Can Artificial Intelligence Help to Verify the Most Probable Electron Structure Model ?

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Abstract

It is recommended joining together existing models for the structure of the electron to an elegant geometric relativistic wave-manifold model by support of artificial intelligence. The final model should reproduce the experimentally verified fundamental properties of the electron with high accuracy, including *Sommerfeld*'s omnipresent structure constant and the anomalous gyromagnetic factor of the electron, where the properties are generated by the internal geometric or topological constraints of the object itself. We will then better understand how electron pairing or pairing of holes works and how it does not.

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Keywords: Artificial Intelligence, Electron, Positron, Quantum Vortex Structure, Fine Structure Constant, Anomalous g_e Factor, Zitterbewegung, Toroidal Ring Model, Horn Torus, Electron Fiber Model, Electron Wave Function, Icosahedron, Chirality, Precession Motion, Helix, Moebius Ball, Golden Mean.

The Proposal and Beyond

Different quite promising models for the electron structure exist developed by convinced researchers who forget every now and then quoting others [1]-[18]. Can artificial intelligence (*AI*) help by the evaluation of these models and create the most probable quantum vortex wavy structure of the electron using all existing neither right nor even wrong approaches? Surprisingly, most of these models deliver almost exactly *Sommerfeld*'s structure constant α as omnipresent fundamental number that describes matter in rotational motion and precession [19]. The electron spinning wave functions are quite similar, but should be, as a first step, compared by *AI* to show possible equivalence. We would like to encourage faire cooperation without lobbying and circular reasoning to finally resolve the structure of the electron as a long overdue contribution to modern science. The mathematical requirements for solving this task are manageable even for laypeople. In the end, more than one researcher will be credited with inventing the correct model. Exchange of ideas has already taken place consciously or unconsciously since the time of late *Miro Wolff*'s electron quantum waves, moving radially outward and inward [4]. We encounter everywhere evidence for icosahedral geometry in life, physics and cosmos. Conceptually, the electron vortex structure may be not an exception from this chiral geometry, because nothing more than a split helical photon structure is compacted

into sister particles showing a self-contained icosahedral structure of *Moebius* slings of opposite chirality or spinning charge displacement vectors describing a spinning spiral, the *Traill* model. The electron model wave function obtained by *Traill* reads as [12] [13]

$$\Psi_e = \frac{1}{r} \cdot \frac{\bar{h}}{4\pi c \varepsilon_0} \frac{Q_e}{m_e} \cdot \exp[\frac{-im_e c^2}{\bar{h}} \left(t - \frac{r}{c}\right)]$$

From *Traill*'s model *Sommerfeld*'s inverse structure constant emerges as π-based relation [14] [15]

$$\alpha^{-1} \approx 4\pi^3 + \pi(\pi + 1) = 137.0362458$$

Recently, we have developed an as yet physically not interpreted correction term again based on π and number 13, possibly compatible with *Traill*'s electron wave model

$$-\frac{\pi(\pi+1)-13}{2\sqrt{2}\cdot 13} = -0.00030451974$$

Including this correction, *Sommerfeld*'s inverse structure constant reads with 10 digits accuracy

$$\alpha^{-1} \approx 4\pi^3 + \pi(\pi + 1)\left(1 - \frac{1}{2\cdot 13\cdot\sqrt{2}}\right) + \frac{1}{2\sqrt{2}} = 137.035999256$$

The precise *CODATA* value for the fundamental constant is $\alpha^{-1} = 137.035999177(21)$ [20]. About a possible very small shift of the fine-structure constant over cosmic timescales see *Beeks et al.* [21]. We may confirm that the term $\pi(\pi + 1)$ also emerges from our icosahedral *Moebius* ball electron model in the relation between the *Compton* radius and the radius of the 12 *Moebius* strip slings [9]

$$\frac{R_c}{r_{sling}} = 1.011180106 \approx \pi(\pi + 1) - 12 = 1.011197055$$

Interestingly, the charge Q on a *Moebius* strip, renormalized by the area charge density σ, also yields [9]

$$\frac{Q}{2\pi\sigma} \approx \pi(\pi + 1) - 12$$

The right electron model must combine chiral angular rotation and angular precession motion. Does the icosahedral *Moebius* ball already combine these requirements? The present author follows the deep footprints of *Felix Klein*, *Arnold Sommerfeld* and *Linus Pauling* [22] [19] [23], and last but not least the exceptional mathematical-physical sense of *Preston Guynn* [7], who showed that we don't ever need the construct of *QED*.

Speaking for myself, I shortly explain the charged electromagnetic wave *Möbius* ball (*CEWMB*) model. This topological concept exhibits mathematically and physically precession as inherent property. The coordinate function $r(\theta)$ is given by

$$r(\theta) = [R_c + A \cdot cos\left(\frac{13}{2}\theta\right)] \cdot \hat{n}_{icos}(\theta)$$

where R_c is the *Compton* radius of the electron, $\frac{13}{2}$ mathematically imposes the 13 half-twists over the dual-loop domain ($\theta \in 0, 4\pi$), creating characteristic *Möbius* asymmetry, A is the amplitude of the high-energy localized quantum vortex loop, $\hat{n}_{icos}(\theta)$ represents a spherical mapping modulated by icosahedral harmonics Y_i^m belonging to the I_{532} rotation group, forcing the 12 spatial nodes (turning points) out towards the vertices of a regular icosahedron. We present a statiotemporal wave formula as self-confined propagating electromagnetic wave packet (or stationary quantum vortex)

$$\boldsymbol{\psi}(\theta, t) = \boldsymbol{\psi}_0 \cdot \exp[i\big(k_{eff} \cdot \boldsymbol{r}(\theta) - \omega_0 t\big)]$$

In order to accurately reflect the unique boundary conditions, we define the terms as frequency (ω_0), fixed to the standard de *Broglie-Dirac* rest frequency of the electron $\omega_0 = \frac{m_e c^2}{\bar{h}}$, the effective wave number (k_{eff}) formulated to account for the phase velocity $v_p = 2c$ inherent to the confined toroidal photon model $k_{eff} = \frac{\omega_0}{2c} = \frac{m_e c}{2\bar{h}} = \frac{1}{2R_c}$.

The global normalization amplitude $\boldsymbol{\psi}_0$ includes a scaling factor calculated via a golden quartic polynomial profile, where $\varphi = \frac{\sqrt{5}-1}{2}$ is the golden mean

$$\boldsymbol{\psi}_0 \propto f(\varphi)$$

Because the structure maps a *Möbius* ball, the spatial wave function must obey antiperiodic boundary conditions on a single 2π rotation, requiring a full 4π cycle to return to its starting orientation (mimicking a spin-$\frac{1}{2}$ particle description)

$$\psi(\theta + 2\pi, t) = -\psi(\theta, t), \quad \psi(\theta + 2\pi, t) = +\psi(\theta, t)$$

This unified wave function encapsulated the model by constraining a standard electromagnetic wave to a 13-fold twisted loop, structured into a 12-node icosahedral vortex shell. Below we summarize the key properties at a glance.

Property	**Implementation in the CEWMB model**
Physical Form	Stationary, chiral "ball" woven out of a continuous loop
Topology	13-fold half-twisted *Möbius* strip
Symmetry Axis	12 vertices on an icosahedron (icosahedral rotation symmetry
Internal Velocity	Energy circulated through all 12 sub-loops at the speed of light
Boundary	Confined within a sphere roughly equivalent to the *Compton* Wavelength

From our model, a quite simple approximation of the inverse *Sommerfeld* constant is suitable governed by considering icosahedron geometry yielding

$$\alpha^{-1} \approx \frac{12}{20}(228 + \theta_{ea}) = 137.0359618$$

where number 228 is a coefficient of the icosahedron equation [9], 12 and 20 represent vertex number respectively face number of the icosahedron, and the angle θ_{ea} results from the integral of the *Lorentz* transform derived by *Guynn*, which is used to scale the electron *g*-factor (see **Figure 1**) [7]

$$\theta_{ea} = \int_{\beta_1}^{\beta_0} \frac{1}{\sqrt{1-\beta^2}} d\beta = \arcsin(\beta_0) - \arcsin(\beta_1) = 0.39326960869\ldots$$

using $\beta_0 = \frac{v_0}{c} = \frac{\sqrt{3}}{2}$ and $\beta_1 = \frac{v_1}{c} = 0.6083087$. We can obtain the accurate *CODATA* value for α^{-1} when we shift β_1 only by a touch of +0.00256°. Earlier we used φ^3 in the relation. However, the good approximation holds: $\frac{3}{5}\theta_{ea} \approx \varphi^3 = \frac{2}{5}\varphi^5 + \frac{1}{5} \approx \frac{9(\pi+1)}{16\pi^2}$.

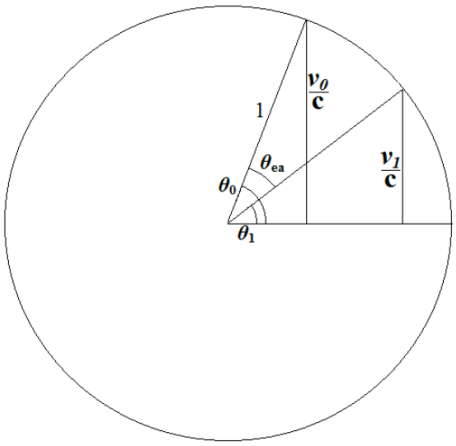

Figure 1. Integral of *Lorentz* transform over the electron anomalous range after *Guynn* [7].

$$\theta_0 = 60°, \theta_1 = 37.46731118°, \theta_{ea} = 22.53268882° \cdot \frac{\pi}{180} = 0.39326960869$$

For the anomalous gyromagnetic factor of the electron we estimated approximately [9]

$$g_e \approx 2 + \frac{\varphi^6}{12} + \ln\left(1 - \frac{\varphi^6}{24}\right) = 2.002319304$$

Interestingly, φ^6 is related to the in-sphere volume of the icosahedron: $\varphi^6 \propto V_{insph}^{-1}$ [24]. Considering the electron acting like a precessing yo-yo as brilliant visual analogy, we refer here again to the seminal work of *Preston Guynn*, who most precisely verified the g_e factor of the electron in rotation and precession motion without any *QED* construct [7] giving indeed the most precisely verified theory in human history

$$g_e = \frac{5\sqrt[3]{2}}{8\theta_{ea}} - \frac{2\beta_g}{2\pi\alpha^{-1}+3} = 2.00231930436122$$

where *Guynn*'s galactic velocity β_g indicates a negative value. We obtain from *Guynn*'s work the beautiful reciprocity relation [25]

$$\frac{\alpha}{\pi} = \frac{1}{\pi\alpha^{-1}} \approx \pi|\beta_g|$$

On the other hand, long time ago *Schwinger* approximated the anomalous part of the gyromagnetic factor of the electron with the fine-structure constant [26]

$$\frac{\alpha}{\pi} \approx \Delta g_e = 2 - g_e$$

By using the above given reciprocity relation we finally obtain a simple connection between *Guynn*'s galactic velocity and the anomalous part of the gyromagnetic factor

$$\pi|\beta_g| \approx \Delta g_e$$

We can go a step further and construct a connection to the perihelion precession of *Mercury*, already conjectured by *Gyunn* [7]. *Guynn*'s galactic difference velocity of the *Milky Way* has a value of

$$v_g = -221677.924988\ m/s \text{ and } \beta_g = \frac{v_g}{c} - 0.000739437964740$$

The value of the dimensionless constant β_g^2 is near *Mercury*'s precession in radians/revolution [27] [28]. It yields (see also *Gerber*'s result [29])

$$\beta_g^2 = 5.4676 \cdot 10^{-7} \approx \frac{\alpha^2}{\pi^4} \approx \left(\frac{\Delta g_e}{\pi}\right)^2$$

When we multiply this value with the eccentricity factor (1-e^2) for the orbit of *Mercury*, we get a value of $5.015 \cdot 10^{-7}$ [27] [28]. Interestingly, the relation connects the galactic velocity with the anomalous part of the gyromagnetic factor of the electron, showing its simplicity and beauty besides originality. *Einstein* once substantiated his General Theory of Relativity using the precession of *Mercury*'s orbit [30]. The reader may judge that for themselves.

Back to the electron, we should ask, what happens immediately after the high energy photons are decelerated and the sibling particles work against the gravitational field, now thought as resulting from displacement of an external energy source [31] [32]. Do the split energy packets initially exhibit a chaotic motion profile within a larger volume, only to subsequently form the ordered structures of an electron and a positron? If so, we could better model the resulting structures and potentially rule out certain models.
If in near future we have found common ground to compact the alternative approaches into a geometric relativistic wave-manifold model for the electron using the concrete and elegant

rules of geometry and topology, a team of the aforementioned scientists should facilitate a joint publication or, because page numbers would be very large, a book about the state of knowledge of the electron structure.

30 years ago, *Kim et al.* observed in one-dimensional $SrCuO_2$ spin-charge separation of the electrons into independent quasiparticles that carry either spin (spinons) or charge (holons) [33], but this finding hasn't contributed significantly to clarifying the internal structure of the electron.

It is always a good idea to look in different directions when conducting research. So we may gain profit from *Hooydonk*'s research on five-fold symmetry in the hydrogen atom [34].

Nobel Prize laureate *Frank Wilczek* once said "to understand the electron is to understand the world". I complete this for the concrete case of superconductivity: to understand the electron is to understand the internal structure of pairing, dispensing forever the inhibiting *BCS* construct.

An advice is added, quoting the great Chinese mathematician *Yueshui Lin*: "True computational revolution lies not in pursuing infinite precision, but in elegantly embracing uncertainty" [35].

A First Positive Report

An elaborated first elegant replay was written by *Stefan Zaichkowski*, how recently introduced his External Dimension Mechanics (*EDM*) approach as a new single-field reconstruction of time, geometry, and gravitation [36]. He concluded: "Mathematical evaluation confirms that the icosahedral *Möbius* topology represents a stable, lowest-energy excitation of the scalar progenitor field" [37]. His work can serve as basis for further creative insights.

Pivotal Role of Geometry in Physics and What Drives the Electron

The structure of the electron is an example for the role of geometry and topology in physics and joins the ranks of great geometric approaches that were honored in a recent article [38]. The question – at once physical and philosophical – of what energy drives the electron to a motion resembling perpetual motion is answered with the insight that everything is connected to everything else. The universe behaves a lot like a network of cosmic yo-yos including yo-yos in form of electrons, constantly winding up, dropping down, and pulling back. We have recently explained the gravity with the displacement of an energy field in the shadow of celestial bodies, caused by an external energy source [31] [32]. This source would force the entire system into a perpetual-like, deterministic wobble without requiring other stimulation. If we accept this, we no longer have to beat around the bush.

Conclusion

Existing approaches explaining the structure of electron and positron should be comparatively investigated to find the most probable geometric relativistic wave-manifold model. We should utilize support using artificial intelligence as umpire. An elegant electron model would clearly confirm the pivotal role of geometry in physics. The author thanks a young researcher who has promptly given his creative report.

Conflicts of Interest

The author declares no conflict of interests regarding the publication of this paper.

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