$\mathbf{p}^{+}(3+/2-) + \mathbf{e}^{-}(+/2-) + \mathbf{p}^{+}(3+/2-) + \boldsymbol{\gamma}(+/-) \longrightarrow (\mathbf{p}^{+}(3+/2-)+\mathbf{n}(3+/3-)) + \boldsymbol{\nu_e}(2+/2-)$$

proton + electron + proton + photon ⟶ 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 $\boldsymbol{\beta}^-$ 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 on Earth.

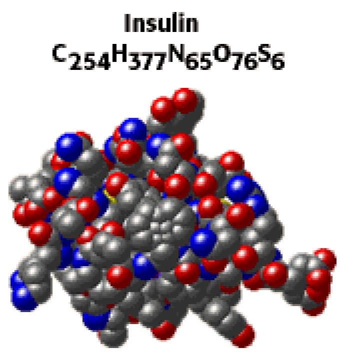
Weak Attractive Forces between Atoms and Molecules (Chemical Bonds)

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 also other weak forces are found 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, which overcoming 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.).

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