

Immediate Impact of Aphysical Quantum Mechanics on Fundamentals of Particle Physics

Victor Vaguine, Ph.D.
The Center for Ontological Quantum Studies
Dallas, Texas USA

Abstract

Aphysical Quantum Mechanics as a deeper quantum theory has resulted in immediate foundational transformation of particle physics, including discovery of particle inner structures of perfect geometry and explanation of the origin of their self-mass. The electron is not a fundamental fermion as claimed by the Standard Model. The electron is a composite fermion. It has in its inner structure three physical and three aphysical components, and three position parameters. The neutrino is focus of the study. The neutrino inner structure consists of intrinsic neutrino with negative weak electric charge and intrinsic antineutrino with positive weak electric charge of opposite helicity, thus preventing neutrino from its annihilation. Electron neutrino self-mass is determined with five digits precision and is equal to 296.118 828 eV. This is one of the greatest AQM triumphs.

*Science is the uncompromising search
for the truth in objective reality.*

No force in the world can stop fundamental scientific truth.

Aphysical Quantum Mechanics (AQM) is the result of thirteen years of my scientific work as an independent scientist outside of the scientific establishment.

Aphysical Quantum Mechanics is a deeper and more profound quantum theory and the origin of the Second Quantum Revolution. Aphysical Quantum Mechanics is published in three separate volumes under the title The Second Quantum Revolution [1], [2], [3].

In principle, one would not expect AQM to produce immediate scientific revolutions in other branches of fundamental physics, such as quantum optics and elementary particle physics, but that is exactly what has happened. Both of these branches—quantum optics and especially elementary particle physics—have undergone the dramatic foundational transformation.

The first quantum revolution has never been completed. For all those decades since 1927, Quantum Mechanics (QM) has remained an incomplete theory with huge fundamental gaps and fundamental pieces missing.

My scientific work sets in motion the Second Quantum Revolution, the genuine and profound one. It brings at the outset an avalanche of fundamental concepts and scientific fundamental discoveries.

AQM expands fundamental understanding of the quantum reality by postulating two more fundamental categories in addition to the physical category: the aphysical category and the elementary consciousness of elementary particles. There is no way one can comprehend quantum reality without these two additional fundamental categories.

I have discovered and explained three-dimensional inner structures and self-masses for each class of elementary particles, including new classes. Every step of their individual interactions in spacetime dynamics can be visualized in the human mind. New principles and new particles (in fact, new classes of elementary particles!) are postulated, with a plethora of new fundamental properties.

It has turned out that the “bread and butter” particles, such as the electron, the photon, the neutrino, the proton, and the neutron, have been left behind and, surprisingly, hardly explored fundamentally. Whatever we knew about these particles prior to the Second Quantum Revolution was only the tip of the iceberg.

The paradigmatic power of Aphysical Quantum Mechanics (AQM) is such that I was able to uncover 53 fundamental misconceptions/absurdities in the Standard Model (SM) theory of particle physics; and to make 27 fundamental scientific discoveries presented in all three Volumes.

AQM opens the floodgates of new physics. It brings democracy into foundational physics. Graduates and undergraduates will be able to select new physics problems to work on among the thousands immediately available. Hundreds of doctoral dissertations will be written based on AQM. And most importantly, for a change, the general public will be brought along.

In his book, “The Structure of Scientific Revolutions”, [4] Thomas S. Kuhn observes that genuine scientific revolutions are manifested by the destructive-constructive paradigm, meaning the massive destruction of old information and its replacement by new.

Not all pre-revolution theories and concepts are destroyed. Those that are along the natural scientific trajectory toward a deeper understanding of objective reality survive and flourish.

That is exactly what is happening in the Second Quantum Revolution driven by Aphysical Quantum Mechanics. It is not by chance the Second Quantum Revolution originated outside the scientific establishment.

The Copenhagen interpretation is replaced by the AQM paradigm. All known longstanding quantum enigmas, paradoxes, and mysteries are resolved. As far as QM is concerned, its role is about to shift from foundational physics to a useful mathematical quantum application tool for the calculation of statistical values, with some paradigmatic limitations recognized and applied.

Here are some principal points of Aphysical Quantum Mechanics:

- Quantum reality consists of three fundamental categories: physical, aphysical, and elementary consciousness.
- One of the core principles of AQM is the spacetime visualization of individual elementary particles and individual elementary quantum processes. *Physics without spacetime visualization has no future.*
- All elementary particles have non-zero size. All elementary particles have the three-dimensional inner structures of perfect geometry consisting of *the physical energy c-ring(s), the aphysical energy cylinder(s), and elementary consciousness.*
- The three-dimensional inner structure of perfect geometry is in conflict with the Heisenberg probabilistic uncertainty principle. The principle is not relevant to individual quantum entities and individual quantum processes.
- The inner structure of the fundamental elementary particle has a single physical c-ring and a single aphysical cylinder; the inner structure of the composite particle has two or more physical c-rings and two or more aphysical cylinders.
- Spin is the expression of elementary consciousness. Spin is the actual rotation in three-dimensional space at Compton angular velocity and peripheral velocity $v = c$. Spin is the mode of existence of the elementary particles and is eternal over their lifetimes. There are no elementary particles without spin, obvious or hidden. Spin can be visualized in a classical way. The elementary consciousness is the force driving spin. *No elementary consciousness – no spin – no self-mass.*
- Elementary particles are particles, never waves. Wave property is a probabilistic expression only.
- Free elementary particles travel in space along their individual trajectories, absolutely defined. The full-fledged elementary particle has a single trajectory. The self-entangled elementary particle has several trajectories but only one carries the physical substance. All other trajectories are aphysical.
- The elementary particle has a defined position in its frame of self-reference with zero momentum. This is also valid for bosons in their frames of self-reference $v = c$. The origin of self-mass (“self-energy”) for fermions and bosons (yes, for bosons!) is established and explained. Both fermions and bosons have self-mass. There is no more division of “massless” and “massive”. Yes, bosons are no

longer “massless”. Bosons have self-mass and zero kinetic energy in their frames of self-reference, $v = c$. Virtual energy does not exist.

- A self-entangled elementary particle can be in several places at the same time, physically always in one place and aphysically in all the others. Just prior to physical-physical interaction, a particle is instantaneously reconstructed to the full-fledged quantum state regardless of distances separating the host and a-fractions, with no violation of special relativity.
- After physical-physical interaction of one elementary particle with another elementary particle or with a macroscopic entity, such as a measurement device, no entanglement between them remains in the aftermath of their interaction. Without much ado, the perennial “measurement problem” exists no longer. There is an exception under some special conditions such as Bose-Einstein condensation at microKelvin temperature and superconductivity.
- AQM has expanded understanding of determinism and causality in the description of the quantum world. Yes, indeed, there are “hidden variables”, such as position parameters. For example, no two muons are identical. The difference in their lifetimes is explained by the difference in initial values of their position parameters acquired at their formation. *A decay of the individual particle is a deterministic process.* Similarly, no two electrons are identical.
- AQM explains that there is a fundamental source of quantum irreducible randomness. It is *the position parameter* which defines the position of the physical c-ring relative to the aphysical cylinder in the inner structure of the elementary particle. Bosons and fundamental (intrinsic) fermions have a single position parameter. Composite fermion such as the electron has more than one position parameter. Examples are shown in Figure 1 for photon and Figure 2 for intrinsic electron.

No two electrons anywhere in the Universe are identical. They have different values of the position parameter(s). *The SM principle of the existence of classes of indistinguishable particles is not valid.*

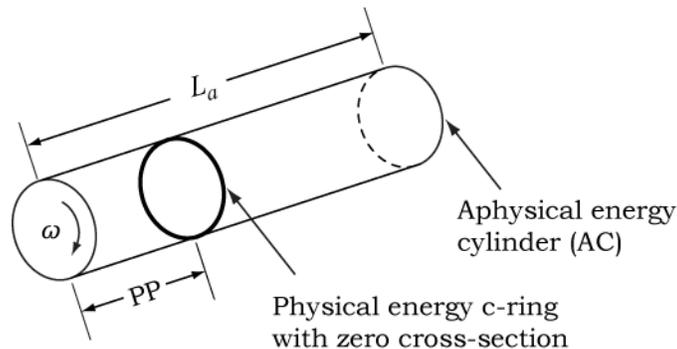


Figure 1 (by permission by ConsReality, Inc.)

Figure 1 shows the inner structure of the photon. PP is position parameter.

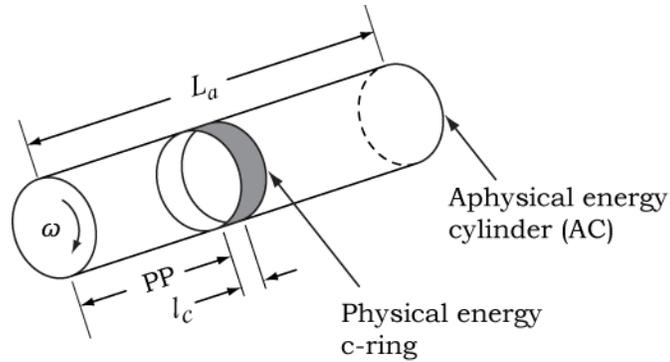


Figure 2 (by permission by ConsReality, Inc.)

Figure 2 shows the inner structure of the fundamental fermion, such as the intrinsic electron.

PP is position parameter.

- In the world of elementary particles, there is harmonious coexistence of the classicality and the quantum. The classical-quantum divide is a myth. *In AQM, the classicality has found its perfect expression.*
- Quantum laws are not universal. The quantum reality is a subset of the objective reality. Gravity is not part of the quantum reality. Humans and cats are not a subset of quantum reality.
- In my firm view, consciousness is the most important and enormously significant fundamental category. However, there is very little understanding of the consciousness as a fundamental category of objective reality. Consciousness cannot be derived from anything and neither can it be reduced to anything. In a nutshell, *the elementary consciousness is self-awareness, awareness, and action.*
- Each elementary particle has non-zero size.

A *pre-corset* c-ring Compton radius of elementary particles can be calculated in a classical way. In case of the electron, prior its formation, a pre-corset c-ring classical Compton radius r_c is equal to $2 \times 3.86 \times 10^{-13}$ meters. After the corset action, the c-ring is “instantaneously” and “dramatically” reduced to extremely small *quantum Compton radius* r_q , estimated in the range of $10^{-22} - 10^{-23}$ meters.

- Each elementary particle has spin rotating with the speed of light at the Compton angular velocity. The speed of light has a special significance in the world of elementary particles. It is incorporated into the inner structure of each elementary particle.
- SM declares that the electron is the basic fermion of electromagnetism. This is an SM fundamental misconception, among many others.
- According to AQM, the electron is a composite particle consisting of two constituents: the intrinsic electron and the electron neutrino (“duo-electrino”). Electron magnetic moment is the result of

electric charge rotation and *weak electric charge rotation*. There is no “anomaly” in the electron magnetic moment. The so-called “anomaly” is actually the electron neutrino magnetic moment. Calculation of “anomaly” on a basis of QED contributions is scientifically “illegitimate”. The electron inner structure has six components: three physical and three aphysical, and three position parameters [3].

- For over a hundred years, scientists have been searching for the electron physical model, with no success. I have discovered the correct electron physical model, which in itself is a historical milestone. The discovery explains a plethora of new physical-aphysical properties of the electron including the origin of self-mass, spin, the electron formation, electrostatic and magnetostatic field configurations, combined magnetic moment, the electric and weak charge fractionation, and three-dimensional configuration of the Cooper electron pairs in superconductivity.
- It is SM fundamental misconception that all fermions have spin $\frac{1}{2}$. The misconception comes from the accepted notion that there is only one Planck constant, it is one of a kind, and is applicable to all fundamental forces. More careful analysis shows that the origin of Planck constant is electromagnetism. I postulated that *each fundamental force has its own Planck constant*.
- According to AQM, the intrinsic neutrino $\hat{\nu}$ and the intrinsic antineutrino $\hat{\bar{\nu}}$ are the fundamental fermions of weak electromagnetism which is a second branch of electromagnetism with spin $\frac{1}{2} \hbar_w$, where \hbar_w is Planck constant of weak electromagnetism. The intrinsic neutrino $\hat{\nu}$ carries exclusively negative weak electric charge $-\omega$ and the intrinsic antineutrino $\hat{\bar{\nu}}$ carries exclusively positive weak charge $+\omega$. A value of weak electric charge ω is established with great precision.
- On the other hand, the commonly accepted neutrino in particle physics is in fact the duo-fermion of weak electromagnetism with two constituents: the intrinsic neutrino ($\hat{\nu}$) and the *reversed* (meaning, opposite helicity) intrinsic antineutrino ($\hat{\bar{\nu}}^R$), presented as

$$\nu = \left\{ \begin{array}{c} \hat{\nu} \\ \hat{\bar{\nu}}^R \end{array} \right\},$$

and the antineutrino, presented as

$$\bar{\nu} = \left\{ \begin{array}{c} \hat{\bar{\nu}}^R \\ \hat{\nu} \end{array} \right\}.$$

- The neutrino has two opposing spins, $+\frac{1}{2} \hbar_w$ and $-\frac{1}{2} \hbar_w$, resulting in spin $S = 0$. *The neutrino has zero spin*. It is *a hidden spin*. Two opposing spins in the neutrino inner structure prevent positive and negative weak electric charges from their mutual annihilation [3].

- I postulated that the neutrino is a single field fermion with magnetostatic energy only. The neutrino is a stable particle, as stable as the electron. The neutrino can travel long distances, as has been confirmed by observations from supernovae and the Sun.
- Contrary to SM, the neutrino is not a lepton.
- The fundamental role of the neutrino in the world of elementary particles has been discovered and explained. The neutrino provides *the corset function* for relative or absolute stability of leptons.
- According to SM, electron neutrino mass is zero, although nowadays few physicists believe that. For many decades there has been ongoing theoretical and experimental effort toward resolving the issue of electron neutrino mass, with marginal results so far. The present consensus is that the electron neutrino mass is less than or equal to 0.120 eV. This is another SM misconception.

The longstanding problem with electron neutrino mass issue is solved in AQM with the precision of five digits. AQM provides a correct value to the electron neutrino self-mass. *The electron neutrino self-mass is equal to 296.118 828 eV.*

This is one of the greatest AQM triumphs.

A new challenge for the mathematically inclined physicists with intuition is to develop a mathematical formalism for the description of individual elementary quantum processes in spacetime dynamics. This is what is on the horizon and coming to quantum physics in the near future. However, even without new mathematics, I was able to reconstruct in detail the spacetime dynamics of selected individual elementary quantum interactions and processes, such as the muon decay and the subsequent formation of the electron.

References

- [1] Victor Vaguine, *The Second Quantum Revolution. Volume One. Foundational Transformation of Quantum Mechanics. Aphysical Quantum Mechanics as Deeper Quantum Theory. Elementary Consciousness of Elementary Particles.* ConsReality Press, 2020.
- [2] Victor Vaguine, *The Second Quantum Revolution. Volume Two. Foundational Transformation of Quantum Optics. AQM Theory of the Photon.* ConsReality Press, 2020.
- [3] Victor Vaguine, *The Second Quantum Revolution. Volume Three. Foundational Transformation of Quantum Electrodynamics. Two Branches of Electromagnetism.* ConsReality Press, 2021.
- [4] Thomas S. Kuhn, *The Structure of Scientific Revolutions*, 3rd edition, The University of Chicago Press, Chicago and London, 1996.