《Universal and Unified Field Theory》
3. *General Symmetric Fields of Electromagnetism, Gravitation and Thermodynamics*

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Abstract: As another major part of the unification theory, the quantum fields give rise to a symmetric environment and bring together *all* field entanglements of the flux conservation and continuity. Remarkably, it reveals the natural secrets of:

1) ***General Symmetric Fields*** - A set of generic fluxions unifying electromagnetism, gravitation, and thermodynamics.
2) ***Thermodynamics and Blackbody*** - Horizon fluxions of thermodynamics, area entropies, and photon-graviton emissions.
3) ***Photon*** *and* ***Light Radiation*** - Conservation of light and photons convertible to or emitted by the triplet quarks of blackholes.
4) ***Graviton*** *and* ***Gravitation*** - Principles of graviton quantity, gravitational transportations and the law of conservation of gravitation.
5) ***Dark Energy*** - A philosophical view of a decisive model to dark energy that lies at the heart of the fundamental nature of potential fields, the superphase modulations and event operations.

Conclusively, this manuscript presents the unification and compliance with the principal theories of classical and contemporary physics in terms of *Symmetric* dynamics.

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INTRODUCTION

A duality nature of virtual and physical coexistences is a universal phenomenon of dynamic entanglements, which always performs as a pair of the reciprocal entities. Each of the states cannot be separated independently of the others. Only together do they form a system as a whole although they may not be bound physically. The potential entanglements are a fundamental principle of the real-life streaming such that one constituent cannot be fully described without considering the other. As a consequence, the state of a composite system is always expressible as a sum of products of states of each constituent. Under the *Law of Event Evolutions* and *Universal Topology* [1], they are fully describable by the mathematical framework of the dual manifolds.

This manuscript further represents the entangling characteristics of both boost transformation and twist transportations in the generic forms symmetrically. As the functional quantity of an object, a set of the vector fields forms and projects its potentials to its surrounding space, arising from or acting on its opponent through a duality of reciprocal interactions dominated by both *inertial Boost* and *spiral Torque* of the *Lorentz* generators at the third horizon between the spacetime manifolds. As a result, it constitutes the general symmetric fields of gravitation, electromagnetism and thermodynamics.

X. SECOND UNIVERSAL FIELD EQUATIONS

Symmetry is the law of natural conservations that a system is preserved or remains unchanged or invariant under some transformations or transportations. As a duality, there is always a pair of intrinsics reciprocal conjugation: Y^-Y^+ symmetry. The basic principles of symmetry and anti-symmetry are as the following:

1) Associated with its opponent potentials of either scalar or vector fields, symmetry is a fluxion system cohesively and completely balanced such that it is invariant among all composite fields.
2) As a duality, an Y^-Y^+ anti-symmetry is a reciprocal component of its symmetric system to which it has a mirroring similarity physically and can annihilate into nonexistence virtually.
3) Without a pair of Y^-Y^+ objects, no symmetry can be delivered to its surroundings consistently and perpetually sustainable as resources to a life streaming of entanglements at zero net momentum.
4) Both Y^-Y^+ symmetries preserve the laws of conservation consistently and distinctively, which orchestrate their local continuity respectively and harmonize each other dynamically.

In mathematics, *World Equations* of (5.7) can be written in term of the scalar, vector, and higher orders tensors, shown as the following:

$$W_b = W_0^\pm + \sum_n h_n\{\kappa_1\langle\dot\partial_\lambda\rangle^\pm + \kappa_2\dot\partial_{\lambda_2}\langle\dot\partial_\lambda 1\rangle_s^\pm + \kappa_3\dot\partial_{\lambda_3}\langle\dot\partial_\lambda 2\rangle_v^\pm\cdots\} \tag{10.1}$$

where κ_n is the coefficient of each order n of the event $\lambda^n = \lambda_1\lambda_2\cdots\lambda_n$ aggregation. The above equations are constituted by the scalar fields: $\phi^\pm$ and $\varphi^\mp$ at the second and third horizon (index s), their tangent vector fields $A_\nu^\pm$ and $B_\nu^\pm$ at the fourth horizon (index v), and their tensor fields at higher horizons.

From the equations (6.18), we constitute a commutation of the Y^+ fluxion of density continuity $\dot\partial_\lambda \mathbf{f}_\nu^+ = \kappa_f\langle\hat\partial_\lambda\hat\partial_\lambda, \check\partial^\lambda\check\partial^\lambda\rangle_\nu^+$ in the dynamic equilibrium $\mathbf{g}_a^- = 0$ of a symmetric system:

$$\boxed{\dot\partial_\lambda \mathbf{f}_\nu^+ = \langle W_0^+\rangle - \kappa_1\left[\check\partial^\lambda 2 - \hat\partial_{\lambda 2}\right]_\nu^+ + \kappa_2\left\langle\check\partial_{\lambda 3}\left(\hat\partial_{\lambda 2} - \check\partial^\lambda 2\right)\right\rangle_\nu^+ + \mathbf{g}_a^-/\kappa_g^- \quad \mathbf{(10.2)}}$$

$$\kappa_1 = \frac{\hbar c^2}{2}, \qquad \kappa_2 = -\frac{(\hbar c)^2}{2E^+}, \qquad \mathbf{g}_0^+ = \frac{\langle W_0^+\rangle}{\hbar c} \tag{10.3}$$

where a pair of potentials $\{\phi_n^+, \varphi_n^-\}$ is mapped to their vector potentials $\{\phi_n^+, V_n^-\}$, and $\mathbf{g}_a^-$ is an Y^+ asymmetric accelerator. The $\mathbf{g}_0^\pm$ is the dark flux continuity of the potential densities, representing a duality of the entangling environments. The entangle bracket $\dot\partial_\lambda \mathbf{f}_\nu^+ = \langle\hat\partial_\lambda\hat\partial_\lambda, \check\partial^\lambda\check\partial^\lambda\rangle_\nu^+$ features the Y^+ continuity for their vector potentials. As one set of the universal laws, the events incepted in the virtual world not only generate its opponent reactions but also create and conduct the real-life objects in the physical world, because the element $\zeta^\nu \mapsto L_\nu^+$ embeds the bidirectional reactions $\hat\partial_\lambda$ and $\check\partial^\lambda$ entangling between the Y^-Y^- manifolds, symmetrically and asymmetrically.

In a parallel fashion, the equation (6.21) under the dynamic equilibrium $\mathbf{g}_a^+ = 0$ can be rewritten to institute Y^- fluxion of density continuity $\dot\partial_\lambda \mathbf{f}_\nu^- = \kappa_f\langle\check\partial_\lambda\check\partial_\lambda, \hat\partial^\lambda\hat\partial^\lambda\rangle_\nu^-$ of the symmetric formulation:

$$\boxed{\dot\partial_\lambda \mathbf{f}_\nu^- = \langle W_0^-\rangle + \kappa_1\left[\check\partial_{\lambda_1} - \hat\partial^\lambda 1\right]_\nu^- + \kappa_2\left\langle\check\partial_{\lambda_1}\left(\hat\partial^\lambda 2 - \check\partial^\lambda 2\right)\right\rangle_\nu^- + \mathbf{g}_a^+/\kappa_g^+ \quad \mathbf{(10.4)}}$$

$$\kappa_1 = \frac{\hbar c^2}{2}, \qquad \kappa_2 = \frac{(\hbar c)^2}{2E^-} = -\frac{(\hbar c)^2}{2E^+}, \qquad \mathbf{g}_0^\pm = \frac{\langle W_0^\pm\rangle}{\hbar c} \tag{10.5}$$

where a pair of potentials $\{\phi_n^-, \varphi_n^+\}$ is mapped to their vector potentials $\{\phi_n^-, V_n^+\}$, and $\mathbf{g}_a^+$ is an Y^+ asymmetric accelerator. The entangle bracket $\dot\partial_\lambda \mathbf{f}_\nu^- = \langle\check\partial_\lambda\check\partial_\lambda, \hat\partial^\lambda\hat\partial^\lambda\rangle_\nu^-$ of the symmetric dynamics features the Y^- continuity for their vector potentials. As another set of the laws, the events initiated in the physical world have to leave a life copy of its mirrored images in the virtual world without an intrusive effect into the virtual world, because the asymmetric element $\zeta_\nu \mapsto L_\nu^-$ doesn't have the

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reaction $\hat{\partial}_\lambda$ to the Y^- manifold. In other words, the virtual world is aware of and immune to the physical world.

Similar to derive the quantum field dynamics at the second horizons, we have derived the fluxions of density commutation (10.2) and continuity (10.4) at the third horizon, where a bulk system of N particles aggregates into macroscopic domain associated with thermodynamics.

Artifact 10.1: Acceleration Tensors. Under the Y^-Y^+ environment, it contains the energy continuity as the physical or virtual resources. The equations of the commutation fluxion $\hat{\partial}_\lambda \mathbf{f}^\pm$ give rise to both of the acceleration tensors $\mathbf{g}_a^\pm = \kappa_g^\pm \partial_\lambda \mathbf{f}_a^\pm$ for dynamics and interactions balancing the virtual or physical forces, asymmetrically:

$$\mathbf{g}_a^-/\kappa_g^- = \left[\hat{\partial}_\lambda \hat{\partial}_\lambda, \check{\partial}^\lambda \check{\partial}^\lambda\right]_v^+ + \zeta^+ \qquad : \zeta^+ = \left(\hat{\partial}_{\lambda_2}\check{\partial}^{\lambda_2} - \hat{\partial}_{\lambda_2}\check{\partial}_{\lambda_3}\right)_v^+ \quad (10.6)$$

$$\mathbf{g}_a^+/\kappa_g^+ = \left[\check{\partial}_\lambda \hat{\partial}_\lambda, \hat{\partial}^\lambda \hat{\partial}^\lambda\right]_v^- + \zeta^- \qquad : \zeta^- = \left(\check{\partial}^{\lambda_2}\hat{\partial}^{\lambda_1} - \hat{\partial}^{\lambda_2}\check{\partial}_{\lambda_1}\right)_v^- \quad (10.7)$$

Apparently, a force is always represented as and given by an asymmetric accelerator. Because the virtual resources are massless and appear as if it were nothing or at zero resources 0^+, the Y^- supremacy of flux continuity equation might be given by $\mathbf{g}_a^- - \mathbf{g}_0^-$ that is maintained by the Y^+ supremacy of the flux commutation. Since the physical world is riding on the world planes where the virtual world is primary and dominant, the acceleration at a constant rate in universe has its special meaning different from the spacetime manifold.

Artifact 10.2: Symmetric Forces of Third Horizon. At a view of the symmetric system (10.4) that the Y^- continuity of density fluxion is sustained by both commutation $[\check{\partial}^\lambda - \hat{\partial}_\lambda]^-$ and continuity $\langle \check{\partial}_\lambda(\hat{\partial}^\lambda - \check{\partial}^\lambda)\rangle^-$, it implies that a) the horizon is given rise to the physical world by the commutative forces of fluxions; and b) the continuity mechanism is a primary vehicle of the Y^- supremacy for its operational actions. Since a pair of the equations (10.2) and (10.4) is generic or universal, it is called *Second Universal Field Equations*, representing the conservations of symmetric dynamics, and of asymmetric motions at a bulk regime or the condensed matter. As a precise duality, the asymmetry coexists with symmetric continuity to extend discrete subgroups, and exhibits additional dynamics to operate spacetime motions and to carry on the symmetric system as a whole. Throughout the rest of this manuscript, the fluxions satisfy the residual conditions of Y^-Y^+ *Symmetric Entanglements*, or at asymmetry $\mathbf{g}_a^\pm = 0$.

$$\bar{\mathbf{g}}^+ = \frac{1}{\hbar c}\hat{\partial}_\lambda \bar{\mathbf{f}}_v^+ = \frac{c}{2}\left[\hat{\partial}_\lambda - \check{\partial}^\lambda\right]_v^+ - \frac{\hbar c}{2E^+}\left\langle \check{\partial}_\lambda\left(\hat{\partial}_\lambda - \check{\partial}^\lambda\right)\right\rangle_v^+ \quad (10.8)$$

$$\bar{\mathbf{g}}^- = \frac{1}{\hbar c}\check{\partial}_\lambda \bar{\mathbf{f}}_v^- = \frac{c}{2}\left[\hat{\partial}_\lambda - \check{\partial}^\lambda\right]_v^- + \frac{\hbar c}{2E^-}\left\langle \check{\partial}_\lambda\left(\hat{\partial}^\lambda - \check{\partial}^\lambda\right)\right\rangle_v^- \quad (10.9)$$

where $\bar{\mathbf{g}}^\pm = \mathbf{g}^\pm - \mathbf{g}_0^\pm$. Defined as a system without asymmetric entanglements or symmetric dynamics, it does not have an asymmetric flux transportation spontaneously.

Artifact 10.3: Y^- ***Transform Fields***. As the function quantity from the second to third horizon, a vector field V_ν forms and projects its potentials to its surrounding space, arisen by or acting on its opponent potential φ^+ through a duality of reciprocal interactions dominated by *Lorentz Generators* [24]. Under the Y^- primary given by the generator of (8.10, 8.11), the event processes institute and operate the entangling fields:

$$\check{T}_{\mu\nu}^{-n} \equiv \frac{\hbar c}{2E^-}\left\langle \hat{\partial}^\lambda - \check{\partial}^\lambda\right\rangle_\gamma^- \mapsto \frac{\hbar c}{2E^-}\left\langle \dot{x}^\mu L_\mu^+ \partial^\mu - \dot{x}^\nu L_\nu^- \partial_\nu\right\rangle_v^- \quad (10.10)$$

$$\check{T}_{\mu\nu}^{-n} = \begin{pmatrix} \xi_0 & \beta_1 & \beta_2 & \beta_3 \\ -\beta_1 & \xi_1 & -e_3 & e_2 \\ -\beta_2 & e_3 & \xi_2 & -e_1 \\ -\beta_3 & -e_2 & e_1 & \xi_3 \end{pmatrix}_\times = \begin{pmatrix} 0 & \mathbf{B}_q^- \\ -\mathbf{B}_q^- & \frac{\check{\mathbf{b}}}{c} \times \mathbf{E}_q^- \end{pmatrix} + \xi_\nu \quad (10.10a)$$

$$\beta_\alpha = \check{T}_{0\alpha}^{-n} \qquad \varepsilon_{iam}^- e_i = \check{T}_{m\alpha}^{-n} \qquad \xi_\nu = \check{T}_{\nu\nu}^{-n} \quad (10.10b)$$

where $\hat{\mathbf{b}}$ is a base vector, symbol $(\ )_\times$ indicates the off-diagonal elements of the tensor, and the *Levi-Civita* connection $\varepsilon_{iam}^- \in Y^-$ represents the left-hand chiral. At a constant speed, this Y^- *Transform Tensor* constructs a pair of its off-diagonal fields: $\check{T}_{m\alpha}^{+n} = -\check{T}_{m\alpha}^{-n}$ and embeds a pair of the antisymmetric matrix as a foundational structure of symmetric fields, giving rise to a foundation of the magnetic ($\beta_a \mapsto \mathbf{B}_q^-$) and electric ($e_\nu \mapsto \mathbf{E}_q^-$) fields.

Artifact 10.4: Y^+ ***Transform Fields***. In the parallel fashion above, the event processes generate the reciprocal entanglements of the Y^+ commutation of the vector V^ν and scalar φ^- fields, shown by the following equations:

$$\hat{T}_{\mu\nu}^{+n} \equiv \frac{\hbar c}{2E^+}\langle \hat{\partial}_\lambda - \check{\partial}^\lambda\rangle_\gamma^+ \mapsto \frac{\hbar c}{2E^+}\langle \dot{x}_\mu L_\mu^+ \partial^\mu - \dot{x}^\nu L_\nu^- \partial_\nu\rangle_v^+ \quad (10.11)$$

$$\hat{T}_{\nu\alpha}^{+n} = \begin{pmatrix} \xi^0 & d^1 & d^2 & d^3 \\ -d^1 & \xi^1 & h^3 & -h^2 \\ -d^2 & -h^3 & \xi^2 & h^1 \\ -d^3 & h^2 & -h^1 & \xi^3 \end{pmatrix}_\times = \begin{pmatrix} 0 & \mathbf{D}_q^+ \\ -\mathbf{D}_q^+ & \frac{\mathbf{u}}{c^2} \times \mathbf{H}_q^+ \end{pmatrix} + \xi^\nu \quad (10.11a)$$

$$d^\alpha = \hat{T}_{0\alpha}^{+n} \qquad \varepsilon_{\nu\alpha\mu}^+ h^\nu = c^2 \hat{T}_{\mu\alpha}^{+n} \qquad \xi^\nu = \hat{T}_{\nu\nu}^{+n} \quad (10.11b)$$

where the *Levi-Civita* connection ε_{iam}^+ represents the right-hand chiral. At a constant speed, this Y^+ *Transport Tensor* constructs another pair of off-diagonal fields $\hat{T}_{\nu\alpha}^{-n} = -\hat{T}_{\nu\alpha}^{+n}$, giving rise to the displacement $d^\alpha \mapsto \mathbf{D}_q^+$ and magnetizing $h^\nu \mapsto \mathbf{H}_g^+$ fields.

Artifact 10.5: Spiral Torque Fields. Because of the Y^-Y^+ continuity and commutation infrastructure of rising *horizons*, an event generates entanglements between the manifolds, and performs the operators of ∂^μ and ∂_m, transports the motion vectors of toques and gives rise to the vector potentials. Parallel to the γ generators, *Spiral Torque*, the χ generators naturally construct a pair of operational matrices into the third horizon that are also antisymmetric for elements in the 4x4 matrixes of the respective manifolds:

$$\check{\Upsilon}_{\mu\nu}^{-a} \equiv \frac{\hbar c}{2E^-}\left\langle \hat{\partial}^\lambda - \check{\partial}^\lambda\right\rangle_\chi^- \mapsto \begin{pmatrix} 0 & \mathbf{B}_g^- \\ -\mathbf{B}_g^- & \frac{\check{\mathbf{b}}}{c} \times \mathbf{E}_g^- \end{pmatrix} = -\check{\Upsilon}_{\nu\mu}^{+a} \quad (10.12a)$$

$$\hat{\Upsilon}_{\nu\mu}^{+a} \equiv \frac{\hbar c}{2E^+}\left\langle \hat{\partial}_\lambda - \check{\partial}^\lambda\right\rangle_\chi^+ \mapsto \begin{pmatrix} 0 & \mathbf{D}_g^+ \\ -\mathbf{D}_g^+ & \frac{\mathbf{u}}{c_g^2} \times \mathbf{H}_g^+ \end{pmatrix} = -\hat{\Upsilon}_{\mu\nu}^{-a} \quad (10.12b)$$

These *Torsion Tensors* construct two pairs of the off-diagonal fields: $\check{\Upsilon}_{m\alpha}^+ = -\check{\Upsilon}_{m\alpha}^-$ and $\hat{\Upsilon}_{m\alpha}^+ = -\hat{\Upsilon}_{m\alpha}^-$, and embed the antisymmetric matrixes as a foundational structure giving rise to i) a pair of the virtual motion stress $\mathbf{B}_g^-$ and physical twist torsion $\mathbf{E}_g^-$ fields at Y^--supremacy, and ii) another pair of the physical displacement stress $\mathbf{D}_g^+$ and virtual polarizing twist $\mathbf{H}_g^+$ fields at Y^+-supremacy. Together, a set of the torsion fields institutes the Gravitational infrastructure at the third horizon.

XI. GENERAL SYMMETRIC FIELDS

For the symmetric fluxions, the entangling invariance requires that their fluxions are either conserved at zero net momentum or maintained by energy resource. Normally, the divergence of Y^- fluxion is conserved by the virtual forces 0^+ of massless energies and the divergence of Y^+ fluxion is balanced by the mass forces of physical resources. Together, they maintain each other's conservations and continuities cohesively and complementarily.

Under physical primacy, the Y^- fluxion generates acceleration tensor $\mathbf{g}_\times^-$ and represents the time divergence of the forces acting on the opponent objects. This divergence, $\check{\partial}_{\lambda=t} = \left(ic\partial_\kappa \quad \mathbf{u}^-\nabla\right)$, appears at the *Two-Dimensional* world plane acting on the 2x2 tensors and extend to the 4x4 spacetime tensors. Substituting the equations (10.10, 10.12) into symmetric (10.9) fluxion, we have the matrix formula in a pair of the vector formulation for the internal fields:

$$\frac{\hbar c}{2E^-}\left\langle \check{\partial}_\lambda\left(\hat{\partial}^\lambda - \check{\partial}^\lambda\right)\right\rangle_v^- = c\left(ic\partial_\kappa \quad \mathbf{u}^-\nabla\right)\begin{pmatrix} 0 & \mathbf{B}^- \\ -\mathbf{B}^- & \frac{\check{\mathbf{b}}}{c} \times \mathbf{E}^- \end{pmatrix} \quad (11.1)$$

$$\mathbf{B}^- = \mathbf{B}_q^- + \mathbf{B}_g^- \qquad \mathbf{E}^- = \mathbf{E}_q^- + \frac{c}{c_g}\mathbf{E}_g^- \quad (11.2)$$

where the $\mathbf{E}_q^-$ and $\mathbf{E}_g^-$ are the *Electric* and *Torsion Strength* fields, and the $\mathbf{B}_q^-$ and $\mathbf{B}_g^-$ are the *Magnetic* and *Twist* fields.

In a parallel fashion, the symmetric Y^+ fluxion (10.8) generates acceleration tensor $\bar{\mathbf{g}}^+$ under virtual primacy for the tensors (10.11) $\hat{T}_{\mu\nu}^{+a}$ and (10.12) $\hat{\Upsilon}_{\mu\nu}^{+a}$. At the third horizon, one has the matrix formula in another pair of the vector formulation for the internal fields:

$$-\frac{\hbar c}{2E^+}\left\langle \check{\partial}_\lambda\left(\hat{\partial}_\lambda - \check{\partial}^\lambda\right)\right\rangle_v^+ = c\check{\partial}_\lambda \mathbf{F}^+ \quad : \check{\partial}_{\lambda=t} = \left(ic\partial_\kappa \quad \mathbf{u}^-\nabla\right) \tag{11.3}$$

$$\mathbf{F}^+ = \kappa_x^+ \begin{pmatrix} 0 & \mathbf{D}_q^+ + \mathbf{D}_g^+ \\ -\mathbf{D}_q^+ - \mathbf{D}_g^+ & \frac{\mathbf{u}_q}{c^2}\times\mathbf{H}_q^+ + \frac{\mathbf{u}_g}{c_g^2}\times\mathbf{H}_g^+ \end{pmatrix} \tag{11.4}$$

where $\mathbf{u}_q$ is speed of a charged object, and $\mathbf{u}_g$ is speed of a gravitational mass. The $\mathbf{D}_q^+$ and $\mathbf{D}_g^+$ are the *Electric* and *Torsion Displacing* fields, and the $\mathbf{H}_q^+$ and $\mathbf{H}_g^+$ are the *Magnetic* and *Twist Polarizing* fields.

Artifact 11.1: Horizon Forces. Apparently, the field of equation (11.3) has a force that gives rise to the next field of the horizons. Projecting on the spacetime manifold, it emerges and acts as the flux forces on objects. With charges or masses, this force is imposed on the physical lines of the world planes and projecting to spacetime manifold at the following expressions:

$$\mathbf{F}_q^+ = Q\mu_e\left(c^2\mathbf{D}_q^+ + \mathbf{u}_q\times\mathbf{H}_q^+\right) \quad : \kappa_q^+ = Qc^2\mu_e,\ c^2 = \frac{1}{\varepsilon_q\mu_q} \tag{11.5}$$

$$\mathbf{F}_g^+ = M\mu_g\left(c_g^2\mathbf{D}_g^+ + \mathbf{u}_g\times\mathbf{H}_g^+\right) \quad : \kappa_g^+ = Mc_g^2\mu_g,\ c_g^2 = \frac{1}{\varepsilon_g\mu_g} \tag{11.6}$$

where Q is a charge, M is a mass, ε_q or ε_g is the permittivity, μ_q or μ_g is the permeability of the materials.

Artifact 11.2: Lorentz Force. In a free space or vacuum, the constitutive relation (11.5) results in a summation of electric and magnetic forces:

$$\mathbf{F}_q = Q\left(\mathbf{E}_q^- + \mathbf{u}_q\times\mathbf{B}_q^-\right) \quad : \mathbf{D}_q^+ = \varepsilon_e\mathbf{E}_q^-,\ \mathbf{B}_q^- = \mu_e\mathbf{H}_q^+ \tag{11.7}$$

known as *Lorentz Force*, discovered in 1889 [25]. Because the fluxion force $\check{\partial}_\lambda\bar{\mathbf{f}}_s^+$ (10.9) is proportional to $(\hat{\partial}_\lambda - \check{\partial}^\lambda)$, the force is statistically aggregated from or arisen by *Dirac Spinors* (9.7), symmetrically.

Following the same methodology, the *Torsion* forces emerges as gravitation given by the internal elements of Y^+ dark fluxions of the symmetric system.

$$\mathbf{F}_g = M\mu_g\left(c_g^2\mathbf{D}_g^+ + \mathbf{u}_g\times\mathbf{H}_g^+\right) = M\left(\mathbf{E}_g^- + \mathbf{u}_g\times\mathbf{B}_g^-\right) \tag{11.8}$$

where $c^2 = 1/(\varepsilon_g\mu_g)$, ε_g is gravitational permittivity and μ_g gravitational permeability of the materials.

Artifact 11.3: Resources. Balanced at the steady states, integrality of the virtual and physical environment is generally at constant or $\mathbf{g}_0^\pm = 0$, and the Y^+ asymmetric accelerator $\mathbf{g}_a^+$ is under eternal states normalizable to zero 0^+. Therefore, a pair of the Y^+ and Y^- continuity of the equations (10.8-10.9) institutes a general expression of conservations of symmetric dynamics:

$$\frac{\hbar c}{2E^-}\left\langle \check{\partial}_\lambda\left(\hat{\partial}^\lambda - \check{\partial}^\lambda\right)\right\rangle_v^- = \bar{\mathbf{g}}^- - \frac{c}{2}\left[\check{\partial}_\lambda - \hat{\partial}^\lambda\right]_v^- = 0^+ \tag{11.9a}$$

$$\frac{\hbar c}{2E^+}\left\langle \check{\partial}_\lambda\left(\check{\partial}^\lambda - \hat{\partial}_\lambda\right)\right\rangle_v^+ = \bar{\mathbf{g}}^+ - \frac{c}{2}\left[\hat{\partial}_\lambda - \check{\partial}^\lambda\right]_v^+ \equiv \mathbf{J}_x \tag{11.9b}$$

The first equation presents invariance of Y^-Y^+ local commutation $\left[\check{\partial}_\lambda - \hat{\partial}^\lambda\right]_v^- \mapsto 0^+$. The second equation reveals that the Y^- resources of the bulk fluxion are characterizable by density $\rho_x\mathbf{u}_x$ and current $\mathbf{J}_x$:

$$\mathbf{J}_x \equiv \mathbf{J}_q^- - \mathbf{J}_g^- \quad : \mathbf{J}_q^- = \left\{\mathbf{u}_q\rho_q, \mathbf{J}_q\right\}, \mathbf{J}_g^- = 4\pi G\left\{\mathbf{u}_g\rho_g, \mathbf{J}_g\right\} \tag{11.10}$$

where the $\mathbf{u}_q$ is a negative charged object and $\mathbf{u}_g$ appears moving in an opposite direction, and G is *Newton's* gravitational constant. The total sources comprise multiple components to include both of the $Y^\mp$ fluxion forces, thermodynamics, as well as asymmetric suppliers.

Artifact 11.4: Y^- Symmetric Fields. Sourced by the virtual time operation $\lambda = t$, the dark fluxion of Y^- boost fields has the Y^+ conservation resources. Combined with (11.1), the equation (11.9a) is equivalent to a pair of the expressions:

$$\left(\mathbf{u}_q\nabla\right)\cdot\mathbf{B}_q^- + \left(\mathbf{u}_g\nabla\right)\cdot\mathbf{B}_g^- = 0 \tag{11.11}$$

$$\frac{\partial}{\partial t}\left(\mathbf{B}_q^- + \mathbf{B}_g^-\right) + \left(\frac{\mathbf{u}_q}{c}\nabla\right)\times\mathbf{E}_q^- + \left(\frac{\mathbf{u}_g}{c_g}\nabla\right)\times\mathbf{E}_g^- = 0 \tag{11.12}$$

It represents the cohesive equations of gravitational and electromagnetic fields under the Y^- symmetric dynamics.

Artifact 11.5: Y^+ Symmetric Fields. Continuing to operate the equation (11.3) through the time events $\lambda = t$, sustained by the resources (11.10), the derivative $\check{\partial}_{\lambda=t}$ to the fields evolves and gives rise to the dynamics of next horizon, shown by the Y^+ field relationships:

$$\mathbf{u}_q\nabla\cdot\mathbf{D}_q^+ + \mathbf{u}_g\nabla\cdot\mathbf{D}_g^+ = \mathbf{u}_q\rho_q - 4\pi G\mathbf{u}_g\rho_g \tag{11.13}$$

$$\frac{\mathbf{u}_q\cdot\mathbf{u}_q}{c^2}\nabla\times\mathbf{H}_q^+ + \frac{\mathbf{u}_g\cdot\mathbf{u}_g}{c_g^2}\nabla\times\mathbf{H}_g^+ - \frac{\partial\mathbf{D}_q^+}{\partial t} - \frac{\partial\mathbf{D}_g^+}{\partial t} \tag{11.14}$$

$$= \mathbf{J}_q - 4\pi G\mathbf{J}_g + \mathbf{H}_q^+\cdot\left(\frac{\mathbf{u}_q}{c}\nabla\right)\times\frac{\mathbf{u}_q}{c} + \mathbf{H}_g^+\cdot\left(\frac{\mathbf{u}_g}{c_g}\nabla\right)\times\frac{\mathbf{u}_g}{c_g}$$

where the formula, $\nabla\cdot(\mathbf{u}\times\mathbf{H}) = \mathbf{H}\cdot(\nabla\times\mathbf{u}) - \mathbf{u}\cdot(\nabla\times\mathbf{H})$, is applied.

Artifact 11.6: General Symmetric Fields. At the constant speed, a set of the formulations above is further simplified to and collected as:

$$\nabla\cdot\left(\mathbf{B}_q^- + \eta\mathbf{B}_g^-\right) = 0^+ \quad : \eta = c_g/c \tag{11.15}$$

$$\nabla\cdot\left(\mathbf{D}_q^+ + \eta\mathbf{D}_g^+\right) = \rho_q - 4\pi G\eta\rho_g \tag{11.16}$$

$$\nabla\times\left(\mathbf{E}_q^- + \mathbf{E}_g^-\right) + \frac{\partial}{\partial t}\left(\mathbf{B}_q^- + \mathbf{B}_g^-\right) = 0^+ \tag{11.17}$$

$$\nabla\times\left(\mathbf{H}_q^+ + \mathbf{H}_g^+\right) - \frac{\partial}{\partial t}\left(\mathbf{D}_q^+ + \mathbf{D}_g^+\right) = \mathbf{J}_q - 4\pi G\mathbf{J}_g \tag{11.18}$$

Because the gravitational fields are given by *Torque Tensors* $\Upsilon_{\mu\alpha}$ and emerged from the second horizon on the world planes, *Gravitational* fields might appear weak where the charge fields are dominant by electrons. At the third horizon, electromagnetic fields become weak while gravitational force can be significant at short range closer to its central-singularity. At the higher horizon, a massive object has a middle range of gravitation fields. For any charged objects, both electromagnetic and gravitational fields are hardly separable although their intensive effects can be weighted differently by the range of distance and quantity of charges and masses.

XII. ELECTROMAGNETISM AND GRAVITATION

As the four fundamental interactions, commonly called forces, in nature, *Electromagnetism* or *Graviton* constitute all type of physical interaction that occurs between electrically charged or massive particles, although they appear as independence or loosely coupled at the third or fourth horizons. The electromagnetism usually exhibits a duality of electric and magnetic fields as well as their interruption in light speed. The graviton represents a torque duality between the virtual and physical energies of entanglements. Not only have both models accounted for the charge or mass volume independence of energies and explained the ability of matter and photon-graviton radiation to be in thermal equilibrium, but also reveals anomalies in thermodynamics, including the properties of blackbody for both light and gravitational radiance.

Artifact 12.1: Maxwell's Equations. At the constant speed c and $\zeta^\mu \to \gamma^\mu$, the *General Symmetric Fields* (11.15-11.18) emerge in a set of classical equations:

$$\nabla\cdot\mathbf{B}_q = 0 \quad : \mathbf{B}_q \equiv \mathbf{B}_q^- \tag{12.1}$$

$$\nabla\cdot\mathbf{D}_q = \rho_q \quad : \mathbf{D}_q \equiv \mathbf{D}_q^+ \tag{12.2}$$

$$\nabla\times\mathbf{E}_q + \frac{\partial\mathbf{B}_q}{\partial t} = 0 \quad : \mathbf{E}_q \equiv \mathbf{E}_q^- \tag{12.3}$$

$$\nabla \times \mathbf{H}_q - \frac{\partial \mathbf{D}_q}{\partial t} = \mathbf{J}_q \qquad : \mathbf{H}_q \equiv \mathbf{H}_q^+ \tag{12.4}$$

known as *Maxwell's Equations*, discovered in 1820s [14]. Therefore, as the foundation, the quantum symmetric fields give rise to classical electromagnetism, describing how electric and magnetic fields are generated by charges, currents, and weak-force interactions. One important consequence of the equations is that they demonstrate how fluctuating electric and magnetic fields propagates at the speed of light.

Artifact 12.2: Electrostatic Force. Taking a spherical surface in the integral form of (12.2) at a radius r, centered at the point charge Q, we have the following formulae in a free space or vacuum:

$$\mathbf{E}(\mathbf{r}) = \frac{Q}{4\pi\varepsilon_0}\frac{\hat{\mathbf{r}}}{r^2} \qquad \mathbf{F}(\mathbf{r}) = q\mathbf{E}(\mathbf{r}) \tag{12.5}$$

known as *Coulomb*'s force, discovered in 1784 [14]. An electric force may be either attractive or repulsive, depending on the signs of the charges.

Artifact 12.3: Gravitational Fields. For the charge neutral objects, the equations (11.15)-(11.18) become a group of the pure *Gravitational Fields*, shown straightforwardly by:

$$\left(\mathbf{u}_g \nabla\right) \cdot \mathbf{B}_g^- = 0 \tag{12.6}$$

$$\mathbf{u}_g \nabla \cdot \mathbf{D}_g^+ = -4\pi G \mathbf{u}_g \rho_g \tag{12.7}$$

$$\frac{\partial}{\partial t}\mathbf{B}_g^- + \left(\frac{\mathbf{u}_g}{c_g}\nabla\right) \times \mathbf{E}_g^- = 0 \tag{12.8}$$

$$\frac{\mathbf{u}_g \cdot \mathbf{u}_g}{c_g^2}\nabla \times \mathbf{H}_g^+ - \frac{\partial \mathbf{D}_g^+}{\partial t} = -4\pi G \mathbf{J}_g + \mathbf{H}_g^+ \cdot \left(\frac{\mathbf{u}_g}{c_g}\nabla\right) \times \frac{\mathbf{u}_g}{c_g} \tag{12.9}$$

At the constant speed, these equations can be reduced to and coincide closely with *Lorentz invariant Theory* of gravitation [5], introduced in 1893.

Artifact 12.4: Newton's Law. For the charge neutral objects, the equations (12.6) become straightforwardly as:

$$\nabla^2 \psi_g^+ = 4\pi G \rho_g \qquad : \mathbf{D}_g^+ = -\nabla \psi_g^+ \tag{12.10}$$

$$\mathbf{F}^- = -m\nabla\psi_g^+ = mG\rho_g \frac{\mathbf{b}_r}{r^2} \tag{12.11}$$

known as *Newton's Law* of Gravity for a homogeneous environment where, external to an observer, source of the fields appears as a point object and has the uniform property at every point without irregularities in field strength and direction, regardless of how the source itself is constituted with or without its internal or surface twisting torsions.

XIII. THERMODYNAMICS

During the formation of the horizons, movements of macro objects undergo interactions with and are propagated by the Y^+ commutative fields, while events of motion objects are characterized by the Y^- continuity dynamics. Under the formations of the ground horizons, the Y^-Y^+ dynamics of the symmetric system aggregates timestate objects to develop thermodynamics related to bulk energies, statistical works, and interactive forces at the third horizon towards the next horizon of macroscopic variables for processes and operations characterized as a massive system, associated with the rising temperature.

For a bulk $\langle W_0^\pm \rangle$ system of N particles, each is in one of three possible states: Y^- |-⟩, Y^+ |+⟩, and neutral |o⟩ with their energy states given by E_n^-, E_n^+ and E_n^o, respectively. If the bulk system has $N_n^\pm$ particles at non-zero charges and $N^o = N - N_n^\pm$ neutrinos at neutral charge, the interruptible energy of the internal system is $E_n = N_n^\pm E_n^\pm$. The number of states $\Omega(E_n)$ of the total system of energy E_n is the number of ways to pick $N_n^\pm$ particles from a total of N,

$$\Omega(E) = \prod \Omega(E_n) = \prod \frac{N!}{N_n^\pm!(N - N_n^\pm)!} \qquad : N_n^\pm = \frac{E_n}{|E_n^\pm|} \tag{13.1}$$

and the entropy, a measure of state probability, is given by

$$S(E) = \sum_n S(E_n) = -k_B \sum_n \log \frac{N!}{(N_n^\pm)!(N - N_n^\pm)!} \tag{13.2}$$

where k_B is ***Boltzmann*** constant [7]. For large N, there is an accurate approximation to the factorials as the following:

$$log\,(N!) = N \log(N) - N + \frac{1}{2}\log(2\pi N) + \Re(1/N) \tag{13.3}$$

known as the *Stirling's* formula, introduced 1730s [6]. Therefore, the entropy is simplified to:

$$S(N_n^\pm) = -k_B N\left[\left(1 - \frac{N_n^\pm}{N}\right)\log\left(1 - \frac{N_n^\pm}{N}\right) + \frac{N_n^\pm}{N}\log\left(\frac{N_n^\pm}{N}\right)\right] \tag{13.4}$$

Generally, one of the characteristics of a bulk system can be presented and measured completely by the thermal statistics of energy $k_B T$ such as a scalar function of the formless entropy above. In a bulk system with intractable energy $E_n^\pm$, its temperature can be arisen by its entropy as the following:

$$\frac{1}{T} \equiv \sum_n \frac{\partial S_n}{\partial E_n} = \sum_n \frac{\mp i k_B}{E_n^\pm}\log\left(\frac{N E_n^\pm}{E_n} - 1\right) \quad : k_B T \in (0, \pm i E_n^\pm) \tag{13.5}$$

With a bulk system of n particles, it represents that both energies $E_n^\pm(T)$ and horizon factor $h_n(T)$ are temperature-dependent.

$$E_n = N E_n^\pm h_n = \frac{N E_n^\pm}{e^{\pm i E_n^\pm / k_B T} + 1} = k_B T N_n^\pm \log\left(\frac{N}{N_n^\pm} - 1\right) \tag{13.6}$$

Apparently, the horizon factor is given rise to and emerged as the temperature T of a bulk system.

Artifact 13.1: Horizon Factor. During processes that give rise to the bulk horizon, the temperature emerges in form of energy between zero and $k_B T \simeq E_n^\pm$, reproducing the n particles balanced at their population $N_n^\pm$. Remarkably, the horizon factor is simplified to:

$$h_n^\pm = \frac{N_n^\pm}{N} = \frac{1}{e^{\pm \beta E_n^\pm} + 1} \qquad : \beta = \frac{i}{k_B T} \tag{13.7}$$

where i presents that the temperature $k_B T$ is a virtual character, the reciprocal of which, $\beta = i/(k_B T)$ is similar to the virtual time dimension ict.

Artifact 13.2: State Probability. Fundamental to the statistical mechanics, we recall that all accessible energy states are equally likely. This means the probability that the system sits in state |n⟩ is just the ratio of this number of states to the total number of states, emerged and reflected in the above equations at the state probabilities, $p_n^\pm = p_n(h_n^\pm)$, to form the macroscopic density and to support the equations of (3.17)-(3.23) by the following expression:

$$p_n^\pm = \frac{h_n^\pm}{\sum h_\nu} = \frac{e^{\pm\beta E_n^\pm}}{Z} \qquad : Z \equiv \sum\nolimits_\nu e^{\pm\beta E_\nu^\pm} = \frac{e^{\pm\beta E_\nu^\pm/2}}{1 - e^{\pm\beta E_\nu^\pm}} \tag{13.8}$$

known as the *Boltzmann* distribution [7], or the canonical ensemble, introduced in 1877. The average energy in a mode can be expressed by the partition function:

$$\tilde{E}^\pm = -i\frac{d\log(Z)}{d\beta} = \pm\frac{iE_n^\pm}{2} \pm \frac{iE_n^\pm}{e^{\pm\beta E_n^\pm} - 1} \quad : E_n^\pm = \mp imc^2 \tag{13.9}$$

As $T \to 0$, the distribution forces the system into its ground state at the lowest energy before transforming to the virtual world. All higher energy states have vanishing probability at zero temperature or the mirroring effects of infinite temperature.

Artifact 13.3: Chemical Potential. For a bulk system with the internal energy and the intractable energy of E_n, the chemical potential $\mu = -\sum \mu_n$ rises from the numbers of particles:

$$\begin{aligned}\mu &= -\sum_n \left(\frac{\partial E_n}{\partial N_n^\pm}\right)_{S,V} = k_B T \sum_n \frac{1 - \left(1 - N_n^\pm/N\right)\log\left(N/N_n^\pm - 1\right)}{\left(1 - N_n^\pm/N\right)} \\ &= -\sum_n \left[E_n^\pm - k_B T\left(1 + e^{\pm\beta E_n^\pm}\right)\right]\end{aligned} \tag{13.10}$$

Its heat capacity can be given by the following definition:

$$C_V \equiv \sum_n \left(\frac{\partial E_n}{\partial T}\right)_{V,N_n^\pm} = k_B \sum_n \frac{N\left(E_n^\pm\right)^2 e^{\pm\beta E_n^\pm}}{\left[k_B T\left(e^{\pm\beta E_n^\pm}+1\right)\right]^2} \tag{13.11}$$

The maximum heat capacity is around $k_B T \to |E^\pm|$. As $T \to 0$, the specific heat exponentially drops to zero, whereas $T \to \infty$ drops off at a much slower pace defined by a power-law.

Artifact 13.4: Thermodynamics. Consider a system with entropy $S(E, V, N_n)$ that undergoes a small change in energy, volume, and number $N_n^\pm$, one has the change in entropy

$$\begin{aligned} dS &= \frac{\partial S}{\partial E} dE + \frac{\partial S}{\partial E}\frac{\partial E}{\partial V} dV + \frac{\partial S}{\partial E}\sum_n \left(\frac{\partial E}{\partial N_n^\pm} dN_n^\pm\right) \\ &= \frac{1}{T}\left(dE + PdV - \sum_n \mu_n dN_n^\pm\right) \quad : \frac{1}{T} = \frac{\partial S}{\partial E}, P = \left(\frac{\partial E}{\partial V}\right)_T \end{aligned} \tag{13.12}$$

known as fundamental laws of thermodynamics of common conjugate variable pairs. The principles of thermodynamics were established and developed by *Rudolf Clausius*, *William Thomson*, and *Josiah Willard Gibbs*, introduced during the period from 1850 to 1879.

Artifact 13.5: Thermal Density Equations. Furthermore, convert all parameters to their respective densities as internal energy density $\rho_E = E/V$, thermal entropy density $\rho_s = S/V$, mole number density $\rho_{n_i} = N_i/V$, and state density of $\rho_\psi \sim 1/V$, the above equation has the entropy relationship among their densities as the following:

$$S_\rho = -k_s \int \rho_\psi dV = -k_s \int \frac{d\rho_E - T d\rho_s - \sum_i \mu_i d\rho_{n_i}}{T\rho_s + \sum_i \mu_i \rho_{n_i} - (P + \rho_E)} dV \tag{13.13}$$

Satisfying entropy equilibrium at extrema results in the general density equations of the thermodynamic fields:

$$Y^- : d\rho_E^- = T d\rho_s^- + \sum\nolimits_i \mu_i d\rho_{n_i}^- \tag{13.14}$$

$$Y^+ : P + \rho_E^+ = T\rho_s^+ + \sum\nolimits_i \mu_i \rho_{n_i}^+ \tag{13.15}$$

The first equation indicates that entropy increases towards Y^- maximum in physical disorder, so that the dynamics of the internal energy are the interactive fields of thermal and chemical reactions as they influence substance molarity. The second equation indicates that entropy decreases towards Y^+ minimum in physical order, so that both external forces and internal energy hold balanced macroscopic fields in one bulk system.

Artifact 13.6: Bloch Density Equations. At the arisen horizon, a macroscopic state consists of pairs of $Y^-\{\rho^-, \varrho^+ = \rho^{-*}\}$ and $Y^+\{\rho^+, \varrho^- = \rho^{+*}\}$ thermal density fields. By mapping $\phi_n^\pm \mapsto \rho^\pm$, $\varphi_n^\pm \mapsto \varrho^\pm$ and $x_0 \mapsto \beta$, the same mathematical framework in deriving (9.15, 9.39) can be reapplied to formulate a duality of the thermal densities, shown by the following:

$$-i\frac{\partial \rho^-}{\partial \beta} = \hat{H}\rho^-, -h_\beta \frac{\partial^2 \rho}{\partial \beta^2} = \hat{H}\rho \quad : \hat{H} \equiv -h_\beta \nabla^2 + \hat{U}(\mathbf{r}, \beta_0) \tag{13.16}$$

where $\rho = \rho^+\rho^-$ and h_β is a horizon constant of thermodynamics. The equations are known as *Bloch* equations introduced in 1932 [8] for the grand canonical ensemble on *N*-particles.

XIV. BLACKBODY AND BLACKHOLE

Every physical body spontaneously and continuously emits electromagnetic, lightwave and gravitational radiations. At near thermodynamic equilibrium, the emitted radiation is closely described by either dark energy (may include Planck's law) for blackbodies or *Bekenstein-Hawking* radiation for blackholes, or in fact at both for normal objects. These waves, making up the radiations, can be imagined as Y^-Y^+-propagating transverse oscillating electric, magnetic and gravitational fields.

Because of its dependence on temperature and area, *Planck* and *Schwarzschild* radiations are said to be thermal radiation obeying area entropies. The higher the temperature or area of a body the more radiation it emits at every potential-propagation of light and entangling-transportation of gravitation. Since a blackhole acts like an ideal blackbody at the second or lower horizons, it reflects no light and absorbs full gravitation.

Artifact 14.1: Electromagnetic Radiation. A radiation consists of photons, the uncharged elementary particles with zero rest mass, and the quanta of the electromagnetic force, responsible for all electromagnetic interactions. Electric and magnetic fields obey the properties of massless superposition such that, for all linear systems, the net response caused by multiple stimuli is the sum of the responses that would have been caused by each stimulus individually. The matter-composition of the medium for the light transportation determines the nature of the absorption and emission spectrum. With the horizon factor (13.7), *Planck* derived in 1900 [4, 9] that an area entropy S_A of radiance of a blackbody is given by frequency at absolute temperature *T*.

$$S_A(\omega_c, T) = \frac{\hbar\omega_c^3}{4\pi^3 c^2 k_B T}\left(e^{\hbar\omega_c/k_B T} - 1\right)^{-1} \simeq \frac{\omega_c^2}{4\pi^3 c^2} \tag{14.1}$$

Expressed as an energy distribution of entropy, it is the unique stable radiation in quantum electromagnetism. Planck's theory was originally based on the idea that blackbodies emit light (and other electromagnetic radiation) only as discrete bundles or packets of energy: photons. Therefore, the above formula is applicable to generate *Photon*s in electromagnetic radiation.

Artifact 14.2: Gravitational Radiation. Blackholes are sites of immense gravitational entanglement. According to the conjectured Y^-Y^+ duality (also known as the AdS/CFT correspondence), blackholes in general are equivalent to solutions of quantum field theory at a non-zero temperature. This means that no information loss is expected in blackholes and the radiation emitted by a blackhole contains the usual thermal radiation. By associating the horizon factor with *Schwarzschild* radius $r_s = 2GM/c^2$ of a blackhole, derived in 1915 [10], an area entropy S_A of the quantum-gravitational radiance is given by frequency at an absolute temperature *T* and constant speed c_g as the following:

$$S_A(\omega_g, T) = \frac{c_g^3}{4\hbar G} \tag{14.2}$$

where *G* is the gravitational constant, known as *Bekenstein-Hawking* radiation [11,12], introduced in 1974. This formula is applicable to generate *Graviton* in gravitational radiations.

Artifact 14.3: Conservation of Energy-Momentum. Since two photons can convert to each of the mass-energies $E_n^\mp = \pm imc^2$, one has the empirical energy-momentum conservation in a complex formula:

$$\hat{E}^2 = \hat{\mathbf{P}}^2 + 4m^2c^4 \;\to\; \left(\hat{\mathbf{P}} + i\hat{E}\right)\left(\hat{\mathbf{P}} - i\hat{E}\right) = 4E_n^+ E_n^- \tag{14.3}$$

$$\hat{E} = -i\hbar\partial_t, \qquad \mathbf{P} = ic\,\hat{\mathbf{p}}, \qquad \hat{\mathbf{p}} = -i\hbar\nabla \tag{14.4}$$

known as the relativistic invariance relating a pair of intrinsic masses at their energy $\hat{E}$ and momentum $\hat{\mathbf{P}}$. As a duality of alternating actions $\hbar\omega \rightleftharpoons mc^2$, one operation $\hat{\mathbf{P}} + i\hat{E}$ is a process for physical reproduction or animation, while another $\hat{\mathbf{P}} - i\hat{E}$ is a reciprocal process for virtual annihilation or creation. They are governed by *Universal Topology*: $W = P \pm iV$, and comply with relativistic wave equation. Together, the above functions institutes conservation of wave propagation of the potential density $\Phi_n^- = \phi_n^- \varphi_n^+$ fields:

$$\nabla^2\Phi_n^- - \frac{1}{c^2}\frac{\partial^2 \Phi_n^-}{\partial t^2} = 4\frac{E_n^- E_n^+}{(\hbar c)^2}\Phi_n^- \tag{14.5}$$

Therefore, besides the (9.42), we demonstrate an alternative approach to derive and amend the *Klein–Gordon* equation, introduced in 1926 [26] or manifestly *Lorentz* covariant symmetry described as that the feature of nature is independent of the orientation or the boost velocity of the laboratory through spacetime [27].

Artifact 14.4: Invariance of Entropy. External to observers at constant speed, a system is describable fully by the coherent entropy $\mathcal{S}_a$ of blackhole radiations to represent the law of conservation of the area fluxions or the time-invariance. As a total energy density travelling on the two-dimensional word planes $\{\mathbf{r} \pm i\mathbf{k}\}$, it is equivalent to a fluxion of blackhole density scaling at entropy $\mathcal{S}_a$ of an area flux continuity (9.45) for the potential radiations in a free space or vacuum, or the law of conservation of the area fluxions:

$$S_A = \Diamond_n = 4\frac{E_n^- E_n^+}{(\hbar c)^2}\Phi_n \tag{14.6}$$

It illustrates that it is the intrinsic radiance of its potential elements that are entangling and transforming between physical and virtual instances. The potential density Φ_n transports as the waves, conserves to the constant energies, carries the potential information, and maintains its continuity states of the area density. Essentially, the entangling bounds on an area entropy S_A in radiance propagating long-range of energy fluxions, before embodying the mass enclave and possessing two-degrees of freedom.

Artifact 14.5: Photon. As a fluxion flow of light, it balances statistically at each of the states $E_n^{\mp} : mc^2 \rightleftharpoons \hbar\omega$, where $\hbar\omega$ is known as the *Planck* matter-energy, introduced in 1900 [9]. Therefore, at a minimum, light consists of two units, a pair of *Photons*. For a total of mass-energy $4m^2c^4$, the equation presents a conservation of photon energy-momentum and relativistic invariance. Because the potential fields on a pair of the world planes are a triplet quark system at $2\varphi_a^+(\phi_b^- + \phi_c^-) \approx 4\varphi_a^+\phi_{b/c}^-$, it is about four times of the density for the wave emission. Applicable to the conservation (14.1) and mass annihilation (9.29), an area energy fluxion of the potentials is equivalent to the entropy of the electro-photon radiations in thermal equilibrium and mass annihilation:

$$S_{A1}(\omega_c, T) = 4\left(\frac{\omega_c^2}{4\pi^3c^2}\right) = \eta_c\left(\frac{\omega_c}{c}\right)^2 \quad : \eta_c = \pi^{-3} \tag{14.7a}$$

where the factor 4 of the first entropy is given by (3.25) that has compensated to account for one blackbody with the dual states at minimum of two physical Y^- and one virtual Y^+ quarks. Apparently, the electromagnetic radiation $\eta_c = \pi^{-3}$ is trivial for a blackhole to emit photons.

In a free space or vacuum for the mass enclave of equation (9.29), an area density is equivalent to the entropy of the dark radiations in thermal equilibrium during the mass acquisition:

$$S_{A2}(\omega_c, T) = 2\frac{m\,\omega_c}{\pi c} = \eta_h\left(\frac{\omega_c}{c}\right)^2 \qquad : \eta_h = \frac{2}{\pi} \tag{14.7b}$$

A summation of the above equivalences results in the total entropy to derive a pair of the complex formulae, known as photon:

$$S_A(\omega_c, T) = S_{A1} + S_{A2} = (\eta_c + \eta_h)\left(\frac{\omega_c}{c}\right)^2 \mapsto 4\frac{E_c^- E_c^+}{(\hbar c)^2} \tag{14.7}$$

$$E_c^{\pm} = \mp\frac{i}{2}\hbar\omega_c \qquad \eta_c = \pi^{-3} = 3.22\,\%\,, \eta_h = \frac{2}{\pi} = 63.7\,\% \tag{14.8}$$

Introduced at 20:00 August 19 of 2017, the coupling constant at η_c or η_h implies that the triplet quarks institute a pair of the photon energies $\mp i\hbar\omega_c/2$ for a blackhole to emit light, dominantly. Accompanying lightwave radiation, it reveals that dark energy can be transformed to (creation) or emitted by (annihilation) the triplet quarks: an electron, a positron and a gluon.

Artifact 14.6: Conservation of Light: From the chapter IX and XVI, we have uncovered the remarkable nature such that, besides the primary properties of visibility, intensity, propagation direction, wavelength spectrum and polarization, the light can be characterized by the law of conservation, shown by the chart.

Artifact 14.6: ***Law of Conservation of Light***

1) *Light remains constant and conserves over time during its transportation.*
2) *Light consists of virtual energy duality as its irreducible unit: the photon.*
3) *A light energy of potential density neither can be created nor destroyed.*
4) *Light has at least two photons for entanglement with zero net momentum.*
5) *Light transports and transforms a duality of virtual wave and real object.*
6) *Without an energy supply, no light can be delivered to its surroundings.*
7) *Light transforms from one form to another carrying potential messages.*
8) *Light is convertible to or emitted by triplets: electron, positron and gluon.*
9) *The net flow across a region is sunk to or drawn from physical resources.*

In summary, photon exhibits wave–particle duality, transports under Y^-Y^+ entanglements, and obeys *Law of Conservation of Light*. It is mediated by inertial boost for transformation and behaves like a particle with definite and finite measurable position or momentum, though not both at the same time. A pair of photons can be emitted by mass objects, transported massless without electric charge, absorbed in photon amounts, refracted by an object or interfered with themselves.

Artifact 14.8: ***Law of Conservation of Gravitation***

1) *Gravitation is operated by torque transportations and the superphase messages.*
2) *Gravitation remains constant and conserves over time during its transportation.*
3) *A gravitation energy of potential density neither can be created nor destroyed.*
4) *Gravitation transports in wave formation virtually and acts on objects physically.*
5) *Without an energy supply, no gravitation can be delivered to its surroundings.*
6) *Gravitation consists of an energy duality as the irreducible complex gravitons.*
7) *Gravitation has at least two gravitons for entanglement at zero net momentum.*
8) *The net fluxion across a region is sunk to or drawn from physical resources.*
9) *External to objects, gravity is inversely proportional to a square of the distance.*

Artifact 14.7: Graviton. Gravitation exhibits wave–particle duality such that its properties must acquire characteristics of both virtual and physical particles. Inherent to the blackhole thermal radiance, gravitational fluxion (14.5) has the transportable commutation of area entropy S_A and conservable radiations of a *Schwarzshild* blackbody. It is equivalent to associate it with *Bekenstein-Hawking* (14.2) radiation.

$$S_A(\omega_g, T) = 4\left(\frac{c_g^3}{4\hbar G}\right) = 4\frac{E_g^- E_g^+}{(\hbar c_g)^2} \;\rightarrow\; E_g^{\pm} = \mp\frac{i}{2}\sqrt{\hbar c_g^5/G} \tag{14.9}$$

where the number 4 is factored for a dual-state system, given by (3.25). Consequently, the gravitational energies $E_g^{\pm}$ contain not only a duality of the complex functions but also an irreducible unit: ***Graviton***, introduced at 21:30 November 25 of 2017, as a pair of graviton units:

$$E_g^{\pm} = \mp\frac{i}{2}E_p \qquad : E_p = \sqrt{\hbar c_g^5/G} \tag{14.10}$$

where E_p is the *Planck* energy. For the blackhole emanations, a coupling constant 100% to emit gravitational radiations implies that graviton is a type of dark energies accompanying particle radiations as a duality of the reciprocal resources. At a minimum, the blackhole emanation, conservation of momentum, or equivalently transportation invariance require that at least a pair of gravitons is superphase-modulated for entanglements transporting at their zero net momentum. Similar to a pair of photons emitted by dark energy, the nature of graviton is associated with the superphase modulation of the Y^-Y^+ energy or dark energy entanglement for all particles. In the center of entanglement, the colliding duality has no net momentum, whereas gravitons always have the temperature sourced from their spiral torques and modulated by superphase of the nature.

Artifact 14.8: Conservation of Gravitation. Similar to acquisition of *Conservation of Light*, we represent the characteristics of gravitation, shown by the chart. Under the superphase modulations, the feature of nature is independent of the orientation and the boost transformation or spiral torque invariance through the world lines. Together with law of conservation of light, the initial state of the universe is conserved or invariant at the horizon where the inception of the physical world is entangling with and operating by the virtual supremacy. As an area density streaming, graviton waves may be interfered with themselves.

Artifact 14.9: Aether Theory. As one of the crucial implication of the law of conservation of light, the nature of lights is propagated at or appeared between where the two objects interrupts potentially at near third horizon. Although the superphase modulation is at all levels of horizons, the transformation, transportation as well as interruption on the world lines are independent to or free from the degrees of freedom in physical space of the redundant coordinates such as$\{\theta, \varphi\}$. Therefore, *Aether* theory [17], introduced by Isaac Newton in 1718, has correctly sensed that there is something existence but incorrectly defined by the interpretation: "the existence of a medium, named as the aether, is a space-filling substance or field, necessary as a transmission medium for the propagation of electromagnetic or gravitational forces." The replacement of *Aether* in modern physics is *Dark Energy,* defined as "an unknown form of energy which is hypothesized to permeate all of space, tending to accelerate the expansion of the universe." Both of the key words, "space-filling" or "all of space" contradicts the law of neither conservation of light nor conservation of gravitation.

Artifact 14.10: Dark Energy. The nature of the mysterious dark energy may have been detected by recent cosmological tests, which make a good scientific case for the context. In a philosophical view, the dark energy lies at the heart of the fundamental nature of potential fields, event operations, and the superphase modulations. Some classical forms might be compliant to our *Universal Topology* for dark energy in terms of the scalar fields:

a) Quintessence is a hypothetical form of dark energy, more precisely a scalar field, postulated as an explanation of the observation of an accelerating rate of expansion of the universe, introduced by *Ratra* and *Peebles* in 1988 [18].

b) Moduli fields, introduced by *Bernhard Riemann* in 1857 [19], are scalar field of global minima, occurring in supersymmetric systems. The first restriction of a moduli space, found in 1979 by *Bruno Zumino* [20], is an *N*=1 theory in 4-dimensions degenerated into a global supersymmetry algebra with the chiral superfields. The *N*=2 supersymmetry algebra contains *Coulomb* branch and *Higgs* branch, corresponding to a *Dirac* spinor supercharge [21-22].

As a summary, although the deeper understanding of the dark energy is out of a scope of this manuscript, our *Universal Topology* aligns well with the similar researches above. Tranquilly, the full model of both philosophical and mathematical achievements has fully arrived as the *Christmas Gifts* of 2013 [23], where a set of the virtual objects, called *Universal Messaons*, constitutes concisely not only the dark energy but also the dark matter and elementary particles. As a consequence, *messaons* complement the fully-scaled quantum properties of virtual and physical particles in accordance well with numerous historical experiments, including the *European Space Agency*'s spacecraft data published in 2013 and 2015, that the universe is composed of 4.82±0.05% ordinary matter, 25.8±0.4% dark matter, and 69.0±1% dark energy.

CONCLUSION

From *First Universal Field Equations* (6.7-8) and (6.12-13) [1], the $Y^{-}Y^{+}$ fluxions are operated to give rise to the horizons where a set of continuities is instituted symmetrically to function as the horizon of *Third Universal Field Equations* (10.2) and (10.4), unifying the symmetric fields of electromagnetism, gravitation and thermodynamics.

For the first time, the *Law of Conservation of Light* is revealed in the comprehensive integrity and characteristics of photon beyond its well-known nature at a constant speed. Remarkably, the *Law of Conservation of Gravitation* demonstrates that graviton is conserved to invariance of the *Torque Transportations* on world lines, given by gravitational fields of Eq (12.6-12.11),symmetrically. Our model of graviton not only quantifies concisely the graviton characteristics, but also unifies cohesively with light, electromagnetic and blackhole fields at the horizons factored by statistical thermodynamics.

In the center of a blackhole, a system of partial differential equations forms the entanglements of gravitational and electromagnetic fields and emerges the associated phase modulations from massive objects for internal communications. Essentially, the natural context of *relativistic boost* $T^{\pm}_{\mu a}$ and spiral torque $\Upsilon^{\pm}_{m\alpha}$ entanglements constitutes and acts as the sources of "photon" and "graviton" fields being operated at the heart of energy formulations of stress strengths and twist torsions, driven by the events descending from the two-dimensional world planes of the dual manifolds and the affine connections aligning to each of the superphase modulations.

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