UNIVERSAL TOPOLOGY $W = P \pm iV$
AND
FIRST HORIZON OF QUANTUM FIELDS

The Christmas Gifts of 2016

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The cover letter to Nature Physics

February 6, 2017

Dear Editors, Editor in Chief, and Peer Reviewers,

Based on a groundswell of supportive feedback, it is my honor submitting you this manuscript that declares the following Five Remarks of the discoveries for your reviewers and feedbacks to the respective questions:

Remark 1: Universal Topology of $W = P \pm iV$ represents alternating supremacies of both physical and virtual dynamics as a life streaming of interwoven events.

For over a century, the law of physics has been revealed and implied in the well-known formulae of (6.5), (7.3) and (7.4) that we are all familiar with. However, the philosophical principles of physics is disgusted by the "math operators" which have governed successfully in deriving Quantum mechanics as well as classic Lagrangian analytical mechanics.

Q: Should this article have demonstrated enough evidences by promoting our well-known formulae of contemporary physics to a new level of the meaning as the natural law of physics: $W = P \pm iV$?

Remark 2: The law naturally represents Dual Manifolds $M\{\mathbf{r} \pm i\mathbf{k}\}$, operating as conjugate opponents with the complex vectors, which is a groundbreaking in the *Spacetime Manifold*.

Because of the vagueness of Minkowski space, "*All attempts to obtain a deeper knowledge of the foundations of physics seem doomed to me unless the basic concepts are in accordance with general relativity from the beginning. This ... forces us to apply free speculation to a much greater extent than is presently assumed by most physicists.*" - Albert Einstein, "On the generalized theory of gravitation" April 1950 (35 years after General Relativity in 1915).

Q: What is the philosophy behind Minkowski space? Should this article have uncovered the philosophy of spacetime deeper or provided at least an alternative option for our potential research?

Remark 3: The duality generates a set of the conjugate *Event Operators* that eliminates or derives the math law of quantum mechanics.

Q: As no amount of careful empirical approach can replace the intrinsic law, should this manuscript have presented the discovery that not only replaces but also derives the "math laws" of quantum mechanics?

Remark 4: Dual Universal Energy Equilibrium, constituted concisely as an infinite sum of series, extends the meaning of Lagrangian density, and the accuracy beyond the second order of Energy Conservation.

Because of the vagueness of Lagrangian density, its aged success has now become the roadblock to our scientific research.

Q: What is the philosophy behind Lagrangian density? Since the well-known Lagrangian density is another successful "math laws" of physics, should this article have extended its true meaning to a duality of *Universal Energy Equilibrium*? Should this discovery have uncovered the philosophy of physics deeper? Should this article have demonstrated our classic Energy Conservation is accurate only up to its second order?

Remark 5: The classic motion equation is boosted to play to a duality of physical and virtual dynamics as an alternative life streaming, which naturally derives the general quantum fields and concisely includes *Schrödinger and Klein–Gordon equations*.

Q: Should this article have presented that the popular Motion Equation has its opponent of complementary, inseparable, and reciprocal partner? Should you be demonstrated the principle of duality operations such that only do *together they operate our life streaming of the world*? Should this discovery have completely removed "math laws" of quantum mechanics and concisely derived the general quantum mechanics?

The author is grateful for the support of editors and the peer reviewers for precious hours offering rigorous review and providing feedbacks.

Respectfully yours,

C. Wei XU

Decision on Nature Physics manuscript NPHYS-2017-01-00211

January 25th, 2017

Dear Mr Xu,

Thank you for submitting your manuscript entitled "Universal Topology $W = P \pm iV$ and First Horizon of Quantum Fields". However, we regret that we are unable to offer to publish it in Nature Physics.

Because we receive many more papers than we can publish, we must decline a substantial proportion of manuscripts without sending them to referees, so that they may be sent elsewhere without delay. Decisions of this kind are made by the editorial staff when it appears that papers, even when technically correct, are unlikely to succeed in the competition for limited space.

Among the considerations that arise at this stage are the length of a manuscript, its likely interest to a broad readership of physicists, the pressure on space in the various fields of interest covered by Nature Physics and the likelihood that a manuscript would seem of great topical interest to those working in the same or related areas of physics.

In the present case, we have no doubt that your findings will be of inherent interest to fellow specialists. But I regret that we are unable to conclude that the paper provides the sort of conceptual advance in scientific understanding that would be likely to excite the immediate interest of researchers in a broad range of other areas of physics. We therefore feel that the present paper would find a more appropriate outlet in a specialist journal, rather than Nature Physics.

I am sorry that we cannot respond more positively. The unfortunate fact is that we receive many more papers than we can undertake to publish, and we must attempt to select those that will be of the greatest interest to a wide audience. I hope that you will rapidly receive a more favourable response elsewhere.

Yours sincerely,

Dr. Iulia Georgescu

Senior Editor

Nature Physics

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Universal Topology $W = P \pm iV$ and First Horizon of Quantum Fields

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Abstract: The universal topology $W = P \pm iV$ is the nature law that intuitively constitutes *a duality of Manifolds* and *Event Operations*. Its *First Horizon* of this framework, naturally comes out with the dual *State Equilibrium* and dual *Motion Dynamics*, which replace the empirical "*math laws"* and give rise to the general quantum fields to concisely include *Schrödinger* and *Klein–Gordon Equations*. As a result, it becomes a groundbreaking in the quest for *Unified Physics*: the workings of a *life streaming* of physical and virtual dynamics.

Keywords: Unified field theories and models, Spacetime topology, Quantum fields in curved spacetime, Quantum mechanics, Theory of quantized fields, Field theory.
PACS: 12.10.-g, 04.20.Gz, 04.62.+v, 03.65.-w, 03.70.+k, 11.10.-z

I. INTRODUCTION AND REMARKS

From *Euclidean* space in 300 BCE, to *Newtonian* mechanics in 1687, the scientific approach known as classical physics seeks to discover the physical laws that mathematically describe the motion of bodies with a basic philosophy for *Physical Existence* of space and *Virtual Existence* of time, which has no manifold relationship of virtual and physical coordinates. Throughout this first generation of physics, the world W is interpreted by the physical function $P(\mathbf{r}, t)$ using a spatial manifold $M\{\mathbf{r}\}$ of three dimensions $\mathbf{r}$:

$$W = P(x_\mu, t) \qquad : x_\mu \in M(\mathbf{r}) = \mathbf{r}\{x_1, x_2, x_3\} \tag{1.1}$$

where time t is set as an independent parameter hidden to $M\{\mathbf{r}\}$.

As the second generation, modern physics couples the virtual $V(x_\mu, t)$ and physical $P(x_\mu, t)$ functions into a single manifold $M\{\mathbf{r} + i\mathbf{k}\}$, known as *Minkowski* space[1], introduced in 1905.

$$W = P(x_\mu, t) + iV(x_\mu, t) \quad : x_\mu \in M\{\mathbf{r} + i\mathbf{k}\} = \{-ct, x_1, x_2, x_3\} \tag{1.2}$$

where c is the speed of light. Although this model, parallel to *Lagrange*[3] density, had advanced physical theories, it has diminished the virtual function $\{i \cdot i \mapsto -1\}$ into a single-stream of manifold $\{-ct, x_1, x_2 x_3\}$ or an indecisive *Lagrangian* density $L = V - T$, introduced in 1788. As a consequence, *Einstein*, *Schrödinger*, *Klein* and *Gordon,* the greatest minds of the twentieth century, had to invent Math Laws as a means of empirical approach to intuit their theories of general relativity and quantum mechanics successfully.

This manuscript mathematically visualize our enlightenments of the nature topology as a common picture describing the evolution and consequent stagnation of their virtual and physical realization and characteristic behaviors of the universe. It illustrates the following groundbreakings towards *Unified Physics*:

1. Embedded in the well-known formulae, the nature reveals us the philosophical law of Universal Topology in the forms of $W = P + iV$ and $W = P - iV$, each functions as the complementary, inseparable and reciprocal opponent to the other. Together, they operates a life streaming of the interwoven dynamics.

2. The law intuitively comes out with Dual Manifolds $M\{\mathbf{r} \pm i\mathbf{k}\}$, the conjugate coordinates with the dual complex vectors $\mathbf{r} \pm i\mathbf{k}$, which presents a groundbreaking in the spacetime manifolds.

3. Each of the manifold basis instinctively gives rise to a set of the conjugate Event Operations $\partial_\mu \in \{\pm\partial_\kappa, \partial_r\}$ that replaces the empirical "math law" and ratifies the intrinsic philosophy to quantum mechanics.

4. With the event operations, Universal Energy-State Equilibrium of the First Horizon is reacted concisely as an infinite sum of series, elevating meaning of a duality to Lagrangian density $L = V \pm iT$ with its infinite accuracy beyond the second order of the traditional Energy Conservation.

5. The classic motion equation is boosted to play a duality of vivid physical and virtual dynamics, which give rise to the first horizon: a pair of the general quantum fields, to concisely include Schrödinger and Klein–Gordon equations, respectively.

As the outcome, this Universal Topology demonstrates the workings of the law for quantum mechanics towards the unified physics...

II. UNIVERSAL TOPOLOGY

Universe is the whole of everything in existence that operates under a system of topologically-ordered natural laws. This philosophy enlightens that the physical nature of P is associated with its virtual nature of iV to constitute a duality of the real world. In mathematics, it formulates the complex-conjugate functions $W^{\pm}(x^\mu)$ of one or more complex variables x^μ in the neighborhood regime of every point in its universe domain G. This nature law, for example, is embedded in the well-known formulae of (6.5), (7.3) and (7.4), which reveals the following expressions, named Universal Topology

$$W^- = P + iV \qquad : W^- \in W \tag{2.1a}$$

$$W^+ = P - iV \qquad : W^+ \in W \tag{2.1b}$$

where i marks the virtual or imaginary part as the conjugate duality.

The Universal Topology of equation (2.1) intuitively represents the two manifolds $M\{\mathbf{r} \pm i\mathbf{k}\}$ as a set of global functions G, each composed of events λ, constituted by hierarchical structures of one coordinate manifold of vector $\overleftarrow{\mathbf{q}}$ for virtual supremacy, and another coordinate manifold of vector $\overrightarrow{\mathbf{q}}$ for physical supremacy. These principles convey that both manifolds operate simultaneously and transforming with their associated vector basis. In complex analysis, the global characteristics of $W \in G(\lambda)$ are a set of holomorphic functions, each with a dedicate manifold:

$$W^- = P(x^\mu, t) + iV(x^\mu, t) \quad : x^\mu \in M\{\mathbf{r} + i\mathbf{k}\} = \{+x_0, x_1, x_2 x_3\} \tag{2.2a}$$

$$W^+ = P(x^\mu, t) - iV(x^\mu, t) \quad : x^\mu \in M\{\mathbf{r} - i\mathbf{k}\} = \{-x_0, x_1, x_2 x_3\} \tag{2.2b}$$

$$\mathbf{r} = \{x_1, x_2, x_3\} \qquad \mathbf{k} = \{ct, \ldots\} \qquad x_0 = ict \tag{2.3}$$

$$dW^2 = dW^+ \cdot dW^- = dP^2 + dV^2 \mapsto g_{\mu\nu} dx^\mu dx^\nu \tag{2.4}$$

The virtual position of $x_0 = ict$ naturally forms a conjugate duality of vectors for the real and imaginary coordinates and the dual event operators:

$$\overrightarrow{\mathbf{q}}\{+x_0, x_1, x_2, x_3\} = \mathbf{r} + i\mathbf{k} \;\mapsto\; \check{\partial}_\mu = \{+\partial_\kappa, \partial_r\} \quad : \mathbf{r} \cdot \mathbf{k} = 0 \tag{2.5}$$

$$\overleftarrow{\mathbf{q}}\{-x_0, x_1, x_2, x_3\} = \mathbf{r} - i\mathbf{k} \;\mapsto\; \hat{\partial}_\mu = \{-\partial_\kappa, \partial_r\} \quad : \mathbf{r} \cdot \mathbf{k} = 0 \tag{2.6}$$

$$\partial_\kappa := \mathbf{b}_0 \partial/\partial x_0, \quad \partial_r := \nabla := \mathbf{b}_\alpha \partial/\partial x_\alpha \tag{2.7}$$

where $\mathbf{b}_\mu$ and $\mathbf{b}_\nu$ are the tetrad basis and a set of the operational symbols $(\overleftarrow{\ },^+,\hat{\ })$ is defined for the virtual manifold and other set of $(\overrightarrow{\ },^-,\check{\ })$ is defined for the physical manifold, shown in the Figure.

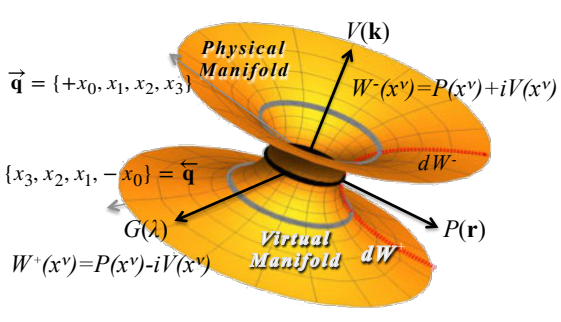

Figure: Dual Manifolds of Universal Topology

Both manifolds simultaneously govern and alternatively perform the event operations as the unified dynamics. Exploring a duality of the

opponent $\pm iV$, we are entering a holistic world $W = P \pm iV$ of the universe ...

From equations of (2.1), the *Universal Topology* represents a duality principle of physical and virtual functions:

$$P(x_\nu) = \frac{1}{2}\left[W^+(x_\mu) + W^-(x_\mu)\right] \quad : x_\mu \in \{\mathbf{r}, \mathbf{k}\}, W^\pm \in W \tag{2.8}$$

$$V(x_\nu) = \frac{i}{2}\left[W^+(x_\mu) - W^-(x_\mu)\right] \quad : x_\mu \in \{\mathbf{r}, \mathbf{k}\}, W^\pm \in W \tag{2.9}$$

Composed into a symmetric $P(x_\mu)$, W^- is in physical primacy dominant to the processes of formations or reproductions. Likewise, composed into an antisymmetric $V(x_\mu)$, W^+ is in virtual primacy dominant to the processes of generations or annihilations. Therefore, the duality of $W^\mp$ is the complementary opposition of inseparable and reciprocal pairs of all natural states.

Therefore, we have mathematically derived that the *Universal Topology* of virtual and physical, space and time manifolds presents the two-sidedness of any event, each dissolving into the other in alternating streams that operate a life of situations, movements, or actions through continuous helix-circulations in a universe topology, which lay behind the context of the main philosophical interpretation of quantum mechanics and beyond ...

III. EVENT OPERATIONS

Generally, operational functions $f(\lambda)$ for an event λ, the first horizon involves the state densities ρ_ψ, space and time exposition Γ, and state entropy S_ψ towards the global equilibrium environment G. Assuming the energy state functions of ψ^- as physical-primacy states, and ψ^+ as virtual-primacy states, the state density ρ_ψ of the first horizon can be expressed by:

$$\rho_\psi = \psi^+(x^\mu)\psi^-(x^\mu) \quad : x^\mu \in M(\mathbf{r} \pm i\,\mathbf{k}) = \{\pm x_0, x_1, x_2, x_3\} \tag{3.1}$$

where the signs of "-" and "+" indicate the physical space and virtual time as a twin in equilibrium.

In a manifold, the entropy is a measure of the specific number of ways in which the manifold operations could be arranged towards either order or disorder. The state entropy $S_\psi \in G$ can be written as the following, assuming the operational function $f(\lambda)$ for the global property at an event λ:

$$dS_\psi = -k_s \int f(\lambda)\rho_\psi d\Gamma = \int L(\phi_n^-, \check{\partial}_\mu\phi_n^-, \phi_n^+, \hat{\partial}_\nu\phi_n^+) d\Gamma \tag{3.2}$$

where k_s is a constant and L is the *Universal Energy Density*. It implies the event λ is equivalent to the operators of either $\check{\partial}_\mu$ or $\hat{\partial}_\mu$. Because of the complex manifolds, the conjugate vectors $\overrightarrow{\mathbf{q}}$ and $\overleftarrow{\mathbf{q}}$ represent that an event λ has a conjugate pair of operators, shown as the following:

$$\lambda : \check{\partial}_\mu \in \{\partial_\kappa^-, \partial_r\} \;\mapsto\; \partial_\kappa^-\phi_n^- = +\frac{\partial}{\partial x_0}\phi_n^-, \;\; \partial_r\phi_n^- := \nabla\phi_n^- \tag{3.3a}$$

$$\lambda : \hat{\partial}_\mu \in \{\partial_\kappa^+, \partial_r\} \;\mapsto\; \partial_\kappa^+\phi_n^+ = -\frac{\partial}{\partial x_0}\phi_n^+, \;\; \partial_r\phi_n^+ := \nabla\phi_n^+ \tag{3.3b}$$

A complex manifold yields a holomorphic function and is complex differentiable in a neighborhood of every point in its domain, such that an operational process can be represented as an infinite sum of terms that are calculated from any operator λ of the function's derivatives at an initial point λ_0, shown as the following

$$f(\lambda) = f(\lambda_0) + f'(\lambda_0)(\lambda - \lambda_0) + \ldots \frac{f^n(\lambda_0)(\lambda - \lambda_0)^n}{n!} \tag{3.4}$$

known as the *Taylor* and *Maclaurin* series[4], introduced in 1715. Because the event process λ is operated in complex composition of the virtual and physical coordinates, it yields a linear function in a form of operational addition: $f(\partial_\kappa + \partial_r) = f(\partial_\kappa) + f(\partial_r)$, where the global vectors of each manifolds $M\{\mathbf{r} \pm i\,\mathbf{k}\}$ constitute their orthogonal coordinate system, respectively.

IV. UNIVERSAL ENERGY EQUILIBRIUM

During space and time dynamics, the timestate density $\phi_n^-\phi_n^+$ is incepted, $\lambda_0 = 0$, by its virtual time evolution, $\lambda = \partial_\kappa$. This event evolution defines its virtual time operation on the timestate density in the form of kinetic energy density $\pm iT$:

$$f(\partial_\kappa^\mp)\,(\phi_n^-\phi_n^+) = (\frac{\kappa_\tau}{2}\partial_\tau^\mp + \kappa_{\tau 2}\partial_\kappa^2 + \ldots)(\phi_n^-\phi_n^+) := \pm\, iT \tag{4.1}$$

$$= \frac{\kappa_\tau}{2}(\frac{\partial\phi_n^-}{\partial x_0}\phi_n^+ - \phi_n^-\frac{\partial\phi_n^+}{\partial x_0}) + \kappa_{\tau 2}(\frac{\partial^2\phi_n^-}{\partial x_0^2}\phi_n^+ - 2\frac{\partial\phi_n^-}{\partial x_0}\frac{\partial\phi_n^+}{\partial x_0} + \phi_n^-\frac{\partial^2\phi_n^+}{\partial x_0^2})$$

where κ_τ and $\kappa_{\tau 2}$ are coefficients of the first and second orders defined as the timestate coefficients. The " $\pm i$ " sign of T represents the physical kinetic energy as a event function of (3.3) operated by the virtual time derivatives $f(\partial_\tau)$ of equation (3.4).

Considering the global event $f(\lambda_0)$, it operates on the timestate density to form the "local" energy $\hat{\lambda} = \lambda_0$ as the internal energy density V_l, known as the potential $\hat{V}(\mathbf{r}, t)$ of the system:

$$f(\lambda_0)\,(\phi_n^-\phi_n^+) = V(\mathbf{r}, t)\,(\phi_n^-\phi_n^+) := V_l \tag{4.2}$$

Meanwhile, the spatial function $f(\partial_r)$ of the equation (3.4) at $\lambda_0 = 0$ operates the spatial events known as physical potential V_r :

$$f(\partial_r)\,(\phi_n^-\phi_n^+) = (\kappa_r\nabla + \kappa_{r2}\nabla^2\cdots)(\phi_n^-\phi_n^+) := V_r \tag{4.3}$$

$$= \kappa_r\left(\nabla\phi_n^-\phi_n^+ + \phi_n^-\nabla\phi_n^+\right) + \kappa_{r2}\left(\nabla^2\phi_n^-\phi_n^+ + 2\nabla\phi_n^-\nabla\phi_n^+ + \phi_n^-\nabla^2\phi_n^+\right) + \cdots$$

where κ_r and κ_{r2} are coefficients of the first and second orders defined as the physical state coefficients.

With the equations of (4.1)-(4.3), it has derived the *Universal Conservation Law of Energy Density* in the following form:

$$L^\mp = V \pm iT = \left[f(\partial_\kappa^\mp) + f(\lambda_0) + f(\partial_r)\right](\phi_n^-\phi_n^+) \tag{4.4}$$

which extends the meaning of the *Lagrangian*[3] density, introduced in 1788. It demonstrates that the *Universal Energy Equilibrium* is operated by a pair of the conjugate operators.

V. DUALITY OF MOTION CONSERVATION

As a natural principle, one entropy decreases and dominants the intrinsic order, or development, of virtual into physical regime, while, at the same time, the opponent entropy increases and dominants the intrinsic annihilation of physical resources into virtual domain. Applying to the equation of (4.4), this principle derives the two motion equations, respectively:

$$\partial_\mu(\frac{\partial L}{\partial(\partial_\mu\phi)}) - \frac{\partial L}{\partial\phi} = 0 \tag{5.1a}$$

$$L = \{L^-, L^+\}, \quad \phi \in \{\phi_n^-, \phi_n^+\}, \quad \partial_\mu \in \{\partial_\kappa^\mp, \partial_r\} \tag{5.1b}$$

extended a duality to the *Euler-Lagrange*[3] equation for the actions of any dynamic system, introduced in the 1750s. The new sets of the variables of ϕ and the operators of ∂_μ signify that both manifolds maintains equilibria formulations from each of the entropy extrema, simultaneously driving a duality of physical and virtual fields of quantum dynamics, shown in the next few sections.

VI. PHYSICAL QUANTUM DYNAMICS

Rising from the time fields of ϕ_n^+ and $\partial_\mu\phi_n^+$, the dynamic reactions under virtual manifold $M\{\mathbf{r} + i\,\mathbf{k}\}$ give rise to the following motion equations of physical state fields ϕ_n^- approximated at the first and second orders of perturbations from equations of *(4.1)-(4.4)* in term of universal energy density of $L^- = (V_l + V_r) + iT$:

$$\frac{\partial L^-}{\partial\phi_n^+} = V\phi_n^- + \kappa_r\nabla\phi_n^- + \kappa_{r2}\nabla^2\phi_n^- + \frac{\kappa_\tau}{2}\frac{\partial\phi_n^-}{\partial x_0} + \kappa_{\tau 2}\frac{\partial^2\phi_n^-}{\partial x_0^2} \tag{6.1a}$$

$$\partial_\kappa^-(\frac{\partial L^-}{\partial(\partial_\tau\phi_n^+)}) = -\frac{\kappa_\tau}{2}\frac{\partial\phi_n^-}{\partial x_0} - 2\kappa_{\tau 2}\frac{\partial^2\phi_n^-}{\partial x_0^2} \quad : \partial_\kappa^- = \partial_\kappa \tag{6.1b}$$

$$\nabla\left(\frac{\partial L^-}{\partial(\nabla\phi_n^+)}\right) = \kappa_r \nabla\phi_n^- + 2\kappa_{r2}\nabla^2\phi_n^- \tag{6.1c}$$

Upon these interwoven relationships, the motion equation of *(6.1)* determines a linear partial differential equation of the state function ϕ_n^- under the supremacy of physical dynamics:

$$3\kappa_{\tau 2}\frac{\partial^2\phi_n^-}{\partial {x_0}^2} + \kappa_\tau\frac{\partial\phi_n^-}{\partial x_0} - \kappa_{r2}\nabla^2\phi_n^- + V(\mathbf{r}, x_0)\phi_n^- = 0 \tag{6.2}$$

giving rise to the following *Physical Quantum Equation* from each of the respective opponents during their virtual interactions:

$$-\frac{3\hbar^2}{2\mu}\frac{\partial^2\phi_n^-}{c^2\partial t^2} - i\hbar\frac{\partial\phi_n^-}{\partial t} + \hat{H}\phi_n^- = 0 : \kappa_\tau = \hbar c, \kappa_{\tau 2} = \kappa_{r2} = \frac{\hbar^2}{2m^*} \tag{6.3}$$

where $\hbar$ is the *Planck* constant[7], introduced in 1900, m^* is the reduced mass, and $\hat{H}$ is defined as the relationship known as *Hamiltonian*[4], introduced in 1834[5]. For the first order of the internal energy and kinetic-energy, equation *(6.3)* emerges as the *Schrödinger* equation[6] introduced in 1926, in the form of:

$$i\hbar\frac{\partial\phi_n^-}{\partial t} = \hat{H}\phi_n^- \quad : \hat{H} \equiv -\frac{\hbar^2}{2m^*}\nabla^2 + V(\mathbf{r}, x_0) \tag{6.4}$$

It represents the manifold dynamics as the function of physical spacial fields rises from its opponent in the virtual time interactions during the time and space evolutions.

As evidence of duality operation, consider N oscillators of quantum objects in the physical manifold. Developed by *Paul Dirac,* the "ladder operator" method allows us to extract effectively the energy eigenvalues as the following[3]:

$$H = \hbar\omega\sum_{i=1}^{N}\left(\hat{a}_i^{\pm}\hat{a}_i^{\mp} \pm \frac{1}{2}\right) \quad : \hat{a}_i^{\mp} = \sqrt{\frac{m\omega}{2\hbar}}\left(r_i \pm \frac{i}{m\omega}p_i\right) \tag{6.5}$$

where $\hat{a}_i^-$ is the operator for wave-mass of physical reproduction, while $\hat{a}_i^+$ is the operator for mass-wave of virtual annihilation. Both of the operators simultaneously perform a duality of the virtual and physical reality of photons, and obey the law of *Universal Topology* - a *life streaming* of interwoven dynamics: $W^{\mp} = P \pm iV$.

VII. VIRTUAL QUANTUM DYNAMICS

Rising from the physical fields of ϕ_n^- and $\partial_\mu\phi_n^-$ in parallel fashion, the dynamic reactions of manifold $M\{\mathbf{r} - i\mathbf{k}\}$ give rise to the following motion equations of the fields ϕ_n^+ approximated at the first and second orders of perturbations from equations of *(4.1)-(4.4)* in term of universal energy density $L^- = (V_l + V_r) + iT$:

$$\frac{\partial L^+}{\partial\phi_n^-} = V\,\phi_n^+ + \kappa_r\nabla\phi_n^+ + \kappa_{r2}\nabla^2\phi_n^+ - \frac{\kappa_\tau}{2}\frac{\partial\phi_n^+}{\partial x_0} + \kappa_{\tau 2}\frac{\partial^2\phi_n^+}{\partial x_0^2} \tag{7.1a}$$

$$\partial_\kappa^+\left(\frac{\partial L^+}{\partial(\partial_\tau\phi_n^-)}\right) = -\frac{\kappa_\tau}{2}\frac{\partial\phi_n^+}{\partial x_0} + 2\kappa_{\tau 2}\frac{\partial^2\phi_n^+}{\partial x_0^2} \quad : \partial_\kappa^+ = -\partial_\kappa \tag{7.1b}$$

$$\nabla\left(\frac{\partial L^+}{\partial(\nabla\phi_n^-)}\right) = \kappa_r\nabla\phi_n^+ + 2\kappa_{r2}\nabla^2\phi_n^+ \tag{7.1c}$$

From these interwoven relationships, the motion equations of (5.1) determine a linear partial differential equation of the time state ϕ_n^+, giving rise to the following *Virtual Quantum Equation* from each respective opponent during their physical interactions:

$$-\kappa_{\tau 2}\frac{\partial^2\phi_n^+}{\partial {x_0}^2} - \kappa_{r2}\nabla^2\phi_n^+ + \hat{V}(\mathbf{r}, x_0)\phi_n^+ = 0 \tag{7.2a}$$

$$\frac{1}{c^2}\frac{\partial^2\phi_n^+}{\partial t^2} - \nabla^2\phi_n^+ + \left(\frac{mc}{\hbar}\right)^2\phi_n^+ = 0 \tag{7.3b}$$

As a result, the above equation represents the virtual dynamics of time fields rising from its opponent in the physical interactions during the time and space evolutions.

For a free particle, the energy is known as the *Einstein* equation[2]: $\hat{V}\phi_n^+ = E\phi_n^+, E = mc^2$, introduced in 1905. This derives the following *Klein–Gordon* equation[3], introduced in 1928.

$$\frac{1}{c^2}\frac{\partial^2\phi_n^+}{\partial t^2} - \nabla^2\phi_n^+ + \left(\frac{mc}{\hbar}\right)^2\phi_n^+ = 0 \tag{7.3a}$$

$$\left[-\delta_{\mu\nu}\partial_\mu\partial_\nu + \left(\frac{mc}{\hbar}\right)^2\right]\phi_n^+ = 0 \quad : \kappa_{\tau 2} = \kappa_{r2} = \frac{\hbar^2}{m} = \frac{\hbar^2}{2m^*} \tag{7.3b}$$

$$\left(\hat{b}^+\hat{b}^- + 1\right)\phi_n^+ = 0 \quad : \hat{b}^{\mp} = \frac{\hbar}{mc}\left(i\frac{\partial}{\partial x_0} \pm \nabla\right) \tag{7.3c}$$

It demonstrates a duality of alternating actions that one operator $\hat{b}^-$ is a process for physical reproduction, while another operator $\hat{b}^+$ is a reverse process for virtual annihilation. They comply with and are governed by the law of *Universal Topology:* $W = P \pm iV$.

For another example, equation of (7.3) derives the energy-momentum conservation in form of $W = P \pm iV$:

$$E^2 = (\mathbf{P}c + imc^2)(\mathbf{P}c - imc^2) \quad : -i\hbar\nabla \mapsto \mathbf{P},\ -\hbar c\partial/\partial x_0 \mapsto E \tag{7.4}$$

known as the relativistic equation relating any object's rest or intrinsic mass m with total energy E and momentum $\mathbf{P}$. It functions as the relativistic fields, representing the law of *Universal Topology* - a *life streaming* of interwoven dynamics: $W = P \pm iV$.

VIII. CONCLUSION

Governed by *Universal Topology* $W = P \pm iV$, the law derives, but are not limited to,

i) A duality of the physical and virtual manifolds:

$$M\{\mathbf{r} \pm i\mathbf{k}\} \tag{8.1}$$

ii) A duality of event operations:

$$\partial_\mu \in \{\partial_\kappa^{\mp}, \partial_r\} \ \mapsto\ \partial_\kappa^{\mp}\phi_n^{\mp} = \pm\frac{\partial}{\partial x_0}\phi_n^{\mp},\ \ \partial_r\phi_n^{\mp} := \nabla\phi_n^{\mp} \tag{8.2}$$

iii) Dual *Universal Energy Equilibrium of Field Density*,

$$L^{\mp} = V \pm iT = \left[V(x_\mu) + \frac{\hbar c}{2}\partial_\mu + \frac{\hbar^2}{2m^*}\partial_\mu^2 + \cdots\right]\left(\phi_n^-\phi_n^+\right) \tag{8.3}$$

iv) Dual *Motion Dynamic Conservations of Quantum Equations:*

$$\frac{3\hbar^2}{2m^*c^2}\frac{\partial^2\phi_n^-}{\partial t^2} + i\hbar\frac{\partial\phi_n^-}{\partial t} = \hat{H}\phi_n^- \ : \hat{H} \equiv \frac{-\hbar^2}{2m^*}\nabla^2 + V(\mathbf{r}, t) \tag{8.4}$$

$$\frac{1}{c^2}\frac{\partial^2\phi_n^+}{\partial t^2} - \nabla^2\phi_n^+ + \frac{m}{\hbar^2}V(\mathbf{r}, t)\phi_n^+ = 0 \tag{8.5}$$

These formulations represent the universal law of the manifolds, event operations, *Lagrangian density*, *Schrödinger* and *Klein–Gordon* equations, rising from a duality of physical space and virtual time dynamics.

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Foreword

This set of papers presents *Universal Topology* of virtual and physical dynamics as the two-sidedness of any event and operator, space and time or virtual and physical, each dissolving into the other in alternating streams that operate a life streaming of situations, movements, actions and beyond ...

The following are highlights of essential material in the previously published literature:

A. The 1st paper, "Universal Topology $W = P \pm iV$ (1. Quantum Fields)", uncovers the following laws
   a. Universal Topology - A holistic world of virtual and physical duality: $W = P \pm iV$
   b. Universal Conservation - The Laws of *Universal Energy and Event Operational Conservations*
   c. Physical Quantum Dynamics - One of the dynamic conservations that derives *Schrödinger* equation
   d. Virtual Quantum Dynamics - A twin of the above conservation that derives *Klein–Gordon* equation

E. The 3rd paper, "Universal Topology $W = P \pm iV$ (3. Dark Fluxions and Thermodynamics)", in rewriting process
   a. Continuity of Physical Fluxion - One of the dark fluxions streamed by its energy state distribution
   b. Continuity of Virtual Fluxion - Another dark fluxion emerging from its twin as the dark sources
   c. Physical Entropy Equation - One of the thermodynamic equations for physical reproduction
   d. Virtual Entropy Equation - A twin of the above equation for virtual annihilation
   e. Equations of Thermodynamics - the thermo-density formulae under the space and time duality

C. The 2nd paper, "Universal Topology $W = P \pm iV$ (2. Electromagnetism and General Relativity)", in rewriting process
   a. Universal Equation - The World Equations of the universe.
   b. *Maxwell* Equations - The Universal Equation includes the Electromagnetic fields
   c. Gravitational Fields - the Universal Equation includes *Newton* and *Einstein* equations

Intuitively following the philosophy of Topology of Universe, this theory represents the Simplicity of Truth, which is readily accessible and replicable by readers with a basic background in mathematical derivation and fundamental principles of physical dynamics.

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