Structure model of atomic nuclei

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Abstract. Neutrons are the particles that move on circular orbits inside the nuclei (with the remaining half of their kinetic energy) around immobilized protons which have spin only. If protons were rotating they would cause orbital magnetism, which has never been observed, beyond magnetic dipole moment of nucleons spin. In addition, no regression of proton has occurred, because it would cause alternating magnetism, which has also never been observed. The first nuclear units are the deuterium, the tritium, the helium-3 and the, so-called, upper-order nuclear unit the helium-4, which is the basic structure unit of the large nuclei. The spin, the magnetic moment and the mass deficit of the above units and of the bonding neutrons are the three experimental constants upon which the nuclei structure is based.

Keywords: Inverse electric field; topology of nucleons.

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1. Neutron of deuterium nucleus ^2_1H rotates around its stationary proton

By the unified theory[1,2] of dynamic space it is described the Genesis and structure of the neutron,[3] which accepts the effect of the Universal antigravity force,[4] that causes centrifugal accelerated motion towards areas of increasing cohesive pressure.[5]

At the scale of nucleus where, due to the neutron's magnetic dipole moment $\mu = -1,913\mu_n$, the calculated negative surface electric charge of neutron is equal to $q_n = -0,685e$ (Eq. 1), resulting the neutron to behaves as a positively charged particle with the positive potential of its inverse electric field[6] as a cloud of positive electrical units (Fig. 3) with result to the reduction the negativity of the nuclear field[6] and to the present of protons in the nuclei.

It is noted that two protons can not exist in the nucleus without the presence of a neutron, because the increased negativity of field causes a cleaving (beta decay β^+) of one proton. There would be no nuclei without the presence of neutrons that reduce the negativity of the protons field.

The further sinking in the lower inverse electric field increases the negativity of the field, resulting to reduce its cohesive pressure and to increase of the neutron mass deficit (see section 4). Therefore, the size of the mass deficit determines the topology of neutrons and nuclear units in the structure model of nuclei. Specifically, at the beta decay β^- and β^+ the locations of these phenomena in the nucleus are determined.

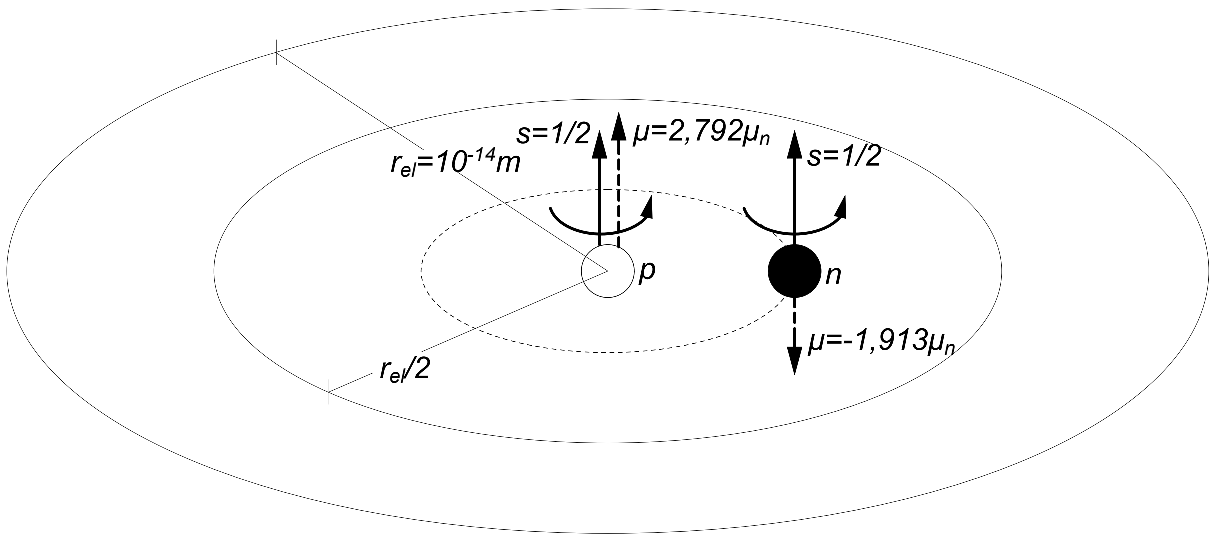

Figure 1. The structure model of deuterium nucleus $^2_1H = p + n$, with the experimental spin[7] $s = 1/2 + 1/2 = 1$ and with the experimental magnetic moment $\mu = (2,792 + a)\mu_n - (1,913 + a + 0,022)\mu_n = 0,857\mu_n$, where $a\mu_n$ and $(a + 0,022)\mu_n$ the increasing magnetic moment (see subsection 3.1) of proton (p) and neutron (n) respectively, $r_{el} \approx 10^{-14}$m the electric[6] radius (Fig. 4) 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

Oppositely, a greater reduction in the negativity of nuclear field may cause a neutron cleaving (beta decay β^-) and a reduction in mass deficit due to increased cohesive pressure.

As we said, at the nucleus scale the neutron behaves as a positively charged particle and repels the closest 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 Δm and is equal to half of the kinetic energy of the neutron. 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 only (Fig. 1). If protons were rotating they would cause orbital magnetism, which has never been observed, beyond magnetic dipole moment of nucleons spin. In addition, no regression of proton has occurred, because it would cause alternating magnetism, which has not been observed.

It is noted that attraction is exerted by the proton's electric field only, causing the neutron to sink deeper into its lower inverse field. After all, there are nuclei, whose neutrons are rotated around columns of strong electric fields, in addition of those that around the protons are rotated.

2. Spin indicates the topology of nucleus original units

The structure of the neutron cortex[8] is described, resulting is the appearance of two negative poles on opposite spherical regions of the cortex (Fig. 2), in the place of two opposite seats of the initial cube, while the surplus of positive units is condensed on its remaining four seats constituting the positive zone of the cortex. These electrically charged regions of the cortex are the particle quarks, to which the particles spin[7] is due.

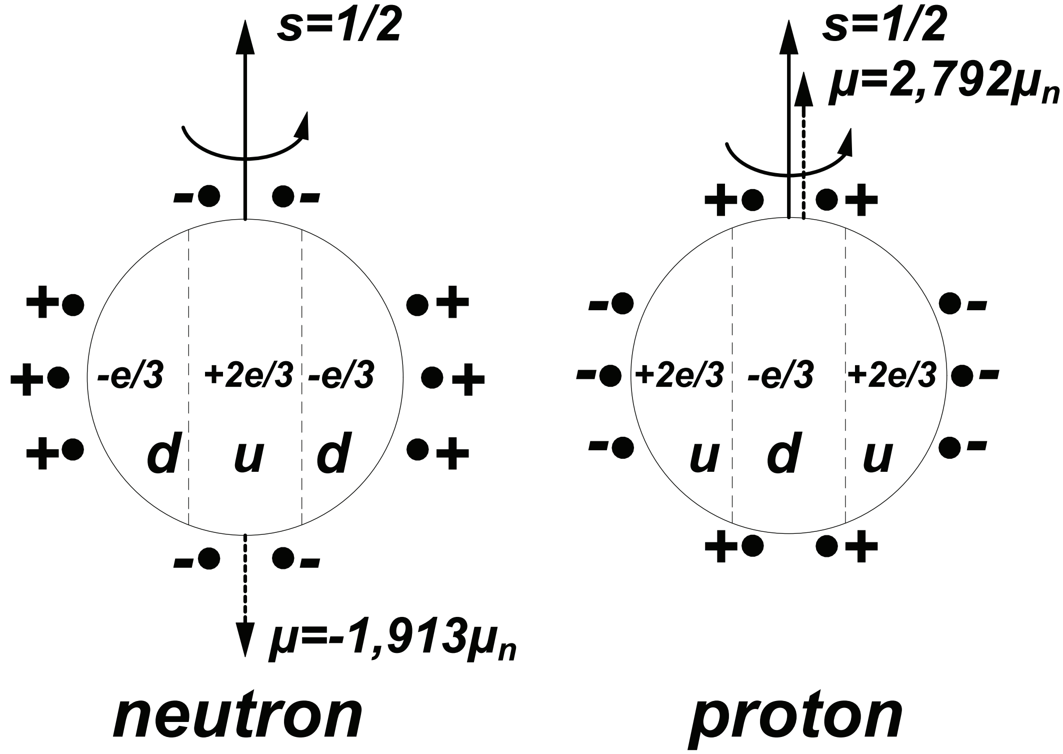

Figure 2. Spin and magnetic dipole moment of neutron and proton with their lower inverse electric fields

Verification of experimental spin of the nuclei, due to the conservation of their rotational momentum, is the first and necessary condition of their structure. The nucleons spin is directed parallel to the nucleus axis.

The nucleus spin is the sum of its nucleons spin or of the so-called first nuclear units and of the additional bonding neutrons. The first nuclear units are the deuterium ${}^2_1H$, the tritium ${}^3_1H$ and the helium ${}^3_2H_e$, with a corresponding experimental spin 1, 1/2 and 1/2, while $s = \pm 1/2$ is the spin[7] of the protons and of the bonding neutrons.

Moreover, helium ${}^4_2H_e$ and all so-called upper-order nuclear units have an experimental spin $s = 0$. Of course, the spin of the nuclei, structured by helium nuclei and by upper-order nuclear units, is $s = 0$. Large nuclei consist of upper-order nuclear units and fewer first nuclear units, which progressively complete into upper-order nuclear ones. So, helium ${}^4_2H_e$ is the basic unit in the structure of the large nuclei.

All the nuclear units orient their axes in the direction of the nucleus axis and their orbits are vertically to this axis. Therefore, spin indicates the topology of all the original units of the nucleus.

3. Magnetic moment of nuclear units

Macroscopically, the neutron is an electrically neutral particle (Eq. 2). At the scale of the atomic nuclei the neutron behaves as a positively charged particle. Below it can be calculated the surface electric charge q_n of neutron from its magnetic dipole moment $\mu = -1,913\mu_n$ and from the magnetic dipole moment of the proton $\mu' = +2,792\mu_n$, whose its electric charge is $e = +1,6 \cdot 10^{-19}$Cb.

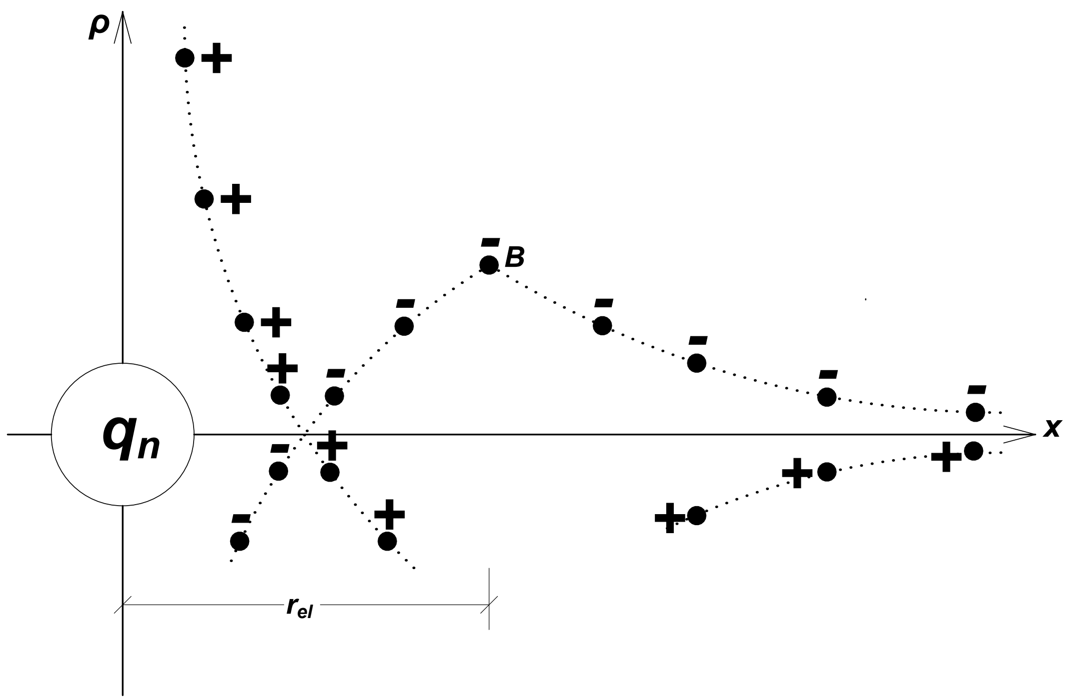

Figure 3. Limited inverse electric field of the calculated negative electric charge $q_n = -0,685e$ of neutron with its cloud of positive electrical units

These magnetic moments μ and μ' must be proportional to the electric charges q_n (neutron) and e (proton), that is

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

which equals to the electric charge of the two negative poles (d quarks) of the neutron cortex.[8] So, the neutron quarks are the two d quarks (each $-e/3$ negative surface charge) and the intermediate u quark $(+2e/3)$. Therefore, the total charge of the neutron is

$$-\frac{e}{3}+\frac{2e}{3}-\frac{e}{3}=0. \tag{2}$$

The above negative surface charge $q_n = -0,685e$ (Eq. 1) of neutron has created an inverse electric field[6] of positive potential as a cloud of positive electric units (Fig. 3) and by its entrance in the nuclear field (indicatively see Fig. 4) affects its negativity (also the cohesive pressure) and forms the architectural structure of the nuclei.[9]

The magnetic dipole moment of the nucleus is the sum of the magnetic moments of the nucleons or of the so-called first nuclear units and of the additional bonding neutrons. Here again we repeat the first nuclear units are the deuterium ^2_1H, the tritium ^3_1H and the helium $^3_2H_e$, with corresponding experimental magnetic moments $\mu = 0,857\mu_n$, $\mu = 2,978\mu_n$ and $\mu = 2,127\mu_n$, where μ_n is the unit of nuclear magneton, while $\mu = 2,792\mu_n$ is the magnetic moment of proton and $\mu = -1,913\mu_n$ is the magnetic moment of the bonding neutrons.

Also, the experimental magnetic moment of helium $^4_2H_e$ and all the upper-order nuclear units and those constructed by them have a magnetic moment $\mu = 0$. It is to be expected that the magnetic moments of nucleons impose a common axis and orient themselves, interacting with each other. In addition, it is recalled that at the interaction of proton-neutron the magnetic moment of these nucleons is increased, while at the interaction of same nucleons their magnetic moment is reduced (see subsection 3.1).

3.1. Fluctuation of nucleons magnetic moment

Magnetic saturation is due to the inductive-inertial phenomenon,[10] in which the moving electron sends positive units in front and negative ones behind. Thus, the separation of the electric units creates a lack of positive units behind the electron and a saturation of those in front, thereby the weakening of the magnetism phenomenon due to the presence of grouping units.[10] Therefore, the increase of the electric field reduces magnetism and vice versa. This phenomenon is also observed in the nuclei, where their lower inverse electric field[6] is changing rapidly and affects directly their magnetic field. We need to calculate this dependence of the two fields (electric and magnetic) on the structure of the nuclei.

The inductive-inertial phenomenon is observed, of course, during of the particles spin, wherein the quarks act as moving electric charges. Thus, the +2e/3 quarks (two positive poles) of the proton spin send easily negative units in front. The latter are in abundance in the inverse electric field of the proton (Fig. 2 and 4), which has difficulty to repel positive units behind due to the lack of them. As result it comes the reduction of the proton magnetic moment.

Correspondingly, the -e/3 quarks (two negative poles) of the neutron spin send easily positive units in front. The latter are in abundance in the inverse electric field of the neutron (Figs 2 and 3), which has difficulty to repel negative units behind due to a lack them. As result it comes the reduction of the neutron magnetic moment.

However, this situation improves significantly in the nuclear environment. As the rotating neutron enters in the lower inverse nuclear field (indicatively see Fig. 4), which has negative units in abundance, it acquires the possibility to increase the grouping units of quarks, by sending negative units behind and positive ones in front, thus increasing the magnetic moment of the neutron. Additionally, by this entrance of the neutron with its positive units of its lower field, the proton's electric field is enhanced. Thus, the proton is facilitated to repulse the positive units behind and an equal number of negative ones in front, increasing its magnetic dipole moment.

It is noted that, upon the interaction of same nucleons, their magnetic moment is reduced. So, the strangeness of fluctuation of the nucleons magnetic moment is interpreted.

4. Mass deficit indicates the topology of nucleus original units

It has been found that the cohesive pressure[5] causes at the core vacuum[3] of neutron (of a radius r) a total gravity force[3]

$$F_0 = 4\pi r^2 P_0, \tag{3}$$

which, due to

$$E_0 = F_0 L_0, \tag{4}$$

is identical with its gravity[11] mass‡

$$m_0 = \frac{E_0}{C_0^2} = \frac{F_0 L_0}{C_0^2} \Rightarrow m_0 = \frac{F_0 L_0}{C_0^2}. \tag{5}$$

Moreover, the dynamic energy of neutron,[12] due to Eq. 3, becomes

$$E_0 = F_0 L_0 = P_0 V = \frac{P_0 4\pi r^3}{3} = \frac{(P_0 4\pi r^2) r}{3} = \frac{F_0 r}{3} \Rightarrow E_0 = \frac{F_0 r}{3}, \tag{6}$$

which decreases proportionally to the F_0 and r. Therefore, the reduction of cohesive pressure[13] in the lower inverse electric field (Fig. 4) creates a reduction of the total gravity force F_0 (Eq. 3) and the dynamic energy (Eq. 6) of the neutron, with result to its mass deficit Δm (Eq. 5), which makes the neutron stable into this field.

The neutrons incur at a mass deficit only, while the protons contribute to its creation. The mass deficit depends solely on the negativity of the nuclear field. Thus, the mass deficit determines also the topology of nucleons and nuclear units.

When a proton enters in the lower inverse nuclear field, the cohesive pressure of the field decreases further (Fig. 4), due to the increased negativity of the above nuclear field. However, this negativity in the environment of the lower field causes an attraction force on the positive cortex[8] of the proton, equilibrating its possible shrinkage and a loss of

‡ $F_f^2 = F_0^2 + F_s^2$,[14] where for the E/M wave[15] applies $F_0 = 0$, therefore $F_f = F_s$, namely the final force F_f of the formation is equal to the accumulated force[14] F_s, where $F_f = E/L_0$ represents the energy of the E/M wave and $F_s = pC_0/L_0$ represents its momentum.[14] Substituting in the above $F_f = F_s$ we have $E/L_0 = pC_0/L_0$, where $p = mC_0$ is the momentum of the formation, so $m = E/C_0^2$.

energy-mass. Therefore, the role of protons is to create the inverse electric field and of neutrons to suffer the consequences of the mass deficit. Nevertheless, protons contribute to the increase of the nuclei mass deficit, because they increase (by their entrance in the nuclear field) the negativity of the field, thus contributing to the reduction of cohesive pressure and therefore to increase of the neutrons mass deficit.[13]

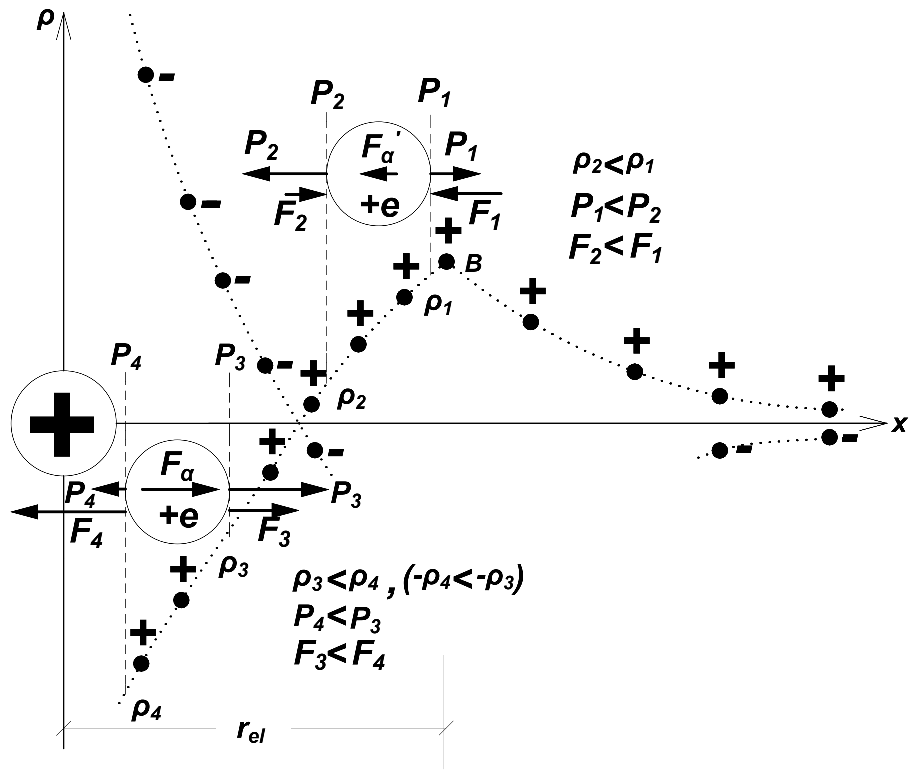

Figure 4. Dynamics of the upper and lower inverse nuclear field by entering a proton into these fields, where ρ_1, ρ_2, ρ_3 and ρ_4 the relative electric densities,[6] F_1, F_2, F_3 and F_4 the Coulomb electric forces,[6] P_1, P_2, P_3 and P_4 the cohesive pressures,[13] F_a' and F_a the antigravity forces,[16] r_{el} the electric radius[6] of nucleus and B the potential barrier

Nucleus is identical with the lower inverse electric-nuclear field where a rapid increase of potential occurs with a corresponding reduction of cohesive pressure. By the mass deficit of the neutron entering the nucleus, the location potential and the topology of the nucleons can be now found. The proton entering the nucleus can be cleaved (beta decay β^+) at the strong negative potential of field, which though reduced by entering of the neutron in the nucleus.

5. References

[1] N.I.Gosdas, *The Unified Theory of Dynamic Space*, Greek Edition (Trohalia, Athens, 1999).

[2] M.Tzoumpas, *Hubble's Law and antigravity - Higgs boson and gravity*, http://viXra.org/abs/1710.0082 [Quantum Gravity and String Theory].

[3] M.Tzoumpas, *Hubble's Law and antigravity - Higgs boson and gravity*, http://viXra.org/abs/1710.0082 (subsection 3.1) [Quantum Gravity and String Theory].

[4] M.Tzoumpas, *Hubble's Law and antigravity - Higgs boson and gravity*, http://viXra.org/abs/1710.0082 (subsection 2.6) [Quantum Gravity and String Theory].
[5] M.Tzoumpas, *Hubble's Law and antigravity - Higgs boson and gravity*, http://viXra.org/abs/1710.0082 (subsection 2.2) [Quantum Gravity and String Theory].
[6] M.Tzoumpas, *Inverse electric-nuclear field*, http://viXra.org/abs/1902.0266 (sections 1 and 2) [High Energy Particle Physics].
[7] M.Tzoumpas, *Why the spin of the particles is equal to $s = \pm 1/2$?*, http://viXra.org/abs/1910.0035 (sections 2) [Quantum Gravity and String Theory].
[8] M.Tzoumpas, *Time as motion phenomenon - Physics Laws do not apply to inertial systems*, http://viXra.org/abs/1802.0372 (section 2) [Relativity and Cosmology].
[9] N.I.Gosdas, *The Structure of Nuclei* (chapter 4, pages 69-203), Greek Edition (SALTO, Thessaloniki, 2001).
[10] M. Tzoumpas, *What is de Broglie's wave-particle?*, http://viXra.org/abs/1806.0248 (section 1) [Quantum Gravity and String Theory].
[11] M.Tzoumpas, *Hubble's Law and antigravity - Higgs boson and gravity*, http://viXra.org/abs/1710.0082 (subsections 3.3 and 3.4) [Quantum Gravity and String Theory].
[12] M.Tzoumpas, *Hubble's Law and antigravity - Higgs boson and gravity*, http://viXra.org/abs/1710.0082 (subsection 3.2) [Quantum Gravity and String Theory].
[13] M. Tzoumpas, *Mass deficit and topology of nucleons*, http://viXra.org/abs/1904.0103 (section 1) [High Energy Particle Physics].
[14] M.Tzoumpas, *Time as motion phenomenon - Physics Laws do not apply to inertial systems*, http://viXra.org/abs/1802.0372 (section 5) [Relativity and Cosmology].
[15] M. Tzoumpas, *Unified E/M waves theory*, http://viXra.org/abs/1905.0079 [Quantum Gravity and String Theory].
[16] M.Tzoumpas, *Universe expansion - Black holes - Nuclear forces*, http://viXra.org/abs/1903.0248 (section 4) [Relativity and Cosmology].