

Nuclear Cohesion and the Spin of the Planck Particle, the Proton, the Electron and the Mesotron as Viewed in the Planck Vacuum Theory

William C. Daywitt

Abstract—The process taking place within the atomic nucleus that prevents the positive proton charges from disrupting the nuclear structure is explained in terms of the mesotron, a particle that carries the negative electron from the neutron to the proton, changing the proton into a neutron and the original neutron into a proton. This process causes the protons and neutrons in the nucleus to change into one other so rapidly that the protons' coulomb repulsions effectively vanish. It appears that particle spin is central to this process, suggesting that particle spin is created for this process.

In the Planck vacuum (PV) theory the mesotron is a heavy electron that is perfectly synchronized with the electron, the proton, and the Planck particle (PP) spin characteristics.

Index Terms—Nuclear Stability, Particle Spin, Mesotron, Heavy Electron, Planck Vacuum State.

I. INTRODUCTION

THE mystery why the positive proton charges do not disrupt the proton-neutron nucleus is a long-standing conundrum. The following calculations provide a simple and straightforward explanation that resolves this mystery. The explanation centers around particle spin and the vacuum state.

The theoretical foundation [1] [2] [3] [4] of the PV theory rests upon the unification of the Einstein, Newton, and Coulomb superforces:

$$\frac{c^4}{G} \left(= \frac{m_* c^2}{r_*} \right) = \frac{m_*^2 G}{r_*^2} = \frac{e_*^2}{r_*^2} \rightarrow r_* m_* c = \frac{e_*^2}{c} \quad (= \hbar) \quad (1)$$

where the ratio c^4/G is the curvature superforce that appears in the Einstein field equations. G is Newton's gravitational constant, m_* and r_* are the Planck mass and length respectively [5, p.1234], and e_* is the massless bare (or coupling) charge. The fine structure constant is given by the ratio $\alpha \equiv e^2/e_*^2$, where e is the observed electronic charge magnitude. The ratio e_*^2/c to the right of the arrow is the spin coefficient for the PP, the proton, and the electron cores respectively, where \hbar is the reduced Planck constant.

The two particle/PV coupling forces

$$F_e(r) = \frac{e_*^2}{r^2} - \frac{m_e m_* G}{r r_*} \quad \text{and} \quad F_p(r) = \frac{e_*^2}{r^2} - \frac{m_p m_* G}{r r_*}$$

[or using (1)]

$$F_e(r) = \frac{e_*^2}{r^2} - \frac{m_e c^2}{r} \quad \text{and} \quad F_p(r) = \frac{e_*^2}{r^2} - \frac{m_p c^2}{r} \quad (2)$$

the electron core ($-e_*, m_e$) and proton core ($+e_*, m_p$) exert on the invisible PV state; along with their coupling constants

$$F_e(r_e) = 0 \quad \text{and} \quad F_p(r_p) = 0 \quad (3)$$

and the resulting Compton (coupling) radii

$$r_e = \frac{e_*^2/c}{m_e c} \quad \text{and} \quad r_p = \frac{e_*^2/c}{m_p c} \quad (4)$$

lead to the important string of Compton relations

$$r_e m_e c = r_p m_p c = \frac{e_*^2}{c} = r_* m_* c \quad (= \hbar) \quad (5)$$

for the electron and proton cores. The PP Compton radius is $r_* = e_*^2/m_* c^2$, derived by equating the Einstein and Coulomb superforces from (1). To reiterate, the equations in (2) represent the forces the free electron or proton cores exert on the invisible PV space, a space that is itself pervaded by a degenerate collection of PP cores ($\pm e_*, m_*$). The positron and antiproton cores are ($+e_*, m_e$) and ($-e_*, m_p$) respectively. The equality of the electron and proton spin magnitudes, and the instability of the neutron [6], stabilize the atomic nucleus.

The e_*^2 is the squared coupling charge, where one of the e_* s belongs to the free particle core and the other charge belongs to any one of the PP cores making up the degenerate PV state.

The ratio e_*^2/c is the spin coefficient, where

$$\vec{S} = \frac{e_*^2}{c} \vec{\sigma} \quad \longrightarrow \quad \frac{e_*^2}{c} \sigma_j \frac{\partial}{\partial x^j} \quad (6)$$

is the relativistic spin of the electron or proton cores. The 2x2 Pauli spin vector is $\vec{\sigma}$. The second expression is the scalar-product sum of \vec{S} with the gradient operator $\partial/\partial x^j$; that is, the PV gradient $\partial/\partial x^j$ in the j th direction weighted by the relativistic spin in that direction. As seen in (5): *the spin magnitudes of the PP, the proton, and the electron cores are identical (the spin of their antiparticles is the negative of the particles)*. Equation (5) is a spin-conservation equation for the Dirac cores. It is seen below that the gradients in equations (6)–(10) are the wavefunction-gradients of the wavefunctions that solve the Dirac-core equations (7)–(10).

After the Introduction in Section I, Section II defines the mesotron so that this *electron-carrier particle* is consistent with the other Dirac-core particles in (5). Section III compares the results here with an outside reference and gives mathematical support to the latter.

II. DIRAC CORES

The 4x1 covariant Dirac-core equations [4] [7] lead to the following four 2x1 spinor equations, (where $x^0 = ct$ and the sum is over $j=1, 2, 3$)

$$i \frac{e_*^2}{c} (u', v') = m_e c u' \tag{7}$$

$$-i \frac{e_*^2}{c} (v', u') = m_e c v' \tag{8}$$

and

$$i \frac{e_*^2}{c} (u'', v'') = m_p c u'' \tag{9}$$

$$-i \frac{e_*^2}{c} (v'', u'') = m_p c v'' \tag{10}$$

which, from top to bottom, describe the electron, positron, proton, and antiproton cores respectively. The u s and v s are the 2x1 spinor wavefunction solutions to the equations. Equations (7)–(10) are *spin angular-momentum equations*, including the spin coefficient e_*^2/c on the left and the various spin momenta $m_e c$ etc. on the right. The parenthetical gradient operators on the left are defined in Appendix A. *The coupling between u and v in (7)&(8) and (9)&(10) is the mechanism that leads to particle-antiparticle annihilation.*

III. NUCLEAR STABILITY AND THE MESOTRON

Using the expanded string of Compton relations

$$r_e m_e c = r_{ez} m_{ez} c = r_p m_p c = \frac{e_*^2}{c} = r_* m_* c \quad (= \hbar) \tag{11}$$

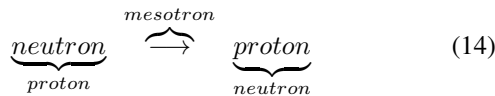
where the mesotron and its antiparticle

$$i \frac{e_*^2}{c} (u, v) = m_{ez} c u \tag{12}$$

and

$$-i \frac{e_*^2}{c} (v, u) = m_{ez} c v \tag{13}$$

are included, leads to the neutron(n)-proton(p) process [8]



that defeats the destructive repulsions of the nuclear protons, while preserving the spin of the cores in (5) and (11).

There is only one reference [8] in the open literature that describes anything resembling the PV theory. In fact the idea behind the process in (14) comes from that source. The history so far has shown that the PV equations have been able to add quantitative substance to the descriptions in that reference. It should be noted, however, that none of the PV-theory development is dependent upon [8]—this fact is what makes the agreements between this reference and the PV theory so spectacular.

IV. URANTIA BOOK COMPARISON

What follows are phrases from Appendix B explained by the Dirac core equations (7)–(10) and (12)&(13). The specific phrases from Appendix B used in the comparison are boldfaced here and in the appendix. The justification for comparing a spacetime based on the mathematics of particle physics to a spacetime of universal scope [4] is that the latter spacetime is fundamentally, and transcendently related to the elementary particles through (1), (5) and (11).

1. there is also present in and among these basic physical units (p,n) a powerful and unknown energy&This universal influence permeates all the space embraced within this tiny energy organization

These statements suggest that the nuclear-cohesion process takes place because of the particle’s or antiparticle’s coupling to the PV state where, from equation (1), this “powerful and unknown energy”

$$m_* c^2 = \frac{e_*^2}{r_*} \tag{15}$$

resides.

2. The interelectronic space of an atom is not empty. Throughout an atom this interelectronic space is activated by wavelike manifestations which are perfectly synchronized with electronic velocity and ultimatonic revolutions.&This unnamed influence seems to be a space-force reaction of the Unqualified Absolute.

From (11) the wavelike manifestations are

$$r_{ez} m_{ez} c = \frac{e_*^2}{c} = r_* m_* c \quad (= \hbar) \tag{16}$$

and the space-force from (1) is

$$\frac{m_* c^2}{r_*} = \frac{e_*^2}{r_*^2} \tag{17}$$

The ultimaton in the ultimatonic spin revolutions is associated with the PP cores from the PV state. The “unqualified absolute” mentioned above includes this state.

3. The charged protons and uncharged neutrons of the nucleus of the atom are held together by the reciprocating function of the mesotron, a particle of matter 180 times as heavy as the electron.

The structure of the mesotron particle is

$$r_{ez} m_{ez} c = \frac{r_e}{180} 180 m_e c = \frac{e_*^2}{c} \quad (= \hbar) \tag{18}$$

in terms of the electron parameters r_e and m_e .

4. superior force-mass power&And these alternations of energy status are so unbelievably rapid that the electric charge is deprived of all opportunity to function as a disruptive influence.&the mesotron functions as an “energy-carrier” particle

The so-called “superior mass-force power” can be seen in the relationship

$$r_{ez} m_{ez} c = \frac{r_e}{180} 180 m_e c = r_e m_e c = \frac{e_*^2}{c} \quad (= \hbar) \tag{19}$$

The n - p process for the “energy-carrier” particle is given by (14).

5. **When atoms perform radioactively, they admit far more energy than would be expected. This excess of radiation is derived from the breaking of the mesotron “energy carrier”, which thereby becomes a mere electron. & The mesotron disintegration is also accompanied by the emission of certain small uncharged particles.**

The excess radiation energy from the mesotron disintegration is

$$m_{e,z}c^2 - m_e c^2 = (180 - 1)m_e c^2. \quad (20)$$

There are also neutrinos [6] associated with the disintegration.

APPENDIX A GRADIENT OPERATOR

The gradient operator (summing over $j=1, 2, 3$)

$$(U, V) \equiv \left(\frac{\partial U}{\partial x^0} + \sigma_j \frac{\partial V}{\partial x^j} \right) \quad (A1)$$

is defined for equations in the form of (7)–(10) and their wavefunctions U and V .

APPENDIX B NUCLEAR COHESION FROM THE URANTIA BOOK

The five comments to follow come from the Urantia Book reference [8, 42:8.1-5], which reads: Reference 8, Paper Number 42, Section 8, and Paragraphs 1-5. Furthermore, when this reference uses the phrase “electronic velocity and ultimatic revolutions” it is referring to the obvious spin aspects of the vacuum-core equations in (12) and (13) and (16). This reference is the only reference in the open literature that relates to the PV theory.

42:8.1 While gravity is one of several factors concerned in holding together a tiny atomic energy system, **there is also present in and among these basic physical units (p,n) a powerful and unknown energy**, the secret of their basic constitution and ultimate behavior, . . . **This universal influence permeates all the space embraced within this tiny energy organization.**

42:8.2 **The interelectronic space of an atom is not empty. Throughout an atom this interelectronic space is activated by wavelike manifestations which are perfectly synchronized with electronic velocity and ultimatic revolutions. . . . This unnamed influence seems to be a space-force reaction of the Unqualified Absolute.**

42:8.3 **The charged protons and the uncharged neutrons of the nucleus of the atom are held together by the reciprocating function of the mesotron, a particle of matter 180 times as heavy as the electron.** Without this arrangement the electric charge carried by the protons would be disruptive of the atomic nucleus.

42:8.4 As atoms are constituted, neither electric nor gravitational forces could hold the nucleus together. The integrity of the nucleus is maintained by the reciprocal cohering function of the mesotron, which is able to hold charged and uncharged particles together because of **superior force-mass power** and by the further function of causing protons and neutrons constantly to change places. The mesotron causes the electric charge of the nuclear particles to be incessantly tossed back

and forth between protons and neutrons. At one infinitesimal part of a second a given nuclear particle is a charged proton and the next an uncharged neutron. **And these alternations of energy status are so unbelievably rapid that the electric charge is deprived of all opportunity to function as a disruptive influence.** Thus does the mesotron function as an **“energy-carrier” particle** which mightily contributes to the nuclear stability of the atom.

42:8.5 The presence and function of the mesotron also explains another atomic riddle. **When atoms perform radioactively, they admit far more energy than would be expected. This excess of radiation is derived from the breaking up of the mesotron “energy carrier”, which thereby becomes a mere electron. The mesotron disintegration is also accompanied by the emission of certain small uncharged particles [the neutrinos].**

REFERENCES

- [1] P. Davies, *Superforce: the Search for a Grand Unified Theory of Nature*. Simon and Schuster, Inc., New York, 1984.
- [2] W.C. Daywitt, “A Model for Davies’ Universal Superforce”, *Galilean Electrodynamics*, Sept./Oct., 83, 2006. See also www.planckvacuumDOTcom.
- [3] W.C. Daywitt, “The Trouble with the Equations of Modern Fundamental Physics”, *American Journal of Modern Physics*. Special Issue: “Physics without Higgs and without Supersymmetry”, v. 5, no. 1-1, 22, 2016.
- [4] W.C. Daywitt, “Comparing the Planck-Vacuum and the Urantia-Book Depictions of the Seven-Dimensional Spacetime”, *European Journal of Engineering Research and Science*, Vol.5, No.12, December, 2020.
- [5] B.W. Carroll, D.A. Ostlie, *An Introduction to Modern Astrophysics*, (Addison-Wesley, San Francisco, Boston, New York, Cape Town, Hong Kong, London, Madrid, Mexico City, Montreal, Munich, Paris, Singapore, Sidney, Tokyo, Toronto, 2007).
- [6] W.C. Daywitt, “The Neutrino Decay of the Free Neutron and the Neutrino Structure According to the Planck Vacuum Theory”, *European Journal of Engineer Research and Science*, VOL. 6, NO. 5, July 2021.
- [7] D.M. Gingrich, *Practical Quantum Electrodynamics*. CRC, The Taylor & Francis Group, Boca Raton, London, New York, 2006.
- [8] Multiple Authors. *The Urantia Book*. Urantia Foundation, www.urantiaDOTorg, 1955.