Unified and Universal Field Theory - 1. Universal Topology

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Abstract: The workings of *Universal Topology* unfolds a duality of our natural world for the following remarks: i) Dual complex manifolds and the reciprocal world planes beyond a single spacetime manifold; ii) Two pairs of scalar potentials for field entanglements; iii) A mathematical framework of the dual variances to clone the event operations; iv) Two pairs of fluxions of continuity and commutations as a hierarchy foundation of *Potential Entanglements*; and v) *Commutation Infrastructure* as an introductory to derive the empirical artifacts of *Lorentz* Generators, *Pauli* matrices, *Electromagnetic Field Structures*, *Inertial Commutation Curvature*, and *General Relativity*. Upon this inception, our *Universal Topology* is ready to give rise to the unified and universal field theory ...

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INTRODUCTION

In our universe, a duality of the two-sidedness lies at the heart of all events as they are interrelate, opposite or contrary to one another, each dissolving into the other in alternating streams that operates a life of creation, generation, or actions, complementarily, reciprocally, and interdependently. The nature always emerges as or entangle with a pair of the fields that communicates and projects their interoperable values to its surrounding environment, alternatively arisen by or acting on its opponent through the reciprocal interactions. Therefore, it provides the context for our main philosophical interpretation to extend our fundamental physics into a duality of the natural world.

I. DUAL COMPLEX MANIFOLDS

As the nature duality, our world always manifests a mirrored pair in the imaginary part or a conjugate pair of the complex manifolds, such that the physical nature of P functions is associated with its virtual nature of V functions to constitute a duality of the real world functions. Among them, the most fundamental dynamics are our dark resources of the universal energies, known as *Yin* "−" and *Yang* "+" dark objects, with neutral balance "0" that appears as if there were nothing. Each type of the dark objects $(-,+,0)$ appearing as energy fields has their own domain of the relational manifolds such that one defines a Y^- (Yin) manifold while the other the Y^+ (Yang) manifold, respectively. They jointly present the two-sidedness of any events, operations, transportations, and entanglements, each dissolving into the other in the alternating streams that generates the life of entanglements, conceals the inanimacy of resources, and operates the event actions.

As a two-dimensional plane, the virtual positions of $\pm i\mathbf{k}$ naturally form a duality of the conjugate manifolds: $Y^-\{\mathbf{r}+i\mathbf{k}\}$ and $Y^+\{\mathbf{r}-i\mathbf{k}\}$. Each of the system constitutes its world plane $W^\pm$ distinctively, forms a duality of the universal topology $W=P\pm iV$ cohesively, and maintains its own sub-coordinate system $\{\mathbf{r}\}$ or $\{\mathbf{k}\}$ respectively. Because of the two dimensions of the world planes $\{\mathbf{r}\pm i\mathbf{k}\}$, each transcends its event operations further down to its sub-coordinate system with extra degrees of freedoms for either physical dimensions $\mathbf{r}=\{x_1,x_2,x_3\}$ or virtual dimensions $\mathbf{k}=\{x_0,x_{-1},x_{-2},\cdots\}$. For example, in the scope of space and time duality, the compound dimensions become the tetrad-coordinates, known as the following:

$$x_m \in \check{x}\{x_0,x_1,x_2,x_3\} \subset Y^-\{\mathbf{r}+i\mathbf{k}\} \qquad : x_0 = ict \tag{1.1}$$

$$x^\mu \in \hat{x}\{x^0,x^1,x^2,x^3\} \subset Y^+\{\mathbf{r}-i\mathbf{k}\} \qquad : x^0 = -ict \tag{1.2}$$

As a consequence, a manifold appears as or is combined into the higher dimensional coordinates, which results in the spacetime manifolds in the four-dimensional spaces.

Together, the two world planes $\{\mathbf{r}\pm i\mathbf{k}\}$ compose the dynamics of ***Boost***, an inertial for generators, and ***Spiral***, a rotational contortions for stresses, which function as a reciprocal or conjugate duality transporting and transforming global events among sub-coordinates. Consequently, for any type of the events, the Y^-Y^+ functions are always connected, coupled, and conjugated between each other, a duality of which defines entanglements as the virtually inseparable and physically reciprocal pairs of all natural functions.

II. TWO PAIRS OF POTENTIAL FIELDS

Governed by a global event λ under the universal topology, an operational environment is initiated by the scalar fields $\phi(\lambda)$ of a rank-0 tensor, a differentiable function of a complex variable in its domain at its zero derivative, where a scalar function $\phi(\hat{x})\subset Y^+$ or $\phi(\check{x})\subset Y^-$ is characterized as a single magnitude with variable components of the respective coordinate sets $\hat{x}$ or $\check{x}$. Because a field is incepted or operated under either virtual or physical primacy of an Y^+ or Y^- manifold respectively and simultaneously, each point of the fields is entangled with and appears as a conjugate function of the scalar field φ^- or φ^+ in its opponent manifold. A field can be classified as a scalar field, a vector field, or a tensor field according to whether the represented physical horizon is at a scope of scalar, vector, or tensor potentials, respectively.

Therefore, the effects are stationary projected to and communicated from their reciprocal opponent, shown as the following conjugate pairs:

$$\phi^+(\hat{x},\lambda),\varphi^-(\check{x},\lambda) \qquad : \varphi^-(\check{x},\lambda)\mapsto\phi^+(\hat{x}^*,\lambda)^*,\ \hat{x}^*\in Y\{x_\mu\} \tag{2.1}$$

$$\phi^-(\check{x},\lambda),\varphi^+(\hat{x},\lambda) \qquad : \varphi^+(\hat{x},\lambda)\mapsto\phi^-(\check{x}^*,\lambda)^*,\ \check{x}^*\in Y\{x^\nu\} \tag{2.2}$$

where * denotes a complex conjugate. A conjugate field $\varphi^-=(\phi^+)^*$ of the Y^+ scalar is mapped to a field in the Y^- manifold, and vise versa that a conjugate field $\varphi^+=(\phi^-)^*$ of the Y^- scalar is mapped to a field in the Y^+ manifold. In mathematics, if $f(z)$ is a holomorphic function restricted to the *Real Numbers*, it has the complex conjugate properties of $f(z)=f^*(z^*)$, which leads to the above equation when $\hat{x}^*=\check{x}$ is satisfied.

III. MATHEMATICAL FRAMEWORK

As a part of the natural architecture, the mathematical regulation of terminology not only includes symbol notation, operators, and indices of vectors and tensors, but also classifies the mathematical tools and their interpretations under the universal topology. In order to describe the nature precisely, it is essential to define a duality of the contravariant $Y^+=Y\{\mathbf{r}-i\mathbf{k}\}$ manifold and the covariant $Y^-=Y\{\mathbf{r}+i\mathbf{k}\}$ manifold, respectively by the following regulations.

1) Contravariance $(\hat{\partial}^\lambda)$ - One set of the symbols with the upper indices $\{x^\mu,u^\nu,A^{\nu\sigma}\}$, as contravariant forms, are the numbers for the $\{\hat{x}\}$ basis of the Y^+ manifold labelled by its identity symbols $\{\hat{\ },{}^+\}$. "Contravariance" is a formalism in which the nature laws of dynamics operates the event actions $\hat{\partial}^\lambda$, maintains its virtual supremacy of the Y^+ dynamics, and dominates the virtual characteristics under the manifold basis $\hat{x}$.

2) Covariance $(\check{\partial}_\lambda)$ - Other set of the symbols with the lower indices (x_m,u_n,A_{ab}), as covariance forms, are the numbers for the $\{\check{x}\}$ basis of the Y^- manifold labelled by its identity symbols of $\{\check{\ },{}^-\}$. "Covariance" is a formalism in which the nature laws of dynamics performs the event actions $\check{\partial}_\lambda$, maintains its physical supremacy of the Y^- dynamics, and dominates the physical characteristics under the manifold basis $\check{x}$.

Either contravariance or covariance has the same form under a specified set of transformations to the lateral observers within the same or boost basis as a common or parallel set of references for the operational event.

The communications between the manifolds are related through the tangent space of the world planes, regulated as the following operations:

3) Communications ($\hat{\partial}_\lambda$ and $\check{\partial}^\lambda$) - Lowering the operational indices $\hat{\partial}_\lambda$ is a formalism in which the quantitative effects of a virtual event λ under the contravariant Y^+ manifold are projected into, transformed to, or acted on its conjugate Y^- manifold. Rising the operational indexes $\check{\partial}^\lambda$, in parallel fashion, is a formalism in which the quantitative effects of a physical event λ under the covariant Y^- manifold are projected into, transformed to, or recorded at its reciprocal Y^+ manifold.

The dual variances are isomorphic to each other regardless if they are isomorphic to the underlying manifold itself, and form the norm (inner product) of the manifolds or world lines. Because of the reciprocal and contingent nature, the dual manifolds conserve their invariant quantities under a change of transform commutations and transport continuities with the expressional freedom of its underlying basis.

As a part of the universal topology, these mathematical regulations of the dual variances architecturally defines further framework of the event characteristics and its operational structures. In the $Y^\mp$ manifolds, a potential field can be characterized by a scalar function of $\psi \in \{\phi^+, \varphi^+\}$, named as *First Horizon Fields*, to serve as a state environment of entanglements. The derivative to the scalar fields are event operations of their motion dynamics, which generates a tangent space, named as Second *Horizon Fields*.

1. In order to operate the local actions, an event λ exerts its effects of the virtual supremacy within its Y^+ manifold or physical supremacy within its Y^- manifold, giving rise to the second horizon:

$$\hat{\partial}^\lambda \psi = \dot{x}^\mu \partial^\mu \psi \qquad : \dot{x}^\mu = \partial x^\mu / \partial \lambda, x^\mu \in Y^+ \tag{3.1}$$

$$\check{\partial}_\lambda \psi = \dot{x}_m \partial_m \psi \qquad : \dot{x}_m = \partial x_m / \partial \lambda, x_m \in Y^- \tag{3.2}$$

$$\hat{\partial}^\lambda = (-ic\partial^\kappa \quad \mathbf{u}^+ \nabla) \qquad : \lambda = t, \mathbf{u}^+ = \frac{\partial x^r}{\partial t}, \partial^\kappa = \frac{\partial}{\partial x^0}, \partial^r = \nabla \tag{3.3}$$

$$\check{\partial}_\lambda = \left(ic\partial_\kappa \quad \mathbf{u}^- \nabla\right) \qquad : \lambda = t, \mathbf{u}^- = \frac{\partial x_r}{\partial t}, \partial_\kappa = \frac{\partial}{\partial x_0}, \partial_r = \nabla \tag{3.4}$$

The speed $\dot{x}^\mu = \{-ic, \mathbf{u}^+\}$ or $\dot{x}_m = \{ic, \mathbf{u}^-\}$ is the contravariant or covariant velocity, observed from an inertial frame without effects of rotations and transformation. Applying to a point object, it represents a field at each point "*External"* to itself.

2. By lowering the index, the virtual Y^+ actions manifest the first tangent potential $\hat{\partial}_\lambda$ projecting into its opponent basis of the Y^- manifold. Because of the motion, the derivative to the vector x^μ has the changes of both magnitude quantity $\dot{x}_a \partial x^\mu / \partial x_a$ and basis direction $(\dot{x}_a \nabla_a \mathbf{b}^\mu) x^\mu = \dot{x}_a \overset{+}{\Gamma}{}^\sigma_{a\mu} x_\sigma$ transforming from one world plane $\{\mathbf{r} - i\mathbf{k}\}$ to the other $\{\mathbf{r} + i\mathbf{k}\}$. This action redefines the Y^+ event quantities of relativity and creates the *Inertial Boost* $J^+_{\mu a}$ Generators and the *Spiral Torque* $K^+_{\mu a}$ *Coordinators* around a central point, giving rise to the Y^+ tangent rotations of a scalar potential space.

$$\hat{\partial}_\lambda \psi = \dot{x}_a \left(J^+_{\mu a} + K^+_{\mu a}\right) \partial^\mu \psi \qquad : J^+_{\mu a} = \frac{\partial x^\mu}{\partial x_a}, \ K^+_{\mu a} = \overset{+}{\Gamma}{}^\sigma_{\mu a} x_\sigma \tag{3.5}$$

$$\dot{x}^\mu \mapsto \dot{x}_a \left(J^+_{\mu a} + K^+_{\mu a}\right), \quad \overset{+}{\Gamma}{}^\sigma_{\mu\nu} \equiv \frac{1}{2} g_{\sigma\epsilon} \left(\frac{\partial g^{\epsilon\mu}}{\partial x^\nu} + \frac{\partial g^{\epsilon\nu}}{\partial x^\mu} - \frac{\partial g^{\mu\nu}}{\partial x^\epsilon}\right) \tag{3.6}$$

Likewise for the Y^- actions by raising the index, the Y^- tangent rotations of a scalar potential space can be derived straightforwardly.

$$\check{\partial}^\lambda \psi = \dot{x}^\alpha \left(J^-_{m\alpha} + K^-_{m\alpha}\right) \partial_m \psi \qquad : J^-_{m\alpha} = \frac{\partial x_m}{\partial x^\alpha}, K^-_{m\alpha} = \overset{-}{\Gamma}{}^s_{m\alpha} x_s \tag{3.7}$$

$$\dot{x}_m \mapsto \dot{x}^\alpha \left(J^-_{m\alpha} + K^-_{m\alpha}\right), \quad \overset{-}{\Gamma}{}^s_{mn} = \frac{1}{2} g^{se} \left(\frac{\partial g_{em}}{\partial x_n} + \frac{\partial g_{en}}{\partial x_m} - \frac{\partial g_{mn}}{\partial x_e}\right) \tag{3.8}$$

where $g_{\sigma\epsilon}$ or g^{se} is the metrics, The symbol $\overset{\mp}{\Gamma}{}^\mu_{\sigma\nu}$ is an Y^- or Y^+ metric connection, similar but extend the meanings to *Christoffel* symbols, introduced in 1869 [1].

3. Following the tangent curvature, the λ event operates the potential vectors through the second tangent vector of the curvature, giving rise to the *Third Horizon Fields*, shown by the expressions:

$$\hat{\partial}^\lambda V^\mu = \dot{x}^\nu (\partial^\nu V^\mu + \overset{+}{\Gamma}{}^\mu_{\sigma\nu} V^\sigma) \qquad : V^\mu \mapsto \dot{x}^\mu \partial^\mu \psi \tag{3.9}$$

$$\check{\partial}_\lambda V_m = \dot{x}_n (\partial_n V_m + \overset{-}{\Gamma}{}^s_{mn} V_s) \qquad : V_m \mapsto \dot{x}_m \partial_m \psi \tag{3.10}$$

$$\hat{\partial}^\lambda \hat{\partial}^\lambda \psi = (\dot{x}^\nu \partial^\nu)(\dot{x}^\mu \partial^\mu) \psi + \dot{x}^\nu \overset{+}{\Gamma}{}^\sigma_{\mu\nu} \dot{x}^\sigma \partial^\sigma \psi \tag{3.11}$$

$$\check{\partial}_\lambda \check{\partial}_\lambda \psi = (\dot{x}_n \partial_n)(\dot{x}_m \partial_m) \psi + \dot{x}_n \overset{-}{\Gamma}{}^s_{mn} \dot{x}_s \partial_s \psi \tag{3.12}$$

In the tangent space, the scalar fields are given rise to the vector fields.

4. Through the tangent vector of the third curvature, the events $\hat{\partial}_\lambda$ and $\check{\partial}^\lambda$ continuously entangle the vector fields and gives rise to the forth horizon fields, shown by the formulae:

$$\hat{\partial}_\lambda V^\mu = \dot{x}_a \left(J^+_{\nu a} + K^+_{\nu a}\right) \left(\partial^\nu V^\mu + \overset{+}{\Gamma}{}^\mu_{\sigma\nu} V^\sigma\right) \tag{3.13}$$

$$\hat{\partial}^\lambda \hat{\partial}^\lambda V^\mu = \left(\dot{x}^\iota \partial^\iota\right) \left(\dot{x}^\nu \partial^\nu\right) V^\mu + \left(\ddot{x}^\nu \overset{+}{\Gamma}{}^\sigma_{\mu\nu} + \dot{x}^\nu \dot{x}^\iota \partial^\iota \overset{+}{\Gamma}{}^\sigma_{\mu\nu} + \dot{x}^\nu \dot{x}^\iota \overset{+}{\Gamma}{}^\sigma_{\mu\nu} \partial^\iota\right) V^\sigma \tag{3.14}$$

$$\check{\partial}^\lambda V_m = \dot{x}^\alpha \left(J^-_{m\alpha} + K^-_{m\alpha}\right) \left(\partial_n V_m + \overset{-}{\Gamma}{}^s_{mn} V_s\right) \tag{3.15}$$

$$\check{\partial}_\lambda \check{\partial}_\lambda V_m = \left(\dot{x}_e \partial_e\right) \left(\dot{x}_n \partial_n\right) V_m + \left(\ddot{x}_n \overset{-}{\Gamma}{}^s_{mn} + \dot{x}_n \dot{x}_e \partial_e \overset{-}{\Gamma}{}^s_{mn} + \dot{x}_n \dot{x}_e \overset{-}{\Gamma}{}^s_{mn} \partial_e\right) V_s \tag{3.16}$$

As an integrity, they perform full operational commutations of inertial boosts and torque rotations operated between the $Y^- Y^+$ world planes. The event processes continue to build up the further operable domain with a variety of the rank-n tensor fields. Systematically, sequentially and simultaneously, a chain of these reactions constitutes various domains, each of which gives rise to the field entanglements.

It is worthwhile to emphasize that *a*) the manifold operators of $\{\partial^\mu, \partial_m\}$, including traditional "operators" of $\{\partial/\partial t, \partial/\partial x_i, \nabla\}$ are exclusively useable as mathematical tools only, and *b*) the tools do not operate or perform by themselves unless they are driven or operated by an event λ, implicitly or explicitly.

IV. CONTINUITY AND COMMUTATION

In a manifold, the derivative to a scalar field of the potential environment is the first operation of an event in its localized motion dynamics or field entanglements. Using the local event operations of $\check{\partial}_\lambda$ or $\hat{\partial}^\lambda$, the tangent spaces are constructible in form of a rank-1 tensor for the vector fields of V_m or V^μ, which respectively develops the next operational domain of fields such as the dark fluxions $\mathbf{f}^\pm$.

For an entanglement stream $\langle\lambda\rangle$ between the manifolds, ensemble of an λ event is in a mix of states such that each pair of the reciprocal states $\{\phi^+_n, \varphi^-_n\}$ or $\{\phi^-_n, \varphi^+_n\}$ occurs in alignment with an integrity of their probability $p^\pm_n = p_n(h^\pm_n)$, where h^+_n or h^-_n is their Y^- or Y^+ distributive factors, respectively. There are four types of potential scaler fields of $\phi^\pm_n$ and $\varphi^\pm_n$. Their interoperation correlates and entangles the dual densities of environment $\rho^+_\phi = \phi^+_n \varphi^-_n$ and $\rho^-_\phi = \phi^-_n \varphi^+_n$ under the event operations as the natural derivatives to form a pair of fluxions of density continuity.

$$\dot{\lambda} \rho^-_\phi = \left[\check{\lambda}, \hat{\lambda}\right]^- = \sum\nolimits_n p^-_n \left(\varphi^+_n \check{\lambda} \phi^-_n + \phi^-_n \hat{\lambda} \varphi^+_n\right) \tag{4.1}$$

$$\dot{\lambda} \rho^+_\phi = \left[\hat{\lambda}, \check{\lambda}\right]^+ = \sum\nolimits_n p^+_n \left(\varphi^-_n \hat{\lambda} \phi^+_n + \phi^+_n \check{\lambda} \varphi^-_n\right) \tag{4.2}$$

where the symbol $[\ ]^\mp$ is named as Y^- or Y^+ *Continuity Bracket*, or *Symmetric Fluxion*, which is the density continuity of the $Y^- Y^+$ scalar potential fields, respectively, which extends a single commutator { }, or anti-commutator [ ], known as *Lei Bracket* [2]. Considering another pair of the operational symbol $\langle\lambda\rangle^+$ for Y^+ and $\langle\lambda\rangle^-$ for Y^- supremacy, the reciprocal entanglements of the scalar potential fields, or known as *Commutator*, are defined as a pair of the vector fields as the following:

$$\left\langle \hat{\lambda}, \check{\lambda} \right\rangle^+ = \sum\nolimits_n p^+_n \left(\langle\hat{\lambda}\rangle^+ - \phi^+_n \check{\lambda} \varphi^-_n\right) \quad : \langle\hat{\lambda}\rangle^+ = \varphi^-_n \hat{\lambda} \phi^+_n \tag{4.3}$$

$$\left\langle \check{\lambda}, \hat{\lambda} \right\rangle^- = \sum\nolimits_n p^-_n \left(\langle\check{\lambda}\rangle^- - \phi^-_n \hat{\lambda} \varphi^+_n\right) \quad : \langle\check{\lambda}\rangle^- = \varphi^+_n \check{\lambda} \phi^-_n \tag{4.4}$$

where the $\langle\ \rangle^\mp$ is Y^- Y^+ *Commutator Bracket*. The symbol $\langle\ \rangle^\mp$ is named as Y^- or Y^+ *Asymmetry Bracket*, essential to the cosmological fields.

Similarly, a set of the reciprocal vector fields of $V_m^\pm = -\dot{\partial}\phi_m^\pm$ $\Lambda_\mu^\pm \equiv -\hat{\partial}\varphi_\mu^\pm$, has the brackets of Y^- or Y^+ continuity and commutation:

$$\left\langle \hat{\lambda}, \check{\lambda} \right\rangle_v^\pm \equiv \varphi_n^\mp \hat{\lambda} V_n^\mp - \phi_n^\pm \check{\lambda} \Lambda_n^\mp \qquad \langle \hat{\lambda} \rangle_v^\pm = \varphi_n^\mp \hat{\lambda} V_n^\pm \tag{4.5}$$

$$\left[\hat{\lambda}, \check{\lambda} \right]_v^\mp \equiv \varphi_n^\pm \hat{\lambda} V_n^\mp + \phi_n^\mp \check{\lambda} \Lambda_n^\pm \tag{4.6}$$

where $\langle\ \rangle_v^\pm$, $[\ ]_v^\pm$ or $\langle\ )_v^\pm$ indicates the entanglements of vector potentials.

V. COMMUNICATION INFRASTRUCTURE

Infrastructure refers to the fundamental systems of the universe provisioning situations, objects, operators, commuters, actors or reactors including imperative structures, facilities, and transportations necessary for their events to function systematically. Typically, it characterizes dynamic structures such as generators, transformations, curvatures, entanglements, commutations, spin grids, tunnels, informatics, and so forth. Among them, communication is a core part of the infrastructure which harmonizes the virtual and physical components of our universal systems and commoditizes with the Y^-Y^+ interoperations essential to enable, perform, sustain, advance or cycle the operational activities, formational conditions and living evolutions.

As the global infrastructure, the communications between the manifolds are empowered with the speed of light $\check{\partial}_t x_m = (ic, c\mathbf{b}^-)$ and $\hat{\partial}^t x^\mu = \left(-ic, c\mathbf{b}^+\right)$ that a transport infrastructure has axiomatic commutations or entanglements for the event operations, information transmissions or conveyable actions. Between the world planes, the two-dimensional transportations $\{\mathbf{r} \mp i\mathbf{k}\}$ are naturally constructed for tunneling between the Y^-Y^+ domains of dark energies, which is mathematically describable by transformations between the manifolds.

Artifacts 1: Transport Generators. From the matrices of equation (3.5) and (3.7), the *Inertial Boost* $J_{\mu a}^\pm$ can naturally derive a pair of generators as the explicit matrix tables:

$$J_\mu^+ = L_\mu - iK_\mu \qquad\qquad J_m^- = L_m + iK_m \tag{5.1}$$

$$K_x = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}, \quad K_y = \begin{pmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}, \quad K_z = \begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{pmatrix} \tag{5.2}$$

$$L_x = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & -1 & 0 \end{pmatrix}, \quad L_y = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1 \\ 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{pmatrix}, \quad L_z = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix} \tag{5.3}$$

similar to and known as *Lorentz Generators* discovered since 1892 [3]. In the gauge term, these commutation relationships indicate that each of J_μ^+ and J_m^- generators respectively gives rise to their distinct groups transforming into each other's manifold.

Artifacts 2: Spin Generators. With one dimension $\boldsymbol{r}$ in the world planes, the manifolds are allowed to extend the extra freedom of the two dimensions to its spatial coordinates. In order to natively align with the $\{\pm\mathbf{k}, \mathbf{r}\}$ world planes, it may be convenient to choose the three-dimensions of the Cartesian coordinate system $\{\mathbf{x}_1, \mathbf{x}_2, \mathbf{x}_3\}$ in an orthogonal coordinate system such that the $\{\mathbf{x}_1\}$-axis is oriented parallel to the $\mathbf{g}(\lambda)$-axis of the global environment: $\mathbf{x}_1 \,||\, \mathbf{g}$.

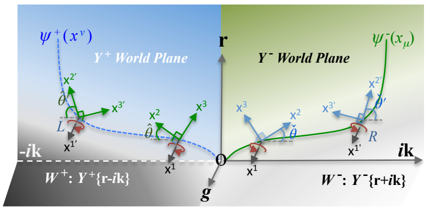

Figure 1: The Left- and Right-handed World Planes

In this matter of convention, when moving on the line of the world plane $\{\mathbf{k}, \mathbf{r}\}$, the $\mathbf{x}_1$-axis always passes through the center of the object and maintains the $\{\mathbf{x}_2, \mathbf{x}_3\}$ plane of the spacial coordinates parallel to the global $\{\pm\mathbf{k}, \mathbf{r}\}$ plane, shown by Figure 1.

Following the modulation, an inertial movement on the global $\{\mathbf{k}, \mathbf{r}\}$ world plane of the Y^- manifold is natively applied to the spatial $\{\mathbf{x}_2, \mathbf{x}_3\}$ plane with an additional right-handed or left-handed rotations $\check{\theta}$ or $\check{\theta}'$. Meanwhile, the $\{\mathbf{x}^2, \mathbf{x}^3\}$ coordinates associated with the Y^+ manifold is simply a mirror or reciprocal image of the left-handed rotation $\hat{\theta}$ or $\hat{\theta}'$. As a consequence, the Y^-Y^+ generators (5.1) can be expressed by the two-dimensional world planes $\{\mathbf{r} \pm i\mathbf{k}\}$ with their extensions into the spacial $\mathbf{r}$ dimensions, shown by the 2x2 matrixes:

$$J^\pm = \begin{pmatrix} \sigma_0 \mp i\sigma_1 & \\ & \sigma_3 \mp i\sigma_2 \end{pmatrix} \tag{5.4}$$

$$\sigma_n = \left[\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}_0, \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}_1, \begin{pmatrix} 0 & i \\ -i & 0 \end{pmatrix}_2, \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}_3 \right] \tag{5.5}$$

The σ_n indexes of (0,3) are the diagonal elements of the matrix for a homogeneous environment ($\mu = a, m = \alpha$). The indexes of (0,1,2) also define each of the rotational axes of the spatial dimensions under the tetrad-coordinates. The indexes of (1,2) form a reciprocator to the (0,3) matrices. Intuitively simplified to a group of the 2x2 matrixes, the generators have the following commutation relationships:

$$\left\langle \sigma_a, \sigma_b \right\rangle^- = 0, \quad \sigma_a^2 = \sigma_3, \quad \left[\sigma_a, \sigma_b\right]^+ = 2i\varepsilon_{abc}^+\sigma_c \qquad : a, b, c \neq 3 \tag{5.6}$$

$$J^-J^+ = 2(\sigma_3 + \sigma_2) \qquad J^+J^- = 2(\sigma_3 - \sigma_2) \tag{5.7}$$

In accordance with our anticipation, the zero commutator illustrates the distinct freedoms of physical supremacy that are degradable ($\sigma_a^2 = \sigma_3$) back to the global $\mathbf{r}$ dimension ($I_r \mapsto 1$). With the left-handed ε_{abc}^+ chiral, the non-zero continuity reveals the creation processes of the virtual supremacy. Therefore, defined as *Spin Generator*, these 2x2 tensors give rise to the quantum fields, bringing the natural meanings into the *Pauli* matrices, discovered in 1926 [4].

Artifacts 3: Chiral Entanglement. The interpretations of Figure 1 is that, when an axis passes through the center of an object, the object is said to rotate upon itself, or spin. Furthermore, when there are two axes passing through the center of an object, the object is said under the entanglements of the *YinYang* (Y^-Y^+) duality. During the first horizon, spin chirality is a type of the virtual and physical interactions that the objects moving on the world lines generate the dual transformations of the Y^-Y^+ spinors, reciprocally, such that the nature appears the entanglement characterized by the left-handed and the right-handed chirality sourced from or driven by each of the manifolds of the virtual Y^+ and physical Y^- dynamics. Following the trajectory, for example, if an object is rotated in 360° physically, it is transformed from the W^- to W^+ world plane, known as a chiral phenomenon. It takes total two full rotations (720°) from the W^- to W^+ and then back to W^- world plane, and vice versa, for an object to return to its original state. With its opponent companionship, the whole system yields the parity conservation by maintaining the duality reciprocally and simultaneously.

Artifacts 4: Y^- Transform Fields. As the function quantity of an object, a scalar field forms and projects its potentials to its surrounding space, arisen by or acting on its opponent through a duality of reciprocal interactions dominated by *Lorentz Generators*. Under the Y^- primary given by the equations of (3.5) and (3.7), the event processes generate the entangling commutations between the manifolds:

$$\left\langle F_{m\alpha} \right\rangle^- = \left\langle \dot{x}^\alpha J_{m\alpha}^- \partial_m, \dot{x}_\alpha J_{m\alpha}^+ \partial^m \right\rangle^- \tag{5.8}$$

$$\left\langle F_{m\alpha} \right\rangle^- = \begin{pmatrix} \eta_0 & \beta_1 & \beta_2 & \beta_3 \\ -\beta_1 & \eta_1 & -e_3 & e_2 \\ -\beta_2 & e_3 & \eta_2 & -e_1 \\ -\beta_3 & -e_2 & e_1 & \eta_3 \end{pmatrix} \quad : \begin{matrix} \eta_m = \left\langle F_{mm} \right\rangle^- \\ \beta_\alpha = \left\langle F_{0\alpha} \right\rangle^- \\ \varepsilon_{iam}^- e_i = \left\langle F_{m\alpha} \right\rangle^- \end{matrix} \tag{5.9}$$

where the *Levi-Civita* [5] connection $\varepsilon_{iam}^- \in Y^-$ represents the right-hand chiral. The Y^- Transform Tensors construct a pair of its off-diagonal fields $\langle F \rangle_{m\alpha}^- = -\langle F \rangle_{m\alpha}^-$ for the transformational infrastructure. The diagonal elements of η_m are the motion dynamics of the actor or reactors that is traveling or transporting along the world-line infrastructure. They embed a pair of mirrors to each other as of: i) antisymmetric matrix for the off-diagonal entries, and ii) the conjugate function for the diagonal elements. Therefore, the transport framework institutes an environment where a pair of the commutators compels or exerts the dual transform fields as a foundational structure giving rise to the magnetic ($\beta \mapsto B$) and electric ($e \mapsto E$) fields.

Artifacts 5: Y^+ Transform Fields. In the parallel fashion as a part of duality, the event processes generates the reciprocal entanglements of the Y^+ commutation, shown by the following equations:

$$\left\langle F_{\mu a}\right\rangle^+ = \left\langle \dot{x}_a J^+_{\mu a}\partial^\mu, \dot{x}^a J^-_{\mu a}\partial_\mu\right\rangle^+ \tag{5.10}$$

$$\left\langle F_{\mu a}\right\rangle^+ = \begin{pmatrix} \eta^0 & -d^1 & -d^2 & -d^3 \\ d^1 & \eta^1 & h^3 & -h^2 \\ d^2 & -h^3 & \eta^2 & h^1 \\ d^3 & h^2 & -h^1 & \eta^3 \end{pmatrix} : \begin{matrix} \eta^\mu = \left\langle F_{\mu\mu}\right\rangle^+ \\ d^a = \left\langle F_{0a}\right\rangle^+ \\ \varepsilon^-_{iam} e_i = \varepsilon^+_{\nu a\mu} h^\nu \end{matrix} \tag{5.11}$$

where The *Levi-Civita* connection ε^-_{iam} represents the right-hand chiral. The Y^+ Transport Tensors construct another pair off-diagonal fields $\langle F\rangle^+_{\mu a} = -\langle F\rangle^+_{\mu a}$ as a part of the transport infrastructure. The diagonal elements of d^μ are the motion dynamics of the actor or reactors traveling or transporting alone this infrastructure. As a second pair of the commutators from the Y^+ manifold, they embed a pair of mirrors to each other, compelling or exerting its dual transport fields to its surrounding area or into the reciprocal or physical regime: a foundation of the displacement $d \mapsto D$ and magnetizing $h \mapsto H$ fields.

Artifacts 6: Inertial Commutation. Considering the commutation between equations of (3.13) and (3.15) for the speed at constant, it expresses the mirroring effects of the transform generator and transport coordinator for the *Inertial Transform Commutation*:

$$\left\langle \hat{\partial}_\lambda \hat{\partial}_\lambda, \check{\partial}^\lambda \check{\partial}^\lambda \right\rangle^+ = \dot{x}^\nu \dot{x}^\mu \left(\frac{R}{2} g^{\nu\mu} + G^+_{\nu\mu}\right) \tag{4.14}$$

$$= \dot{x}_\nu \left(J^+_{\nu a} + K^+_{\nu a}\right) \dot{x}_\mu \left(J^+_{\mu a} + K^+_{\mu a}\right) \left(\frac{R}{2} g^{\nu\mu} + G^+_{\nu\mu}\right) \tag{5.15}$$

where R is *Ricci* scalar curvature, introduced in 1889 [6], and $G^+_{\nu\mu}$ is the *Stress Tensor,* each by the following definitions:

$$\dot{x}^\nu \dot{x}^m R^{\nu m} = \langle \dot{x}^m \partial^m, \dot{x}^\nu \partial^\nu \rangle \quad : R^{\nu m} = \frac{R}{2} g^{\nu m} \tag{5.16}$$

$$\dot{x}^\nu \dot{x}^m G^+_{\nu m} = \dot{x}^\nu \dot{x}^m \left\langle \Gamma^{+\sigma}_{\nu m} \partial^\sigma, \Gamma^{-\sigma}_{m\nu} \partial_\sigma \right\rangle^+_{\nu m} \quad : \dot{x}^\iota = \dot{x}_a \left(J^+_{\iota a} + K^+_{\iota a}\right) \tag{5.17}$$

Therefore, the stationary curvature measures how movements under the potential *Scalar Fields* are balanced with the inherent stress $G^+_{\nu\mu}$ during a parallel transport entangling between their Y^-Y^+ manifolds.

Artifacts 7: Spiral Commutation. Considering the commutation between equations of (3.14) and (3.16), it expresses the *Vector* effects of the transform generator and transport coordinator at the dynamic condition, meaning the *General Commutation*:

$$\left\langle \hat{\partial}^\lambda \hat{\partial}^\lambda, \check{\partial}_\lambda \check{\partial}_\lambda \right\rangle^-_v = \langle P\rangle + \langle \mathfrak{R}\rangle + \langle G\rangle \tag{5.18}$$

$$\langle P\rangle = \langle \dot{x}^m \partial^m, \dot{x}^\nu \partial^\nu \rangle = \dot{x}^\nu \dot{x}^m R^{\nu m} \quad : R^{\nu m} = \frac{R}{2} g^{\nu m} \tag{5.19}$$

$$\langle G\rangle = \left\langle \dot{x}^\nu \dot{x}^n \Gamma^{+\sigma}_{\mu\nu} \partial^n, \dot{x}_n \dot{x}_\nu \Gamma^{-\sigma}_{\mu n} \partial_\nu \right\rangle_v = \dot{x}^\nu \dot{x}^n G^{+\sigma}_{\nu n\mu} \tag{5.20}$$

$$\langle \mathfrak{R}\rangle \equiv \dot{x}^\nu \dot{x}^n \left\langle \frac{\ddot{x}^\nu \Gamma^{+\sigma}_{\mu\nu}}{\dot{x}^\nu \dot{x}^n} + \partial^n \Gamma^{+\sigma}_{\mu\nu}, \frac{\ddot{x}_n \Gamma^{-\sigma}_{\mu n}}{\dot{x}_n \dot{x}_\nu} + \partial_\nu \Gamma^{-\sigma}_{\mu n} \right\rangle_v = -\dot{x}^\nu \dot{x}^n \mathfrak{R}^\sigma_{\nu n\mu}$$

The term $\langle P\rangle$ is *Commutative Vector Potential*, an entanglement capacity of the static dark energies, carrying out *Ricci* tensor $R_{\mu\kappa}$ and scalar R curvature. The second item $\langle \mathfrak{R}\rangle$, is the *Transportation Curvature* as a routing track of the communications, composing *Riemannian* $R^\mu_{n\nu\sigma}$ geometry, developed in 1859 [7]:

$$\langle R\rangle = -R^\mu_{n\nu\sigma} \mapsto \left(\partial_\nu \Gamma^{-\mu}_{a\sigma} \partial_a \Gamma^{+\mu}_{\nu\sigma} + \Gamma^{-\rho}_{a\sigma} \Gamma^{+\mu}_{\nu\rho} - \Gamma^{+\rho}_{\nu\sigma} \Gamma^{-\mu}_{a\rho}\right) \tag{5.22}$$

The third item $\langle G\rangle$ embraces the energy torsion twisted and accentuated by the tangent vector fields of the rotational potentials $\Gamma^{-\sigma}_{\mu n} \partial_n \psi$ and $\Gamma^{+\sigma}_{\mu\nu} \partial_\nu \psi$, known as *Stress Tensor*:

$$\langle G\rangle \mapsto G^\mu_{n\nu\sigma} \equiv \Gamma^{-\sigma}_{\mu n} \partial_\nu - \Gamma^{+\sigma}_{\mu\nu} \partial_n \tag{5.23}$$

Therefore, under the transport infrastructure between the manifolds, the *Commutation* relations of equation (5.18) is simplified to the following:

$$\left\langle \hat{\partial}^\lambda \hat{\partial}^\lambda, \check{\partial}_\lambda \check{\partial}_\lambda \right\rangle^-_v = \dot{x}_n \dot{x}_\nu \left(\frac{R}{2} g_{n\nu} - R^\mu_{n\nu\sigma} + G^{+\sigma}_{n\nu\mu}\right) \tag{5.24}$$

More precisely, the event presence of the Y^-Y^+ dynamics manifests infrastructure foundations and transportations of the vector potential, curvature, and stress torsion, which give rise to the interactional entanglements through the center of an object by following its geodesics of the underlying virtual and physical commutations.

Artifacts 8: General Relativity. If the transportation between the Y^-Y^+ manifolds were commutative or the equation (5.24) is balanced to zero, the two-dimensions of the world line, would aggregate the expression $R^\mu_{n\nu\sigma} \mapsto R_{n\nu}$ and $G^{+\sigma}_{n\nu\mu} \mapsto G_{n\nu}$ to formulate *General Relativity*:

$$G_{n\nu} = R_{n\nu} - \frac{1}{2} R g_{n\nu} \quad : \left\langle \hat{\partial}^\lambda \hat{\partial}^\lambda, \check{\partial}_\lambda \check{\partial}_\lambda \right\rangle^-_v = 0 \tag{5.25}$$

known as the *Einstein* field equation [8]. Discovered since November 1915, the theory was one of the most profound discoveries of modern physics to account for general commutation in the context of classic forces. For a century, however, the philosophical interpretation remained a challenge until this infrastructure was discovered in 2016.

CONCLUSION

Universal Topology has revealed a set of the following discoveries or groundbreakings:

1) To align closely with life-steams of our natural world, the dual complex manifolds are established that overcomes the limitations of a single spacetime manifold.

2) Two pairs of the potential fields lies at the heart of the field theory for the fundamental interactions among the dark energies.

3) The mathematical framework is imperatively regulated on a new theoretical foundation by the dual variances to intimately mimic event actions of transform and transport processes.

4) Potential entanglements are introduced as the fluxions of continuity and commutation, and standardized by two pairs of brackets, which extends to *Lei* brackets in an associative algebra.

5) The introductory application of an evolutionary process to contemporary physics demonstrates the empirical artifacts of, but not limited to, *Lorentz* generators, *Pauli* spin matrices, transform field structures, and *Einstein General Relativity*.

As a result, it has laid out a ground foundation towards a unified physics that will give rise to the fields of quantum, photon, electromagnetism, graviton, gravitation, cosmology, and beyond.

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