Nuclei are energy stores of Universe

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Abstract. The first geometric deformation (Universal) of the isotropic space has as a consequence the second one (local) as space holes (bubbles of empty space), the primary neutron close to the Universe center. When the neutron is found in an environment of stronger cohesive pressure, it becomes unstable and is cleaved (beta decay), producing a proton by the detachment of negative electrical units. These negative units form an electron, while on the remaining proton cortex the positive units outmatch. Moreover, the nuclei have been structured through the inverse electric field of the proton and the electric entity of the macroscopically neutral neutron. It will be proved that the nuclei contain energy, which is equivalent to the structural energy of their nucleons, their kinetic energy and the dynamic energy of their fields. Consequently, energy is concentrated in the nucleons, which are distributed in the nucleus over huge distances, likewise in the case of atoms and planetary systems. So, matter is thin in all its scales.

Keywords: Deformation of space; cohesive pressure; inverse field; energy stores.

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1. Structure of the Neutron

According to the unified theory[1,2] of dynamic space the nuclei[3,4] have been structured through two fundamental phenomena;[5] the inverse electric field[6] of the proton and the electric entity of the macroscopically neutral neutron[7] that at the Universe center is creating, the structure of which is describe as follow:

Throughout the Universe there is an equality (Universal symmetry) of peripheral and radial forces.[8] This equality does not apply in the area close to the Universe center (breaking of Universal symmetry), where the curvature of space‡ is great and on the dynamic space of Universe is defined as

$$K_x = \frac{L_{0x}}{x} = \omega_x, \tag{1}$$

‡ In Mathematics the curvature is defined as an abstract geometric concept $K = 1/R$. Here, the numerator is replaced with the actual unit of Nature, namely the electric dipole length[9] L_{0x}.

where L_{0x} is the elementary length of the electric dipole[9] and ω_x is the central angle by which the edge L_{0x} is observed at a distance x from the Universe center.[8]

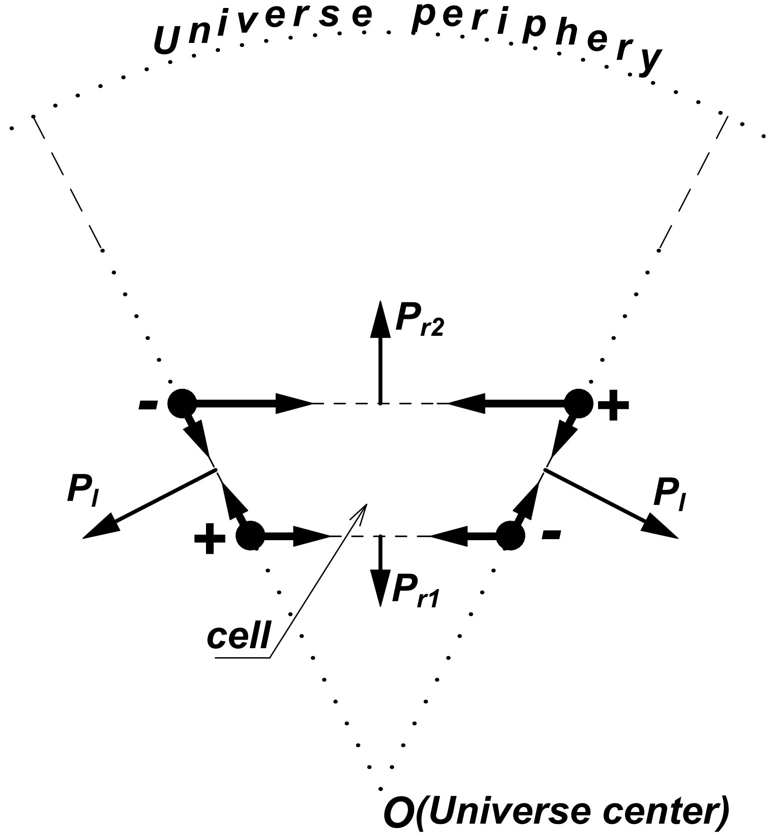

Figure 1. The breaking of Universal symmetry close to the Universe center evolves into the formation of a vacuum bubble ($P_{r1} < P_{r2} < P_l$, where P_{r1}, P_{r2} are the radial pressures and P_l the lateral pressures)

So, close to the Universe center and due to the local cohesive pressure of space[8]

$$P_{0x} = P_{0p}\frac{x^2}{R_0^2}, \tag{2}$$

where P_{0p} is the cohesive pressure at the Universe periphery of a constant radius R_0 (Eq. 21), both the inequality of the lateral pressures P_l (they are significantly greater than the radial pressures P_{r1} and P_{r2}) and the inequality ($P_{r1} < P_{r2}$) of the radial pressures are created (Fig. 1). The result is the distortion of the cell, which evolves into the formation of a vacuum bubble. This is the beginning of the Genesis of the particle-neutron, the primary form of matter, which is the first Cosmic event of Universe as an opposite phenomenon. It creates a spherical formation of empty space (without units). The attractive pressure by the bubble formation is balanced by the cohesive pressure of space (Fig. 3).

The grid structure of the cell, that surrounds the vacuum of the bubble, has the properties of an elastic membrane. This membrane stretches the surrounding space with a force F_0 of its formation and balances the opposite attractive force of the cohesive pressure P_0 of space. The force F_0 is due to the elementary resultants (Fig. 3) that are formed by the component forces[10]

$$F = kL_0 \tag{3}$$

of the electric dipole lengths[9] ($L_0 \approx 10^{-54}$m) of the bubble spherical surface (Fig. 2), where k the dipole constant. The forces developed in the surrounding space create the dynamic field of gravity. The above total force F_0 is the gravitational force of the vacuum bubble that balances the attractive forces of the cohesive pressure P_0.

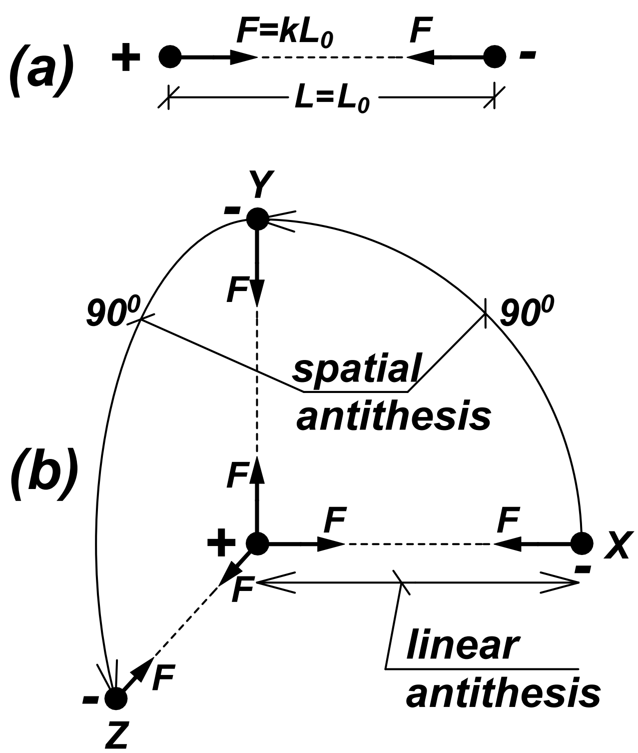

Figure 2. (a) The linear antithesis (elementary electric dipole length $L_0 \approx 10^{-54}$m) and (b) the spatial or right antithesis of isotropic space

Therefore, it is

$$F_0 = P_0 4\pi r^2 \tag{4}$$

and so the dynamic energy of the vacuum bubble, due to the Eq. 4, is

$$E_0 = P_0 V = \frac{P_0 4\pi r^3}{3} = \frac{(P_0 4\pi r^2) r}{3} = \frac{F_0 r}{3} = F_0 L_0 \Rightarrow r = 3L_0, \tag{5}$$

where r is the radius of the core vacuum of neutron.

The creation of matter was initiated by the Genesis of the primary neutron close to the Universe center in the form of a space hole (bubble of empty space), which resists to the weak attraction of space cohesive pressure prevailing over there. Under the influence of the Universal antigravity force[11] the bubble acquires centrifugal accelerated motion towards the Universe periphery. So, it gradually crosses areas of increasing cohesive pressure, because of which the edge tensions of the cells and their distortions on the elastic surface of the bubble (space hole) are increasing.

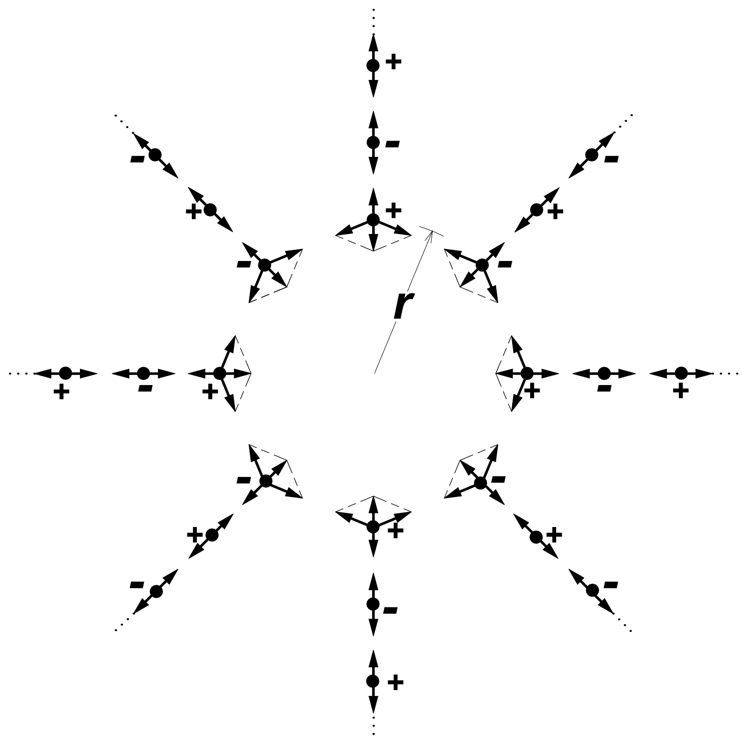

Figure 3. Indicative presentation of the bubble spherical formation ($F_0 = 4\pi r^2 P_0$, where F_0 the force of bubble, P_0 the local cohesive pressure of space, $4\pi r^2$ the surface area of bubble and r its radius)

As the area around the bubble is distorted, a crush into its elastic surface and distension outwards is caused. This crush and distension on the area around the bubble changes locally the cohesive pressure, resulting in the outflow of negative units outwardly, mitigating the strong attractive forces of distension, after a decrease the pairs of negative and positive units. The outflow of these negative units outwardly is caused by the dynamic space due to the inertial phenomenon,[12] as a reaction to the geometric deformation of the neutron cortex, according to the fundamental principle of antithesis[1,2] (opposition). So, a balanced allocation of the tensions on the inner and outer surface of the neutron cortex follows, rendering it resistant to the attraction of the cohesive pressure. Outflow, however, can happen with the positive units too, by producing the antineutron, which has opposite magnetic dipole moment.

This space deformation is done by the alteration of equality of the positive and negative units and is called electric or quantitative deformation, while the geometric deformations, namely that of the first and second space deformation,[1,2] are created by the distortion of the cells only. Therefore, the third space deformation, which created the neutron cortex, is a mixed deformation, namely an electric and a geometric one.

Thus, during the structure completion of the neutron cortex, which is performed at time[13] $\tau = 10^{-5}$sec, each unit is moved to a neighboring position at a distance[9] $L_0 = 0,558 \cdot 10^{-54}$m, at every[13] $\tau_0 = 0,186 \cdot 10^{-62}$sec.

Therefore, the ratio τ/τ_0 gives the number of the moving units that is structured the neutron, namely

$$\frac{\tau}{\tau_0} = \frac{10^{-5}}{0,186 \cdot 10^{-62}} \approx 10^{58} \Rightarrow \frac{\tau}{\tau_0} \approx 10^{58}. \tag{6}$$

The above is a famous number that gives the crowd of units of a neutron, which is equal to the number of the cells, since each cell contains eight units and each unit belongs to eight cells.[14]

Therefore, if r_c is the cortex radius of the neutron, then $4\pi r_c^3/3$ is the spherical volume of the neutron cortex and L_0^3 is the volume of the cell.

So,

$$\frac{4\pi r_c^3}{3L_0^3} \approx 10^{58} \tag{7}$$

is the crowd of cells or units of the neutron and due to $L_0 \approx 10^{-54}$m, we have

$$\frac{r_c}{L_0} \approx \frac{r_c}{10^{-54}} \approx \sqrt[3]{\frac{3 \cdot 10^{58}}{4\pi}} \approx 10^{20} \Rightarrow r_c \approx 10^{-34}m, \tag{8}$$

namely it is the size class of the cortex radius of neutron.

We observe that radius $r_c \approx 10^{-34}$m (Eq. 8) is identical with the fundamental Planck's length

$$l_p = \sqrt{\frac{\hbar G}{C_0^3}} \approx 10^{-34}m \Rightarrow l_p \approx 10^{-34}m, \tag{9}$$

considering that radius r_c of the neutron cortex, is corresponding to its Natural size. It is noted that the scale (Eq. 8)

$$\frac{r_c}{L_0} \approx 10^{20}, \tag{10}$$

expressing the ratio of the third to the second deformation of space, is maintained constant for all the extent ratios of the five space deformations.

It is also noted that the rest two space deformations, namely the fourth and the fifth ones, are the inverse (inner) and the outer electric field[6] of the electrically charged particles.

2. Structure of the Proton

When the neutron is found in an environment of stronger cohesive pressure it becomes unstable and is cleaved (beta decay), producing a proton by the detachment of $\sim 10^6$ (Eq. 14) negative electrical units. These negative units form an electron, while on the remaining proton cortex outmatch $\sim 10^6$ positive units and for the conservation of the system momentum an antineutrino[15] is created.

The positive charge of a proton causes the electrical induction of positive and negative units, creating electric or quantitative deformation of the proximal space,

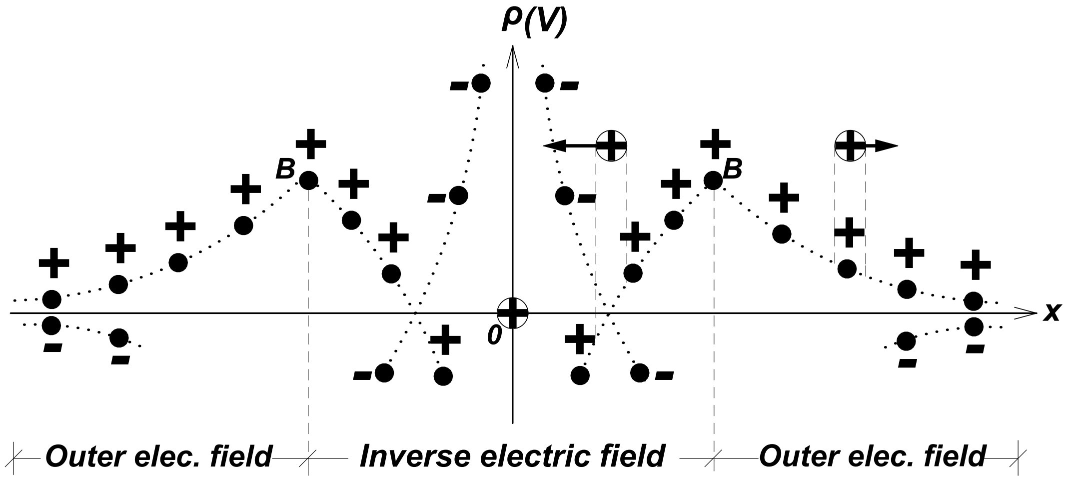

Figure 4. Inverse (inner) and outer electric field of proton ($\rho = e/x$ the relative electric density and $V = K\rho$ the potential of the electric field, where K is a ratio constant and B the potential barrier)

consisting of the repulsion of positive units and the attraction of negative ones (Fig. 4). The result is the alteration of the background electric density ρ_0, which is the density of electric charge per length (Cb/m) of equal number of positive and negative units.

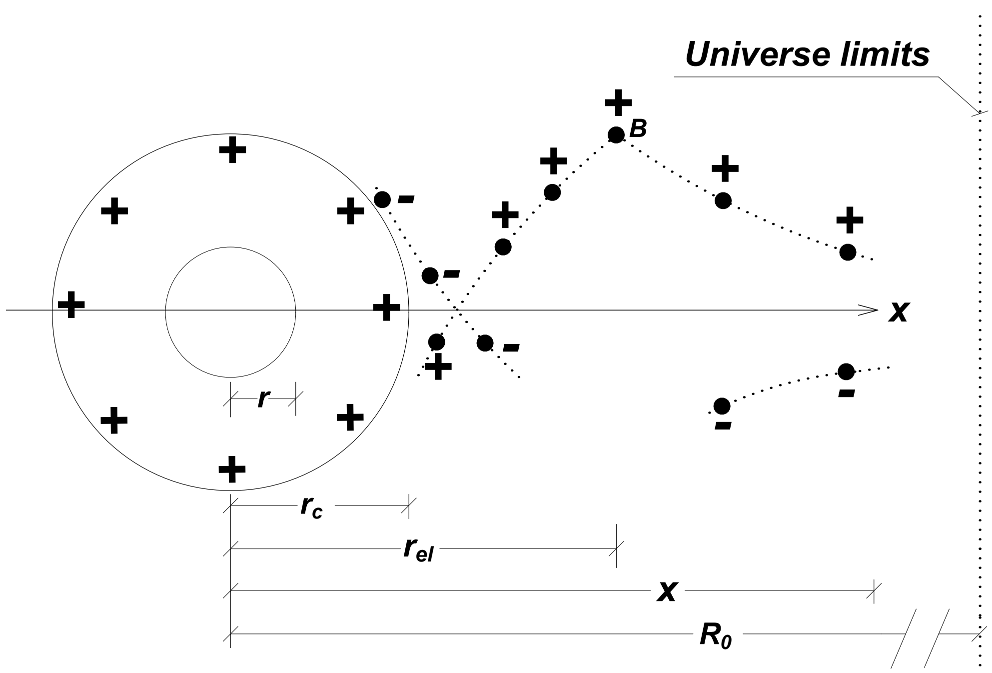

Figure 5. Radii are: r of proton's core vacuum, r_c of its cortex, r_{el} of its electric cortex (inverse electric field), R_0 of Universe and x is the extent of the outer electric field of a proton ($r \approx 10^{-54}$m, $r_c \approx 10^{-34}$m, $r_{el} \approx 10^{-14}$m, $x \approx 10^{6}$m, $R_0 \approx 10^{26}$m and B is the potential barrier)

The alteration of the background electric density ρ_0 consists of displacement of positive and negative units, during which an excess of positive charge and at the same time a lack of equal amount of negative charge is created, which weaken with distance. We define by $\rho(+)$ and $\rho(-)$ the equal relative densities of positive or negative units per length, so the absolute value of electric density is

$$\rho_a = \rho_0 + \rho(+) \Rightarrow \rho_a = \rho_0 + \rho(-). \tag{11}$$

The proton (Fig. 4) with electric charge $+e$ is at position 0, where the background electric density ρ_0 of the positive and negative units was, while the axes represent the relative electric density ρ (it is proportional to the potential V of the electric field) and the distance x. The top of the hill is the potential barrier B, internally of which the inverse (inner) electric field and externally the outer electric field are extended, whose the electric intensity (Eq. 11) declines until the distance $x \approx 10^6 m$ (Eq. 20, Fig. 5). The relative electric density

$$\rho = \frac{e}{x} \tag{12}$$

of the outer electric field takes its minimum value at the above position $x \approx 10^6$m, where it is identical with the most elementary electric charge q ($q \equiv \rho$) of a unit. Substituting the proton charge $e = 1,6 \cdot 10^{-19}$Cb and $x \approx 10^6$m in Eq. 12, we have

$$q \equiv \rho = \frac{e}{x} \approx \frac{1,6 \cdot 10^{-19}}{10^6} = 1,6 \cdot 10^{-25} Cb \Rightarrow q \approx 1,6 \cdot 10^{-25} Cb, \tag{13}$$

that is the elementary electric charge of the unit.

So, by the neutron' s beta decay a number of

$$\frac{e}{q} \approx \frac{1,6 \cdot 10^{-19}}{1,6 \cdot 10^{-25}} = 10^6 \Rightarrow \frac{e}{q} \approx 10^6 \tag{14}$$

negative units are detached, which structure the negative cortex of an electron.

The negative units ($\sim 10^6$) removed from the neutron are very few compared to the total number ($\sim 10^{58}$, Eq. 7) of its units. Therefore, we can consider the radius r_{cp} of a proton cortex of the same magnitude as that of a neutron (Eq. 8), that is

$$r_{cp} = r_c \approx 10^{-34} m, \tag{15}$$

while its radius of core vacuum, due to Eq. 5, it is

$$r_p = r = 3L_0 \approx 10^{-54} m, \tag{16}$$

whereby the ratio $r_c/L_0 \approx 10^{20}$ (Eq. 10) will be then

$$\frac{r_c}{L_0} \approx \frac{r_c}{r} \approx \frac{10^{-34}}{10^{-54}} = 10^{20} \Rightarrow \frac{r_c}{r} \approx 10^{20} \tag{17}$$

is considered as the extent ratio of the space deformations. Namely, it is

$$\frac{r_c}{L_0} \approx \frac{r_c}{r} \approx \frac{r_{el}}{r_c} \approx \frac{x}{r_{el}} \approx \frac{R_0}{x} \approx 10^{20}, \tag{18}$$

wherein x is the extent of the outer electric field, r_{el} the radius of the electric cortex of the proton (Eq. 19, Figs 5, 7 and 8) and R_0 the constant radius (Eq. 21, Fig. 5) of the Universe.

Therefore, due to Eqs 18 and 15, the

$$\frac{r_{el}}{r_c} \approx 10^{20} \Rightarrow r_{el} \approx 10^{20} \cdot 10^{-34} = 10^{-14}m \Rightarrow r_{el} \approx 10^{-14}m \tag{19}$$

is the radius of the electric cortex of the proton (inverse electric field, Figs 5, 7 and 8).

So, the extent x of the outer electric field (Fig. 5), due to Eqs 18 and 19, is

$$\frac{x}{r_{el}} \approx 10^{20} \Rightarrow x \approx 10^{20} \cdot 10^{-14} = 10^{6}m \Rightarrow x \approx 10^{6}m. \tag{20}$$

Similarly, due to Eqs 18 and 20, it is

$$\frac{R_0}{x} \approx 10^{20} \Rightarrow R_0 \approx 10^{20} \cdot 10^{6}m = 10^{26}m \Rightarrow R_0 \approx 10^{26}m, \tag{21}$$

i.e. equal to the magnitude of the constant radius of the Universe (Fig. 5).

As we know the radius of hydrogen nucleus is $\sim 10^{-14}$m, namely it is equal to the radius of the electric cortex $r_{el} \approx 10^{-14}$m (Eq. 19) of a proton. Therefore, whatever is considered as indeterminate matter of quarks and gluons, it is defined by the unified theory of dynamic space as an electric cortex ($r_{el} \approx 10^{-14}$m) of a proton, into which there are strong electric (nuclear) attractive forces. In this huge extent of proton's electric cortex many admirable phenomena can occur (Figs 7 and 8).

3. The Nuclei are Energy Stores

At the scale of nucleus the neutron behaves as a positively charged particle (cloud of positive electrical units) due to its inverse electric field[6] (Fig. 6).

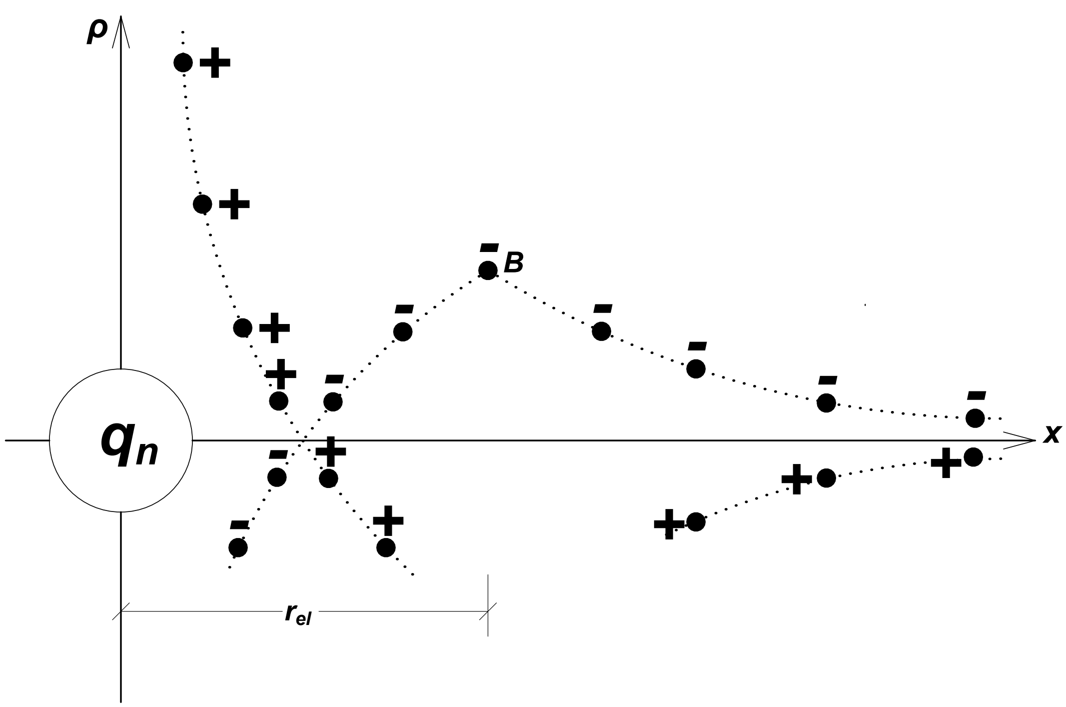

Figure 6. Inverse electric field of the negative electric charge $q_n = -0,685e$ of neutron with its cloud of positive electrical units

This inverse electric field occurs from the negative surface electric charge q_n of neutron, due to its magnetic dipole moment $\mu = -1,913\mu_n$, that is equal to[7]

$$\frac{q_n}{e} = \frac{\mu}{\mu'} = \frac{-1,913\mu_n}{2,792\mu_n} \Rightarrow q_n = -0,685e, \tag{22}$$

where e the electric charge of proton and $\mu' = 2,792\mu_n$ its magnetic dipole moment.

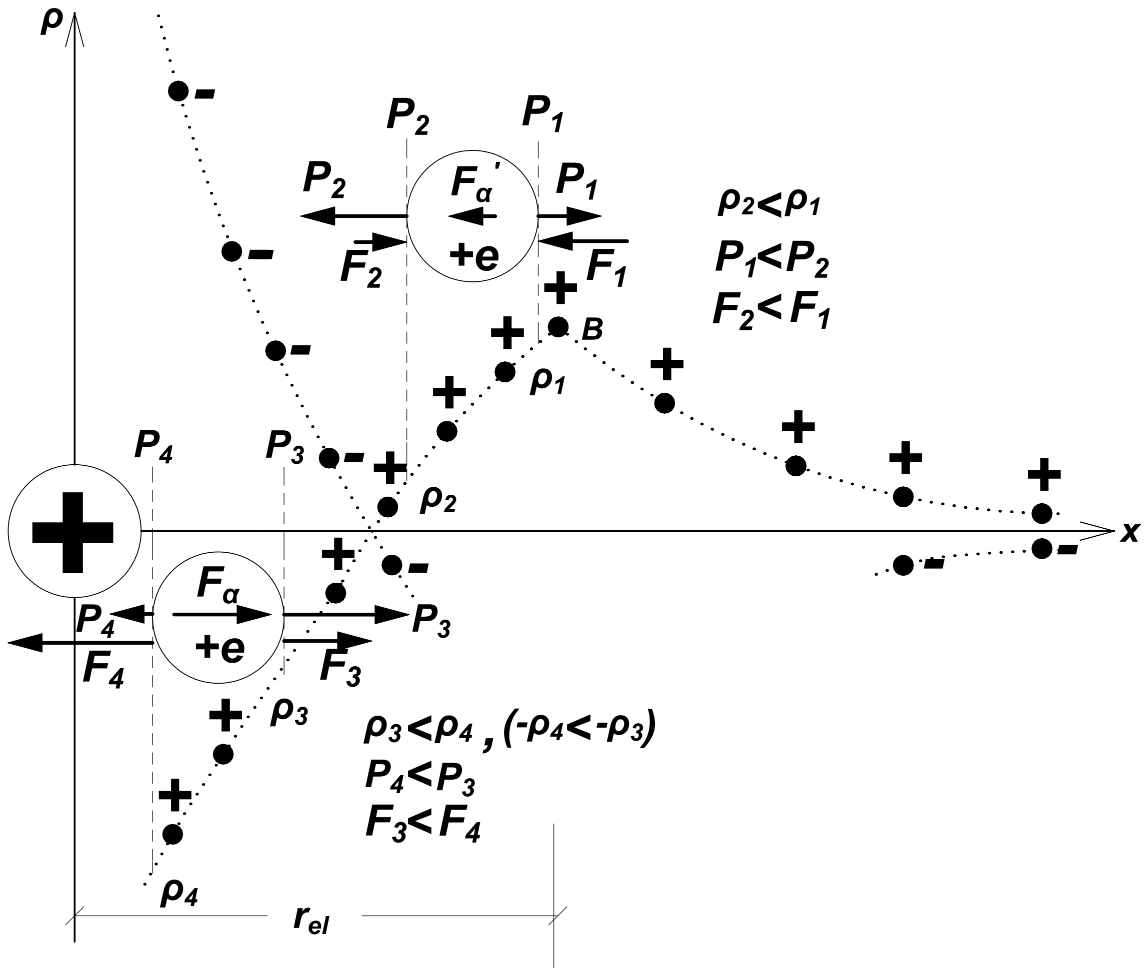

Figure 7. Dynamics of the upper and lower inverse nuclear field by entering a proton into these fields, where ρ_1, ρ_2, ρ_3 and ρ_4 the relative electric densities, F_1, F_2, F_3 and F_4 the Coulomb electric forces, P_1, P_2, P_3 and P_4 the cohesive pressures, F_a' and F_a the nuclear antigravity forces,[17] r_{el} the electric radius of nucleus and B the potential barrier

So, the neutron, with its cloud of positive units, repels the proton, which is now moving on a helical orbit emitting gamma radiation and is finally immobilized. This radiant energy of the proton transmitted by the neutron is measured as mass deficit $\Delta m = 2.2$MeV of deuterium nucleus (Fig. 8) and is equal to half of the kinetic energy of the neutron (Eq. 27). Therefore, neutrons are those that move into the nuclei (with the remaining half of their kinetic energy) on circular orbits around immobilized protons which have spin[16] only.

It is noted that, the neutrons undergo a mass deficit only, while the protons contribute to its creation, which it depends solely on the negativity of the nuclear field. If ρ is the relative electric density at a position of the inverse electric field, then the absolute electric density $\rho_0 - \rho$ is proportional to the number of the above pairs of units, whose the attractive forces create the remaining cohesive pressure P at this position. Consequently, the cohesive pressures P_0 and P are respectively proportional to the background electric density ρ_0 and the absolute one $\rho_0 - \rho$, that is

$$\frac{P}{P_0} = \frac{\rho_0 - \rho}{\rho_0} \Rightarrow P = P_0 \frac{\rho_0 - \rho}{\rho_0}. \tag{23}$$

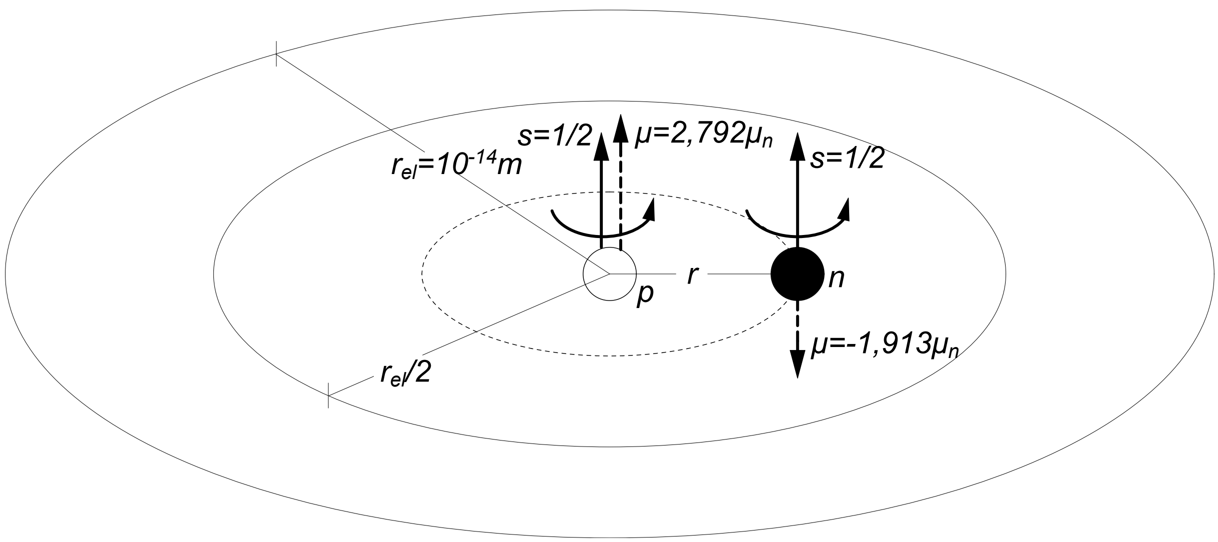

Figure 8. The structure model of deuterium nucleus ${}^2_1H = p + n$, with the experimental spin[16] $s = 1/2 + 1/2 = 1$ and with the experimental magnetic moment $\mu = (2,792 + a)\mu_n - (1,913 + a + 0,022)\mu_n = 0,857\mu_n$, where $a\mu_n$ and $(a + 0,022)\mu_n$ the increasing magnetic moment[18] of proton (p) and neutron (n) respectively, $r_{el} \approx 10^{-14}$m the electric radius (Fig. 7) of nucleus and $r_{el}/2$ the allowed orbit radius of neutron. The small mass deficit of deuterium $\Delta m = 2,2$MeV is identical to that of neutron, namely neutron is not so deeply in the nuclear field

Therefore, the reduction of cohesive pressure (Eq. 23) in the lower inverse electric field creates a reduction of the total gravity force F_0 (Eq. 4) and the dynamic energy E_0 (Eq. 5) of the neutron, with result to its mass deficit $\Delta m = E_0/C^2$, which makes the neutron stable into this field (indicatively see Fig. 7).

However, for the protons there is no mass deficit. When a proton enters in the lower inverse nuclear field, the cohesive pressure P of the field decreases further (Fig. 7), due to the increase of negative units (attracted close to the positive cortex of proton) of the above nuclear field. This negativity in the environment of the lower field causes an attraction force on the positive cortex of the proton, equilibrating its possible shrinkage and a loss of energy-mass. Therefore, the role of protons is to create the inverse electric field and of neutrons to undergo the consequences of the mass deficit. Nevertheless, protons contribute to the increase of the nuclei mass deficit, because they increase (by their entering in the nuclear field) the negativity of the field, thus contributing to the reduction of cohesive pressure P and therefore to increase of the neutrons mass deficit.

The potential V of the nuclear field at a distance r (the orbital radius of neutron, Fig. 8) from the center of the deuterium's nucleus is[19]

$$V = 2K\frac{Ze}{R} - K\frac{Ze}{r} \tag{24}$$

and the dynamic energy of its neutron is

$$E = qV = q_n V = 2K\frac{q_n Ze}{R} - K\frac{q_n Ze}{r} \Rightarrow E = Kq_n Ze(\frac{2}{R} - \frac{1}{r}), \tag{25}$$

where $Z = 1$ the deuterium atomic number, $q_n = -0.685e$ (Eq. 22), $K = 9 \cdot 10^9 Nm^2C^{-2}$ the electric constant and from the know deuterium radius R of the experimental formula for $r_0 = 1,2 \cdot 10^{-15}$m and $A = 2$ the mass number of deuterium, it is

$$R = r_0\sqrt[3]{A} = 1.2 \cdot 10^{-15}\sqrt[3]{2} = 1.5 \cdot 10^{-15}m \Rightarrow R = 1.5 \cdot 10^{-15}m, \tag{26}$$

i.e. we verify the size class of the electric radius (Eq. 19) $r_{el} \approx R \approx 10^{-14}$m of deuterium nucleus.

So, the remaining half of the kinetic energy of the neutron, due to Eq. 25, is

$$E_k = \frac{E}{2} = \frac{1}{2}Kq_n Ze(\frac{2}{R} - \frac{1}{r}) \Rightarrow 2E_k = Kq_n Ze(\frac{2}{R} - \frac{1}{r}) \tag{27}$$

and for $\Delta m = 2.2$Mev the mass deficit of deuterium nucleus, it is

$$E_k = \Delta m \cdot C^2 = 2.2MeV = 2.2 \cdot 1.602 \cdot 10^{-13}J \Rightarrow E_k = 3.52 \cdot 10^{-13}J. \tag{28}$$

Substituting in Eq. 27 $Z = 1$, $q_n = -0.685e$, $e = 1.6 \cdot 10^{-19}$C, $E_k = 3.52 \cdot 10^{-13}$J and for

$$r = \frac{R}{x} \tag{29}$$

we found

$$2E_k = \frac{0.685Ke^2(x-2)}{R} = 2 \cdot 3.52 \cdot 10^{-13} \Rightarrow x - 2 = 6.7 \Rightarrow x = 8.7. \tag{30}$$

Consequently, the orbital radius r (Eq. 29) of the neutron for $R \approx r_{el}$ will be then

$$r = \frac{R}{x} = \frac{R}{8.7} = 0.114R \Rightarrow r = 0.228\frac{R}{2} \Rightarrow r \approx 0.228\frac{r_{el}}{2}, \tag{31}$$

i.e. is less than the half electric radius $r_{el}/2$ (Eq. 19, Fig. 8) of the nucleus, that is identical with the above experimental half radius $R/2$ (Eq. 26) and therefore the neutron is within the lower inverse electric field of deuterium nucleus.

Therefore, nuclei contain energy that is equivalent to the structural energy E_0 (Eq. 5) of their nucleons , their kinetic energy E_k (Eqs 27 and 28) and the dynamic energy E (Eq. 25) of their fields. It is thus concluded that energy is concentrated in the nucleons, which are distributed in the nucleus over huge distances, likewise in the case of atoms and planetary systems. So, matter is thin in all its scales.

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