Ultimate Possibilities of Physics

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Abstract In an attempt to describe the ultimate possibilities of physics, I would like to present a theory of physics referred to as Quantum Field Mechanics that, in my opinion, unifies quantum theory and relativity, and collapses many speculative ideas pursued by the physics community. In this way, a consistent basis is obtained for further research.

1 Introduction

Several highly abstract models are in vogue among physicists (possible in physics?) in an attempt to pursue unification of theories. These models describe artifacts that are extremely difficult to falsify. Examples of such models are String Theory the Multiverse. Before those intellectually interesting models are pursued any further, it seems to be far more efficient to seek a unifying theory that considers nature solely at directly observable scales within our own universe.

Quantum Field Mechanics (QFM), originated by Andrei P. Kirilyuk, realizes unification of quantum theory and relativity by leveraging absolutely minimal observation-based conjectures. This particular unification appears correct since the theory is self-consistent, avoids unnecessary abstractions, and is devoid of singularities and paradoxes [2,3]. In addition, QFM allows clear physical interpretation of observables and reproduces many elements of current theories. QFM confirms some of the original ideas of Louis de Broglie on the nature of massive particles and their 'internal clock' [1].

The following section describes the main characteristics of QFM, where mathematical details have largely been omitted. Next, a comparison is made between elements of QFM and current theories. Lastly, I would like to address the 'ultimate possibilities of physics', to hypothesize where this could lead us.

2 Quantum Field Mechanics

2.1 Protofields and Protofield Interaction

Based on experiments, four fundamental interactions are distinguished in nature. Of those interactions, electromagnetic interaction and gravity both have a long-range character. Weak interaction and strong interaction are short-range interactions. In order to match the observed types of interactions with theory while relying on minimal assumptions it is conjectured that two fundamental fields, called *protofields*, are present in nature which facilitate both interactions between particles and the existence of particles, resulting in ultimate unification.

The so-called *electromagnetic protofield* is responsible for electromagnetic interaction and weak interaction. The *gravitational protofield* facilitates gravity and strong interaction. It is also assumed that, in the absence of any interaction between them, the protofields are homogeneous. This ensures that there are no preferential motion directions for protofield perturbations and that, within a protofield, the short- and long-range interactions transition into one another in a continuous fashion.[1] In order to enure that protofield perturbations can be identified with particles it must be assumed that they can be created and persist 'locally' without dissolving into a perturbationless field. This requires that the protofields are frictionless and are mutually attractive. Section 2.2 provides an analysis of this interaction, which confirms the existence of stable, but dynamic, perturbations.

From observations, it is known that the long-range electromagnetic interaction is much stronger than gravity. Therefore, in order to match particle interaction behavior mediated by the protofields with observed interaction strengths, the electromagnetic protofield must be much more mobile compared to the stiff gravitational protofield [2,3]. The very different protofield mobilities and protofield attraction have several consequences for the behavior and observability of protofield perturbations. A perturbation in both fields will be primarily observable within the electromagnetic protofield. The speed of a perturbation in the electromagnetic protofield should be constrained by its attraction to the gravitational protofield and be fixed due to the extreme stiffness of the the latter. After further development of the theory and comparison with results from contemporary relativity, it turns out that this speed can be identified with the speed-of-light c [2,3].

2.2 State Equation

In its most general form, protofield interaction is described by the state equation equation [2,3]

$$[h_g(\xi)+V_{eg}(q,\xi)+h_e(q)]\Psi(q,\xi)=E\,\Psi(q,\xi) \tag{2.1}$$

where

- ξ is the degree of freedom of the gravitational protofield,
- $h_g(\xi)$ is a linear operator that represents the free gravitational protofield,
- q is the degree of freedom of the electromagnetic protofield (the actual number of degrees is considered later),
- $h_e(q)$ is a linear operator that represents the free electromagnetic protofield,
- $V_{eg}(q,\xi)$ is the protofield interaction potential or entanglement potential that represents the attractive binding between both protofields,[2]
- the eigenfunction $\Psi(q,\xi)$ is the state function, which describes the dynamics resulting from the protofield interaction,
- the eigenvalue E is the energy of the protofield interaction energy.

The operators $h_e(q)$ and $h_g(\xi)$ are the Hamiltonians of the unbound protofields. The variables q and ξ are independent, since the protofields in their unbound state are assumed to be independent entities. The exact mathematical form of the free protofield Hamiltonians $h_e(q)$ and $h_g(\xi)$ and the interaction potential $V_{eg}(q,\xi)$ is left unspecified, since the detailed properties of the protofields and their interaction are unknown. For this reason, the general interaction description does not impose any constraints on their form, apart from the fact that the interaction potential $V_{eg}(q,\xi)$ describes protofield attraction.

The state equation is symmetric, because it takes the existence of both protofields and their interaction into account and considers both protofields equally important. Therefore, the state equation describes the most fundamental symmetry in nature. To stress this symmetry in a

[1] As indicated later, this continuous transition occurs in a non-linear fashion. This differs from current theory, which introduces several types of (virtual) particles to describe particle interaction in a discrete fashion.

[2] This potential function should not be confused with electrostatic / gravitational potentials from classical field theories.

notational sense, the protofield interaction potential $V_{eg}(q,\xi)$ is situated between the free field Hamiltonians. The state equation, with the bipartite potential function $V_{eg}(q,\xi)$, must be distinguished from conventional two-body interaction descriptions, which consider one interacting body and a single argument potential acting on this body. Such half-interaction models provide incomplete, but in general very good, approximate descriptions.

The deceptively simple form of the state equation suggests that its general solution should also be simple, particularly because the superposition principle holds. Analysis of the state function $\Psi(q,\xi)$ shows that this is not the case [2,3]. The properties of the state function are investigated by rewriting the state equation as an effective potential equation that is explicit in the gravitational protofield degree of freedom and implicit in terms of the electromagnetic protofield degree of freedom. Using the effective potential equation, it is demonstrated that the general state function solution has several intricate properties.

Two types of states (modes or existence) are present in the general state function, namely a single weakly bound *intermediate state* and one or more strongly bound *reduction states* (also called *quanta*).[3] Since there are no additional constraints imposed, all states must appear with equal likelihood. Furthermore, cannot simultaneously occur and are, therefore, *mutually exclusive.* Consequently, all states must occur (appear) individually and, in one or another way, transition into one another, causing the states to be dynamic.

Since the general state function has one or more reduction states and a single intermediate state, two cases are distinguished, namely massive particles and photons. A particular state function solution that has at least two reduction states (and the intermediate state) is identified with a *massive particle* [2,3]. A particular state function solution that has only one reduction state (and the intermediate state) is identified with a *photon* [3].[4]

In case of massive particles, despite the fact that the state equation is linear, the general state function $\Psi(q,\xi)$ exhibits a self-sustaining highly non-linear pulsating ('repeatedly collapsing') behavior, since all states must be traversed. As a result, the state function performs an unceasing pulsating process of the form $\cdots R \rightarrow I \rightarrow R \rightarrow I \rightarrow R \cdots$, called *quantum beat process*, where *R* indicates one of the pulse-like reduction states and *I* indicates the intermediate state.

During the pulse-like dynamics, the protofields dynamically entangle (intertwine) and are momentarily strongly bound into a point-like corpuscular state, corresponding to a dynamically created *space point*.[5] After maximum entanglement, the protofields dynamically disentangle into the weakly bound intermediate state, before transitioning into yet another strongly bound reduction state.

The intermediate state facilitates the dynamic transitions between any two subsequent pulse-like reduction states. Since the reduction states emerge dynamically and, because there is no preference with respect to their appearance, a *random transition* must occur from the current reduction state, through the intermediate state, to the next dynamically selected reduction state. The existence of this random oscillation phenomenon can, in principle, never be found in a single-argument potential interaction description because, in the latter case, it cuts out the dynamic contribution of interaction partners [2].

[3] Kirilyuk normally calls these states intermediate realization and reduction realization. Weak (strong) binding means that there is a small (large) perturbation in the electromagnetic protofield caused by protofield attraction.
[4] Photons could also be identified with particle that have only an intemediate state. More investigations are needed to determine the exact number of reduction states.
[5] Protofield entanglement (intertwinement) is a consequence of the simultaneous effects of protofield attraction and rotation (i.e. spin, see section 2.6).

The internal random unceasing quantum beat process gives rise to dynamically emerging discrete *space* and *time*. Space emerges as the discrete high-density points created in the course of the entangement dynamics of reduction states. Time emerges as a consequence of non-linear pulsation.[6] According to [2], the two protofields and their interaction give rise to 3-dimensional space. Another possibility is that the electromagnetic protofield has 3 degrees of freedom. Since it is this protofield that is primarily observable, upon its dynamic interaction with the gravitational protofield, this leads to a 3-dimensional observable space.

Asymmetry and *irreversibility* of time is a consequence of the randomness of the state-transitions of the quantum beat process. As time progresses, any memory about the states that have been traversed is lost. That is to say, upon creation of a new quantum beat state, the past is dynamically destroyed at the edge of the present. Similarly, the order of future state transitions cannot be predicted.

The unceasing motion of protofield perturbations, combined with the random state transitions between at least two reduction states, must result in random spatial motion of the pulsating quantum beat process of a massive particle (zitterbewegung). This motion occurs at the speed-of-light (section 2.1). The random motion causes *inertia* of massive particles, because it counteracts any change in externally observable particle motion (see below).

The random motion at the speed-of-light performed by a massive particle has a uniform or non-uniform distribution of space-points. A uniform local distribution of space-points is identified with a *stationary particle*. A non-uniform distribution of dynamically generated space points is identified with a *particle in motion*. That is, the average of random space-point motion corresponds to particle motion. Therefore, the notions of being stationary or in motion are *relative*. It follows that a massive particle in motion has two co-existing behaviors: internal random motion and externally observable linear (coherent) motion. This behavior gives rise to a world that appears to be non-random and predictable, but has an underlying unpredictability at small scales (co-existence of determinism, randomness and uncertainty). The external motion can only approximate the speed-of-light when the distribution of dynamically generated space points is highly uniform.

Upon particle motion, a sequence $\cdots I \rightarrow I \rightarrow I \rightarrow I \cdots$ of intermediate state occurrences (where the presence of the interposed reduction states is omitted) becomes spatially organized, because intermediate states are interposed between reduction states. The average behavior of the intermediate state is identified with *de Broglie's wave*, which should not be confused with the more fundamental state function $\Psi(q, \xi)$. Dynamically created space points are observed in collision experiments as the *corpuscular property* of particles. It can now be understood that every particle has a combined wave-corpuscular character, also referred to as *wave-particle duality*.

The dynamic quantum beat process of massive particles perturbs both protofields, which in turn gives rise to the four known types of interactions between particles. Short-range interactions are extremely non-linear due to the reduction state dynamics of quantum beat processes. The long-range interactions become more linear farther away from quantum beat processes, which approaches weakly bound protofield behavior.

In case of photons, the dynamic transitions between reduction states is non-random, since only one reduction state exists. Consequently, photons do not perform an internal random quantum

[6] The internal pulsation (clock) in electrons has been confirmed experimentally [4].

beat process. They are oscillating protofield perturbations that are, again, primarily observable in the electromagnetic protofield, and perform linear motion at the speed-of-light. In other words, photons resemble massive particles, but without the inertia causing randomness of the latter. Their internal motion and externally observable motion is identical.

2.3 Quantum Condition

In QFM, the quantum beat process of an electron in motion is described relative to a 'displacement frame' as the quantum condition

$$h = E\,\Delta t - \sum_{i=1}^{3} p_i \Delta x_i \qquad (2.2)$$

where h is Planck's constant, Δt is the *discrete quantum period* of the particle in motion, E is the *energy* of the particle,[7] and p_i is a proportionality factor called *momentum* of the particle in the direction of one of its three possible displacements Δx_i. The particular form of the action condition can be motivated from quantum beat behavior [2,3]. For Δt holds that $\Delta t \geq \Delta t_0 > 0$, where Δt_0 is the quantum beat period of a stationary electron.[8]

Quantum condition (2.2) is not tied to a particular coordinate frame of reference, but holds relative to a given displacement frame. A displacement frame is a set of orthogonal axes with respect to which particle motion (not location) is observed. The quantum condition yields many results from classical dynamics and relativistic theory of a free massive particle, such as the relativistic expressions for energy and momentum, and Schrodinger's wave equation [2,3]. Therefore, $h \neq 0$ is essential to reproduce both classical and relativistic behavior and $h \rightarrow 0$ does not correspond to the classical limit.

2.4 Quantum Beat Frequency of an Electron

The action condition $h = E\,\Delta t_0$ of a stationary electron is obtained by setting all displacements Δx_i equal to zero in (2.2), such that $\Delta t = \Delta t_0$. This action condition yields the relation

$$E = h\,v_0 = m_0 c^2 \qquad (2.3)$$

where the quantum beat frequency is defined as $v_0 \equiv 1/\Delta t_0$ and Einstein's relation $E = m_0 c^2$ is used as a definition of the notion of rest-mass m_0. Using (2.3) and the accepted values for Planck's constant, the speed-of-light and rest-mass, the quantum beat frequency of a stationary electron is calculated as $v_0 \approx 10^{20}$ Hz. This value is supported by experimental work [4] and theoretical considerations [5].

2.5 Lorentz Transformation

Since the left-hand side of (2.2) is constant, this expression describes relativistic invariant motion. More specifically, it expresses that quantum and (special) relativistic behavior are unified and originate from the randomly oscillating protofield interaction (quantum beat process). Using (2.2), the Lorentz transformation that relates discrete time and displacement between different states of motion of an electron gets exactly the same form as in Special Relativity [3].

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7 Which is the relativistic energy of the massive particle and should not be identified with the protofield interaction energy.

8 The quantum beat period Δt and the displacements Δx_i (i=1..3) over a single quantum beat period must not be interpreted as uncertainties.

2.6 Spin

Since the electromagnetic protofield is much more mobile than the gravitational protofield, during the reduction phase of a quantum beat cycle of a massive particle when the protofields are strongly bound together, the motion of the gravitational protofield is smaller than the motion of the electromagnetic protofield. Therefore, a continuous rotation must occur in both protofields which is driven by the sheer instability of the unceasing quantum beat dynamics. This rotation is unified with the quantum beat pulsation into a single process and is identified with physically observed particle *spin* [2,3].

2.7 Charge

The quantum beat processes of electrons and positrons must have the same frequency, since their masses are identical, see (2.4). Then, for a consistent description of the notion of *electric charge*, the quantum beat processes of electrons and positrons must have an opposite phase [2,3]. If any quantum beat phase would be possible, then those particle could sometimes be attracting and other times be repelling.[9]

Experimentally detected sets of two/three quarks inside hadrons are naturally identified with space-points that are created in the course of quantum beat process dynamics. Therefore, it is natural to assume that hadrons are bound aggregates of two or three quantum beat processes which are frequency synchronized, and phase- or anti-phase synchronized with the quantum beat processes of electrons. This assumption provides a consistent notion of electric charge for all massive particles and might explain the observed fractional charges [3], see also subsection 2.10.

2.8 Electromagnetic Interaction

Electromagnetic interaction is caused by the long-range interaction of the quantum beat dynamics of massive particles through the electromagnetic protofield. This interaction is described by the *potential quantum condition* of an electron (or positron) with charge q [3]:

$$h=(H-q\phi)\Delta t-\sum_{i=1}^{3}(\Pi_i-qA_i)\Delta x_i \qquad (2.4)$$

where

- ϕ is the *electromagnetic scalar potential* at the location of the particle.
- $\boldsymbol{A}\equiv(A_1, A_2, A_3)$ is the *electromagnetic vector potential* at the location of the particle.
- $(\phi, \boldsymbol{A})$ is the *electromagnetic potential* at the location of the particle.
- H is the *generalized energy* of the particle in the electromagnetic potential.
- $\boldsymbol{\Pi}\equiv(\Pi_1, \Pi_2, \Pi_3)$ is the *generalized momentum* of the particle in the electromagnetic potential.

The quantum beat period Δt and displacement $(\Delta x_1, \Delta x_2, \Delta x_3)$ of the particle are similar to the corresponding free particle entities, but now pertain to the particle subjected to electromagnetic interaction.

Quantum condition (2.4) and the Lorentz transformation (section 2.5) are used to derive all main results from electromagnetic theory such as potential and field transformations and Maxwell's equations [3].

[9] Phase synchronization of oscillators is a well-known phenomenon that occurs between identical non-linear behaving objects. It was observed by Christiaan Huygens with two closely spaced clocks that were interconnected by a stiff medium. The pendulum motion of the clocks converges, in his case, to exact anti-phase consonance [6, pp. 105-109].

2.9 Gravity

The theory can also be extended to incorporate (long-range) gravitational interaction caused by particle dynamics through the gravitational protofield by approximating the motion of the particle subjected to gravity as piece-wise free particle motion. This can be accomplished by introducing the physically rationalized metric g_{ij} and the invariant interval Δs as

$$\Delta s^2 = \sum_{i=0}^{3} g_{ij} \Delta x_i \Delta x_j \tag{2.5}$$

where the interval Δs is equal to $c \Delta t_0$ and the Δx_i are as in (2.4). The metric equation yields the geodesic equation of General Relativity which describes the motion of particles subject to gravity [3]. Unlike General Relativity, this description does not rely on curved space-time.

2.10 Bound Quantum Beat Processes and Fractional Charge of Hadrons

By investigating the structure of particles and particle decay processes, it appears that the charge $Q(p)$ of any particle *p*, which quantifies long-range electromagnetic interaction, can be written as a linear combination of short-range 'fractional charges' that are detected in high-energy experiments [3], i.e.

$$Q(p) = \sum_{i=1}^{N} Q_i^F(p) \tag{2.6}$$

where N=0..3 indicates the number of quantum beat processes of the particle, see Table 2.1. The *fractional charge* $Q_i^F(p)$ of the *i*-th quantum beat process of a particle *p* is equal to

$$Q_i^F(p) = \frac{1}{2}\left(\varphi_i(p) + \frac{B(p)}{N}\right) \tag{2.7}$$

where $\varphi_i(p)$ is the phase of the *i*-th quantum beat process (-1 and +1 for quantum beat processes of massive particles and 0 for photons) and the quantum number *B*(*p*) is defined as in Table 2.1.[10]

Class	*B* for Particles	*B* for Anti-Particles	# of Quantum Beat Processes *N*
Baryons	1	-1	3
Mesons	0	0	2
Leptons[11]	-1	1	1
Neutrinos	-1	1	1
Photons	0	0	0

Table 2.1: Values of *B* and *N*

This results in fractional charges of particles as indicated in Table 2.2. In contrast with leptons, the fractional charge of hadrons is a real fraction. The fractional charges of (anti-)mesons differ from the Standard Model, but have never been measured as far as known to the current author.

[10] Quantum number *B*(*p*) differs from the baryon number of the Standard Model. However, it has some similarities with both the Baryon number and the Lepton number.

[11] Excluding neutrinos.

Class	Fractional Charges		
Baryons	-1/3		+2/3
Anti-Baryons	-2/3		+1/3
(Anti-) Mesons	-1/2		+1/2
Leptons	-1		
Anti-leptons			1
(Anti-) Neutrinos	0		0
Photons		0	
	$\varphi_i=-1$	$\varphi_i=0$	$\varphi_i=+1$
	Phases		

Table 2.2: Fractional Charges

2.11 Planck Time, Length and Mass

In order to provide the current equations for Planck time T_P, Planck mass M_P, and Planck length L_P with a proper physical interpretation in the context of QFM, the gravitational constant G_0 needs to be replaced by the inter-protofield interaction strength G_i such that

$$L_P^r=\left(\frac{G_i\hbar}{c^3}\right)^{1/2},\quad T_P^r=\left(\frac{G_i\hbar}{c^5}\right)^{1/2},\text{ and } M_P^r=\left(\frac{\hbar c}{G_i}\right)^{1/2} \tag{2.8}$$

where the superscript r signifies the rescaling [2,3]. In this way, G_i, $\hbar$ and c are all particle properties in contrast with G_i.

The mass-hierarchy problem, which takes issue with the vast energy gap between the currently observed largest particle mass and the Planck mass, is solved when it is assumed that the largest mass of particles M_P^r is close to the currently observed largest particle mass. Under this assumption, an estimate of the ratio of G_i and the gravitational constant G_0 is obtained by combining the expression for Planck's mass $M_P=\left(\hbar c/G_0\right)^{1/2}$ and the adjusted Planck mass M_P^r, which results in

$$\frac{G_i}{G_0}=\frac{(M_P)^2}{(M_P^r)^2}=4.7\times10^{20}\ -\ 4.7\times10^{22} \tag{2.9}$$

2.12 Particle Stability

The very large ratio (2.9) may ensure stability of electrons, since it is unlikely that they can be destroyed by gravity. In the same way, it is argued that quantum beat processes that are bound together into hadrons execute self-preserving non-linear oscillation. Stiffness of the gravitational protofield results in a short-range interaction, aka as strong force, between quantum beat processes that must be attractive. Non-linear quantum beat behavior makes this attraction many orders of magnitude stronger than gravity. A quantitative description of the strong force and effect of electromagnetic protofield interaction on particle stability remain to be provided in the context of QFM.

3 Comparison to Current Theories

3.1 The Character of Time

One of the main differences between current theories of physics and QFM is that the latter introduces a precise notions of space and time. Current theories often model time as a continuous background parameter without ever being able to specify its physical meaning. Furthermore, physicist hardly ever seem to be in agreement on the character of time, or even its necessity for describing nature [9]. According to QFM, space and time are united in a single process and are both crucial for unification of theories of physics, see condition (2.1).

Most equations of physics are symmetric in time, suggesting that time travel is possible. However, this is merely a mathematical artifact which ignores the existence of the underlying random behavior of the state function.

According to QFM, time is dynamically produced by a quantum beat process and, therefore, has a local character. However, since quantum beat processes are globally synchronized time also has a global character.

Since, in QFM, time corresponds to the oscillation period of a physical quantum beat process, it should not be interpreted physically as a dimension of an abstract mathematical space. However, the particle displacements Δx_i and particle time Δt in quantum condition (2.2) can be treated mathematically together in terms of a 4-dimensional space which yields all results from Special Relativity (section 2.5). Gravity imposes additional constraints on the relation between discrete displacement and time, which may be compatible with QFM (more research is required) such that some of the main local results from General Relativity might be reproduced.

3.2 Wave Function Collapse and the Many World Interpretation

The supposed instantaneous collapse of the wave function, that occurs according to Quantum Mechanics, does not exist in QFM. Every state of a massive particle is dynamically created and destroyed within a discrete quantum beat period Δt_0 . The wave function, defined as the average of the state function $\Psi(q, \xi)$ over many quantum beats, does not collapse into a single state.

Each of the states (modes of existence) of the state function $\Psi(q, \xi)$ could be interpreted as a 'world' by itself. This 'world' gets dynamically created and is subsequently destroyed as part of the unceasing oscillating quantum beat process and re-appears again at a random moment in the future. This interpretation does not correspond with the many-world interpretation for the universe as a whole, which has no place in QFM.

3.3 Origin of Mass

According to QFM, the mass of a free particle originates from its unceasing pulsation, presence of internal random 'thermodynamic' motion, and the binding energy between quantum beat processes (in case of hadrons). For electrons, the internal oscillation appears to be confirmed experimentally [4]. Consequently, there is no need for a Higgs particle to generate particle mass. If correct, the current pursuit for the Higgs particle is in vain.

3.4 Origin of the Universe, Dark Matter and Dark Energy

The interacting protofields constitute the physical universe, but the origin of this universe cannot be deduced from within QFM. Inclusion of the big-bang hypothesis requires an extra assumption beyond the previously stated conjectures and introduces an inconsistent perspective of the fundamental character of space and time.

Current cosmology relies on dark matter and dark energy as place holders to model the dynamic behavior of galaxies and the supposed accelerating expansion of the universe. These notions do not appear in QFM and would also require assumptions beyond its foundation. In QFM, the notions of dark matter and dark energy may be explained as artifacts of ignored internal randomness of matter [2]. Explanation of dark matter gives results that may be compatible with MOND [7].

3.5 Faster-than-Light Communication

As indicated, any protofield disturbance is primarily observable in the mobile electromagnetic field and propagates at the speed-of-light. It is well known that stiff media propagate transverse disturbances much faster than mobile media. This leaves open the possibility of faster-than-light interaction through the gravitational protofield, although probably impractical for information exchange.

4 The Original Issue

Let's step back to the issue of 'ultimately possibilities of physics' and assess it in the context of QFM. It is clear that QFM accomplishes unification of quantum theory and relativity and reproduces many results of current physics. However, it requires that some prevalent theories need to be viewed in a different light.

More specifically, the quantum beat process of an electron locally unifies pulsation, rotation, randomness, and dynamically created time and space into a single process. Global quantum beat frequency synchronization and (anti-)phase synchronization is maintained among massive particles, resulting in coherent notions of charge and time. Interaction between massive particles is the result of their quantum beat dynamics and is mediated by the protofields. Photons are identified with non-random oscillating objects. With this understanding, it might be 'ultimately possible' to describe all physical phenomena consistently as part of a single unifying paradigm.

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