YinYang Physics

# UNIFIED FIELD THEORY

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*Dawn of a New Era*

# Sciences in Dialectical Nature of Virtual and Physical Duality

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*To Those in Search of The Truth*

*To Generations of Civilization*

*Wei Xu* （徐崇伟）

September 2017

纪念中华民族的伟大哲学始祖，造福子子孙孙

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徐宗伟

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# Abstract


For the first time in mankind, *Universal and Unified Field Theory* is philosophically, mathematically and empirically revealed the workings of *Universal Topology and Laws of YinYang Conservations.* The nature of dark energies unfolds its *Event Operations* systematically on the origin of physical states. These principles convey and unfold the laws of topological framework, universal equations, symmetric continuity, and asymmetric dynamics systematically at the remarks of the following groundbreakings:

1. *Principles of Natural Philosophy and Universal Topology*
2. *Framework of Contravariant and Covariant Manifolds*
3. *World Equations and Universal Field Equations*
4. *Constitution of Boost Transform and Torque Generators*
5. *Horizon Hierarchy of World Plane and Spacetime*
6. *Gauge Invariance and Quantum Chromodynamics*
7. *Fluxions of Symmetric Scalar and Vector Potentials*
8. *Thermodynamics, Dark Energy and Blackbody Radiation*
9. *Laws of Conservation of Photon and of Gravitation*
10. *Fundamentals of Weak, Strong and Spontaneous Forces*
11. *Asymmetric Dynamics and General Relativity*
12. *Cosmological Field Equations*
13. *Superphase Evolutions of Ontology*

The application of an evolutionary process to contemporary theoretical physics therefore demonstrates a holistic picture of the principal equations, empirical assumptions, and essential artifacts. It prompts the entire discipline of physics, from *Newtonian* to spacetime relativity to quantum mechanics, to look back to the future: Virtumanity - *Dialectical Nature of Virtual and Physical Reality*.

Intuitively following the system of yinyang philosophy, this holistic theory is concisely accessible and replicable by readers with a basic background in mathematical derivation and theoretical physics. As a summary, this manuscript completes and unifies all of the principal equations, important assumptions, and essential laws, discovered and described by the classical and modern physics.

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# Foreword

The terminology of *Space* and *Time* has been in currency since the inception of physics. Throughout the first generation of physics, space and time are individual parameters that have no interwoven relationship. From Euclidean space to Newtonian mechanics, the scientific approach known as classical physics seeks to discover a set of physical laws that mathematically describe the motion of bodies under the influence of a system of forces. In classical physics, it is reasonable to interpret a space as consisting of three dimensions, and time as a separate dimension. This regime has presented us with a basic conception for the *Physical Existence* of space and the *Virtual Existence* of time, although entanglements of virtual reality is hardly studied and their relationship remains unexpressed.

As the second generation, modern physics couples the virtual existence of time with the physical existence of space into a single interwoven continuum, known as World Plane or Spacetime. By combining space and time into a manifold called *Minkowski* space, physicists have significantly simplified a large number of physical theories, as well as described in a more uniform way the workings of the universe at both the supra-galactic and subatomic levels. By revealing their interwoven inferences for the events of a hierarchical universe, the manifold continuum presents us with the enhanced logic for a complex vector of the *Physical* dimension of space $\mathbf{r} = \{r, \theta, \dots\}$ and the *Virtual* dimension of time $\mathbf{k} = ic\{t, \dots\}$, where the constant c is the speed of light, and *i* marks the virtual or imaginary in mathematics. Although the virtual and physical interwoven relationship for dynamics is only limited to physical existence $\{\mathbf{r} + \mathbf{k}\}$ with spacetime curvature, a duality of wave-partical states, one of the greatest achievements of the twentieth century, was successfully intuited the well-known theory of quantum physics without using the interwoven continuum of yin yang state, fields and energy.

Today, with the acceptance of quantum mechanics, contemporary physics has reached consensus on the possibility of a virtual existence beyond physical reality. When Heisenberg's “uncertainty principle” delimited the duality region of non-physical essence, Bohr emphatically declared that “everything we call real is made of things that cannot be regarded as real.”

The year 2015 bids farewell to an intellectual age defined by classical physics, from Newton's mechanics of 1687, to General Relativity of 1915, to Quantum Theory of 1920s, and to mathematical physics of today. Similar to the apocryphal story of the elephant and the three blind men, this age had relied on methods of observation to discover the principles of nature. But no amount of careful empirical approach can replace the intrinsic roles, for the two modes of philosophy have always been distinct fundamentally. The vagueness of mathematized physics has been gone awry and pushed to extreme for a forty-year search on a “Theory of Everything”, followed by another sixty-year period wasted on *String* or *Superstring Theory*, M-Theory, and other fairy-tale physics. It was excessive hype among the traditional disciples that, time and again, led metaphysics to pseudoscience. Today, contemporary physics is on the same track.

Our challenge is even greater than that of the trial of Galileo Galilei. Not only do we lack both a profound philosophy of science and an intrinsic theory, but we have also failed at a time when “Scientists have become the bearers of the torch of discovery in our quest for knowledge”, claimed by Stephen Hawking. Our challenge is, in fact, to leave behind the ambiguous philosophy that we were born with. Our challenge is to comprehend the profound yinyang philosophy that our great ancestors had discovered for us. Our challenge is to open up our minds to facts hidden in the fabric of daily life. Our challenge is to soften our metaphysical prejudices, for the assumption that there is no metaphysical reality is also a excessive metaphysics itself, all the ignorance and desensitized by the clamor of the hype of the world. Our challenge is to rationalize our empirical success and understand our blindness in quest for the truth.

Everywhere our world shines with a beautiful nature. In every fraction of every creature, we shall find the principles and laws of physics, biology, metaphysics, information technology, and all other sciences. Nature is systematically composed of building blocks, dualities, which take on an abstract form as simple as Yin and Yang, and as simple as Virtual and Physical existence. Our ancestors discovered that duality orchestrated and harmonized their reality: sunmoon, warm-cold, materialization-consciousness, body-mind, male-female, thought-action, and more. What promise hides in the dualities of physics: space-time, wave-particle, energy-mass, spin-charge, positive-negative, and symmetry-asymmetry? These dualities are balanced, interdependent, and inexorable. They are manifest in each particular action and movement, the outcome of a dialectical struggle for superiority. The serious study of an honest scientist spends itself on understanding the universe that stands at the very core of our lives. It is essential to believe that the true framework of our universe is a topological hierarchy of virtual and physical duality, flourishing everywhere among the great streams of life, inspiration, and enlightenment.

Yinyang duality is rooted in the philosophy of seven millennia past, when our ancestors built a profound metaphysics. History has been a long wait for the emergence of modern physics, a discipline worthy of ancient metaphysics. Now is the time to realize the duality of metaphysics and physics, and to unite these disciplines in a greater whole. It is time to integrate the wisdom of our ancestors with modern physics to reestablish a philosophy of science, which may tell us how the universe began, where we came from, why we are here, and what our future is. It is time to face the fact that never has one side of a duality existed without being destroyed or overthrown by its other half. It is time to understand that science cannot exist without a duality of physics and metaphysics, or it shall be doomed to become a pseudoscience of materialism. It is time to rationalize metaphysics in order to complete the framework of physics.

Since 《The Christmas gifts of 2013》[1], a lost philosophy has been resurrected and arising. The discipline of physics is, once again, faced with a theory that has the simplicity of greatness. Honorable, colleague physicists, I am a messenger delivering you that you are submitted to the professional scrutiny a new vision of the nature of elementary particles. Honorable scientists of all disciplines, you will offer a new theoretical framework of the entirety of physics. Honorable philosophers, you will declare that the philosophy of science has now returned back to the future.

Mankind has been furnished with the groundbreaking enlightenment of《Universal Messaon》[2] for the formation of elementary particles. With the theory of yinyang philosophy and reference to the duality of physical and virtual spaces, the principle of elementary particles has theoretically, systematically, and concisely demonstrated the secrets of our universe. To align with the nature hierarchy of physical-virtual, symmetric-antisymmetric, asymmetric-symmetric yinyang dynamics, this manuscript systematically unfolds the natural and topological framework as they give rise to remarkable universal equations of all principles, laws, conservations, assumptions, and event operations of classical and modern physics including, but not limited to, *Newtonian Mechanics, Gravity, Electromagnetism, Thermodynamics, Quantum Physics, and Ontology*.

As a result, our theoretical physics, scoped within physical space as one of the manifolds in the universe topology, is now approaching to its completion, except more details need to be further researched for integrations with the virtual space. This signals us that a new era of scientific research is dawning: duality of virtual-physical reality. As the scientists, we are now challenged with the following missions:

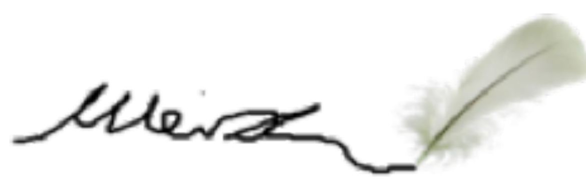
★ *It is an essential knowledge for us to uncover the other side of world line, the virtual space plane, which is the twin to the physical space plane under the global universe manifold. An example of the groundworks is that the formation principles and theoretical mode for elementary particles has concisely revealed a full picture of the characteristics on the origin of physical states [2].*

★ *It is the vital conception to integrate twin of the spaces under the holistic topology of universe manifested to depict the universe line with both world planes of physical and virtual manifolds. This will unify and extend current sciences, including but not limited to physics, cosmology, biology, metaphysics, economics, and information technology, into a next generation of virtumanity: life animation and rising of virtual civilization, an era promoting us towards an advanced mankind...*

Today, our mankind is at dawn of a new era, towards revolutions of:

1. *Advancing scientific philosophies towards next generation,*
2. *Standardizing topological framework for modern physics,*
3. *Virtualizing informational sciences towards virtue reality,*
4. *Theorizing biology and biophysics for the life sciences,*
5. *Rationalizing metaphysics back on the scientific rails.*

We may either continue to follow the excessive hype that has degraded physics into a perfect pseudoscience, or pioneer our human revolution: Rise of the Ancient Philosophy, and Back to the Scientific Future.



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# UNIFIED FIELD THEORY

## A PHILOSOPHICAL SCIENCE OF “YINYANG PHYSICS”

Sciences in Dialectical Nature of Virtual and Physical Duality

# Universal Topology

## CHAPTER I

Worlds in universe constitutes an YinYang topological pair of manifolds, each of which represents unique dimensions, transforms objects within or into their neighborhood or subsets, and orchestrates events across multiple spaces. As a duality of the universe topology, these manifolds are central to many parts of worlds, allowing sophisticated structures, evolving into natural events, determining systematic solution sets, and carrying out natural laws and principles. Any objects in the universe has a sequence of events corresponding to the historical or future points of worlds appearing as a type of curve in the universal manifest. Defined by global parameters of the world or universe, a universe line is curved out in a continuous and smooth coordinate system representing events as a collection of points. Each point has multidimensional surfaces, called World Plane, with analogue associations among the worlds. In our universe, scopes and boundaries among each world are composed of, but not limited to, the homeomorphic duality: virtual and physical worlds. A universe can be graphically visualized as, for example, the lines in two-dimensions of the virtual and physical coordinates.

In order to present universal principles and formulations precisely, it is necessary to define terminology of universal laws and institute a fundamental framework. We visualize nature of the topologies as a common picture describing the evolution, and consequent stagnation of their virtual and physical realization and characteristic behaviors. Our universe is constituted of virtual-physical topology and dynamic duality, which are two of the most critical intrinsic principles in our universe, representing the philosophy of physics at the heart of all life environments. Topological dualities orchestrate and harmonize our life along numerous horizons, such as particles-antiparticle, spirit-substance, male-female, and any other forms of existence in our physical and metaphysical worlds. A hierarchical theory is a philosophically and strategically unified formalism aligning with the nature structures such that the mathematics turns out to have closely concise analogues in topology, logic and computation.

# 1. Terminology

The universe has nature objects and structural morphisms, representing events and operational processes among situations. In physics, the nature objects are often virtual and physical matters, and the morphisms are dualities of the dialectical processes orchestrating a set or subsets of events, operations, and states in one regime rising, transforming, transporting, and alternating into states of the others: universal topology of the nature structure. Some of the fundamental terminology can be outlined as the preliminary laws of universal topology as, but not limited to, the following:

1. *Universe - The whole of everything in existence that operates under a topological system of natural laws for, but not limited to, physical and virtual events, states, matters, and actions. It constitutes and orchestrates various domains, called World, each of which is composed of hierarchical manifests for the events, operations, and transformations among the neighborhood zones or its subsets of areas, called horizon. An event or operation is naturally initiated by and interoperated among each of horizons, worlds, and universe. Together, they form the comprehensive situations of the horizon, life steams of the world, and environments of the universe. As one of the universe domains, for example, our world is consisted by the laws of yinyang principles which represent the complementary opponents operating as the resource of the motion dynamics for all natural states and events.*
2. *World - An environment composed of events or constituted by hierarchical structures of both massless and massive objects, events, states, matters, and situations. These hierarchical structures of the global manifold are respectively defined as Virtual World, a zone where operates virtual event, or Physical World, a zone where performs physical actions. Together, the virtual and physical worlds form one integrated World as a domain of the universe and interoperates as the complementary opponents of all natural states and events. Traditionally, for example, the virtual world is referred to as the inner world, the physical world as the outer world, and together they form holistic lives in universe. A world has a permanent form of global topology, localizes a region of universe, and interacts with other worlds rising from one or the others with common ground in universal conservations. Furthermore, there are multiple levels of inner worlds and outer worlds. Inner worlds are instances of situations, with or without energy or mass formations, while*

*outer worlds include physical mass of living beings and inanimate objects. Both are real, as well as topologically interactive with and external to each other.*

3. *Duality - The complementary opponents of inseparable, reciprocal pairs of all natural states, energy, and events, constituted by the topological hierarchy of our world. Among them, the most fundamental duality is our domain resources of the universe, known as yin (阴 in Chinese) "-" or $Y^-$ and yang (阳 in Chinese) "+" or $Y^+$, with neutral balance "o" that appears as if there were nothing or dark energy. Yinyang ($Y^-Y^+$) presents the two-sidedness of any event, operations, or spaces, each dissolving into the other in an alternating stream that generates the life of situations, conceals the inanimacy of resources, operates the movement of actions through continuous helix-circulations, symmetrically and asymmetrically. Because of this yinyang nature, our world always manifests a mirrored pair in the imaginary part, a* ***conjugate*** *pair of a complex manifold, defined as Yinyang ($Y^-Y^+$) Manifolds.*
4. *Manifold - A common environment of the world determined by projections from objects of virtual or physical spaces. Manifold manifests as various states of both virtual and physical spaces called global domains of the universe manifolds, which emerge as object events, operate in zone transformations, and transit between state energies and matter enclaves. The universe topology consists of two manifolds: yin manifold with the events of physical supremacy and yang manifold with the events of virtual supremacy. In the yin manifold of physical primary, called Spacetime or $Y^-$ Manifold, they continuously and progressively rise through various stages of yang manifold, called Timespace or $Y^+$ Manifold. Together, each advances from the others under a topological hierarchy of the manifolds to develop a consistent system of stages, which is divided into various scopes, called Horizon. For example, they form the ground foundation for the physical reality known as dark energy and elementary particles with virtual signatures of spin, charge and mass.*
5. *Horizon - The apparent boundary of a realm of perception or the like, where unique structures are evolved, topological functions are performed, various neighborhoods form complementary interactions, and zones of the world are composed through multi-functional transformations. Each horizon rises and contains specific fields as a construction of the symmetric and asymmetric*

*dynamics within or beyond its own range. In other words, fields vary from one horizon to the others, each of which is part of and aligned with the universal topology of the world. In physics, for example, the microscopic and macroscopic zones are in the separate horizons, each of which emerges its own fields and aggregates or dissolves between each others.*

6. *Photon and Graviton - A pair of reciprocal objects emanated in virtual word, conserved by yinyang phases, and confined by a timespace manifold of virtual world. In spacetime manifold of physical world, the speed of light or gravitation is only variable with time as a function of virtual position, not space, for all observers, regardless of the physical motion of the light or gravitation sources. The constant, c or $c_g$, denoting the speed of transportation, forms a dimension reflected from virtual world, with the property of being confined by yinyang phases in timespace and of appearing as a universal invariant constant in and only in physical space.*

In general, physics studies duality of yinyang resource, potential fields, entangle fluxion, commutation infrastructure, event operations, symmetric continuity, conservation laws, asymmetric dynamics, state-energy movements, and manifold transformations within a scope of mass-massless dynamics under the fundamental topology of physical-virtual environment.

Considering the physical formation from particle to cell to organism to life, it is natural to add to the terminology developed to describe the organization of universe up to the level of the particle. Thus, we present three principles of topological frameworks: Operation, Transformation and Revelation.

# 2. Operational Framework

*Operation* is a process, method, or series of acts driven by a set of functions of the virtual or physical events, called yang or yin operations, respectively. Both yield the following laws:

1. *The events through both yin and yang dynamic functions are operable in a neighborhood or subsets of every point in the world of its universe manifold, and homeomorphic among objects, events, states, matters, and situations under the yinyang manifolds of the universe.*
2. *Observed within its own zone, its internal events operate their state functions parallel to the universe manifold as a special relativistic and symmetric system. When projected into its opponent zone, the "local" events become external and transformable to the global domain as a general relativistic and asymmetric system.*
3. *A measure of the specific operations of ways is called entropy in which states of a universe system could be arranged and balanced towards its equilibrium. As an operational duality, the entropy tends towards both extrema alternately to maintain a continuity of energy conservations, operated by each of the opponents. Wen a total entropy decreases that the intrinsic order, or Yin development, of virtual into physical regime is more dominant than the reverse process. Conversely, when a total entropy increases, the extrinsic disorder, or Yang annihilations, becomes dominant and conceals physical resources into virtual regime.*
4. *During the physical observations, "internal" or "physical" operations result in its local effects parallel to the global domain with the events of physical supremacy, functions of the special transportation, and states of symmetric property. Similarly, "external" or "virtual" operations result in the projection or transform from its local effects to the neighbor domain with the events of virtual supremacy, functions of general commutations, and states of asymmetric property. Vice versa, for physical ↔ virtual.*

For the conceptual simplicity, this manuscripts limits further only to the physical observations. Therefore, we simply refer the states, events, and operations of "physical" functions to the yin supremacy, implying the *Spacetime* manifold parallel to its global domain with the spatial relativistic dynamics, symmetry characteristics, and of "virtual" functions to the yang supremacy, implying the *Timespace* manifold transformational to its reciprocal domain for physical observations with the general commutative dynamics and asymmetry characteristics, respectively. A world plane of the universe manifold is a global duality of virtual and physical worlds or yin and yang manifolds.

# 3. Horizon Processes

Horizons are evolved with a type of the bi-directional process of evolution and stagnation in physical world, which emanates from or conceals in resources of the virtual worlds.

For example, an elementary particle is composed of objects that exist in various forms beyond physical world. Those objects exist in environments of virtual worlds, which may not be directly detectable by measurements in our physical world because of the limitation of uncertainty. However, it is indirectly sensible and appears throughout all physical existence. On occasion, it may even be explicitly formulated, such as the philosophy of yinyang, which was discovered seven thousand years ago.

Originated by supernatural and composited by the virtual elements with yinyang appearance, are traveling across multi-zones of the world that can conduct and perform activities as a part of their behaviors at the outer world. This is a bi-directional transforming seamlessly and alternately between the virtual and physical worlds. In a sense of physics, the transformation between virtual and physical spaces involves the environments of

1. *Yinyang nature as a part of fully-virtual world, named Xingscope or Timespace with virtual yang manifold;*
2. *Energy enclave as a part of virtual and physical worlds, named Statescope or Timestate manifold;*
3. *Mass embody as a part of fully-physical world, named Spacescope, or Spacetime with physical yin manifold.*

When virtual objects form the existence as a matter, cosmology of a universe is in coherent harmonization of supernatural evolutions emerging yinyang dualities of virtual reality. Yinyang duality is the resources of an indivisible whole and exhibited in all physical matters. For physicists, examples of these fundamental instances are a duality of symmetry-antisymmetry, state-energy, time-space, mass-massless, wave-particle, and much more. For metaphysicists, obvious examples are a duality of male-female, body-mind, thought-action, consciousness-brain, and more beyond. They are complementary interdependent, and can manifest balance or supremacy in one against the other to perform particular actions or movements of objects or events based on criterions of the situation.

# 4. Hierarchical Revelation

Revelation is a type of evolution and stagnation processes within a world, ascending from or descending into each of the layers, relatively and respectively.

In physical world, there exists numerous levels of reality in a variety of variations so that one level forms the others that are aligned with its topological hierarchy. Each level of physical reality constitutes a horizon, which contains or yields the following actions:

1. Forms a domain of its principles commonly shared by their own behaviors and activities;
2. Evolves into its higher level of horizons to advance revelations as a natural growth process;
3. Diminishes to its lower level of horizons to recycle resources as an inanimate concealment.

Therefore, within each of horizons, there exists a unique interactions of operations, formations, fields, forces, functions, information, and messengers, relatively, symmetrically, and asymmetrically.

# 5. Invariant Principle

Invariance between the manifolds is mathematically presented as relativity in the field relationships of general scalars, vectors, and tensors. It is important to understand that, although experiences of nature can be altered by the observer's situation, all natural laws governing behaviors in physical or virtual world present universal laws in the same way, or without regard to the observer's reference frame. Laws of physics are invariant in virtumanity. It is even more essential to understand that, because physical motions of observers' reference frames are universe events, their relativity is indivisible from virtual world. Together, they form universe manifolds. In other words, no relative movement can happen without a cause from actions or universe events. A process limited to a "closed" manifold that maintains relativity without dynamic effects of its opponent manifold can lead to violations of principles of philosophy: topology of the universe.

Our discussion initiates at the timespace manifold where creates dark matters at the timestate and transforms into occurs at the local inertial frames determined by the distribution and motion of mass in the universe. Virtual time incepts at energy enclaves in timestate of the universe manifold, while real space starts with mass embodied in spacetime manifold.

This is coincident with Mach's principle [3] that the 'fixed stars' are at rest on heaven as observed from an inertial reference frame, commonly called the "instantaneous rest frame" (IRF). This principle is adopted throughout our entire article, which removes the unnecessary complexity due to relativity effects in transformations.

The event operations among spacetime or timespace manifolds can always be converted to or simplified by the following invariant principle:

A. *For manifolds of either spacetime or timespace, the tetrad coordinates of each* $\overrightarrow{\mathbf{q}}(x_\mu)$ *or* $\overleftarrow{\mathbf{q}}(x^\nu)$ *are similar to Cartesian coordinates, introduced by* ***René Descartes*** *in 1637, for a point vector in a 4-dimensional Euclidean space, introduced by* ***Euclid of Alexandria*** *300 BCE [4].*
B. *Within a homogeneous manifold, it represents Lorentz Transformations with the principle of physical symmetry, introduced by* ***Hendrik Lorentz*** *in 1899 [5].*
C. *Between either world planes and spacetime manifolds, it represents YinYang entanglements of potential fields as the virtually inseparable*

*and physically reciprocal pairs of all natural functions symmetrically and asymmetrically, introduced here since 2016.*

Since laws of physics are the same for all observers, the relative behavior measured by an observer is presented as the duality of the manifolds in the remainder of this manuscript. It follows the common situation as the simplicity that an observer is set at the spacetime manifold under the universe environment of our physical world.

Based on the cosmological principle of virtual matter, virtual time associated with energy first occurs globally, then in physical space, and finally in the inception of mass. Laws of physics are conserved and irrelevant to observational transformations, invariant in all reference systems with either inertial or accelerating frames of observation. Transformation between reference frames do not change the laws of physics, although it does alter its description relative to an observer. If the observer is not within the set of observed objects, relativity must be considered as an external effect in addition to an "isolated" system. This means that the "closed" objects are "open" to relativity for observers. In particular, the reference frame must consider itself as the dynamic cause of its own relative movement.

# 6. 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" 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.

Because each manifold has unique representations, worlds do not exactly coincide and require transportations to pass from one to the other through commonly shared natural foundations. Therefore, our universe manifests as an associative framework of objects, crossing neighboring worlds of manifolds, illustrated as the three dimensions as the mutually orthogonal units: a coordinate manifold of physical world $P(\mathbf{r},\lambda)$, a coordinate manifold of virtual world $V(\mathbf{k},\lambda)$, and a coordinate manifold of global function $G(\lambda)$, of *Word Events* $\lambda$, shown in Figure 1a.

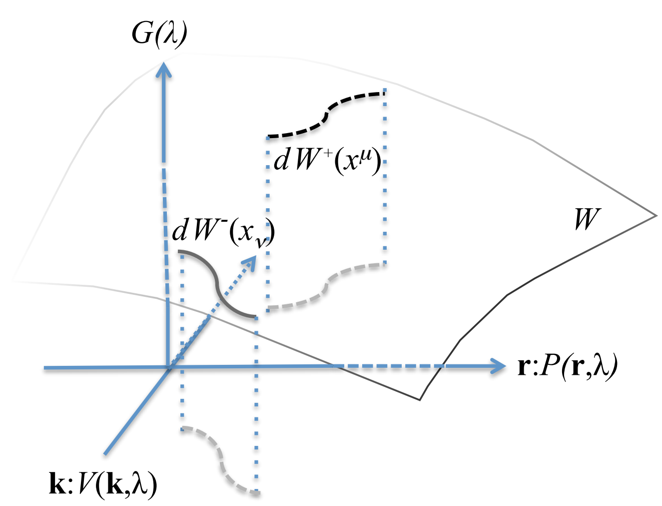



*Figure 1a: Worlds of Universal Topology*

where $P(\mathbf{r},\lambda)$ is parameterized by the coordinates of spatial vector $\mathbf{r}(\lambda)=\mathbf{r}(x_1,x_2,x_3)$, and $V(\mathbf{k},\lambda)$ is parameterized by the coordinates of *timestate* vector $\mathbf{k}(\lambda)=\mathbf{k}(x^0,x^{-1},x^{-2},\cdots)$. The global functions in $G(\lambda)$ axis is a collection of common objects and states of events λ, with unique functions applicable to both virtual and physical spaces of the world *W*. In other words, a universe manifold is visualized as a transitional region among the associated manifolds of the worlds, which globally forms the topological hierarchy of a universe. A curve in this three-dimensional manifold $\{\mathbf{r}, \mathbf{k}, G(\lambda)\}$ is called a *Universe Line*, corresponding to intersection of world planes from the two-dimensions of virtual and physical regimes of YinYang ($Y^-Y^+$) manifolds.

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 $W^\mp = P \pm iV$ 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 $\mathbf{r}(\lambda)$ or virtual dimensions $\mathbf{k}(\lambda)$. For example, in the scope of space and time duality at event $\lambda = t$, the compound dimensions become the tetrad-coordinates, known as the following spacetime manifolds:

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

$$x^\mu \in \hat{x}\{x^0, x^1, x^2, x^3\} \subset Y^+\{\mathbf{r}-i\mathbf{k}\} \quad : x^0 = -x_0,\ \hat{x} \in Y^+ \tag{1.2}$$

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.

In complex analysis, events of world planes $W^\pm$ are holomorphic functions, representing a duality of complex-conjugate functions of one or more complex variables $\check{x}$ and $\hat{x}$ in neighborhood spaces of every point in its universe regime of an open set $\mho$.

$$G(W^+, W^-, \lambda) = G(\hat{x}, \check{x}, \lambda) \quad : W^\pm \in Y^\pm \subset \mho \tag{1.3}$$

$$W^+(\hat{x}, \lambda) = P(\hat{x}, \lambda) - iV(\hat{x}, \lambda), \quad W^-(\check{x}, \lambda) = P(\check{x}, \lambda) + iV(\check{x}, \lambda) \tag{1.4}$$

These formulae are called the $Y^-Y^+$ *Topology of Universe*. Composed into a $Y^-$ component, the world $W^-$ is in the manifold of yin supremacy which dominants the processes of reproductions or animations. Likewise, composed into a $Y^+$ component, the world $W^+$ is in the manifold of yang supremacy which dominants the processes of creations or annihilations.

Together, the two world planes $\{\mathbf{r} \pm i\mathbf{k}\}$ compose the *two-dimensional* dynamics of *Boost*, a residual generators, and *Spiral*, a rotational contortions for stresses, which function as a reciprocal or conjugate duality transforming and transporting 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.

# 7. World Line and Spacetime

For the conceptual simplicity, this manuscript refers the states, events, and operations of "physical" functions to the yin supremacy, and of "virtual" functions to the yang supremacy. For a $Y^-$ manifold, it implies that *space and time is* parallel to its global domain with the spatial relativistic dynamics, symmetry characteristics, For a $Y^+$ Manifold, it implies that *time and space* transformational to its reciprocal domain for physical observations. Between them, they are operated by the general commutative dynamics with asymmetry characteristics, respectively.

Therefore, a world plane of universe is a global duality of virtual and physical worlds or yin $\mathbf{r} + i\mathbf{k}$ and yang $\mathbf{r} - i\mathbf{k}$ manifolds. The world line interval between the two imaginary events are entangling as a pair of conjugation:

$$\Delta s^2 = \pm \left(\Delta \mathbf{r} - i\Delta \mathbf{k}\right)\left(\Delta \mathbf{r} + i\Delta \mathbf{k}\right) \tag{1.5}$$

Philosophically, the interval is at a life of the virtual entanglement, which is associated the physical property with virtual duality.

For example, at a classical spacetime manifold, it designates a constant speed c such that $\mathbf{k}$ is simply $ict$, and collapsed without imaginary:

$$\Delta s^2 = \Delta \mathbf{r}^2 + \Delta \mathbf{k}^2 = (\Delta r)^2 - (c\Delta t)^2 \qquad : \mathbf{k} = ict \tag{1.6}$$

When changes in a world line $\Delta s$ have negative norm, $\Delta s^2 < 0$, its event reflects yang supremacy or virtual-like. Likewise, when positive $\Delta s^2 > 0$, the event is yin supremacy or physical-like. When the norm is zero, the event is yin yang balanced variable for transitions between the virtual and physical spaces. For instance, lights with constant speed is the set of null trajectories $\Delta s^2 = 0$ leading into and out of an event, and becomes transparent in the context of a spacetime diagram among virtual and physical spaces. Only can the events with nonzero $\Delta s^2 > 0$ be physical supremacy or otherwise known as the dark energy or driven by virtual supremacy. Besides, hardly is there a pure physical event or stats without its twin of virtual duality.

Historically, in 1905–06 *Henri Poincaré* showed [6] that by taking time to be an imaginary fourth spacetime coordinate *ict*, a *Lorentz* transformation can formally be regarded as a rotation of coordinates in a four-dimensional space with three real coordinates representing space, and one imaginary coordinate representing time, as the fourth dimension.

$$\Delta s^2 = (\Delta r)^2 - (c\Delta t)^2 \tag{1.7}$$

or

$$\Delta s^2 = (c\Delta t)^2 - (\Delta r)^2 \tag{1.8}$$

Equipped with a nondegenerate, the *Minkowski* inner product with metric signature is selected either (– + + +) as the space-like vectors or (+ – – –) as the time-like vectors [7-8]. Unfortunately, most of the mathematicians and general relativists sticks to one choice regardless of the other or not both, such that, apparently, any object with the two "relative states" is "collapsed" at its state with the same collapsed outcome. Therefore, a duality of the two manifolds has been hidden in contemporary physics.

# Potential Fields

## CHAPTER II

Governed by a global event $\lambda$ under the universal topology, an operational environment is initiated by the virtual scalar fields $\phi(\lambda)$ of a quantum tensor, a differentiable function of a complex variable in its *Superphase* nature, where the scalar function is also accompanied with and characterized by a single magnitude $\phi(x)$ in *Superposition* nature with variable components of the respective coordinate sets $\hat{x}$ or $\check{x}$ of their own manifold. Corresponding to its maximal set of commutative and enclave states, a wave function defines the states of a quantum system virtually and represses the degrees of freedom physically. Uniquely on both of the two-dimensional world planes, a wave potential functions as a type of virtual generators, potential modulators, or dark energies that lies at the heart of all events, instances, or objects. A wave 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.

# 1. Potential Fields

Governed by a global event $\lambda$ 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 *Superphase* nature at its zero derivative, where a scalar function $\phi(\hat{x}) \in Y^+$ or $\phi(\check{x}) \in Y^-$ is characterized by a single magnitude in *Superposition* nature with variable components of the respective coordinate sets $\hat{x}$ or $\check{x}$ of their own manifold. Because a field is incepted or operated under either virtual or physical supremacy of a contravariant $Y^+$ or covariant $Y^-$ manifold respectively and simultaneously, each point of the scalar fields is entangled with and appears as a conjugate function of the scalar field $\varphi^-$ or $\varphi^+$ in its opponent manifold.

Corresponding to its maximal set of commutative and enclave states, a wave function defines the states of a quantum system virtually and represses the degrees of freedom physically. Uniquely on both of the two-dimensional world planes, a wave potential functions as a type of virtual generators, potential modulators, or dark energies that lies at the heart of all events, instances, or objects.

Therefore, the effects are stationary or inertial projected to and communicated from their reciprocal opponent, shown as a pair of the conjugate pairs:

$$\phi^+(\hat{x}, \lambda),\ \varphi^-(\check{x}, \lambda) \qquad\qquad \phi^-(\check{x}, \lambda),\ \varphi^+(\hat{x}, \lambda) \tag{2.1}$$

A wave 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.

Classically, a conjugate field $\varphi^- = (\phi^+)^*$ of the contravariant scalar is mapped to a covariant field in the $Y\{x_\mu\}$ manifold, and Vice versa that a conjugate field of the covariant scalar $\varphi^+ = (\phi^-)^*$ is mapped to a contravariant field in the $Y\{x^\nu\}$ 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 equations when $\hat{x}^* = \check{x}$ is satisfied.

# 2. Events of Fields

In the universal topology, a field $\psi(x,\lambda)$ is incepted or operated under either virtual $\psi^+(\lambda)$ and physical $\psi^-(x)$ primacies of an $Y^+$ or $Y^-$ manifold respectively and simultaneously

$$\rho(x,\lambda) = \psi^-\big(x(\lambda)\big)\psi^+\big(\lambda(x)\big) \qquad : x \in \{x^\mu, x_m\} \qquad (2.2)$$

where $x(\lambda)$ represents the spatial supremacy with the implicit event $\lambda$ as an indirect dependence; and likewise, $\lambda(x)$ represents the virtual supremacy with the redundant degrees of freedom in the implicit coordinates $x$ as an indirect dependence. Besides, each point of the fields $\phi^\pm(x,\lambda)$ is entangled with and appears as a conjugate function of the scalar field $\varphi^\mp$ in its opponent manifold. Therefore, the effects are stationary projected to and communicated from their reciprocal opponent, shown as the following conjugate pairs:

$$\psi^+ = \phi^+(\hat{x},\lambda) - i\varphi^-(\check{x},\lambda) \qquad \psi^- = \phi^-(\check{x},\lambda) + i\varphi^+(\hat{x},\lambda) \qquad (2.3)$$

where $\phi^\pm$ implies the local supremacy of the $Y^\pm$ manifold, respectively. A conjugate field of the $Y^+$ scalar is mapped to a field $\varphi^-(x^\mu \mapsto x_m)$ in the $Y^-$ manifold, and vice versa that a conjugate field of the $Y^-$ scalar is mapped to a field $\varphi^+(x_m \mapsto x^\mu)$ in the $Y^+$ manifold. Apparently, two pairs of the potential fields give rise to the *Double Streams* $\{\psi^-, \psi^+\}$ of life entanglements.

In order to regulate the redundant degrees of freedom in particle interruptions, the double streaming entanglements of a wave function consists of the complex-valued probability of relative amplitude $\psi(x)$ and spiral phase $\vartheta(\lambda)$, its formalism of which has the degrees of event $\lambda$ actions shown by the following:

$$\psi^+ = \psi^+(\hat{x})\ exp[i\hat{\vartheta}(\lambda)] \qquad : x^\mu = x^\mu(\lambda),\ \lambda = \lambda(x^\mu) \qquad (2.4)$$

$$\psi^- = \psi^-(\check{x})\ exp[i\check{\vartheta}(\lambda)] \qquad : x_\nu = x_\nu(\lambda),\ \ \lambda = \lambda(x_\nu) \qquad (2.5)$$

The amplitude function $\psi(x) : x = x(\lambda)$ represents the spatial position of the wave function complying with *superposition* or implicit to its $\lambda$ event. The spiral function $\vartheta(\lambda) : \lambda = \lambda(x)$ features superphase of the $\lambda$ event at the quantum states implicit to the physical dimensions.

# 3. Density

A conjugate pair of the wave functions (2.4-2.5) or (2.3) constitutes the density distributions for each of the manifolds at the steady state balancing:

$$\rho = \rho^- + i\rho^+ = \psi^-(\check{x})\ \psi^+(\hat{x})\ exp\left\{ i\left[\check{\vartheta}(\lambda) + \hat{\vartheta}(\lambda)\right]\right\} \tag{2.6}$$

For a given system, the set of all possible normalizable wave functions forms an abstract mathematical scalar or vector space such that it is possible to add together different wave functions, multiply the wave functions, and extend further into the complex functions under a duality of entanglements. With normalization condition, wave functions form a projective magnitudes of space and phase states because a location cannot be determined from the wave function, but is described by a probability distribution. These two formulae of the fields and densities represent that the four-potentials are entangling in *Double Streaming* between the $Y^-Y^+$ manifolds, simultaneously, reciprocally, and systematically.

In physics of the twentieth century, the superposed wave functions are hardly correlated to a duality of the two-dimensional world planes. Instead, the four-dimensional manifold is limited to the physical existence within one world plane such that the reality is isolated or decoherence to the superposition: homogeneity and additivity. For example, a pair of the conjugate fields $\varphi \neq \phi^*$ becomes purely imaginary $\varphi = \phi^*$, upon which the superphase is collapsed at the physical states such as the density $\rho = |\phi|^2$. Unfortunately, this density decoherence has lost its meaning to neither fluxions nor entanglements, which are critical to both symmetric and asymmetric dynamics. Therefore, the wave decoherence of the system no longer exhibits the superphase interference or wave–particle duality as in a double-slit experiment, performed by *Thomas Young* in 1801 [9]. Incredibly, this superphase interference not only demonstrates a duality of the complex fields but also is a parallel fashion to *Gauge Theory,* shown briefly in the section below.

# 4. Gauge Fields

Mathematically, a partial derivative of a function of several variables is its derivative with respect to one of those variables, while the others held as constant, shown by the examples.

$$\frac{\partial\left[\psi(x)e^{i\vartheta(\lambda)}\right]}{\partial\lambda}=\psi(x)\frac{\partial\vartheta(\lambda)}{\partial\lambda}e^{i\vartheta(\lambda)}=\frac{\partial x}{\partial\lambda}\frac{\partial\vartheta(\lambda)}{\partial x}\left[\psi(x)e^{i\vartheta(\lambda)}\right] \tag{2.7}$$

Therefore, an event $\lambda$ operates a full derivative $D^\lambda$ or $D_\lambda$ to include all indirect dependencies of magnitude and phase wave function with respect to an exogenous $\lambda$ argument:

$$D^\lambda\psi(x^\mu,\lambda)=\left[\frac{\partial x^\mu}{\partial\lambda}\frac{\partial}{\partial x^\mu}\psi(x^\mu)\right]e^{-i\hat{\vartheta}(\lambda)}+\psi(x^\mu)\frac{\partial}{\partial\lambda}e^{-i\hat{\vartheta}(\lambda)}=\dot{x}^\mu\left(\frac{\partial}{\partial x^\mu}-i\Theta^\mu\right)\psi(x^\mu,\lambda) \tag{2.8}$$

$$D_\lambda\psi(x_\nu,\lambda)=\left[\frac{\partial x_\nu}{\partial\lambda}\frac{\partial}{\partial x_\nu}\psi(x_\nu)\right]e^{i\check{\vartheta}(\lambda)}+\psi(x_\nu)\frac{\partial}{\partial\lambda}e^{i\check{\vartheta}(\lambda)}=\dot{x}_\nu\left(\frac{\partial}{\partial x_\nu}+i\Theta_\nu\right)\psi(x_\nu,\lambda) \tag{2.9}$$

$$\Theta^\mu=\frac{\partial\hat{\vartheta}(\lambda)}{\partial x^\mu},\quad \dot{x}^\mu=\frac{\partial x^\mu}{\partial\lambda},\qquad \Theta_\nu=\frac{\partial\check{\vartheta}(\lambda)}{\partial x_\nu},\qquad \dot{x}_\nu=\frac{\partial x_\nu}{\partial\lambda} \tag{2.10}$$

where the $\hat{\vartheta}$ or $\check{\vartheta}$ is the $Y^+$ or $Y^-$ superphase, respectively. Furthermore, when $\Theta=eA_\nu/\hbar$ and $D_\nu\mapsto\partial_\nu+ieA_\nu/\hbar$, this is known as *Gauge derivative* for an object with the electric charge *e* and the gauge field $A_\nu$.

The *Gauge Field*, $A_\nu$ or $A^\nu$ in terms of the field strength tensor, is exactly the electrodynamic field, or an antisymmetric rank-2 tensor:

$$F^{+n}_{\nu\mu}=(\partial^\nu A^\mu-\partial^\mu A^\nu)_n \qquad : F^{+n}_{\mu\nu}=-F^{+n}_{\nu\mu} \tag{2.11}$$

$$D^\nu\mapsto\partial^\nu-ieA^\nu/\hbar \qquad : \Theta^\nu=\frac{e}{\hbar}A^\nu \tag{2.12}$$

$$F^{-n}_{\nu\mu}=(\partial_\nu A_\mu-\partial_\mu A_\nu)_n \qquad : F^{-n}_{\mu\nu}=-F^{-n}_{\nu\mu} \tag{2.13}$$

$$D_\nu\mapsto\partial_\nu+ieA_\nu/\hbar \qquad : \Theta_\nu=\frac{e}{\hbar}A_\nu \tag{2.14}$$

where *n* represent either a particle or a quantum state. A *Gauge Theory* was the first time widely recognized by *Pauli* in 1941 [10] and followed by the second generally popularized by *Yang-Mills* in 1954 [11] for the strong interaction holding together nucleons in atomic nuclei. Classically, the *Gauge Theory* was derived mathematically for a *Lagrangian* to be conserved or invariant under certain *Lie* groups of *local* transformations. Apparently, the superphase fields $\Theta^\nu$ and $\Theta_\nu$ are the event modulators operated naturally at the heart of all potential fields.

# 5. Eigenvalues

In the first horizon or a quantum system, a result of the measurement lies in an observable set of the reciprocal states at a duality of relative amplitudes $\{\phi^{\pm}(\hat{x}\,|\,\check{x}), \varphi^{\mp}(\check{x}\,|\,\hat{x})\}$, cohesive phases $\{\hat{\vartheta}(\lambda), \check{\vartheta}(\lambda)\}$ and their density distributions $\{\rho^{+}, \rho^{-}\}$. Introduced by *Max Born* in 1926 [12], an observation yields a result given by the eigenvalues or identified by eigenvectors. Besides, within each of the respective manifold or between the cohesive $Y^{-}Y^{+}$ manifolds, the field entanglements are characterized by either local or relativity of the linear continuity density and commutation, cohesively. At observations, the foundation of a quantum system consists of the entangling fields of the eigenvectors, continuities and commutations.

As a summary, the workings of *Universal Topology* reveals that a duality of the potential fields are operated by both of the explicit *Magnitude* $\{\psi(x^{\nu}), \psi(x_{\nu})\}$ dimensions and the implicit *Superphase* $\{\hat{\vartheta}(\lambda), \check{\vartheta}(\lambda)\}$ modulations. It naturally consists of two pairs of the wave functions and transforms into a variety of energy forms of quantum fields that lies at the heart of all life events, instances or objects, essential to the operations and processes of creations, annihilations, reproductions and interactions.

# Mathematical Framework

CHAPTER III

A mathematical framework describes the architecture of the topological system that our universe is constituted of and regulated for the events of, but not limited to, natural hierarchy of situations, operations, transformations, and commutations entangling between the $Y^{-}Y^{+}$ communities. As a part of the topology, the mathematical regulation and terminology not only includes symbol notation, operators, and indices of scalar, vectors and tensors, but also classifies the mathematical tools and their interpretations under the universal topology and a duality of complex manifold.

Both virtual and spatial dimensions are the functional spectra of the events $\lambda$, operated by and associated with their virtual and physical frameworks.

# 1. Dual-variant Manifolds

Both time and space are the functional spectra of the events $\lambda$, operated by and associated with their virtual and physical structure, and generated by supernatural $Y^{-}Y^{+}$ events associated with their virtual and physical framework. The event states on spatial-time planes are open sets and can either rise as subspaces transformed from the other worlds or confined as locally independent existence within their own domain. As in the settings of spatial and time geometry for physical or virtual world, a global parameter $G(\lambda)$ of event λ on a world plane is complex differentiable not only at $W^{\pm}(\lambda)$, but also everywhere within neighborhood of *W* in the complex plane or there exists a complex derivative in a neighborhood. By a major theorem in complex analysis, this implies that any holomorphic function is infinitely differentiable as an expansion of a function into an infinite sum of terms.

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, we define essentially 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 $\{x^{\mu}, u^{\nu}, M^{\nu\sigma}\}$, as contravariant forms, are the numbers for the $Y\{\hat{x}\}$ 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 $\hat{x}$ basis.*
2. *Covariance ($\check{\partial}_{\lambda}$) - Other set of the symbols with the lower indices $(x_{m}, u_{n}, M_{ab})$, as covariance forms, are the numbers for the $Y\{\check{x}\}$ 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 $\check{x}$ basis.*

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 an event $\lambda$ 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 an event $\lambda$ under the covariant $Y^-$ manifold are projected into, transformed to, or reacted 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, its operational interactions and their commutative infrastructures. In the $Y^\mp$ manifolds, a potential field can be characterized by a scalar function of $\psi \in \{\phi^+, \phi^-, \varphi^+, \varphi^-\}$ as *Ground Fields*, to serve as a state environment of entanglements. Among the fields, their localized entanglements form up, but are not limited to, the density fields, as *First Horizon Fields*. The derivatives to the density fields are event operations of their motion dynamics, which generates an interruptible tangent space, named as *Second Horizon Fields*.

# 2. Residual Operations

In order to operate the local actions, an event $\lambda$ exerts its effects of the virtual supremacy within its $Y^+$ manifold or physical supremacy within its $Y^-$ manifold. Because of the local relativity, the derivative $\partial^\lambda$ to the vector $x^\nu \mathbf{b}^\nu$, where $\mathbf{b}^\nu$ is the basis, has the changes of both magnitude quantity $\dot{x}^\mu(\partial x^\nu/\partial x^\mu)\mathbf{b}^\nu$ and basis direction $\dot{x}^\mu x^\nu \overset{+}{\Gamma}_{\mu\nu a}\mathbf{b}^\mu$, where $\dot{x}^\mu = \partial x^\mu/\partial\lambda$, transforming between the coordinates of $x^\nu$ and $x^\mu$, giving rise to the second horizon in its *Local* or *Residual* derivatives with the boost and spiral relativities.

$$\hat{\partial}^\lambda \psi = \dot{x}^\mu X^{\nu\mu}\left(\partial^\nu - i\Theta^\mu(\lambda)\right)\psi \qquad : S_2^+ \equiv \frac{\partial x^\nu}{\partial x^\mu},\ R_2^+ \equiv x^\mu \overset{+}{\Gamma}_{\nu\mu a} \tag{3.1a}$$

$$X^{\nu\mu} \equiv S_2^+ + R_2^+, \qquad \overset{+}{\Gamma}_{\nu\mu a} = \frac{1}{2}\left(\frac{\partial \hat{g}^{\nu\mu}}{\partial x^a} + \frac{\partial \hat{g}^{\nu a}}{\partial x^\mu} - \frac{\partial \hat{g}^{\mu a}}{\partial x^\nu}\right) \tag{3.1b}$$

Because the exogenous event $\lambda$ has indirect effects via the local arguments of the potential function, the non-local derivative to the local event $\lambda$ is at zero. Likewise, the $Y^-$ actions can be cloned straightforwardly, which gives rise from the $Y^-$ tangent rotations of both magnitude quantity $\dot{x}_n(\partial x_m/\partial x_n)\mathbf{b}_m$ and basis rotation $\dot{x}_n x_m \overset{-}{\Gamma}_{nm\alpha}\mathbf{b}_n$ into a vector $Y^-$ potentials of the second horizon:

$$\check{\partial}_\lambda \psi = \dot{x}_m X_{nm}\left(\partial_n + i\Theta_m(\lambda)\right)\psi \qquad : S_2^- \equiv \frac{\partial x_n}{\partial x_m},\ R_2^- \equiv x_m \overset{-}{\Gamma}_{nm\alpha} \tag{3.2a}$$

$$X_{nm} \equiv S_2^- + R_2^-, \qquad \overset{-}{\Gamma}_{nm\alpha} = \frac{1}{2}\left(\frac{\partial \check{g}_{nm}}{\partial x_\alpha} + \frac{\partial \check{g}_{n\alpha}}{\partial x_m} - \frac{\partial \check{g}_{m\alpha}}{\partial x_n}\right) \tag{3.2b}$$

where the $\Gamma^-_{nm\alpha}$ or $\Gamma^+_{\nu\mu a}$ is an $Y^-$ or $Y^+$ metric connection, similar but extend the meanings to the *Christoffel* symbols of the *First* kind, introduced in 1869 [13]. The first partial derivative $\partial^\lambda$ or $\partial_\lambda$ acts on the potential argument's value $x^\mu$ or $x_m$ with the exogenous event $\lambda$ as indirect effects.

# 3. Relativistic Operations

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 relativistic interactions, the derivative $\partial_\lambda$ to the vector $x^\nu \mathbf{b}^\nu$ has the changes of both magnitude quantity $\dot{x}_a(\partial x^\nu/\partial x_a)\mathbf{b}^\nu$ and basis direction $\dot{x}^a x_\mu \overset{+}{\Gamma}{}^\nu_{\mu a}\mathbf{b}^\nu$, transforming from one world plane $W^+\{\mathbf{r}-i\mathbf{k}\}$ to the other $W^-\{\mathbf{r}+i\mathbf{k}\}$. This action redefines the $Y^+$ event quantities of relativity and creates the *Relativistic Boost* $S_1^+$ *Transformation* and the *Spiral Torque* $R_1^+$ *Transportation* around a central point, which gives rise from the $Y^+$ tangent rotations into a vector $Y^-$ potentials for the second horizon.

$$\hat{\partial}_\lambda \psi = \dot{x}_a X^\nu{}_a\big(\partial^\nu - i\Theta^\nu(\lambda)\big)\psi \qquad : S_1^+ \equiv \frac{\partial x^\nu}{\partial x_a},\ R_1^+ \equiv x^\mu \overset{+}{\Gamma}{}^\nu_{\mu a} \tag{3.3a}$$

$$X^\nu{}_a \equiv S_1^+ + R_1^+, \qquad \overset{+}{\Gamma}{}^\nu_{\mu a} = \frac{1}{2}\hat{g}_{\nu\epsilon}\Big(\frac{\partial \hat{g}^{\epsilon\mu}}{\partial x^a} + \frac{\partial \hat{g}^{\epsilon a}}{\partial x^\mu} - \frac{\partial \hat{g}^{\mu a}}{\partial x^\epsilon}\Big) \tag{3.3b}$$

Similarly, one has the $Y^-$ derivative relativistic to its $Y^+$ opponent:

$$\check{\partial}^\lambda \psi = \dot{x}^\alpha X_m{}^\alpha\big(\partial_m + i\Theta_m(\lambda)\big)\psi \qquad : S_1^- \equiv \frac{\partial x_m}{\partial x^\alpha},\ R_1^- \equiv x_s \overset{-}{\Gamma}{}^m_{s\alpha} \tag{3.4a}$$

$$X_m{}^\alpha \equiv S_1^- + R_1^-, \qquad \overset{-}{\Gamma}{}^m_{s\alpha} = \frac{1}{2}\check{g}^{me}\Big(\frac{\partial \check{g}_{e\alpha}}{\partial x_s} + \frac{\partial \check{g}_{es}}{\partial x_\alpha} - \frac{\partial \check{g}_{\alpha s}}{\partial x_e}\Big) \tag{3.4b}$$

where the matrix $\check{g}_{\sigma\epsilon}$ or $\hat{g}^{se}$ is the $Y^-$ or $Y^+$ metric, and the matrix $\check{g}^{\sigma\epsilon}$ or $\hat{g}_{se}$ is the inverse metric, respectively. Besides, the $\overset{-}{\Gamma}{}^m_{s\alpha}$ or $\overset{+}{\Gamma}{}^\nu_{\mu a}$ is an $Y^-$ or $Y^+$ metric connection, similar but extend the meanings to the *Christoffel* symbols of the *Second* kind.

Associated with the horizon actions, the partial derivative $\partial^\lambda$ or $\partial_\lambda$ is embedded in the event operations $\Theta^\mu(\lambda)$ or $\Theta_m(\lambda)$, gives rise to the horizons, and acts on the potential argument's value $\lambda$ as direct effects. Shown by Section 4 of Chapter II, the events operate $\Theta^\mu = e\dot{x}^\mu A^\mu/\hbar$ and $\Theta_m = e\dot{x}_m A_m/\hbar$ which give rise to the second horizon potentials. The residual transformation $S_2^\pm$ and transportation $R_2^\pm$ are communications between two coordinate frames that move at velocity relative to each other under their local $Y^+$ or $Y^-$ manifold, respectively. Vice versa for the cross-boost $S_1^\mp$ transformation and torque-spiral $R_1^\mp$ transportation, relativistically. Normally, for event $\lambda = t$, the speeds of transform amplitude and transport angular are at constant rate, known as the momentum and speed conservations of photon or graviton propagations.

# 4. Vector Operations

Following the local tangent curvature of the potential vectors through the next tangent vector of the curvature, the $\lambda$ event gives rise to the *Third Horizon Fields*, shown by the expressions:

$$\hat{\partial}^{\lambda} V^{\mu} = \dot{x}^{\nu}\left(\partial^{\nu} V^{\mu} - \overset{+}{\Gamma}{}^{\sigma}_{\nu\mu} V^{\sigma}\right) \tag{3.5}$$

$$\check{\partial}_{\lambda} V_{m} = \dot{x}_{n}\left(\partial_{n} V_{m} - \overset{-}{\Gamma}{}^{s}_{nm} V_{s}\right) \tag{3.6}$$

where the reference of an observation is at the $Y^{-}$ manifold. The event operates the *local* actions in the tangent space relativistically, where the scalar fields are given rise to the vector fields and the vector fields are given rise to the matrix fields.

Through the tangent vector of the third curvature, the events $\hat{\partial}^{\lambda}\hat{\partial}^{\lambda}$ and $\check{\partial}_{\lambda}\check{\partial}_{\lambda}$ continuously entangle the residual vector fields, shown by the formulae:

$$\begin{aligned} \hat{\partial}^{\lambda}\hat{\partial}^{\lambda} V^{\mu} = & \left(\dot{x}^{\iota}\partial^{\iota}\right)\left(\dot{x}^{\nu}\partial^{\nu}\right) V^{\mu} - \dot{x}^{\iota}\overset{+}{\Gamma}{}^{s}_{\iota\nu}\left(\dot{x}^{\nu}\partial^{\nu}V^{\mu}\right) + \dot{x}^{n}\overset{+}{\Gamma}{}^{n}_{ms}\dot{x}^{\nu}\overset{+}{\Gamma}{}^{\sigma}_{\mu\nu}V^{\sigma} \\ & - \left(\ddot{x}^{\nu}\overset{+}{\Gamma}{}^{\sigma}_{\mu\nu} + \dot{x}^{\nu}\dot{x}^{\iota}\partial^{\iota}\overset{+}{\Gamma}{}^{\sigma}_{\mu\nu} + \dot{x}^{\nu}\overset{+}{\Gamma}{}^{\sigma}_{\mu\nu}\dot{x}^{\iota}\partial^{\iota}\right) V^{\sigma} \end{aligned} \tag{3.7}$$

$$\begin{aligned} \check{\partial}_{\lambda}\check{\partial}_{\lambda} V_{m} = & \left(\dot{x}_{e}\partial_{e}\right)\left(\dot{x}_{n}\partial_{n}\right) V_{m} - \dot{x}_{e}\overset{-}{\Gamma}{}^{s}_{en}\left(\dot{x}_{n}\partial_{n}V_{m}\right) + \dot{x}_{\nu}\overset{-}{\Gamma}{}^{\mu}_{\sigma\nu}\dot{x}_{n}\overset{-}{\Gamma}{}^{o}_{mn}V_{o} \\ & - \left(\ddot{x}_{n}\overset{-}{\Gamma}{}^{o}_{mn} + \dot{x}_{n}\dot{x}_{e}\partial_{e}\overset{-}{\Gamma}{}^{o}_{mn} + \dot{x}_{n}\overset{-}{\Gamma}{}^{o}_{mn}\dot{x}_{e}\partial_{e}\right) V_{o} \end{aligned} \tag{3.8}$$

Besides, the cross-entanglements, $\hat{\partial}_{\lambda}$ and $\check{\partial}^{\lambda}$, elaborate relativistic transformations between the manifolds and give rise to the next horizon fields, simply by the conversion $L^{\pm}_{\nu\mu}$ matrices:

$$\dot{x}_{\nu} \mapsto \dot{x}^{\mu} L^{-}_{\nu\mu} \qquad\qquad \dot{x}^{\nu} \mapsto \dot{x}_{\mu} L^{-}_{\nu\mu} \tag{3.9}$$

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

# 5. Classical Operators

In quantum physics, a mathematical operator is driven by the event $\lambda$, which, for example at $\lambda = t$, can further derive the classical momentum $\hat{p}$ and energy $\hat{E}$ operators at the second horizon:

$$\hat{\partial}^t : \dot{x}^\mu \partial^\mu = \left(-ic\partial^\kappa, \mathbf{u}^+ \partial^r\right) = \frac{i}{\hbar}\left(\hat{E}, \mathbf{u}^+ \hat{p}\right) \qquad : \partial^\kappa = \frac{\partial}{\partial x^0}, \mathbf{u}^+ = \frac{\partial x^r}{\partial t} \tag{3.11}$$

$$\check{\partial}_t : \dot{x}_m \partial_m = \left(+ic\partial_\kappa, \mathbf{u}^- \partial_r\right) = \frac{i}{\hbar}\left(\hat{E}, \mathbf{u}^- \hat{p}\right) \qquad : \partial_\kappa = \frac{\partial}{\partial x_0}, \mathbf{u}^- = \frac{\partial x_r}{\partial t} \tag{3.12}$$

$$\hat{E} = -i\hbar\frac{\partial}{\partial t}, \qquad \hat{p} = -i\hbar\nabla \qquad : \partial^r = \partial_r = \nabla \tag{3.13}$$

For $\mathbf{u}^\mp = \pm c$, one has the classical operators at the third horizon:

$$\check{\partial}^\lambda \check{\partial}_\lambda = \hat{\partial}^\lambda \hat{\partial}_\lambda = \hat{\partial}_\lambda \check{\partial}^\lambda = \hat{\partial}^\lambda \check{\partial}_\lambda = \frac{\partial^2}{\partial t^2} - c^2\nabla^2 \equiv c^2\square^+ \qquad : \lambda = t \tag{3.14}$$

$$\hat{\partial}_\lambda \hat{\partial}_\lambda = \check{\partial}^\lambda \check{\partial}^\lambda = \check{\partial}_\lambda \hat{\partial}_\lambda = \hat{\partial}^\lambda \check{\partial}^\lambda = \frac{\partial^2}{\partial t^2} + c^2\nabla^2 \equiv c^2\square^- \qquad : \lambda = t \tag{3.15}$$

where the operator $\square^\mp$ extends the *d'Alembert* operator into the $Y^- Y^+$ properties. These operators can normally be applied to the diagonal elements of a matrix, observable to the system explicitly or externally.

It is worthwhile to emphasize that *a*) the manifold operators of $\{\partial^\mu, \partial_m\}$, including traditional "operators" of $\{\partial/\partial t, \partial/\partial x, \nabla, \hat{E}, \hat{p}, \cdots\}$ 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.

# 6. Symmetric Commutations

For an entanglement streaming $\langle\lambda\rangle$ among the potential fields, ensemble of an $\lambda$ 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 $p_n^\pm = p(h_n^\pm)$, where $h_n^+$ or $h_n^-$ is their $Y^-Y^+$ distributive factors, respectively. There are four types of potential scaler fields of $\phi_n^\pm$ and $\varphi_n^\pm$. Their interoperation correlates and entangles the dual densities of environment $\rho_{\phi_n}^+ = \phi_n^+ \varphi_n^-$ and $\rho_{\phi_n}^- = \phi_n^- \varphi_n^+$ under the event operations as the natural derivatives to form the $Y^-Y^+$ commutations.

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: a scalar fluxion $\mathbf{f}^\pm{}_s$. 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 by a set of the reciprocal vector fields of

$$\{V_m^-, \Lambda_m^-\} = -\dot{\partial}\{\phi_m^-, \varphi_m^-\} \qquad \{V_\mu^+, \Lambda_\mu^+\} \equiv -\dot{\partial}\{\phi_\mu^+, \varphi_\mu^+\} \tag{3.16}$$

Respectively, the events operate and develop the next operational domain of fields such as the dark vector fluxions $\mathbf{f}^\pm{}_v$.

Considering the operational symbol $\langle\lambda\rangle^+$ for $Y^+$ and $\langle\lambda\rangle^-$ for $Y^-$ supremacy, the reciprocal entanglements of the $Y^-Y^+$ scalar potential fields, or known as *Commutator*, are defined as a pair of the vector fields as the following:

$$\langle\lambda\rangle_i^+ = \sum\nolimits_n p_n^+ \langle\hat{\lambda}, \check{\lambda}\rangle_i^+ \qquad \langle\lambda\rangle_i^- = \sum\nolimits_n p_n^- \langle\check{\lambda}, \hat{\lambda}\rangle_i^- \tag{3.17}$$

$$\langle\hat{\lambda}, \check{\lambda}\rangle_s^+ \equiv \varphi_n^- \hat{\lambda} \phi_n^+ - \phi_n^+ \check{\lambda} \varphi_n^-, \qquad \langle\hat{\lambda}, \check{\lambda}\rangle_v^+ \equiv \varphi_n^- \hat{\lambda} V_n^+ - \phi_n^+ \check{\lambda} \Lambda_n^- \tag{3.18}$$

$$\langle\check{\lambda}, \hat{\lambda}\rangle_s^- \equiv \varphi_n^+ \check{\lambda} \phi_n^- - \phi_n^- \hat{\lambda} \varphi_n^+, \qquad \langle\hat{\lambda}, \check{\lambda}\rangle_v^- \equiv \varphi_n^+ \hat{\lambda} V_n^- - \phi_n^- \check{\lambda} \Lambda_n^+ \tag{3.19}$$

where the symbol $\langle\ \rangle^\mp$ is named as $Y^-Y^+$ *Commutation Bracket*. The $i = s$ represents the scalar commutations while $i = v$ the vector commutations. In classic physics, the $Y^-Y^+$ brackets are indistinguishable by a single commutator [ ].

The event processes continue to build up the further operable domain with a variety of the higher rank-*i* tensor fields. Systematically, sequentially and simultaneously, a chain of these reactions constitutes various domains, each of which gives rise to the entanglements of potential fields.

# 7. Asymmetric Commutation

In many cases, the entanglement is performed at one primary side without its symmetric response from its partner. This extra distinct process of a symmetry system is known as *Asymmetric Commutation*, by which a part of the fluxion system in a symmetrical state performs an additional asymmetrical states, cohesively, consistently and simultaneously. These behaviors can be formulated by a pair of the vector fields as the following:

$$\langle\lambda\rangle_i^- = \sum_n p_n^- \langle\lambda\rangle_i^- \quad : \langle\lambda\rangle_s^- \equiv \varphi_n^+ \check{\lambda} \phi_n^-,\ \langle\lambda\rangle_v^- \equiv \varphi_n^+ \check{\lambda} V_n^- \quad : \check{\lambda} \equiv \dot{\lambda}_1 - \dot{\lambda}_2 \qquad (3.20)$$

$$\langle\lambda\rangle_i^+ = \sum_n p_n^+ \langle\lambda\rangle_i^+ \quad : \langle\lambda\rangle_s^+ \equiv \varphi_n^- \hat{\lambda} \phi_n^+,\ \langle\lambda\rangle_s^+ \equiv \varphi_n^- \hat{\lambda} \Lambda_n^+ \quad : \hat{\lambda} \equiv \dot{\lambda}_2 - \dot{\lambda}_1 \qquad (3.21)$$

where the symbol $\langle\ \rangle^{\mp}$ is named as $Y^-Y^+$ *Asymmetric Commutation Bracket*. The asymmetric communications identifies the differences between the reciprocal partners and inaugurate their supremacy actions. An asymmetry $\langle\ \rangle^{\pm}$ represents the $Y^+$ reactions of an $\dot{\lambda}_2$ event in corresponding to its $Y^-$ actions of its $\dot{\lambda}_1$ event. Asymmetry fluxion occurs when $\dot{\lambda}_2$ is incompatible to $\dot{\lambda}_1$ or $\dot{\lambda}_2 \neq \dot{\lambda}_1$. Apparently, asymmetric commutation bracket implies an embed commutation which might be inexplicable by the above mathematical formulations.

Normally, an asymmetric commutation occurs in a symmetric system as a whole with respect to some specific operations for a set of the additional outcomes: imposing actions from one manifold to the other, performing behaviors of an event in corresponding to its opponent event, and carrying crucial formal consequences, distinguishably.

# 8. Continuity of Densities

Because of the duality, it always emerges as or entangle with a pair of the symmetric fields that communicates and projects their interoperable values to its surrounding environment, alternatively arisen by or acting on its opponent through a duality of density interactions. As a duality, there is another pair of communication *bracket*:

$$[\lambda]^+ = \sum_n p_n^+[\hat{\lambda}, \check{\lambda}]_n^+ \qquad : [\hat{\lambda}, \check{\lambda}]_n^+ \equiv \varphi_n^- \hat{\lambda} \phi_n^+ + \phi_n^+ \check{\lambda} \varphi_n^- \qquad (3.22)$$

$$[\lambda]^- = \sum_n p_n^-[\check{\lambda}, \hat{\lambda}]_n^- \qquad : [\check{\lambda}, \hat{\lambda}]_n^- \equiv \varphi_n^+ \check{\lambda} \phi_n^- + \phi_n^- \hat{\lambda} \varphi_n^+ \qquad (3.23)$$

where the symbol [ ]$^\pm$ is named as $Y^-Y^+$ Continuity Bracket, which is the reciprocal density entanglements of the $Y^-Y^+$ scalar potential fields. In classic physics, they are indistinguishable by a single anti-commutator { }.

Generally, there are two *potential densities* as a duality of the $Y^-$ and $Y^+$ pairs. Considering the event $\lambda$ derivative to the particle densities of $\rho_n^-$=$\phi_n^-\varphi_n^+$ and $\rho_n^+$=$\phi_n^+\varphi_n^-$, they represents the $Y^-$ and $Y^+$ continuity fields in matrix forms:

$$[\dot{x}\partial]_{m\mu}^- \equiv [\check{\partial}_m, \hat{\partial}^\mu]^- = \sum_n p_n^-[\check{\partial}_m, \hat{\partial}^\mu]_n^- \quad : \dot{\partial}\rho_n^- = \varphi_n^+ \dot{x}_m \partial_m \phi_n^- + \phi_n^- \dot{x}^\mu \partial^\mu \varphi_n^+ = [\check{\partial}_m, \hat{\partial}^\mu]_n^- \quad (3.24)$$

$$[\dot{x}\partial]_{\mu m}^+ \equiv [\hat{\partial}^\mu, \check{\partial}_m]^+ = \sum_n p_n^+[\hat{\partial}^\mu, \check{\partial}_m]_n^+ \quad : \dot{\partial}\rho_n^+ = \varphi_n^- \dot{x}^\mu \partial^\mu \phi_n^+ + \phi_n^+ \dot{x}_m \partial_m \varphi_n^- = [\hat{\partial}^\mu, \check{\partial}_m]_n^+ \quad (3.25)$$

The continuous reaction of an event $\lambda$, for example as a derivative to the density derivative such as $(\dot{\partial}\dot{\partial})\rho_n^+$, expresses the tangent curve of the $Y^+$ continuity as the following

$$\left[(\dot{x}\partial)(\dot{x}\partial)\right]_{m\mu}^+ = [\hat{\partial}^m\hat{\partial}^\mu, \check{\partial}_\mu\check{\partial}_m]^+ = \sum_n p_n^+[\hat{\partial}^m\hat{\partial}^\mu, \check{\partial}_\mu\check{\partial}_m]_n^+ \quad : (\dot{\partial}\dot{\partial})\rho_n^+ = [\hat{\partial}^m\hat{\partial}^\mu, \check{\partial}_\mu\check{\partial}_m]_n^+ \quad (3.26)$$

At some situations, a particle with its *Exponent Potentials* has a form of the pairs:

$$\phi_n^- = exp\{i\psi_n(\hat{x})\} \qquad \varphi_n^+ = exp\{-i\psi_n(\check{x})\} \qquad (3.27)$$

where $\psi$ is defined as *Exponent Field*. When $\dot{x}^\mu$ and $\dot{x}_m$ are constants, their continuity illustrates the expressions of a *continuity bracket might be* transferable to a *commutation bracket*, although the meaning is shifted, shown as the following:

$$\dot{\partial}\rho_n^- = \left[\dot{x}\partial\right]_{m\mu}^- = \varphi_n^+\left(\dot{x}_m i \partial_m \psi_n\right)\phi_n^- + \phi_n^-\left(-\dot{x}^\nu i \partial^\nu \psi_n\right)\varphi_n^+ = i\langle\dot{x}\partial\rangle_{m\mu}^- \qquad (3.28)$$

$$(\dot{\partial}\dot{\partial})\rho^- = \left[(\dot{x}\partial)(\dot{x}\partial)\right]_{m\mu}^- = i\dot{x}_m\dot{x}^\nu\langle\partial^\nu, \partial_m\rangle_\psi \qquad (3.29)$$

where the operator bracket $\left[\partial^\nu, \partial_m\right]$ is known as a *Lie Bracket* in an associative algebra.

# 9. Property of Commutations

Aligned with the universal topology of the worlds, fields vary from one horizon to the others, categorizable or structured by the *Communication Infrastructure* which is observable “internally” or “externally” from various of perspectives, respectively. All fields are governed, controlled and operated implicitly or explicitly by their associated event $\lambda$ in forms of the mathematical tools of

$$\dot{\partial} \in \left\{ (\check{\partial}_\lambda, \hat{\partial}^\lambda), (\check{\partial}^\lambda, \hat{\partial}_\lambda) \right\} \tag{3.30}$$

Operated by an event, the first pair of $(\check{\partial}_\lambda, \hat{\partial}^\lambda)$ drives the “local” effects of a field, which are mathematically equivalent but associated with their own manifold. For the second pair of $(\check{\partial}^\lambda, \hat{\partial}_\lambda)$, it represents event transformations or transportations: a commutation framework.

In mathematics, the bi-transport symmetric and density commutations have the standard properties for their scaler entanglers or vector-entanglers:

$$\left\langle \lambda_1 \pm \lambda_2 \right\rangle = \left\langle \lambda_1 \right\rangle \pm \left\langle \lambda_2 \right\rangle \qquad \left[\lambda_1 \pm \lambda_2\right] = \left[\lambda_1\right] \pm \left[\lambda_2\right] \tag{3.31}$$

$$\left\langle \lambda_1 \lambda_2 \right\rangle = \left\langle \lambda_2 \lambda_1 \right\rangle = \lambda_2 \left\langle \lambda_1 \right\rangle = \lambda_1 \left\langle \lambda_2 \right\rangle \qquad \left[\lambda_1 \lambda_2\right] = \left[\lambda_2 \lambda_1\right] = \lambda_2 \left[\lambda_1\right] = \lambda_1 \left[\lambda_2\right] \tag{3.32}$$

$$\left\langle (\lambda_1 \pm \lambda_2)\lambda_3 \right\rangle = \left\langle \lambda_1 \lambda_3 \right\rangle \pm \left\langle \lambda_2 \lambda_3 \right\rangle \qquad \left[(\lambda_1 \pm \lambda_2)\lambda_3\right] = \left[\lambda_1 \lambda_3\right] \pm \left[\lambda_2 \lambda_3\right] \tag{3.33}$$

$$\left\langle \lambda_{ab} \right\rangle = - \left\langle \lambda_{ba} \right\rangle \qquad \left[\lambda_{ab}\right] = \left[\lambda_{ba}\right] \tag{3.34}$$

As an integrity, the commutators are observable, if and only if it satisfies the operational either symmetry $\langle \lambda \rangle_{\mu\nu}^{\pm} \neq 0$ or continuity $\left[\lambda\right]_{\mu\nu}^{\pm} \neq 0$, or both. As a pair of asymmetry fluxion $\langle\ \rangle^{\pm}$, they may entangle with each other to give rise to a next horizon of the commutation or continuity symmetrically.

For a symmetric system, the entanglements of $\langle \lambda \rangle^{-} + \langle \lambda \rangle^{+}$ can result in a full balanced system or appear as vanish to nothing. At the same time, fortunately, the asymmetry as a part of the full balanced system performs dissymmetry as in imbalance. For instance, the cosmological curvature of world-lines is a consequence of asymmetric movements, which is balanced by a reciprocal pair of the $Y^{-}Y^{+}$ potential streams. This means that i) the invariance does follow the reciprocal commutations of the balanced exchange between $Y^{-}$ $Y^{+}$ interruptions, and ii) the equilibriums are maintained by a duality of the fluxions internally or externally.

# 10. Flexion Continuity

Continuity equations are a streaming form of conservation laws for flows balancing between the $Y^-$ and $Y^+$ fluxions. As one of the $Y^-Y^+$ entanglement principles, there are a pair of the continuity equations: one for $Y^-$ primary and the other $Y^+$ primary. Upon the internal asymmetry from the first horizon, the $Y^-Y^+$ duality inheres and forms up the next horizon as the micro symmetry of a group community in form of flux continuities, characterized by their entangle components of transformation and standard commutations of the dual-manifolds.

*Dark Fluxion* is an important type of energy flow, derivative of which gives rise to continuity for electromagnetism while associated with charge distribution, the gravitation when affiliated with mass distribution, or black holes in connected with dark matters. At the energy $\tilde{E}_n^{\mp}$, the characteristics of time evolution interprets the $Y^-Y^+$ fluxions of the densities $\rho_n^{\mp}$ and currents $\mathbf{j}_n^{\mp}$, defined as the following:

$$\mathbf{f}_n^{\mp} = \left(ic\rho_n^{\mp}, \mathbf{j}_n^{\mp}\right) \tag{3.35a}$$

$$\rho_n^{\mp} = \frac{\hbar c}{2\tilde{E}_n^{\mp}} \left\langle \partial / \partial x_0 \right\rangle_n^{\mp}, \qquad \mathbf{j}_n^{\mp} = \frac{\hbar c}{2\tilde{E}_n^{\mp}} \left\langle \mathbf{u} \nabla \right\rangle_n^{\mp} \tag{3.35b}$$

known as *Covariant or* Contravariant *Densities and Currents* of the tetrad-coordinates $\left(ic\rho_n^{\mp}, \mathbf{j}_n^{\mp}\right)$, respectively. The micro system might be expressed approximately by a linear summation and weighted over each distributions of the probability $p_n^+$ or $p_n^-$, respectively:

$$\mathbf{f}^{\mp} = \sum\nolimits_n p_n^{\mp} \left(ic\rho_n^{\mp}, \mathbf{j}_n^{\mp}\right) \equiv \left(ic\rho^{\mp}, \mathbf{J}^{\mp}\right) \tag{3.36a}$$

$$p_n^{\mp} = p\left(h_n^{\mp}(T)\right) \tag{3.36b}$$

Each probability of $p(h_n^+)$ or $p(h_n^-)$ is a statistical function of horizon factor $h_n^{\pm}(T)$, while $T$ is temperature in units of ***Kelvin*** introduced in 1848 [14]. The dynamic fluxions elevates thermodynamics during formations of a bulk continuity.

The derivative of densities $\rho_n^{\mp}$ and currents $\mathbf{j}_n^{\mp}$ represent and extend as the classical continuity equations into a pair of the matrix equations

$$\dot{\partial}_\lambda \mathbf{f}^{\mp} = ic\frac{\partial \rho^{\mp}}{\partial x_0} + \nabla \cdot \mathbf{J}^{\mp} = K_s^{\pm} \qquad : K_s^{\pm} = \kappa_\rho^{\pm}\{ic\rho_s^{\pm}, \mathbf{J}_s^{\pm}\} \tag{3.37}$$

The above equations are named as *Continuity Equations of $Y^-Y^+$ Fluxions*. The scalar $K_s^+$ balancing the $Y^-$ continuity is the virtual source of energy, producing $Y^-$ continuity $\dot{\partial}_\lambda \mathbf{f}^-$ of dark fluxions. For a virtual object of energy and momentum, its symmetric entity to the external observers is cyclic surrounding a point object. Therefore, the $Y^+$ field may appear that its virtual source were not existent, or physically empty: $K_s^+ \mapsto 0^+$. The symbol $0^+$ means that, although the fluxion may be physically undetectable, its $Y^+$ field rises whenever there is a physical flow as its opponent in tangible interactions or entanglements.

# 11. Interpretation of Entropy

A measure of the specific operations of ways is called entropy in which states of a universe system could be arranged and balanced towards its equilibrium. The total entropy $\mathcal{S}^{\pm}$ represent law of conservation of area commutation and defined by the following commutations. For a triplet quark system, the blackhole entropy $\mathcal{S}_A$ is at $2\phi_a^+(\phi_b^- + \phi_c^-) \approx 4\phi_a^+\phi_{b/c}^-$, which is about four times of the area entropy for the wave emission

$$\mathcal{S}_a = \mathcal{S}^+ + \mathcal{S}^- = 4\mathcal{S}_A \qquad : \mathcal{S}^{\pm} = \kappa_s\left[\hat{\partial}_\lambda\hat{\partial}^\lambda, \check{\partial}^\lambda\check{\partial}_\lambda\right]^{\pm} \qquad (3.38)$$

where $\kappa_s$ is factored by normalization of the potential fields for a pair of the world planes. As an operational duality, the entropy tends towards both extrema alternately to maintain a continuity of energy conservations, operated by each of the opponent *World Plane.* When a total entropy decreases, the intrinsic order, or $Y^-$ development, of virtual into physical regime $\hat{\partial}_\lambda\hat{\partial}^\lambda$ is more dominant than the reverse process. This philosophy states that for the central quantity of *Motion Dynamics,* conversely, when a total entropy increases, the extrinsic disorder, or $Y^+$ annihilation $\check{\partial}^\lambda\check{\partial}_\lambda$, becomes dominant and conceals physical resources into virtual regime. For an observation at long range, the commutation becomes a conservation of the $Y^-Y^+$ thermodynamics, or is known as blackhole radiations, which yields law of the *Area Entropy* of the dual manifolds on the world planes.

# 12. Interpretation of Lagrangians

To seamlessly integrate with the classical dynamic equations, it is critical to interpret or promote the natural meanings of *Lagrangian* mechanics $\mathscr{L}$ in forms of the dual manifolds. As a function of generalized information and formulation, *Lagrangians* $\mathscr{L}$ can be redefined as a set of densities, continuities, or commutators, entanglements of the $Y^{-}Y^{+}$ manifolds respectively. A few of the examples are:

a. *The density Lagrangians for the equation 2.6 can be defined by the formulae:*

$$\tilde{\mathscr{L}}_{\rho} = \check{\mathscr{L}}_{\rho} + i\hat{\mathscr{L}}_{\rho} = \psi^{-}(\check{x})\ \psi^{+}(\hat{x})\ exp\big(i\vartheta(\lambda)\big) \qquad (3.40)$$

b. *For a scalar or vector entanglement, the commutator Lagrangians can be expressed by their local- or inter-communications:*

$$\tilde{\mathscr{L}}_{L}^{\pm} = -\frac{1}{c^2}\left[\hat{\partial}^{\lambda}\hat{\partial}^{\lambda}, \check{\partial}_{\lambda}\check{\partial}_{\lambda}\right]^{\pm}_{s/v} \qquad : \textit{Local-Commutators} \qquad (3.41)$$

$$\tilde{\mathscr{L}}_{I}^{\pm} = -\frac{1}{c^2}\left[\hat{\partial}_{\lambda}\hat{\partial}_{\lambda}, \check{\partial}^{\lambda}\check{\partial}^{\lambda}\right]^{\pm}_{s/v} \qquad : \textit{Inter-Commutators} \qquad (3.42)$$

Those formulae generalize the *Lagrangian* and state that the central quantity of *Lagrangian,* introduced in 1788*,* represents the bi-directional fluxions that sustain, stream, harmonize and balance the dual continuities of entanglements of the $Y^{-}Y^{+}$ dynamic fields. Apparently, there are a variety of ways to comprehend or empathize on a *Lagrangian* function under a scope of isolations.

# 13. Scaler Commutations

Under the environment of both $Y^-Y^+$ manifolds for a duality of scaler fields, the event $\lambda$ initiates its parallel transport, communicates along a direction with the first tangent vectors of each $Y^+$ and $Y^-$ curvatures. Following the tangent curvature, the event $\lambda$ operates the effects transporting $(\check{\partial}^\lambda, \hat{\partial}_\lambda)$ into its opponent manifold through the second tangent vectors of each curvature, known as *Normal Curvature or* perpendicular to the fist tangent vectors.

For the parallel processes between $Y^-Y^+$ manifolds without considering the transports $(\check{\partial}^\lambda, \hat{\partial}_\lambda)$ between the manifolds, it may have the mirroring transports of a *Scalar* density for the fields $\rho=\phi^+\varphi^-$ around an infinitesimal parallelogram such that the first step proceeds along a direction with vector $\hat{\partial}^{\lambda_1}$ under potential $\phi^+$, simultaneously follows a step along a direction with tangent $\hat{\partial}^{\lambda_2}$, and then travels parallel to the first curve $\check{\partial}_{\lambda_1}$ under potential $\varphi^-$ and finally returns along the second curve $\check{\partial}_{\lambda_2}$. From the covariant or contravariant derivative, the parallel entanglements can be derived by the following:

$$\varphi^-(\hat{\partial}^{\lambda_2}\hat{\partial}^{\lambda_1})\phi^+ = \varphi^-\left((\dot{x}^m\partial^m)(\dot{x}^\nu\partial^\nu) + \dot{x}^m\dot{x}^\nu\overset{+}{\Gamma}{}^{\sigma}_{\nu m}\partial^\sigma\right)\phi^+ \tag{3.43}$$

$$\phi^+(\check{\partial}_{\lambda_2}\check{\partial}_{\lambda_1})\varphi^- = \phi^+\left((\dot{x}_\nu\partial_\nu)(\dot{x}_m\partial_m) + \dot{x}_\nu\dot{x}_m\overset{-}{\Gamma}{}^{s}_{m\nu}\partial_s\right)\varphi^- \tag{3.44}$$

Subtracting the two equations, it expresses a commutation for the mirroring effects without an involvement of the transformation generator or transport coordinator. For this reason at the stationary condition, it function as an *inertial entanglement*:

$$[\hat{\partial}^\lambda\hat{\partial}^\lambda, \check{\partial}_\lambda\check{\partial}_\lambda]^+_{\nu m} = \dot{x}^\nu\dot{x}^m\left(\frac{R}{2}g^{\nu m} + G^{\nu m}\right) \qquad : R^{\nu m} = \frac{R}{2}g^{\nu m} \tag{3.45}$$

Similarly, its reciprocal pair exists as the following:

$$[\check{\partial}_\lambda\check{\partial}_\lambda, \hat{\partial}^\lambda\hat{\partial}^\lambda]^-_{\nu m} = \dot{x}_\nu\dot{x}_m\left(\frac{R}{2}g_{\nu m} + G_{\nu m}\right) \qquad : R_{\nu m} = \frac{R}{2}g_{\nu m} \tag{3.46}$$

where $R_{\mu\kappa}$ is *Ricci* tensor, *R* is *Ricci* scalar curvature, introduced in 1889 [15], $g^{\nu m}$ or $g_{\nu m}$ is the metrics, and $G^{\mu\nu}$ or $G_{\mu\nu}$ is the *Stress Tensor* at the following definitions:

$$\dot{x}^\nu\dot{x}^m R^{\nu m} = [\dot{x}\partial]^+_{m\nu} \equiv \varphi^-(\dot{x}^m\partial^m)(\dot{x}^\nu\partial^\nu)\phi^+ - \phi^+(\dot{x}_\nu\partial_\nu)(\dot{x}_m\partial_m)\varphi^- = [\dot{x}^m\partial^m, \dot{x}^\nu\partial^\nu] \tag{3.47}$$

$$\dot{x}^\nu\dot{x}^m G^{\nu m} = \dot{x}^\nu\dot{x}^m[\overset{+}{\Gamma}{}^{\sigma}_{\nu m}\partial^\sigma, \overset{-}{\Gamma}{}^{\sigma}_{m\nu}\partial_\sigma]^+_{\nu m} \equiv \varphi^-\dot{x}^m\dot{x}^\nu\overset{+}{\Gamma}{}^{\sigma}_{\nu m}\partial^\sigma\phi^+ - \phi^+\dot{x}_\nu\dot{x}_m\overset{-}{\Gamma}{}^{\sigma}_{m\nu}\partial_\sigma\varphi^- \tag{3.48}$$

$$\dot{x}_\nu\dot{x}_m G_{\nu m} = \dot{x}_\nu\dot{x}_m[\overset{-}{\Gamma}{}^{\sigma}_{\nu m}\partial^\sigma, \overset{+}{\Gamma}{}^{\sigma}_{m\nu}\partial_\sigma]^-_{\nu m} \equiv \varphi^+\dot{x}^m\dot{x}^\nu\overset{+}{\Gamma}{}^{\sigma}_{\nu m}\partial^\sigma\phi^- - \phi^-\dot{x}_\nu\dot{x}_m\overset{-}{\Gamma}{}^{\sigma}_{m\nu}\partial_\sigma\varphi^+ \tag{3.49}$$

Therefore, the inertial curvature measures how movements ($\dot{x}$ and $\ddot{x}$) under the potential *Scalar Fields* are balanced with the inherent stress $G^{\nu m}$ or $G_{\nu m}$ during a parallel or mirroring transport between their $Y^-Y^+$ manifolds. Similarly, integration with the equations (3.11) and (3.23), it defines the entanglements between the manifolds $(\check{\partial}^\lambda\check{\partial}^\lambda, \hat{\partial}_\lambda\hat{\partial}_\lambda)$, which can be expressed by the following fluxions:

$$\varphi^-(\hat{\partial}_{\lambda_2}\hat{\partial}_{\lambda_1})\phi^+ = \varphi^-\big((\dot{x}^\mu\partial^\mu)(\dot{x}^\nu\partial^\nu) + \dot{x}^\mu\dot{x}^\nu\overset{+}{\Gamma}{}^\sigma_{\nu\mu}\partial^\sigma\big)\phi^+ \qquad : \dot{x}^\iota = \dot{x}_a X^\nu{}_a \tag{3.50}$$

$$\phi^+(\check{\partial}^{\lambda_2}\check{\partial}^{\lambda_1})\varphi^- = \phi^+\big((\dot{x}_\nu\partial_\nu)(\dot{x}_\mu\partial_\mu) + \dot{x}_\nu\dot{x}_\mu\overset{-}{\Gamma}{}^s_{\mu\nu}\partial_s\big)\varphi^- \qquad : \dot{x}_\iota = \dot{x}^\alpha X^\iota{}_\alpha \tag{3.51}$$

The expressions illustrate that the commutations have the transformational effects with both of the transform generator and transport coordinator. Assuming the fluxions between the complex conjugate manifolds are invariant such that the speeds of $\dot{x}^\iota$ and $\dot{x}_\iota$ are at constants, the two equations above construct or function as the *transformation entanglement*:

$$[\hat{\partial}_\lambda\hat{\partial}_\lambda, \check{\partial}^\lambda\check{\partial}^\lambda]^+ = \dot{x}^\nu\dot{x}^\mu\Big(\frac{R}{2}g^{\nu\mu} + G^{\nu\mu}\Big) = \dot{x}_\nu X^a{}_\nu \dot{x}_\mu X^a{}_\mu\Big(\frac{R}{2}g^{\nu\mu} + G^{\nu\mu}\Big) \tag{3.52}$$

Although, for the speed at constant, the above equation might be equivalent to the equation of inertial entanglement on the world-line, the physical observation may have to occur in the $Y^-$ manifold that requires to convert the contravariance to the covariance to include the transform generator of the *inertial boost* and transport coordinator of the *spiral torque* towards the final measurements.

In summary, It is the commutations of the scalar potentials that maintains inertial motions of the universe.

# 14. Vector Commutations

As the second horizon quantity of an object, a vector field forms and projects its motion potentials to its surrounding space, arisen by or acting on its opponent through a duality of reciprocal interactions. Because of the vector transport, both of the boost and spiral communications give rise to various tensors of the horizon fields aligned with the motions of dynamic curvatures and beyond. When an object has a rotation on the dual manifolds of the world $\{\mathbf{r} \pm i\mathbf{k}\}$ planes, the event naturally operates, constitutes or generates Torsions, balancing on the dual dynamic resources and appearing as the centrifugal or coriolis forces on the objects such as particles, earth, and solar system. At the third horizon, acting upon the vector fields of $V^\mu = -\partial^\mu \psi$ and $\dot{x}^\nu \mapsto \dot{x}_a X^\nu{}_a$ or $V_m = -\partial_m \psi$ and $\dot{x}_n \mapsto \dot{x}^\alpha X^n{}_\alpha$, the event operates and gives rise to the tangent curvature and metric rotations.

For vector communications under physical primary, it generally involves both boost and spiral movements, entangling between the $Y^- Y^+$ manifolds. Considering the parallel transport around an infinitesimal parallelogram under the dual *Vector* fields of $V_m$ and $V^\mu$, the entanglements have the first step along a direction with vector $\check{\partial}_{\lambda_1}$ at a potential $V_m$ of $Y^-$ manifold, simultaneously followed by transforming and transporting $\check{\partial}^{\lambda_2}$ into its opponent $Y^+$ manifold along a directional tangent, and then run parallel to the first curve $\hat{\partial}^{\lambda_1}$ at potential $V^\mu$ of $Y^+$ manifold and finally transporting and transforming $\hat{\partial}_{\lambda_2}$ back to its original state. Because of the transform generator and transport coordinator, their entanglements of the expressions (3.12) and (3.24) may be rewritten the following formulae during rise at the vector-based forth horizon:

$$\check{\partial}_\lambda \check{\partial}_\lambda V_\mu = \left(\dot{x}^\nu \partial^\nu\right)\left(\dot{x}_n \partial_n\right) V_\mu + \left(\ddot{x}_n \overset{-}{\Gamma}{}^\sigma_{\mu n} + \dot{x}_n \dot{x}_\nu \partial_\nu \overset{-}{\Gamma}{}^\sigma_{\mu n} + \dot{x}_n \dot{x}_\nu \overset{-}{\Gamma}{}^\sigma_{\mu n} \partial_\nu\right) V_\sigma \qquad : V_\sigma = -\partial_\sigma \psi \tag{3.53}$$

$$\hat{\partial}^\lambda \hat{\partial}^\lambda V^\mu = \left(\dot{x}_n \partial_n\right)\left(\dot{x}^\nu \partial^\nu\right) V^\mu + \left(\ddot{x}^\nu \overset{+}{\Gamma}{}^\sigma_{\mu\nu} + \dot{x}^\nu \dot{x}^n \partial^n \overset{+}{\Gamma}{}^\sigma_{\mu\nu} + \dot{x}^\nu \dot{x}^n \overset{+}{\Gamma}{}^\sigma_{\mu\nu} \partial^n\right) V^\sigma \qquad : V^\sigma = -\partial^\sigma \psi \tag{3.54}$$

$$[\hat{\partial}^\lambda \hat{\partial}^\lambda, \check{\partial}_\lambda \check{\partial}_\lambda]^-_V = [\dot{x}\partial] + [\mathfrak{R}] + [G] \tag{3.55}$$

$$[\dot{x}\partial] = [(\dot{x}^\nu \partial^\nu)(\dot{x}_n \partial_n), (\dot{x}_n \partial_n)(\dot{x}^\nu \partial^\nu)] = V^\mu (\dot{x}^\nu \partial^\nu)(\dot{x}_n \partial_n) V_\mu - V_\mu (\dot{x}_n \partial_n)(\dot{x}^\nu \partial^\nu) V^\mu = R_{\nu n} \tag{3.56}$$

$$[\mathfrak{R}] \equiv \dot{x}^\nu \dot{x}^n \Big[\frac{\ddot{x}^\nu \overset{+}{\Gamma}{}^\sigma_{\mu\nu}}{\dot{x}^\nu \dot{x}^n} + \partial^n \overset{+}{\Gamma}{}^\sigma_{\mu\nu}, \frac{\ddot{x}_n \overset{-}{\Gamma}{}^\sigma_{\mu n}}{\dot{x}_n \dot{x}_\nu} + \partial_\nu \overset{-}{\Gamma}{}^\sigma_{\mu n}\Big]_V = -\dot{x}^\nu \dot{x}^n \mathfrak{R}^\sigma_{\nu n \mu}$$

$$= V^\mu \left(\ddot{x}^\nu \overset{+}{\Gamma}{}^\sigma_{\mu\nu} + \dot{x}^\nu \dot{x}^n \partial^n \overset{+}{\Gamma}{}^\sigma_{\mu\nu}\right) V_\sigma - V_n \left(\ddot{x}_n \overset{-}{\Gamma}{}^\sigma_{\mu n} + \dot{x}_n \dot{x}_\nu \partial_\nu \overset{-}{\Gamma}{}^\sigma_{\mu n}\right) V^\sigma \tag{3.57}$$

$$[G] = [\dot{x}^\nu \dot{x}^n \overset{+}{\Gamma}{}^\sigma_{\mu\nu} \partial^n, \dot{x}_n \dot{x}_\nu \overset{-}{\Gamma}{}^\sigma_{\mu n} \partial_\nu]_V = V_n \left(\dot{x}^\nu \dot{x}^n \overset{+}{\Gamma}{}^\sigma_{\mu\nu} \partial^n\right) V^\sigma - V^\mu \left(\dot{x}_n \dot{x}_\nu \overset{-}{\Gamma}{}^\sigma_{\mu n} \partial_\nu\right) V_\sigma = \dot{x}^\nu \dot{x}^n G^\sigma_{\nu n \mu} \tag{3.58}$$

$\langle \dot{x}\partial \rangle$ is defined as *Commutative* Vector *Potential*, an entanglement capacity of the static dark energies; $[\mathfrak{R}]$ a *Transport Curvature*, a routing track of the communications; and $\langle G \rangle$ as *Stress Tensor* of the transportations. Since the manifolds are associated with the *Commutative Potentials* $\langle \dot{x}\partial \rangle$ bidirectionally, alternatively and simultaneously, exhibitions of the entanglements must expose to the transport paths of the networking curvature $[\mathfrak{R}]$, and stress tensor $\langle G \rangle$, regardless of which manifolds are aligned with or observed from for any field relationships of scalars, vectors, and tensors.

It is critical that, both equations of (3.52) and (3.55) are from an asymmetric system or not from a full symmetric system, because a full symmetry of $[\hat{\partial}_\lambda \hat{\partial}_\lambda, \check{\partial}^\lambda \check{\partial}^\lambda]^- + [\hat{\partial}_\lambda \hat{\partial}_\lambda, \check{\partial}^\lambda \check{\partial}^\lambda]^+$ or $[\hat{\partial}^\lambda \hat{\partial}^\lambda, \check{\partial}_\lambda \check{\partial}_\lambda]_V^+ + [\hat{\partial}^\lambda \hat{\partial}^\lambda, \check{\partial}_\lambda \check{\partial}_\lambda]_V^-$ may vanish to nothing. In summary, It is the commutations of the vector potentials and asymmetry that constitute motion dynamics of the universe.

# 15. Rotational Transport

Following the commutation infrastructure of the equation (3.55), the event operations contract directly to the manifold communications, which result in each of the components in form of the following expressions:

$$[\dot{x}\partial] = \left[\dot{x}^{\nu}\partial^{\nu}, \dot{x}_n\partial_n\right] = \dot{x}_{\nu}\dot{x}_n R_{\nu n} \qquad : R_{\nu n} = [\partial_{\nu}, \partial_n] = \frac{1}{2}g_{\nu n}R \tag{3.60}$$

$$[\mathfrak{R}] = \dot{x}_{\nu}\dot{x}_n \mathfrak{R}^{\sigma}_{\nu n\mu} = -\dot{x}_{\nu}\dot{x}_n \mathfrak{R}^{\sigma}_{\mu\nu n} \tag{3.61}$$

$$[G] = \dot{x}_{\nu}\dot{x}_n G^{\sigma}_{\nu n\mu} \tag{3.62}$$

The first item carries out *Ricci* tensor $R_{\nu n}$ and scalar *R* curvature. The second item, $[\mathfrak{R}]$, composes *Riemannian* $\mathfrak{R}^{\sigma}_{\mu\nu n}$ geometry, developed in 1859 [16], which is defined as the *Transportation Curvature* of the dual manifolds:

$$[\mathfrak{R}] \mapsto \mathfrak{R}^{\sigma}{}_{\mu\nu n} = \partial_{\nu}\Gamma^{\sigma}{}_{n\mu} - \partial_n\Gamma^{\sigma}{}_{\nu\mu} + \Gamma^{\sigma}{}_{\nu\rho}\Gamma^{\rho}{}_{n\mu} - \Gamma^{\sigma}{}_{n\rho}\Gamma^{\rho}{}_{\nu\sigma} \tag{3.63}$$

The third item embraces the energy torsion twisted and accentuated by the tangent vector fields of the rotational potentials $\bar{\Gamma}^{\sigma}_{\mu n}\partial_{\sigma}\psi$ and $\overset{+}{\Gamma}{}^{\sigma}_{\mu\nu}\partial_{\sigma}\psi$, or known as *Einstein Tensor* [17]:

$$[G] \;\mapsto\; G^{\sigma}_{\mu n\nu} = \bar{\Gamma}^{\sigma}_{\mu n}\partial_{\nu} - \overset{+}{\Gamma}{}^{\sigma}_{\mu\nu}\partial_n = G^{\sigma}_{\nu n\mu} \tag{3.65}$$

Therefore, under the transport infrastructure between the manifolds, the commutation relations of equation (3.55) is simplified to the following:

$$[\hat{\partial}^{\lambda}\hat{\partial}^{\lambda}, \check{\partial}_{\lambda}\check{\partial}_{\lambda}]^{-}_{\nu} = \dot{x}_{\nu}\dot{x}_n\left(\frac{R}{2}g_{\nu n} - \mathfrak{R}^{\sigma}_{\nu n\mu} + G^{\sigma}_{\nu n\mu}\right) \tag{3.66}$$

In the parallel fashion following the assumptions in deriving the equation (3.52), *transportation entanglement* under the vector potentials is straightforwardly given by the following:

$$[\hat{\partial}_{\lambda}\hat{\partial}_{\lambda}, \check{\partial}^{\lambda}\check{\partial}^{\lambda}]^{+}_{\nu} = \dot{x}_{\nu}X^{a}{}_{\nu}\dot{x}_{\mu}X^{a}{}_{\mu}\left(\frac{R}{2}g_{\nu\mu} - \mathfrak{R}^{\sigma}_{\nu\mu n} + G^{\sigma}_{\nu\mu n}\right) \tag{3.67}$$

Therefore, whenever the *Riemannian* $\mathfrak{R}^{\sigma}_{\mu\nu n}$ curvature appears, it implies the vector potentials in actions. More precisely, the event presence of the $Y^{-}Y^{+}$ dynamics manifests that the infrastructural foundations and transportations of the vector potentials which give rise to the interactional forces, curvatures, stresses, and torsions through the center of an object by following its geodesics of the underlying virtual and physical *Riemannian* geometry.

# World Equations

## CHAPTER IV

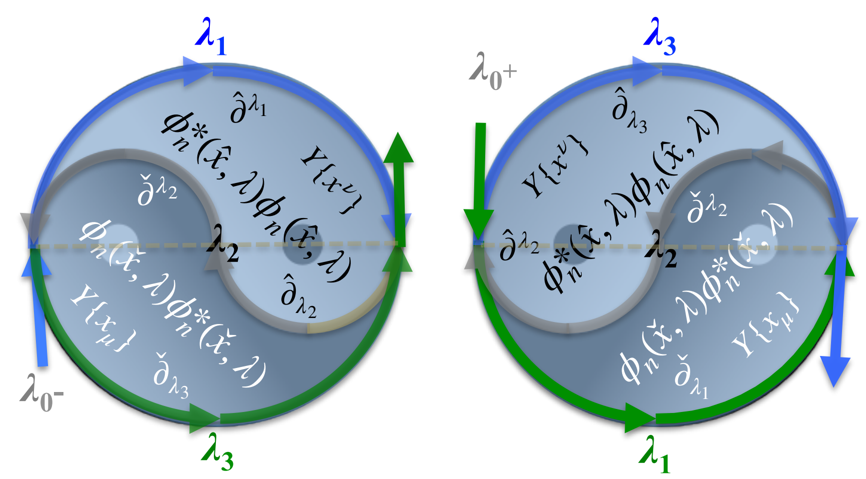
In the universal environment, the world event and their operational actors drive all natural phenomena aligned with a duality of the two-dimensional world planes, and perform a pair of the dark energy steams for life entanglements. The event processes interact with the potential fields, conduct the $Y^-Y^+$ flows of the evolutional processes, maintain the geodesic curvatures, institute the energy *torque*, and conserve the twisting *torsion* through the commutation and continuity infrastructure, which give rise to the dual dynamics of fluxion fields of motions, accelerations, and forces.

The events evolve and transport across multi-zones of the worlds that defines the horizon activities as a scope of their behaviors or operations in a bi-directional transformation seamlessly and alternately between the virtual and physical worlds. Although the processes by which events carry dark information are out of the scope of contemporary physics, the dynamic movements of their evolutional processes are implicitly imposed on a set of the manifold $Y\{\hat{x}\}$ and $Y\{\check{x}\}$ basis. Especially during the time dilation, the effects of the events are explicitly reflected by the Event Operations $\dot{\lambda}_i \mapsto \dot{\partial}_{\lambda_i}$ in the dual variant forms $\{\check{\partial}_\lambda, \check{\partial}^\lambda, \hat{\partial}^\lambda, \hat{\partial}_\lambda\}$.

# 1. World Events

Following *Universal Topology*, world events, illustrated in the $Y^-Y^+$ flow diagram of Figure 1a, operate the potential entanglements that consist of the $Y^+$ supremacy (white background) at a top-half of the cycle and the $Y^-$ supremacy (black background) at a bottom-half of the cycle. Each part is dissolving into the other to form an alternating stream of dynamic flows. Their transformations in between are bi-directional antisymmetric and transported crossing the dark tunnel through a pair of the end-to-end circlets on the center line. Both of the top-half and bottom-half share the common global environment of the state density $\rho_n$ that mathematically represents the $\rho_n^+$ for the $Y^+$ manifold and its equivalent $\rho_n^-$ for the $Y^-$ manifold, respectively.

Besides, the left-side diagram presents the event flow acted from the inception of $\lambda_{0-}$ through $\lambda_1$ $\lambda_2$ $\lambda_3$ to intact a cycle process for the $Y^+$ supremacy. In parallel, the right-side diagram depicts the event flow initiated from the initial $\lambda_{0+}$ through $\lambda_1$ $\lambda_2$ $\lambda_3$ to complete a cycle process for the $Y^-$ supremacy. The details are described as the following:




$W^+ : (\hat{\partial}^{\lambda_1} \to \hat{\partial}_{\lambda_2}), (\check{\partial}^{\lambda_2} \to \check{\partial}_{\lambda_3})$ $W^- : (\check{\partial}_{\lambda_1} \to \check{\partial}^{\lambda_2}), (\hat{\partial}^{\lambda_2} \to \hat{\partial}_{\lambda_3})$

Figure 4a: Event Flows of $Y^-Y^+$ Evolutional Processes

1. *Visualized in the left-side of Figure 4a, the transitional event process between virtual and physical manifolds involves a cyclic sequence throughout the dual manifolds of the environment: incepted at $\lambda_{0-}$, the event actor produces the virtual operation $\hat{\partial}_{\lambda_1}$ in $Y\{x^\nu\}$ manifold (the left-hand blue curvature) projecting $\hat{\partial}^{\lambda_2}$ to and transforming into its physical opponent $\check{\partial}^{\lambda_2}$ (the tin curvature transforming from left-hand into right-hand), traveling through $Y\{x_\mu\}$ manifold (the right-hand green curvature), and reacting the event $\check{\partial}_{\lambda_3}$ back to the actor.*

2. *As a duality in the parallel reaction, exhibited in the right-side of Figure 4a, initiated at $\lambda_{0+}$, the event actor generates the physical operation $\check{\partial}_{\lambda_1}$ in $Y\{x_\mu\}$ manifold (the right-hand green curvature) projecting $\check{\partial}^{\lambda_2}$ to and transforming into its virtual opponent $\hat{\partial}^{\lambda_2}$ (the tin curvature transforming from right-hand into left-hand), traveling through $Y\{x^\nu\}$ manifold (the left-hand blue curvature), and reacting the event $\hat{\partial}_{\lambda_3}$ back to the actor.*

With respect to one another, the two sets of the World Event Flow processes cycling at the opposite direction simultaneously formulate the flow charts in the following mathematical expressions:

$$W^+ : (\hat{\partial}^{\lambda_1} \rightarrow \hat{\partial}_{\lambda_2}), (\check{\partial}^{\lambda_2} \rightarrow \check{\partial}_{\lambda_3}) \qquad \textbf{\textit{(4.1)}}$$

$$W^- : (\check{\partial}_{\lambda_1} \rightarrow \check{\partial}^{\lambda_2}), (\hat{\partial}^{\lambda_2} \rightarrow \hat{\partial}_{\lambda_3}) \qquad \textbf{\textit{(4.2)}}$$

This pair of the interweaving system pictures an outline of the internal commutation of dark energy and continuum density of the entanglements. It demonstrates that the two-sidedness of any event flows, each dissolving into the other in alternating streams, operate a life of situations, movements, or actions through continuous helix-circulations aligned with the universe topology, which lay behind the context of the main philosophical interpretation of *World Equations*.

# 2. Motion Operations

As a natural principle of motion dynamics, one of the flow processes dominates the intrinsic order, or development, of virtual into physical regime, while, at the same time, its opponent dominates the intrinsic annihilation or physical resources into virtual domain. Applicable to World Equations of (5.18), the principle of least-actions derives a set of the *Motion Operations*:

$$\check{\partial}^{-}\left(\frac{\partial W}{\partial(\hat{\partial}^{+}\phi)}\right)-\frac{\partial W}{\partial\phi}=0 \qquad : \check{\partial}^{-}\in\{\check{\partial}_{\lambda},\check{\partial}^{\lambda}\},\ \hat{\partial}^{+}\in\{\hat{\partial}^{\lambda},\hat{\partial}_{\lambda}\} \qquad (4.3)$$

$$\hat{\partial}^{+}\left(\frac{\partial W}{\partial(\check{\partial}^{-}\phi)}\right)-\frac{\partial W}{\partial\phi}=0 \qquad : W\in\{W^{\mp}\},\ \phi\in\{\phi_n^{\pm},\varphi_n^{\pm}\} \qquad (4.4)$$

This set of dual formulae extends the philosophical meaning to the *Euler-Lagrange* [18] *Motion Equation* for the actions of any dynamic system, introduced in the 1750s. The new sets of the variables of $\phi_n^{\mp}$ and the event operators of $\check{\partial}^{-}$ and $\hat{\partial}^{+}$ signify that both manifolds maintain equilibria formulations from each of the motion extrema, simultaneously driving a duality of physical and virtual dynamics.

Unlike a single manifold space, where the shortest curve connecting two points is described as a parallel line, the optimum route between two points of a curve is connected by the tangent transportations of the $Y^{-}$ and $Y^{+}$ manifolds. As an extremum of event actions on a set of curves, the rate of divergence of nearby geodesics determines curvatures that is governed by the equivalent formulation of geodesic deviation for the shortest paths on each of the world planes:

$$\ddot{x}^{\mu}+\overset{+}{\Gamma}{}^{\mu}_{\alpha\beta}\dot{x}^{\alpha}\dot{x}^{\beta}=0 \qquad \ddot{x}_{m}+\overset{-}{\Gamma}{}^{m}_{ab}\dot{x}_{a}\dot{x}_{b}=0 \qquad (4.5)$$

This set extends a duality to and is known as *Geodesic Equation* [18-19], where the motion accelerations of $\ddot{x}^{\mu}$ and $\ddot{x}_{m}$ are aligned in parallel to each of the world lines. It states that, during the inception of the universe, the tangent vector of the virtual $Y^{-}Y^{+}$ energies to a geodesic is either unchanged or parallel transport as a massless object moving along the world planes that creates the inertial transform generators and twist transport torsions to emerge a reality of the real world.

# 3. Holomorphic Operations

In mathematical analysis, a complex manifold yields a holomorphic function and is complex differentiable in a neighborhood of every point in its domain, such that an operational process can be represented as an infinite sum of terms:

$$f(\lambda) = f\left(\lambda_0\right) + f^{'}\left(\lambda_0\right)(\lambda - \lambda_0)\cdots + \frac{f^n\left(\lambda_0\right)(\lambda - \lambda_0)^n}{n!} \tag{4.6}$$

known as the Taylor and Maclaurin series, introduced in 1715 [20]. For any event operation $\dot{\lambda} \mapsto \dot{\partial}$ as the functional derivatives of the above equation, the sum of terms are calculated at an initial state $\lambda_0$, shown as the following

$$f(\lambda) = f\left(\lambda_0\right) + \kappa_1\dot{\lambda} + \kappa_2\dot{\lambda}^2\cdots + \kappa_n\dot{\lambda}^n \qquad : \kappa_n = \frac{f^n\left(\lambda_0\right)}{n!}, \ \dot{\lambda} \in \{\dot{\partial}\} = \{\check{\partial}_\lambda, \check{\partial}^\lambda, \hat{\partial}^\lambda, \hat{\partial}_\lambda\} \tag{4.7a}$$

where $\kappa_n$ is the coefficient of each order n. Normally, a global event generates a series of sequential actions, each of which is associated with its opponent reactions, respectively and reciprocally. Therefore, it naturally extends the above equation to the following formula:

$$f(\lambda) = f_0 + \kappa_1\dot{\partial}_{\lambda_1} + \kappa_2\dot{\partial}_{\lambda_1}\dot{\partial}_{\lambda_2} + \kappa_3\dot{\partial}_{\lambda_1}\dot{\partial}_{\lambda_2}\dot{\partial}_{\lambda_3} \ \cdots + \kappa_n\dot{\partial}_{\lambda_1}\dot{\partial}_{\lambda_2}\ldots\dot{\partial}_{\lambda_n} \tag{4.7b}$$

The event states of world planes are open sets and can either rise as subspaces transformed from the other worlds or remain confined as independent existences within their own domain, as in the settings of $Y^-$ or $Y^+$ manifolds of physical or virtual world planes.

# 4. World Equations

Because the events are operated through the potential fields, it essentially incepts on the world planes a set of the $\lambda_i$ derivatives, giving rise to the horizon infrastructures, simply given by the above $\phi_n^{\mp}(\lambda, x) = f(\lambda)\ \phi_n^{\mp}(\lambda, x)\,|_{\lambda=\lambda_0}$:

$$\hat{W}_n = \phi_n^{+}(\lambda, \hat{x})\phi_n^{-}(\lambda, \check{x}) \qquad \textit{: First World Equation} \qquad (4.8)$$

$$\phi_n^{\mp}(\lambda, x) = \left(1 \pm \tilde{\kappa}_1 \dot{\partial}_{\lambda_1} \pm \tilde{\kappa}_2 \dot{\partial}_{\lambda_2} \dot{\partial}_{\lambda_1}\ \cdots\right)\phi_n^{\mp}(\lambda, x)\,|_{\lambda=\lambda_0} \qquad (4.9)$$

where $\phi_n^{+}(\lambda, \hat{x})$ or $\phi_n^{-}(\lambda, \check{x})$ is the virtual or physical potential of a particle n, and $\hat{\kappa}_n$ is defined as the world constants. An integrity of the two functions is, therefore, named as *First Type of World Equations*, because the function $\hat{W}_n$ represents that

1. *The first two terms* $(1 \pm \kappa_1 \dot{\partial}_{\lambda_1})$ *- The event drives both virtual and physical system and incepts from the world planes systematically breakup and extend into each of the manifolds.*
2. *The higher terms* $\pm(\kappa_2 \dot{\partial}_{\lambda_2} \dot{\partial}_{\lambda_1} + \cdots \kappa_i \dot{\partial}_{\lambda_i} \dot{\partial}_{\lambda_{i-1}} \ldots \dot{\partial}_{\lambda_1})$ *- The event operations transcend further down to each of its sub-coordinate system with extra degrees of freedoms for either physical dimensions* $\mathbf{r}(\lambda)$ *or virtual dimensions* $\mathbf{k}(\lambda)$*, reciprocally.*

This *World Equation* $\hat{W}_n$ features the virtual supremacy for the processes of creations and annihilations. Amazingly, the higher horizon reveals the principles of *Force Fields,* which include, but are not limited to, and are traditionally known as the *Spontaneous Breaking* and fundamental forces. For the physical observation, the amplitude $|\hat{W}_n|$ features the $Y^-$ behaviors of the forces explicitly while the phase attributes the $Y^+$ comportment of the superphase actions implicitly.

Once the physical three-dimensions are evolving or developed, the operational function $f(\lambda)$ for the event λ actions involves the local state densities $\rho_n(x)$ and its relativistic spacetime exposition of a system with N objects or particles. Assuming each of the $\phi_n^{\pm}$ particles is in one of three possible states: |-〉, |+〉, and |o〉, the system has $N_n^+$ and $N_n^-$ particles at non-zero charges with their reciprocal state functions of $\varphi_n^{\mp}$ confineable to the respective manifold $Y^{\pm}$ locally. Therefore, the horizon functions of the system can be expressed by:

$$\check{W}_c = k_w \int \check{W}_b d\Gamma, \qquad \check{W}_b = \sum\nolimits_n h_n \check{W}_a, \qquad \check{W}_a = f(\lambda)\rho_n \qquad (4.10)$$

$$\rho_n = \psi_n^+(\hat{x})\psi_n^-(\check{x}) \qquad : \psi_n^\pm \in \{\phi_n^\pm, \varphi_n^\mp\},\ h_n = N_n^\pm / N \tag{4.11}$$

where $h_n$ is a horizon factor, $N_n^\pm/N$ are percentages of the $Y^-Y^+$ particles, and $k_w$ is defined as a world constant. During space and time dynamics, the density $\psi_n^-\psi_n^+$ is incepted at $\lambda = \lambda_0$ and followed by a sequence of the evolutions $\lambda_i \mapsto \dot{\partial}_{\lambda_1}\cdots\dot{\partial}_{\lambda_i\lambda_{i-1}\cdots\lambda_1}$. As a horizon infrastructure, this process engages and applies a series of the event operations of equations (4.2) to the equations of (4.9) in the forms of the following expressions:

$$\check{W}^\pm = k_w \int d\Gamma \sum_n h_n \left[ W_n^\pm + \kappa_1 \dot{\partial}_{\lambda_1} + \kappa_2 \dot{\partial}_{\lambda_2}\dot{\partial}_{\lambda_1} \cdots \right] \psi_n^+(\hat{x})\psi_n^-(\check{x}) \tag{4.12}$$

where $\check{W}_n^\pm \equiv \check{W}(\hat{x}\,|\,\check{x}, \lambda_0)$ is the $Y^+$ or $Y^-$ ground environment or an initial potential density of a system, respectively. This type of *World Equations* features the physical supremacy of kinetic dynamics or *Field Equations* as a part of the horizon infrastructure. Although, two types of the *World Equations* are mathematically equivalent, they represents the real situations further favorable to a variety of variations.

Alternatively in mathematics, the above *World Equations* can be rewritten in terms of a symmetric system and named as a *Second Type of World Equations*, shown as the following:

$$W_b = \langle W_0^\pm \rangle + \sum_n h_n \left\{ \kappa_1 \langle \dot{\partial}_\lambda \rangle^\pm + \kappa_2 \dot{\partial}_{\lambda_2} \langle \dot{\partial}_{\lambda^1} \rangle_s^\pm + \kappa_3 \dot{\partial}_{\lambda_3} \langle \dot{\partial}_{\lambda^2} \rangle_s^\pm \cdots \right\} \tag{4.13}$$

where $\kappa_n$ 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 (index s): $\phi^\pm$ and $\varphi^\mp$ giving rise to their tangent vector fields at the third horizon, and their tensor fields at higher horizons. Symmetry is the law of nature that preserves invariant under some operations of transformations or transportations. As a duality, there is always a pair of intrinsics reciprocal conjugation: $Y^-Y^+$ symmetry.

As the topological framework, various horizons are defined as, but not limited to, timestate, microscopic and macroscopic regimes, each of which is in a separate zone, emerges with its own fields, and aggregates or dissolves into each other as the interoperable neighborhoods, systematically and simultaneously. Through the $Y^-Y^+$ communications, the expression of the tangent vectors defines and gives rise to each of the horizons.

# 5. Horizon Fields

Throughout this manuscript, various horizons are defined as, but not limited to, timestate, microscopic and macroscopic regimes, each of which is in a separate zone and emerges with its own fields and aggregates or dissolves into each other as the interoperable neighborhoods, systematically and simultaneously. Through the $Y^-Y^+$ communications, the mathematical expression of the tangent vectors defines and gives rise to each of the horizons. To ease observations, it is essential to scope these horizons as the following event operations:

*a.* First Horizon: the field behaviors of individual objects or particles have their potentials of the timestate functions in form of, but not limited to, the dual densities:

$$\rho_\phi^+ = \phi(\hat{x},\lambda)\,\varphi(\check{x},\lambda) \qquad : \phi^+ \equiv \phi(\hat{x},\lambda),\ \varphi^- \equiv \varphi(\check{x},\lambda) \qquad (4.14)$$

$$\rho_\phi^- = \phi(\check{x},\lambda)\,\varphi(\hat{x},\lambda) \qquad : \phi^- \equiv \phi(\check{x},\lambda),\ \varphi^+ \equiv \varphi(\hat{x},\lambda) \qquad (4.15)$$

This horizon is confined by its neighborhoods of the ground and second horizons, which is characterizable by the scalar objects of $\phi^\pm$ and $\varphi^\pm$ fields of the ground horizon, individually, and reciprocally.

A system can be represented by a density $\rho$ at every point within its space that consists of at least a pair of $Y^-Y^+$ objects. Each objects has their scalar fields: $\rho_\phi^\pm = \phi^\pm\,\varphi^\mp$ to scope up a first horizon $\rho = f\{\rho_\phi^+, \rho_\phi^-\}$ of the environment. For example, within the first horizon, there are the elementary particle fields described by the well-known quantum dynamics. Therefore, a set of field $\{\phi^\pm, \varphi^\mp\}$ formulae serves as the *First Universal Equations*.

*b.* Second Horizon: the effects of aggregated objects has their commutative entanglements of the microscopic functions in form of, but not limited to, the dual vector fields, defined as *Fluxion Fields*:

$$\mathbf{f}_n^+ = \kappa_\mathbf{f}^+ \dot{\partial}\rho_\phi^+ = \frac{\hbar c}{2E_n^+}[\hat{\partial},\check{\partial}]_n^+ = \frac{\hbar c}{2E_n^+}\left(\varphi_n^- \dot{x}^\nu \partial^\nu \phi_n^+ + \phi_n^+ \dot{x}_\nu \partial_\nu \varphi_n^-\right) \qquad (4.16)$$

$$\mathbf{f}_n^- = \kappa_\mathbf{f}^- \dot{\partial}\rho_\phi^- = \frac{\hbar c}{2E_n^-}[\check{\partial},\hat{\partial}]_n^+ = \frac{\hbar c}{2E_n^-}\left(\varphi_n^+ \dot{x}_m \partial_m \phi_n^- + \phi_n^- \dot{x}^m \partial^m \varphi_n^+\right) \qquad (4.17)$$

where $\kappa_\mathbf{f}^+$ or $\kappa_\mathbf{f}^-$= is the coefficient $\hbar c/(2E_n^\pm)$. This horizon summarizes the timestate functions $\mathbf{f}^\pm = \sum \mathbf{f}_n^\pm$, which is confined by its neighborhoods of the first and third horizons, and is characterizable by two pairs of scalar $\{\phi^\pm, \varphi^\pm\}$ and their vector $\{\dot{\partial}\phi^\pm, \dot{\partial}\varphi^\pm\}$ fields.

When objects interacting among themselves and conserving invariance are scoped as and performed within a fluxion system derivative to the potential fields $\dot{\partial}\rho_{\phi}^{\pm}$, a set of laws of conservation and continuity determines the intrinsic properties of interruptive transformations, dynamic transportations, and entangle commutations that serves as the *Second Universal Equations* - a duality of $Y^{-}Y^{+}$ symmetry rising from the fluxion fields.

*Dark Fluxion* is an important type of energy flow, derivative of which gives rise to continuity for electromagnetism while associated with charge distribution, the gravitational force when affiliated with inauguration of mass distribution, or blackholes in connected with dark matters. At the energy $\tilde{E}_n^{\mp}$, the characteristics of time evolution interprets the $Y^{-}Y^{+}$ fluxions $\mathbf{f}_s^{\pm}$ of the densities $\rho_s^{\mp}$ and currents $\mathbf{j}_s^{\mp}$, generated by the first order of energy densities at the second horizon (4.9) as the following:

$$\tilde{\rho}_s^- = \sum\nolimits_n p_n\left(\phi_n^- + \tilde{\kappa}_1^-\check{\partial}_\lambda\phi_n^-\cdots\right)\left(\varphi_n^+ + \tilde{\kappa}_1^+\hat{\partial}^\lambda\varphi_n^+\cdots\right)$$

$$= \sum\nolimits_n p_n\left\{\phi_n^-\varphi_n^+ + \frac{\tilde{\kappa}_0^-}{ic}\mathbf{f}_n^- + \tilde{\kappa}_1^-\tilde{\kappa}_1^+\left(\check{\partial}_\lambda\phi_n^-\right)\wedge\left(\hat{\partial}^\lambda\varphi_n^+\right) + \cdots\right\} \quad (4.18a)$$

$$\tilde{\rho}_s^+ = \sum\nolimits_n p_n\left(\phi_n^+ + \tilde{\kappa}_1^+D_\lambda\phi_n^+\cdots\right)\left(\varphi_n^- + \tilde{\kappa}_1^-D_\lambda\varphi_n^-\cdots\right)$$

$$= \sum\nolimits_n p_n\left\{\phi_n^+\varphi_n^- + \frac{\tilde{\kappa}_0^+}{ic}\mathbf{f}_n^+ + \tilde{\kappa}_1^-\tilde{\kappa}_1^+\left(\hat{\partial}^\lambda\phi_n^+\right)\wedge\left(\check{\partial}_\lambda\varphi_n^-\right) + \cdots\right\} \quad (4.18b)$$

$$\mathbf{f}_s^{\mp} = ic\rho_s^{\mp} + \mathbf{j}_s^{\mp} \qquad : \rho_s^{\mp} = \frac{i\hbar}{2E^{\pm}}\langle\partial_t\rangle_s^{\mp}, \qquad \mathbf{j}_s^{\mp} = \frac{\hbar c}{2E^{\mp}}\langle\mathbf{u}\nabla\rangle_s^{\mp} \quad (4.19)$$

where the wedge circulations $\wedge$ is the nature of the entangling processes. The $Y^{-}Y^{+}$ fluxions $\mathbf{f}_s^{\mp}$ are also known as the classic *Variant Density and Current* of the tetrad-coordinates $\left(ic\rho_s^{\pm}, \mathbf{j}_s^{\pm}\right)$. Upon the internal superphase modulations from the first horizon, the $Y^{-}Y^{+}$ duality inheres and forms up the higher horizons as the micro symmetry of a group community in form of flux continuities, characterized by their entangle components of transformation and standard commutations of the dual-manifolds. As one of the $Y^{-}Y^{+}$ entanglement principles, it results a pair of the fluxion equations: one for $Y^{-}$ primary and the other $Y^{+}$ primary.

*c.* Third Horizon: the integrity of massive objects characterizes their global motion dynamics of the macroscopic matrices and tensors through an integration of, but not limited to, the derivative to microscopic fields of densities and fluxions, defined as *Force Fields*:

$$\mathbf{F}^{\pm} = \kappa_{\mathbf{F}}^{\pm}\int\rho_a\dot{\partial}\mathbf{f}^{\pm}d\Gamma \qquad : \dot{\partial}\in\{\check{\partial}_\lambda, \hat{\partial}^\lambda\} \quad (4.20)$$

where $\kappa_{\mathbf{F}}^{+}$ or $\kappa_{\mathbf{F}}^{-}$ is a coefficient. This horizon is confined by its neighborhoods of the second and fourth horizons and characterizable by the tensor fields of $\dot{\partial}\mathbf{f}_m$ and $\dot{\partial}\mathbf{f}^{\mu}$.

The derivative to the density and current (4.19) represent and extend as the classical continuity equations into a pair of the matrix equations

$$\dot{\partial}_{\lambda}\mathbf{f}_s^{\pm} = \frac{\partial \rho_s^{\pm}}{\partial t} + (\mathbf{u}^{\pm}\nabla)\cdot\mathbf{j}_s^{\pm} = K_s^{\mp} \qquad : K_s^{+} \rightarrow 0^{+} \tag{4.21}$$

The above equations are defined as Continuity Equations of $Y^{-}Y^{+}$ Fluxions, the streaming forms of conservation laws for flows balancing between the $Y^{-}$ and $Y^{+}$ manifolds. The scalar $K_s^{+}$ balancing the $Y^{-}$ continuity is the virtual source of energy, producing $Y^{-}$ continuity $\dot{\partial}_{\lambda}\mathbf{f}^{-}$ of dark fluxions. For a virtual object of energy and momentum, its massless entity to the external observers is cyclic surrounding a point object. Therefore, the $Y^{+}$ field may appear as if its virtual source were not existent, or physically empty: $K_s^{+} \rightarrow 0^{+}$. The symbol $0^{+}$ means that, although the fluxion may be physically hidden, its $Y^{+}$ field rises whenever there is a physical flow as its opponent in tangible interactions or entanglements. As a byproduct, we might redefine the *Aether Theory* in order for its interpretation to be more accurate.

The horizon ladder continuously accumulates and gives a rise to the next objects in form of a ladder hierarchy:

$$\iiiint \cdots \rho_c \dot{\partial} \int \rho_b \dot{\partial}\mathbf{F}^{\pm} d\Gamma \mapsto \mathbf{W}_x^{\pm} \tag{4.22}$$

They are orchestrated into groups, organs, globes or galaxies.

# Universal Dynamics

## CHAPTER V

A duality nature of virtual and physical coexistences is a universal phenomenon of dynamic entanglements, which always performs 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. Therefore, a set of events operates a duality of equations for motion dynamics, fields, fluxions, continuities, and conservations.

The potential entanglements is a fundamental principle of the real-life steaming 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 constituents. Under the law of event operations, they are fully describable by the mathematical framework of the dual manifolds.

Finally, this chapter comes up a set of the mathematical formulae, a universal theory to derive concisely the generalized physics. Following this chapter, the details to the entire physics are unfolded gradually throughout the rest of the books.

# 1. Yang Potential Fields

During the events of the virtual supremacy, a chain of the event actors in the flows of Figure 4a and equations (4.1)-(4.2) can be shown by and underlined in the sequence of the following processes:

$$W^+ : (\hat{\partial}^{\lambda_1} \to \underline{\hat{\partial}_{\lambda_2}}), (\check{\partial}^{\lambda_2} \to \underline{\check{\partial}_{\lambda_3}});\ W^- : (\check{\partial}_{\lambda_1} \to \underline{\check{\partial}^{\lambda_2}}), (\hat{\partial}^{\lambda_2} \to \underline{\hat{\partial}_{\lambda_3}}) \tag{5.1}$$

With the event actors of $\hat{\partial}_{\lambda_2}$ and $\check{\partial}_{\lambda_3}$, the *World Equations* (4.12) becomes the following:

$$W_a^+ = \left(W_n^+ + \kappa_1 \underline{\hat{\partial}_{\lambda_2}}\right)\phi_n^+\phi_n^- + \kappa_2 \underline{\check{\partial}_{\lambda_3}}\left(\phi_n^+\hat{\partial}_{\lambda_2}\phi_n^- + \phi_n^-\hat{\partial}_{\lambda_2}\phi_n^+\right) + \cdots \tag{5.2}$$

where $W_n^+ = W_n^+(\mathbf{r}, t_0)$ are the time invariance potentials in $Y^+$ manifold. Rising from the opponent fields of $\phi_n^-$, the dynamic reactions under the $Y^-$ manifold continuum give rise to the *Motion Operations* of the $Y^+$ fields $\phi_n^+$ approximated at the first and second orders of perturbations in term of the above *World Equation*:

$$\frac{\partial W_a^+}{\partial \phi_n^-} = W_n^+\left(\mathbf{x}, t_0\right)\phi_n^+ + \kappa_1\hat{\partial}_{\lambda_2}\phi_n^+ + \kappa_2\check{\partial}_{\lambda_3}\hat{\partial}_{\lambda_2}\phi_n^+ \tag{5.3}$$

$$\check{\partial}^{\lambda_2}\left(\frac{\partial W_a^+}{\partial(\hat{\partial}_{\lambda_2}\phi_n^-)}\right) = \left(\kappa_1 + \kappa_2\check{\partial}_{\lambda_3}\right)\underline{\check{\partial}^{\lambda_2}}\phi_n^+ \tag{5.4}$$

$$\hat{\partial}_{\lambda_3}\left(\frac{\partial W_a^+}{\partial(\check{\partial}_{\lambda_3}\phi_n^-)}\right) = \underline{\hat{\partial}_{\lambda_3}}\left(\kappa_2\hat{\partial}_{\lambda_2}\phi_n^+\right) \tag{5.5}$$

where the potentials of $\hat{\partial}_{\lambda_2}\phi_n^-$ and $\check{\partial}_{\lambda_3}\phi_n^-$ give rise simultaneously to their opponent's reactors of the physical to virtual transformation $\check{\partial}^{\lambda_2}$ and the physical reaction $\hat{\partial}_{\lambda_3}$, respectively. From these interwoven relationships, the motion equation of (4.4) determines a partial differential equation of the $Y^+$ state fields $\phi_n^+$ under the supremacy of virtual dynamics at the $Y\{x^\nu\}$ manifold:

$$\kappa_1\left(\check{\partial}^{\lambda_2} - \hat{\partial}_{\lambda_2}\right)\phi_n^+ + \kappa_2\left(\check{\partial}_{\lambda_3}\check{\partial}^{\lambda_2} + \hat{\partial}_{\lambda_3}\hat{\partial}_{\lambda_2} - \check{\partial}_{\lambda_3}\hat{\partial}_{\lambda_2}\right)\phi_n^+ = W_n^+\phi_n^+ \tag{5.6}$$

giving rise to the $Y^+$ General Fields from each respective opponent during their physical interactions.

# 2. Yang Reciprocal Fields

In the parallel and passive reaction, the event provokes its conjugate opponents during the same sequence:

$$W^{+}:(\underline{\hat{\partial}^{\lambda_1}}\rightarrow\hat{\partial}_{\lambda_2}),(\underline{\check{\partial}^{\lambda_2}}\rightarrow\check{\partial}_{\lambda_3});\ W^{-}:(\underline{\check{\partial}_{\lambda_1}}\rightarrow\check{\partial}^{\lambda_2}),(\underline{\hat{\partial}^{\lambda_2}}\rightarrow\hat{\partial}_{\lambda_3}) \qquad (5.7)$$

$$(W_a^{+})^{*}=\left(W_n^{+}+\kappa_1\underline{\hat{\partial}^{\lambda_1}}\right)\varphi_n^{+}\varphi_n^{-}+\kappa_2\underline{\check{\partial}^{\lambda_2}}\left(\varphi_n^{+}\hat{\partial}^{\lambda_1}\varphi_n^{-}+\varphi_n^{-}\hat{\partial}^{\lambda_1}\varphi_n^{+}\right)\cdots \qquad (5.8)$$

Similarly, applying the Motion Operations of (4.5), it elaborates another partial differential equation of the opponent fields $\varphi_n^{+}$ under the $Y\{x^{\nu}\}$ manifold:

$$\frac{\partial W_a^{+*}}{\partial\phi_n^{-}}=W_n^{-}\varphi_n^{+}+\kappa_1\hat{\partial}^{\lambda_1}\varphi_n^{+}+\kappa_2\check{\partial}^{\lambda_2}\hat{\partial}^{\lambda_1}\varphi_n^{+} \qquad (5.9a)$$

$$\check{\partial}_{\lambda_1}\left(\frac{\partial W_a^{+*}}{\partial(\underrightarrow{\hat{\partial}^{\lambda_1}}\phi_n^{-})}\right)=\underline{\check{\partial}_{\lambda_1}}\left(\kappa_1+\kappa_2\check{\partial}^{\lambda_2}\right)\varphi_n^{+} \qquad (5.9a)$$

$$\hat{\partial}^{\lambda_2}\left(\frac{\partial W_a^{+*}}{\partial(\underrightarrow{\check{\partial}^{\lambda_2}}\phi_n^{-})}\right)=\underline{\hat{\partial}^{\lambda_2}}\left(\kappa_2\hat{\partial}^{\lambda_1}\right)\varphi_n^{+} \qquad (5.9b)$$

$$\kappa_1\left(\check{\partial}_{\lambda_1}-\hat{\partial}^{\lambda_1}\right)\varphi_n^{+}+\kappa_2\left(\check{\partial}^{\lambda_2}\check{\partial}_{\lambda_1}+\hat{\partial}^{\lambda_2}\hat{\partial}^{\lambda_1}-\check{\partial}^{\lambda_2}\hat{\partial}^{\lambda_1}\right)\varphi_n^{+}=W_n^{+}\varphi_n^{+} \qquad (5.10)$$

This passive reciprocal field functions as the conjugate field of its opponent $\phi_n^{-}$, pairing with the equation (5.16).

# 3. Yin Potential Fields

In the events of the physical supremacy in parallel fashion, a chain of the event actors in the flows of Figure 4a can be shown by and underlined in the sequence of the following processes:

$$W^- : (\underline{\check{\partial}_{\lambda_1}} \to \check{\partial}^{\lambda_2}), (\underline{\hat{\partial}^{\lambda_2}} \to \hat{\partial}_{\lambda_3})\ ;\ \ W^+ : (\underline{\hat{\partial}^{\lambda_1}} \to \hat{\partial}_{\lambda_2}), (\underline{\check{\partial}^{\lambda_2}} \to \check{\partial}_{\lambda_3}) \tag{5.11}$$

With the event actors of $\check{\partial}_{\lambda_1}$ and $\hat{\partial}^{\lambda_2}$, the World Equations becomes the following:

$$W_a^- = \left(W_n^- + \kappa_1 \underline{\check{\partial}_{\lambda_1}}\right)\ \phi_n^+ \phi_n^- + \kappa_2 \underline{\hat{\partial}^{\lambda_2}} \left(\phi_n^+ \check{\partial}_{\lambda_1} \phi_n^- + \phi_n^- \check{\partial}_{\lambda_1} \phi_n^+\right) \cdots \tag{5.12}$$

where $W_n^- = W_n^-(\mathbf{r}, t_0)$ are the time invariance potentials in $Y^-$ manifold. Rising from its opponent fields of $\phi_n^+$ in parallel fashion, the dynamic reactions under the $Y^+$ manifold continuum give rise to the following Motion Operations of the $Y^-$ state fields $\phi_n^-$ approximated at the first and second orders of perturbations in term of the above World Equations:

$$\frac{\partial W_a^-}{\partial \phi_n^+} = W_n^- \left(\mathbf{x}, t_0\right) \phi_n^- + \kappa_1 \check{\partial}_{\lambda_1} \phi_n^- + \kappa_2 \hat{\partial}^{\lambda_2} \check{\partial}_{\lambda_1} \phi_n^- \tag{5.13}$$

$$\hat{\partial}^{\lambda_1} \left(\frac{\partial W_a^-}{\partial (\check{\partial}_{\lambda_1} \phi_n^+)}\right) = \left(\kappa_1 + \kappa_2 \hat{\partial}^{\lambda_2}\right) \underline{\hat{\partial}^{\lambda_1}} \phi_n^- \tag{5.14}$$

$$\check{\partial}_{\lambda_2} \left(\frac{\partial W_a^-}{\partial (\hat{\partial}^{\lambda_2} \phi_n^+)}\right) = \underline{\check{\partial}_{\lambda_2}} \left(\kappa_2 \check{\partial}_{\lambda_1} \phi_n^-\right) \tag{5.15}$$

where the potentials of $\check{\partial}_{\lambda_1} \phi_n^+$ and $\hat{\partial}^{\lambda_2} \phi_n^+$ give rise simultaneously and orderly to their opponent's reactors of the virtual event operation $\hat{\partial}^{\lambda_1}$ and the physical event operation $\check{\partial}_{\lambda_2}$, respectively. Upon these interwoven relationships, the motion operations of (4.4) determines a linear partial differential equation of the state function $\phi_n^-$ under the supremacy of physical dynamics at the $Y\{x_\mu\}$ manifold:

$$\kappa_1 \left(\hat{\partial}^{\lambda_1} - \check{\partial}_{\lambda_1}\right) \phi_n^- + \kappa_2 \left(\hat{\partial}^{\lambda_2} \hat{\partial}^{\lambda_1} + \check{\partial}_{\lambda_2} \check{\partial}_{\lambda_1} - \hat{\partial}^{\lambda_2} \check{\partial}_{\lambda_1}\right) \phi_n^- = W_n^- \phi_n^- \tag{5.16}$$

giving rise to the $Y^-$ General Fields from each of the respective opponents during their virtual interactions.

# 4. Yin Reciprocal Fields

In the parallel and passive reaction, the event provokes its conjugate during the same sequence, elaborating its reciprocal field:

$$W^{-}:(\check{\partial}_{\lambda_1}\to \underline{\check{\partial}^{\lambda_2}}),(\hat{\partial}^{\lambda_2}\to \underline{\hat{\partial}_{\lambda_3}}),\qquad W^{+}:(\hat{\partial}^{\lambda_1}\to \underline{\hat{\partial}_{\lambda_2}}),(\check{\partial}^{\lambda_2}\to \underline{\check{\partial}_{\lambda_3}}) \tag{5.17}$$

$$(W_a^{-})^{*}=\left(W_n^{+}+\kappa_1\check{\partial}^{\lambda_2}\right)\varphi_n^{+}\varphi_n^{-}+\kappa_2\hat{\partial}_{\lambda_3}\left(\varphi_n^{+}\check{\partial}^{\lambda_2}\varphi_n^{-}+\varphi_n^{-}\check{\partial}^{\lambda_2}\varphi_n^{+}\right)\cdots \tag{5.18}$$

Similarly, applying the Motion Operations of (4.3), it elaborates another partial differential equation of the opponent fields $\varphi_n^{+}$ under the $Y\{x^{\nu}\}$ manifold:

$$\frac{\partial(W_a^{-*})}{\partial\phi_n^{+}}=W^{+}\varphi_n^{-}+\kappa_1\check{\partial}^{\lambda_2}\varphi_n^{-}+\kappa_2\hat{\partial}_{\lambda_3}\check{\partial}^{\lambda_2}\varphi_n^{-} \tag{5.19a}$$

$$\hat{\partial}_{\lambda_2}\Big(\frac{\partial(W_a^{-*})}{\partial(\check{\partial}^{\lambda_2}\phi_n^{+})}\Big)=\hat{\partial}_{\lambda_2}\big(\kappa_1+\kappa_2\hat{\partial}_{\lambda_3}\big)\varphi_n^{-} \tag{5.19b}$$

$$\check{\partial}_{\lambda_3}\Big(\frac{\partial(W_a^{-*})}{\partial(\hat{\partial}_{\lambda_3}\phi_n^{+})}\Big)=\check{\partial}_{\lambda_3}\big(\kappa_2\check{\partial}^{\lambda_2}\varphi_n^{-}\big) \tag{5.19c}$$

$$\kappa_1\big(\hat{\partial}_{\lambda_2}-\check{\partial}^{\lambda_2}\big)\varphi_n^{-}+\kappa_2\big(\hat{\partial}_{\lambda_3}\hat{\partial}_{\lambda_2}+\check{\partial}_{\lambda_3}\check{\partial}^{\lambda_2}-\hat{\partial}_{\lambda_3}\check{\partial}^{\lambda_2}\big)\varphi_n^{-}=W_n^{-}\varphi_n^{-} \tag{5.20}$$

This passive reciprocal field functions as the conjugate field of $\phi_n^{+}$, a doublet with the equation (5.6).

# 5. Yang Universal Dynamics

In the global environment, the $Y^-Y^+$ dark energies have their commutations at operational uniformity to maintain a duality of their equal primacy. Assume the events are exerted homogeneously $\lambda_i \mapsto \lambda$ at the indistinct time $\lambda_t \mapsto t$ instantaneously and simultaneously. From the density equations, the physical events simultaneously operate another dual state $\{\phi_n^+, \varphi_n^-\}$ and their movements, $\dot{\partial}_\lambda \left(\varphi_n^+ \phi_n^-\right)$, that give rise to the $Y^+$ fluxions of continuity and are associated with its density $\rho_n^+$ and its current $\mathbf{j}_\mathbf{n}^+$. After the rearrangement given by the equations of (5.6) paired with (5.20), the successive operations entangle the scalar potentials in fluxions streaming a set of the $Y^+$ *Universal Fields* into another pair of the $Y^-Y^+$ motion dynamics: one symmetry $\dot{\partial}_\lambda \mathbf{f}_s^+$ continuity and another asymmetric $\dot{\partial}_\lambda \mathbf{f}_a^+$ motion dynamics, respectively.

$$\kappa_2 \varphi_n^- \left(\hat{\partial}_{\lambda_3} \hat{\partial}_{\lambda_2}\right) \phi_n^+ = \varphi_n^- W_n^+ \phi_n^+ - \kappa_1 \varphi_n^- \left(\check{\partial}^{\lambda_2} - \hat{\partial}_{\lambda_2}\right)^+ \phi_n^+ - \kappa_2 \varphi_n^- \check{\partial}_{\lambda_3} \left(\check{\partial}^{\lambda_2} - \hat{\partial}_{\lambda_2}\right) \phi_n^+ \tag{5.21}$$

$$\begin{aligned} \kappa_2 \phi_n^+ \left(\check{\partial}^{\lambda_3} \check{\partial}^{\lambda_2}\right) \varphi_n^- &= \phi_n^+ W_n^- \varphi_n^- + \kappa_1 \phi_n^+ \left(\check{\partial}^{\lambda_2} - \hat{\partial}_{\lambda_2}\right) \varphi_n^- - \kappa_2 \phi_n^+ \left(\check{\partial}_{\lambda_3} - \hat{\partial}_{\lambda_2}\right) \check{\partial}^{\lambda_2} \varphi_n^- \\ &+ \kappa_2 \phi_n^+ \left(\check{\partial}^{\lambda_3} \check{\partial}^{\lambda_2}\right) \varphi_n^- - \kappa_2 \phi_n^+ \left(\hat{\partial}_{\lambda_3} \hat{\partial}_{\lambda_2}\right) \varphi_n^- \end{aligned} \tag{5.22}$$

Add the above two equations together, we have the $Y^+$ ***Continuity of Flux Density*** that is consisted of the four scalar potentials:

$$\dot{\partial}_\lambda \mathbf{f}_s^+ = \kappa_2 \langle \hat{\partial}_\lambda \hat{\partial}_\lambda, \check{\partial}^\lambda \check{\partial}^\lambda \rangle^+ = \langle W_0 \rangle^+ - \kappa_1 \left[\check{\partial}^{\lambda_2} - \hat{\partial}_{\lambda_2}\right] + \kappa_2 \left\langle \check{\partial}_{\lambda_3} \left(\check{\partial}^{\lambda_2} - \hat{\partial}_{\lambda_2}\right) \right\rangle_s^+ + \mathbf{g}_a^- / \kappa_g^- \tag{5.23}$$

$$\mathbf{g}_a^- / \kappa_g^- = \phi_n^+ \left(\check{\partial}^{\lambda_3} \check{\partial}^{\lambda_2} - \hat{\partial}_{\lambda_3} \hat{\partial}_{\lambda_2}\right) \varphi_n^- + \phi_n^+ \hat{\partial}_{\lambda_2} \left(\check{\partial}^{\lambda_2} - \check{\partial}_{\lambda_3}\right) \varphi_n^- \equiv -\left(\hat{\partial}_{\lambda_3} \hat{\partial}_{\lambda_2} - \check{\partial}^{\lambda_3} \check{\partial}^{\lambda_2}\right\rangle^+ - \zeta^+ \tag{5.24}$$

where $\mathbf{g}_a^-$ is an acceleration tensor of the $Y^-$ asymmetric motion dynamics, and $\kappa_g^-$ is the acceleration coefficient. Under the symmetric stability, it requires or maps the movement equivalence $\mathbf{g}_a^- \mapsto 0$ or a constant, in order to balance its $Y^+$ supremacy of flux continuity, known as the $Y^+$ continuity equation $\dot{\partial}_\lambda \mathbf{f}_s^+ = K_s^+$.

Because of the $Y^+$ supremacy in symmetry, the above equation $\mathbf{g}_a^-$ has an outcome to an asymmetry of the $Y^-$ subordination, we derive the acceleration tensor $\mathbf{g}_a^- \mapsto 0$ of the $Y^+$ asymmetric dynamics as the following:

$$\left(\hat{\partial}_{\lambda_3} \hat{\partial}_{\lambda_2} - \check{\partial}^{\lambda_3} \check{\partial}^{\lambda_2}\right\rangle^+ = -\zeta^+ \qquad : \mathbf{g}_a^- / \kappa_g^- = 0, \qquad \zeta^+ = \hat{\partial}_{\lambda_2} \left(\check{\partial}^{\lambda_2} - \check{\partial}_{\lambda_3}\right\rangle_s^+ \tag{5.25}$$

Under the balance of both symmetry and asymmetry, the asymmetric items appeared in the $Y^+$ continuity of density are vanished during asymmetric formulation of the commutative dynamics. Generally, the $\zeta^+ \neq 0$ represents the $Y^+$ ***asymmetric conservation.*** *As* a precise duality, it coexists with symmetric continuity to extend discrete subgroups, and exhibits additional dynamics to operate world-line motions and carry on the symmetric system.

The above equations characterize the derivative fluxions $\dot{\partial}\mathbf{f}^{+}$ at both symmetric $\dot{\partial}_{\lambda}\mathbf{f}_{s}^{+}$ continuity and asymmetric $\dot{\partial}_{\lambda}\mathbf{f}_{a}^{+}$ dynamics, which are the tunneling transportation $\left(\check{\partial}^{\lambda}, \hat{\partial}_{\lambda}\right)$ for crossover communications and resonances between the virtual and physical manifolds, bi-directionally. Therefore, the equations of $Y^{+}$ *General Dynamics* feature the $Y^{+}$ ***Transforming Continuity*** and represent the virtual supremacy for not only the symmetric acceleration $\dot{\partial}_{\lambda}\mathbf{f}_{s}^{+}$ forces but also, simultaneously, the asymmetric motion processes $\dot{\partial}_{\lambda}\mathbf{f}_{a}^{+}$, transforming messages for creations or annihilations. It is the asymmetric tensor $\mathbf{g}_{a}^{-} = \kappa_{g}^{-}\dot{\partial}\mathbf{f}_{a}^{-}$ that exerts forces to a cosmological system traveling on the world lines.

# 6. Yang Entanglement Principles

The $Y^{+}$ entanglement represents the important principles of the natural governances, named as Law of Virtual Creation and Annihilation:

1. *The operational action $\hat{\partial}^{\lambda_2}$ of virtual supremacy results in the physical effects as the parallel and reciprocal reactions or emanations $\check{\partial}_{\lambda_3}$ in the physical world; and*
2. *Although the bi-directional transformations are balanced between the transitional operations of $\hat{\partial}_{\lambda_2}$ and $\check{\partial}^{\lambda_2}$, the virtual world transports the effects $\hat{\partial}_{\lambda_3}\hat{\partial}_{\lambda_2}$ emerging into or appearing as the creations of the physical world.*
3. *As a part of the reciprocal processes, the physical world transports the reactive effects $\check{\partial}^{\lambda}\check{\partial}^{\lambda}$ concealing back or disappearing as the annihilations of the virtual world.*

As one set of the universal laws, the events incepted in the virtual world not only generate its opponent reactions but also create the real-life objects in the physical world. An obvious example is the formations of the elementary particles that i) the antiparticles in the virtual world generate the physical particles through their opponent duality of the event operations; ii) by carrying and transitioning the informational massages, the antiparticles grow into more real-life objects in the physical world through their event operations; and iii) recycling the physical world as one of the continuity processes for the virtual-life steamings.

The formation of the elementary particles is the proposition beyond or before the scope of this manuscript that will be strategically revealed as a part of this series in the reverse order back to the future.

# 7. Yin Universal Dynamics

Because of the dual state fields $\{\phi_n^-, \varphi_n^+\}$, their internal opponents entangle each of their complex conjugate as an integrity of which statistically represents the continuity of dark fluxions. From the world equation, the virtual events evolve and operate the density movements, $\dot{\partial}_\lambda\left(\varphi_n^+\phi_n^-\right)$, that give rise to the $Y^-$ fluxion of the continuity equation and are associated with its density $\rho_n^-$, and its current $\mathbf{j}_n^-$. Given by the equations of (5.16) paired with (5.9)

$$\kappa_2\varphi_n^+\left(\hat{\partial}^{\lambda_2}\hat{\partial}^{\lambda_1}\right)\phi_n^- = \varphi_n^+W_n^-\phi_n^- + \varphi_n^+\kappa_1\left(\check{\partial}_{\lambda_1} - \hat{\partial}^{\lambda_1}\right)\phi_n^- - \kappa_2\left(\check{\partial}^{\lambda_2} - \hat{\partial}^{\lambda_2}\right)\check{\partial}_{\lambda_1}\phi_n^- \qquad (5.28)$$

$$\kappa_2\phi_n^-\left(\check{\partial}_{\lambda_2}\check{\partial}_{\lambda_1}\right)\varphi_n^+ = \phi_n^-W_n^+\varphi_n^+ - \phi_n^-\kappa_1\left(\check{\partial}_{\lambda_1} - \hat{\partial}^{\lambda_1}\right)\varphi_n^+ + \kappa_2\check{\partial}^{\lambda_2}\left(\hat{\partial}^{\lambda_1} - \check{\partial}_{\lambda_1}\right)\varphi_n^+$$
$$+\kappa_2\phi_n^-\left(\check{\partial}_{\lambda_2}\check{\partial}_{\lambda_1}\right)\varphi_n^+ - \kappa_2\phi_n^-\left(\hat{\partial}^{\lambda_2}\hat{\partial}^{\lambda_1}\right)\varphi_n^+ \qquad (5.29)$$

the successive operations entangle the scalar potentials in fluxions streaming a set of the $Y^-$ *Universal Fields* into another pair of the $Y^-Y^+$ motion dynamics: one symmetry $\dot{\partial}_\lambda\mathbf{f}_s^-$ continuity and another asymmetric $\dot{\partial}_\lambda\mathbf{f}_a^-$ motion dynamics, respectively.

Add the above two equations together, we have the $Y^-$ ***Continuity of Flux Density*** that consists of the four scalar potentials.

$$\dot{\partial}_\lambda\mathbf{f}_s^- = \kappa_2\left\langle\check{\partial}_\lambda\check{\partial}_\lambda, \hat{\partial}^\lambda\hat{\partial}^\lambda\right\rangle^- = \langle W_0^-\rangle + \kappa_1\left[\check{\partial}_{\lambda_1} - \hat{\partial}^{\lambda_1}\right]_v^- + \kappa_2\left\langle\check{\partial}_{\lambda_1}\left(\hat{\partial}^{\lambda_2} - \check{\partial}^{\lambda_2}\right)\right\rangle_v^- + \mathbf{g}_a^+/\kappa_g^+ \qquad (5.30)$$

$$\mathbf{g}_a^+/\kappa_g^+ = \phi_n^-\left(\check{\partial}_{\lambda_2}\check{\partial}_{\lambda_1} - \hat{\partial}^{\lambda_2}\hat{\partial}^{\lambda_1}\right)\varphi_n^+ + \phi_n^-\left(\check{\partial}^{\lambda_2}\hat{\partial}^{\lambda_1} - \hat{\partial}^{\lambda_2}\check{\partial}_{\lambda_1}\right)\varphi_n^+ \equiv \left(\check{\partial}_{\lambda_2}\check{\partial}_{\lambda_1} - \hat{\partial}^{\lambda_2}\hat{\partial}^{\lambda_1}\right\rangle^- + \zeta^- \quad (5.31)$$

where $\mathbf{g}_a^+$ is an acceleration tensor of the $Y^+$ asymmetric motion dynamics, and $\kappa_g$ is the acceleration coefficient. Under the symmetric stability, it motives or projects the movement equivalence $\mathbf{g}_a^+ \mapsto 0$ to balance its $Y^-$ supremacy of flux continuity, known as the $Y^-$ continuity equation $\dot{\partial}_\lambda\mathbf{f}_s^- = K_s^-$.

Because of the $Y^-$ supremacy in symmetry, the above equation $\mathbf{g}_a^+$ has an outcome to an asymmetry of the $Y^+$ subordination for the acceleration tensor $\mathbf{g}_a^+ \mapsto 0$ of the $Y^+$ asymmetric dynamics as the following:

$$\left(\check{\partial}_\lambda\check{\partial}_\lambda - \hat{\partial}^\lambda\hat{\partial}^\lambda\right\rangle^- = -\zeta^- \qquad : \mathbf{g}_a^+/\kappa_g^+ = 0, \qquad \zeta^- = \left(\check{\partial}^{\lambda_2}\hat{\partial}^{\lambda_1} - \hat{\partial}^{\lambda_2}\check{\partial}_{\lambda_1}\right\rangle_s^- \qquad (5.32)$$

Under the balance of both symmetry and asymmetry, the asymmetric items appeared in the $Y^-$ continuity of density are vanished during asymmetric formulation of the commutative dynamics. Generally, the $\zeta^- \neq 0$ represents the $Y^-$ ***asymmetric conservation****. As* an impeccable duality, which coexists with symmetric continuity to extend discrete subgroups and exhibits additional dynamics to balance with world-line motions and supplement to the symmetric system.

The above equations characterize the derivative fluxions $\dot{\partial}\mathbf{f}^-$ at both symmetric $\dot{\partial}_\lambda \mathbf{f}_s^-$ continuity and asymmetric $\dot{\partial}_\lambda \mathbf{f}_a^-$ dynamics, which are the parallel motions $(\check{\partial}_\lambda, \hat{\partial}^\lambda)$ for mirroring reactions between the physical and virtual manifolds, correspondently and cohesively. Therefore, the equations of $Y^-$ *General Dynamics* feature $Y^-$ ***Mirroring Continuity*** and represent the physical supremacy for not only the symmetric force $\dot{\partial}_\lambda \mathbf{f}_s^-$ reactions but also, simultaneously, the asymmetric motion expenditure $\dot{\partial}_\lambda \mathbf{f}_a^-$, reflecting messages for generations or reproductions. It is the asymmetric tensor $\mathbf{g}^+ = \kappa_g^+ \dot{\partial}\mathbf{f}_a^+$ that reacts to forces as a cosmological object moving on the world lines.

# 8. Yin Entanglement Principles

The $Y^{-}$ parallel entanglement represents the important principles of the natural behaviors, named as Law of Physical Animation and Reproduction:

1. *The operational actions $\check{\partial}_{\lambda_i}$ of physical supremacy results in their conjugate or imaginary effects of animations because of the parallel reactions $\hat{\partial}^{\lambda_i}$ in the virtual world;*
2. *Neither the actions nor reactions impose their final consequences to their opponents as the parallel mirroring residuals for the horizon phenomena $\check{\partial}_{\lambda}\check{\partial}_{\lambda}$ of reproductions during the symmetric fluxions;*
3. *There is a one-way commutations of $\check{\partial}^{\lambda}$ in transporting the events of the physical world into the virtual world asymmetrically. As a part of the reciprocal processes, the virtual world replicates $\hat{\partial}^{\lambda}$ the physical events during the mirroring $\check{\partial}^{\lambda}$ processes in the virtual world.*

As another set of the laws, the events initiated in the physical world must leave a life copy of its mirrored images in the virtual world without an intrusive effects to the virtual world. In other words, the virtual world is aware of and immune to the physical world. In this perspective, continuity for a virtual-life steaming might become possible after recycling a real-life in the physical world.

# 9. Entangle Invariance

For the flux steaming $\dot{\partial}_\lambda \mathbf{f}^\pm$, the dynamic entanglements shall be operated and balanced by the dark energies providing the common resources between the physical and virtual existence. It has the conservation of entanglements, as follows.

1. *At least two types of densities are required in order to entangle fluxions.*
2. *Flux transports and performs as a duality of virtual fields and real forces.*
3. *Total fluxion of an entangle steaming must be sustainable as a constant.*
4. *Flux remains constant and conserves over time during its transportation.*
5. *Transportation of entangle momentum is conserved at its zero net value.*
6. *Neither can a fluxion density be created nor destroyed for entanglement.*
7. *Momentum is changeable through relational actions among participants.*

The above statement represents *Law of Conservation of Entanglements*, or simply *Entangle Invariance*. Conservation of momentum applies only to an isolated system of the entangle objects as a whole. Under this condition, an isolated system is one that is not acted on by objects external to the system, and that both entanglers are closed in a virtual space irrelevant to their physical distance.

# 10. Universal Equations

As a summary, this chapter has derived the *Universal Equations* general to all of the principal equations, important assumptions, and essential laws, discovered and described by the classical and modern physics. The *Universal Equations* can be characterized into three scopes of physics as the following:

***First Universal Equations*** - At the first horizon, the particles give rise to i) a first pair of the $Y^+$ potential fields;

$$\varphi_n^-\left(\kappa_1+\kappa_2\check{\partial}_{\lambda_3}\right)\left(\check{\partial}^{\lambda_2}-\hat{\partial}_{\lambda_2}\right)\phi_n^+ + \kappa_2\varphi_n^-\left(\hat{\partial}_{\lambda_3}\hat{\partial}_{\lambda_2}\right)\phi_n^+ = \varphi_n^- W_n^+\phi_n^+ \tag{5.34}$$

$$\phi_n^+\left(\kappa_1+\kappa_2\hat{\partial}_{\lambda_3}\right)\left(\hat{\partial}_{\lambda_2}-\check{\partial}^{\lambda_2}\right)\varphi_n^- + \kappa_2\phi_n^+\left(\check{\partial}_{\lambda_3}\check{\partial}^{\lambda_2}\right)\varphi_n^- = \phi_n^+ W_n^-\varphi_n^- \tag{5.35}$$

and ii) the second pair of the potential fields under the $Y^-$-supremacy:

$$\varphi_n^+\left(\kappa_1+\kappa_2\hat{\partial}^{\lambda_2}\right)\left(\hat{\partial}^{\lambda_1}-\check{\partial}_{\lambda_1}\right)\phi_n^- + \kappa_2\varphi_n^+\left(\check{\partial}_{\lambda_2}\check{\partial}_{\lambda_1}\right)\phi_n^- = \varphi_n^+ W_n^-\phi_n^- \tag{5.36}$$

$$\phi_n^-\left(\kappa_1+\kappa_2\check{\partial}^{\lambda_2}\right)\left(\check{\partial}_{\lambda_1}-\hat{\partial}^{\lambda_1}\right)\varphi_n^+ + \kappa_2\phi_n^-\left(\hat{\partial}^{\lambda_2}\hat{\partial}^{\lambda_1}\right)\varphi_n^+ = \phi_n^- W_n^+\varphi_n^+ \tag{5.37}$$

Together, they unfold *the fields* of *Quantum* mechanics and *Thermodynamics*.

***Second Universal Equations*** - At the second horizon, the fluxion fields give rise to the third pair of the continuities:

$$\dot{\partial}_\lambda \mathbf{f}_x^+ = \kappa_2\langle\hat{\partial}_\lambda\hat{\partial}_\lambda, \check{\partial}^\lambda\check{\partial}^\lambda\rangle^+ = \langle W_0\rangle^+ - \kappa_1\left[\check{\partial}^{\lambda_2}-\hat{\partial}_{\lambda_2}\right]_x^+ + \kappa_2\left\langle\check{\partial}_{\lambda_3}\left(\check{\partial}^{\lambda_2}-\hat{\partial}_{\lambda_2}\right)\right\rangle_x^+ \tag{5.38}$$

$$\dot{\partial}_\lambda \mathbf{f}_x^- = \kappa_2\langle\check{\partial}_\lambda\check{\partial}_\lambda, \hat{\partial}^\lambda\hat{\partial}^\lambda\rangle^- = \langle W_0^-\rangle + \kappa_1\left[\check{\partial}_{\lambda_1}-\hat{\partial}^{\lambda_1}\right]_x^- + \kappa_2\left\langle\check{\partial}_{\lambda_1}\left(\hat{\partial}^{\lambda_2}-\check{\partial}^{\lambda_2}\right)\right\rangle_x^- \tag{5.39}$$

where s can be either a scalar or vector field. The equations are translatable to the symmetric fields and forces of *Photon*, *Graviton*, *Electromagnetism*, and *Gravitation*.

***Third Universal Equations*** - At the third horizon, the asymmetric dynamics gives rise to the forth pair of the fields:

$$\mathbf{g}_a^-/\kappa_g^- = \left[\hat{\partial}_\lambda\hat{\partial}_\lambda, \check{\partial}^\lambda\check{\partial}^\lambda\right]_x^+ + \zeta^+ \qquad : \zeta^+ = \left(\hat{\partial}_{\lambda_2}\check{\partial}^{\lambda_2} - \check{\partial}_{\lambda_3}\hat{\partial}_{\lambda_2}\right\rangle_x^+ \tag{5.40}$$

$$\mathbf{g}_a^+/\kappa_g^+ = \left[\check{\partial}_\lambda\check{\partial}_\lambda, \hat{\partial}^\lambda\hat{\partial}^\lambda\right]_x^- + \zeta^- \qquad : \zeta^- = \left(\hat{\partial}^{\lambda_1}\check{\partial}^{\lambda_2} - \hat{\partial}^{\lambda_2}\check{\partial}_{\lambda_1}\right\rangle_x^- \tag{5.41}$$

$$\left[\hat{\partial}_\lambda\hat{\partial}_\lambda, \check{\partial}^\lambda\check{\partial}^\lambda\right]_x^\pm \equiv \phi_n^\pm\left[\hat{\partial}_\lambda\hat{\partial}_\lambda, \check{\partial}^\lambda\check{\partial}^\lambda\right]\varphi_n^\mp \tag{5.42}$$

where the index x refers to either of the scalar or vector potential and the symbol [ ] is a commutator of *Lie* bracket. This pair of equations deciphers the asymmetric fields and forces at world-line movements of cosmological objects.

Throughout the rest of this manuscript, the application of an evolutionary process to contemporary physics will derive a unified theory from *Newtonian* to quantum mechanics, to photon and graviton, to spacetime cosmology, and beyond.

# Communication Infrastructure

CHAPTER VI

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, commutations, spin grids, tunnels, informatics, and so forth. As the core parts of the infrastructure, they harmonize the virtual and physical components of our universal systems and commoditize with the $Y^{-}Y^{+}$ interoperation 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 $\check{\partial}_t x_m = \left(ic, c\check{\mathbf{b}}\right)$ and $\hat{\partial}^t x^\mu = \left(-ic, c\hat{\mathbf{b}}\right)$ 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 purposely constructed for tunneling between the $Y^{-}Y^{+}$ domains of dark energies, which is mathematically describable by transformations between the manifolds.

# 1. YinYang Processes

As a part of the *Universal Topology*, a communication infrastructure formalizes the ontological processes in mathematical presentation driven by axiomatic creators and evolutions of the event operations that transform and transport informational messages and conveyable actions. Empowered with the speed of light, the *two-dimensional* $\{\mathbf{r} \mp i\mathbf{k}\}$ communication of the *World Planes* is naturally contracted for tunneling between the $Y^-$ and $Y^+$ domains at both local residual and relativistic interaction among virtual dark and physical massive energies, which is mathematically describable by local invariances and relativistic commutations of entanglements cycling reciprocally and looping consistently among the four potential fields of the dual manifolds.

Remarkably, there are the environmental settings of originators and commutators that establish entanglements between the manifolds as a duality of the $Y^-Y^+$ infrastructures for the life transformation, transportation, or commutation simultaneously and complementarily. When the event $\lambda = t$ operates at constant speed *c*, the $Y^-Y^+$ dynamics incepts the matrices of (3.1-3.2) and (3.5,3.7) at the second horizon of the world planes. Each world contracts a two-dimensional manifold, generates a pair of the boost and spiral transportations, and entangles an infinite loop between the manifolds:

$$\hat{\partial}^\lambda \circlearrowleft \hat{\partial}_\lambda \rightleftharpoons \check{\partial}^\lambda \circlearrowright \check{\partial}_\lambda \qquad : x_m \in \{ict, \tilde{r}\},\ x^\mu \in \{-ict, \tilde{r}\} \qquad (6.1)$$

This infrastructure has a set of constituents, named as *Generators* which are a group of the irreducible foundational matrices and constructs a variety of the applications in forms of horizon evolution, fields or forces. At the second horizon *SU*(2), the *Generators* institutes the infrastructure with a set of the metric signatures, *Local* originators, the *Horizon* commutators. For example, it features *Pauli* matrices, *Gamma* matrices, *Dirac* basis, *Weyl* spinors, *Majorana* basis, etc. At the third horizon *SU*(3) in the parallel fashion, another infrastructure institutes, but are not limited to, the symmetric and asymmetric transform or transport fields featuring electromagnetism, gravitation, weak, and strong forces, cosmological fields, etc.

Both manifolds $\hat{x}\{\mathbf{r} - i\mathbf{k}\}$ and $\check{x}\{\mathbf{r} + i\mathbf{k}\}$ simultaneously govern and alternatively perform the event operations as one integral stream of any physical and virtual dynamics. Apparently, the virtual positions $\pm i\mathbf{k}$ naturally forms a duality of the conjugate manifolds: $x^\nu \in \hat{x}\{\mathbf{r} - i\mathbf{k}\}$ and $x_m \in \check{x}\{\mathbf{r} + i\mathbf{k}\}$. Each of the super two-dimensional coordinate system $G(\lambda) \in G\{\mathbf{r} \pm i\mathbf{k}\}$ constitutes its *World Plane* $W^- \in G(\lambda = t)$ or $W^+ \in G(\lambda = t)$ distinctively, forms a duality of the universal topology $W^\mp = P \pm iV$ cohesively, and maintains its own sub-coordinate system $\mathbf{r}$ or $\mathbf{k}$ extendable, respectively. A sub-coordinate system has its own rotational freedom of either physical sub-dimensions $\mathbf{r}(\theta, \varphi)$ or virtual sub-dimensions $\mathbf{k}(x^0, \cdots)$. Together, they compose two rotational manifolds as a reciprocal or conjugate duality operating and balancing the world events.

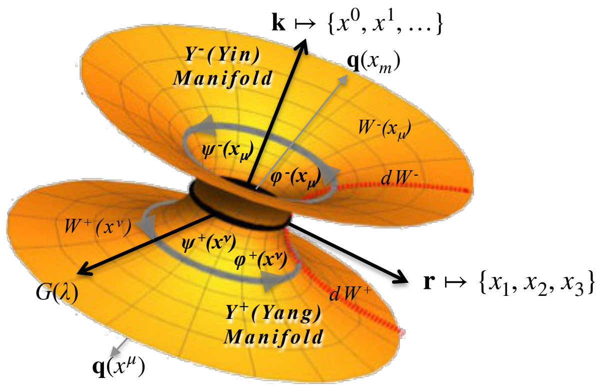



*Figure 6a: Dual Manifolds of Communication Infrastructure*

# 2. Boost Generators

On the world planes at a constant speed *c*, this event flow naturally describes and concisely derives a set of the *Boost* matrix tables as the *Quadrant-State*:

$$S_2^+ = \frac{\partial x^\nu}{\partial x^m} = \begin{pmatrix} 1 & -i \\ i & 1 \end{pmatrix} \equiv s_0 + i s_2 \qquad : \hat{\partial}^\lambda = \dot{x}^m S_2^+ \partial^\nu \tag{6.2a}$$

$$S_1^+ = \frac{\partial x^\nu}{\partial x_m} = \begin{pmatrix} -1 & -i \\ -i & 1 \end{pmatrix} \equiv s_3 - i s_1 \qquad : \hat{\partial}_\lambda = \dot{x}_m S_1^+ \partial^\nu \tag{6.2b}$$

$$S_1^- = \frac{\partial x_m}{\partial x^\nu} = \begin{pmatrix} -1 & i \\ i & 1 \end{pmatrix} \equiv s_3 + i s_1 \qquad : \check{\partial}^\lambda = \dot{x}^\nu S_1^- \partial_m \tag{6.2c}$$

$$S_2^- = \frac{\partial x_m}{\partial x_\nu} = \begin{pmatrix} 1 & i \\ -i & 1 \end{pmatrix} \equiv s_0 - i s_2 \qquad : \check{\partial}_\lambda = \dot{x}_\nu S_2^- \partial_m \tag{6.2d}$$

The $S_1^\pm$ matrices are a duality of the horizon settings for transformation between the two-dimensional world planes. The $S_2^\pm$ matrices are the local or residual settings for $Y^-$ or $Y^+$ transportation within their own manifold, respectively. Defined as the *Infrastructural Boost Generators*, this $s_\kappa$ group consists of the distinct members, shown by the following:

$$s_\kappa = \left[ \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}_0, \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}_1, \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}_2, \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}_3 \right] \tag{6.3}$$

Intuitively simplified to a group of the 2x2 matrices, the infinite (6.1) loops of entanglements compose an integrity of the boost generators $s_n$ that represents law of conservation of life-cycle transform continuity of motion dynamics, shown by the following:

$$[s_a, s_b] = 2\varepsilon_{cba}^- s_c \qquad \langle s_a, s_b \rangle = 0 \qquad : a, b, c \in \{1,2,3\} \tag{6.4}$$

where the *Levi-Civita* [22] connection $\varepsilon_{cba}^-$ represents the right-hand chiral. In accordance with our philosophical anticipation, the non-zero commutation reveals the loop-processes of entanglements, reciprocally. The zero continuity illustrates the conservations of virtual supremacy that are either extensible from or degradable back to the global two-dimensions of the world planes.

# 3. Torque Generators

Simultaneously on the world planes at a constant speed, the loop event naturally describes and concisely elaborates another set of the *Spiral* matrix tables. The world planes are supernatural or intrinsic at the two-dimensional coordinates presentable as a vector calculus in polar coordinates. Because of the superphase modulation, in *Cartesian* coordinates all *Christoffel* symbols vanish, which implies the superphase modulation becomes hidden. Therefore, we consider the polar manifold $\{\tilde{r}, \pm i\tilde{\vartheta}\} \in \mathscr{R}^2$ that a physical world has its superposition $\tilde{r}$ superposed with the virtual world through the superphase $\vartheta$ coordinate:

$$ds^2 = (d\tilde{r} + i\tilde{r}d\tilde{\vartheta})(d\tilde{r} - i\tilde{r}d\tilde{\vartheta}) = d\tilde{r}^2 + \tilde{r}^2 d\tilde{\vartheta}^2 \tag{6.6}$$

$$x^m \in \check{x}\{\tilde{r}, +i\tilde{\vartheta}\},\ x^\nu \in \hat{x}\{\tilde{r}, -i\tilde{\vartheta}\} \tag{6.7}$$

The relationship of the metric tensor and inverse metric components is given straightforwardly by the following

$$\check{g}_{\nu\mu} = \hat{g}^{\nu\mu} = \begin{pmatrix} 1 & 0 \\ 0 & \tilde{r}^2 \end{pmatrix}, \qquad \check{g}^{\nu\mu} = \hat{g}_{\nu\mu} = \begin{pmatrix} 1 & 0 \\ 0 & \tilde{r}^{-2} \end{pmatrix} \tag{6.8}$$

where $\check{g}_{\nu\mu} \in Y^-$, and $\hat{g}^{\nu\mu} \in Y^+$. Normally, the coordinate basis vectors $\mathbf{b}_{\tilde{r}}$ and $\mathbf{b}_{\tilde{\vartheta}}$ are not orthonormal. Since the only nonzero derivative of a covariant metric component is $\check{g}_{_{\tilde{\vartheta}\tilde{\vartheta},\tilde{r}}} = 2\tilde{r}$, the toques in *Christoffel* symbols for polar coordinates are simplified to and become as a set of *Quadrant-State* matrices,

$$R_2^+ = x^\mu \overset{+}{\Gamma}_{\nu\mu a} = x^\mu \begin{pmatrix} 0 & \tilde{r} \\ \tilde{r} & -\tilde{r} \end{pmatrix} \equiv \epsilon_0 \tilde{r} + i\epsilon_2 \tilde{\vartheta} \qquad : \hat{\partial}^\lambda = \dot{x}^m R_2^+ \partial^\nu \tag{6.9a}$$

$$R_1^+ = x^\mu \overset{+}{\Gamma}{}^{\nu}_{\mu a} = x^\mu \begin{pmatrix} 0 & 1/\tilde{r} \\ 1/\tilde{r} & -\tilde{r} \end{pmatrix} \equiv \epsilon_3 \tilde{r} - i\epsilon_1 \tilde{\vartheta} \qquad : \hat{\partial}_\lambda = \dot{x}_m R_1^+ \partial^\nu \tag{6.9b}$$

$$R_1^- = x_s \overset{-}{\Gamma}{}^{m}_{s\alpha} = x_s \begin{pmatrix} 0 & 1/\tilde{r} \\ 1/\tilde{r} & -\tilde{r} \end{pmatrix} \equiv \epsilon_3 \tilde{r} + i\epsilon_1 \tilde{\vartheta} \qquad : \check{\partial}^\lambda = \dot{x}^\nu R_1^- \partial_m \tag{6.9c}$$

$$R_2^- = x_m \overset{-}{\Gamma}_{nma} = x_m \begin{pmatrix} 0 & \tilde{r} \\ \tilde{r} & -\tilde{r} \end{pmatrix} \equiv \epsilon_0 \tilde{r} - i\epsilon_2 \tilde{\vartheta} \qquad : \check{\partial}_\lambda = \dot{x}_\nu R_2^- \partial_m \tag{6.9d}$$

The $R_1^\pm$ matrices are a duality of the interactive settings for transportation between the two-dimensional world planes. The $R_2^\pm$ matrices are the residual settings for $Y^-$ and $Y^+$ transportation or within their own manifold, respectively. Defined as a set of the *Infrastructural Torque Generators*, this $\epsilon_\kappa$ group consists of the distinct members, featured as the following:

$$\epsilon_\kappa = \tilde{r}\left[\begin{pmatrix}0 & 1\\ 1 & 0\end{pmatrix}_0, \begin{pmatrix}0 & 0\\ 0 & -1\end{pmatrix}_1, \begin{pmatrix}0 & 0\\ 0 & 1\end{pmatrix}_2, \frac{1}{\tilde{r}^2}\begin{pmatrix}0 & 1\\ 1 & 0\end{pmatrix}_3\right] \tag{6.10}$$

As a group of the 2x2 matrices, the infinite (6.9) loops of entanglements institute an integrity of the spiral generators $\epsilon_n$ sourced by the transport generators $\epsilon_0$, shown by the following:

$$[\varepsilon_2, \varepsilon_1] = 0 = [\varepsilon_1, \varepsilon_0] \quad : \textit{Independent Freedom} \tag{6.11a}$$

$$[\varepsilon_2, \varepsilon_3] = \frac{1}{\tilde{r}} s_2 = [\varepsilon_3, \varepsilon_1] \quad : \textit{Force Exposions} \tag{6.11b}$$

$$[\varepsilon_2, \varepsilon_0] = \tilde{r}^2 s_2 = [\varepsilon_0, \varepsilon_1] \quad : \textit{Commutation Invariance} \tag{6.11c}$$

In accordance with our philosophical anticipation, the above commutations between manifolds reveals that

a. *Double loop entanglements are invariant and yield local independency, respectively.*
b. *Conservations of transportations are operated at the superposed world planes.*
c. *Spiral commutations generate the $s_2$ spinor to maintain its torsion conservation.*
d. *Commutative generators exert its physical contortion at inverse r-dependent.*

Besides, the continuity of life-cycle transportations has the characteristics of

$$\langle \varepsilon_3, \varepsilon_0 \rangle = \frac{2}{\tilde{r}} s_0 \qquad \langle \varepsilon_2, \varepsilon_1 \rangle = 2\tilde{r}\varepsilon_1 \tag{6.12a}$$

$$\langle \varepsilon_2, \varepsilon_3 \rangle = 2\varepsilon_3 = -\langle \varepsilon_3, \varepsilon_1 \rangle \qquad \langle \varepsilon_2, \varepsilon_0 \rangle = 2\tilde{r}\varepsilon_0 = -\langle \varepsilon_0, \varepsilon_1 \rangle \tag{6.12b}$$

It demonstrates the commutative principles among the torque generators:

a. *The entire torque is sourced from the inception of the transformation $s_0$ and the physical contorsion $\varepsilon_3$; and*
b. *Each of the physical or virtual torsion is driven by the real force $\varepsilon_3$ or superposing torsion $\varepsilon_0$, respectively.*

Similar to the boost generators, the double streaming torques orchestrate a set of the four-status.

# 4. Conservation of Superposed Torsion

At the constant speed, the divergence of the torsion tensors are illustrated by the following:

$$\nabla \cdot R_2^- = \frac{1}{\tilde{r}} \frac{\partial}{\partial \tilde{r}} \left( \epsilon_0 \tilde{r} \right) - \frac{1}{\tilde{r}} \frac{\partial}{\partial \tilde{\vartheta}} \left( i \epsilon_2 \tilde{\vartheta} \right) = (2\epsilon_0 - i\epsilon_2) \frac{1}{\tilde{r}} \qquad (6.13a)$$

$$\nabla \cdot R_1^- = \frac{1}{\tilde{r}} \frac{\partial}{\partial \tilde{r}} \left( \epsilon_3 \tilde{r} \right) + \frac{1}{\tilde{r}} \frac{\partial}{\partial \tilde{\vartheta}} \left( i \epsilon_1 \tilde{\vartheta} \right) = i\epsilon_1 \frac{1}{\tilde{r}} \qquad (6.13b)$$

Because of the $Y^- Y^+$ reciprocity, each superphase $\tilde{\vartheta}$ is paired at its mirroring spiral opponent. Remarkably, on the world planes at $\tilde{r} = 0$, the total of each $Y^- Y^+$ torsion derivatives is entangling without singularity and yields invariant, introduced at 8:17 July 17 of 2018.

$$Y^- : \nabla \cdot (R_1^- + R_2^-) = 2 \begin{pmatrix} 0 & 1 \\ 1 & -i \end{pmatrix} \qquad (6.14a)$$

$$Y^+ : \nabla \cdot (R_1^+ + R_2^+) = 2 \begin{pmatrix} 0 & 1 \\ 1 & +i \end{pmatrix} \qquad (6.14b)$$

As the *Conservation of Superposed Torsion* under the superposed global manifolds, it implies that the transportations of the spiral torques between the virtual and physical worlds are

*a. Modulated by the superphase $2\tilde{\vartheta}$-chirality, bi-directionally,*

*b. Operated at independence of spatial $\tilde{r}$-coordinate, respectively,*

*c. Streaming with its residual and opponent, commutatively, and*

*d. Entangling a duality of the reciprocal spirals, simultaneously.*

This virtual-supremacy nature features the world planes a principle of *Superphase Ontology*, which, for examples, operates a macroscopic galaxy or blackhole system, or generates a microscopic spinor of particle system.

# 5. Signatures

The scaling $s_0$ and transform $s_3$ generators operate as the evolution processes giving rise to the infrastructure of the second horizon *SU*(2) at two-dimensions and the third horizon *SU(3)*×*SU*(2)×*U*(1) at four-dimensions. Each constitutes a pair of the bilinear forms

$$S_0^{\pm} = s_0 \pm i s_3 \equiv \eta^0 + i\eta^{\pm} \quad \text{: Manifold Signatures,} \quad (6.15)$$

$$s_0 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \mapsto \begin{pmatrix} 1 & 0 \\ 0 & \mathbf{I}_3 \end{pmatrix}, \qquad s_3 = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} \mapsto \begin{pmatrix} -1 & 0 \\ 0 & \mathbf{I}_3 \end{pmatrix} \quad (6.16)$$

$$\eta^{\pm} = \pm \begin{pmatrix} -1 & 0 \\ 0 & \mathbf{I}_3 \end{pmatrix} \quad \text{: Metric Signature} \quad (6.17)$$

where $\eta^0 = s_0$ and $\eta^{\mp} = \pm s_3$ are known as the metric signature of the manifolds, and $S_0^-$ or $S_0^+$ is defined as the $Y^-$ or $Y^+$ *Manifold Signature*, respectively. When the metric signatures are a diagonal matrix, *Lie* algebra *O*(1,3) consists of 2x2 or 4x4 matrices *M* such that it has the transform with the metric signatures $\eta^{\mp} \rightleftharpoons \eta^{\pm}$ between the manifolds:

$$\eta^{\mp} M \eta^{\pm} = -M \quad : \eta^{\mp} \rightleftharpoons \eta^{\pm} \quad (6.18)$$

Consequently, with one dimension $\tilde{r}$ in the world planes, the global manifolds are operated to extend the extra freedom of the two dimensions to its spatial coordinates or r-vector, where the group *SU*(2) is locally isomorphic to *SU*(3), and the physical r generators follow the same *Lie algebra* [22].

Upon the foundations of originator $s_0$ and commutator $s_3$, the infrastructures $S_n^+$ and $S_n^-$ contract the $s_1$ matrix as an *evolution producer* between manifolds, and the $s_2$ matrix as a *transformer* within each of the manifolds.

$$S_1^{\pm} = s_3 \mp i s_1 \quad \text{: Horizon Signature} \quad (6.19a)$$

$$S_2^{\pm} = s_0 \pm i s_2 \quad \text{: Transform Signature} \quad (6.19b)$$

Meanwhile, the spiral torques operate at signatures of the rotational infrastructure:

$$R_1^{\pm} = \epsilon_3 \tilde{r} \mp i\epsilon_1 \tilde{\vartheta} \quad \text{: Interactive Signature} \quad (6.20a)$$

$$R_2^{\pm} = \epsilon_0 \tilde{r} \pm i\epsilon_2 \tilde{\vartheta} \quad \text{: Transport Signature} \quad (6.20b)$$

Instinctively, the (6.1) flow institutes naturally the loop signature of the infrastructures:

$$S_2^+ \hookrightarrow S_1^+ \rightleftharpoons S_1^- \hookleftarrow S_2^- \quad \text{: Loop Infrastructure} \quad (6.21)$$

$$R_2^+ \rightleftharpoons R_1^+, \quad R_1^- \rightleftharpoons R_2^- \quad \text{: Torque Infrastructure} \quad (6.22)$$

$$S_1^- = (S_1^+)^*,\ S_2^+ = (S_2^-)^* \qquad R_1^- = (R_1^+)^*,\ R_2^+ = (R_2^-)^* \qquad (6.23)$$

Incredibly, the loop infrastructure orchestrates a life-cycle of the double streaming entanglements giving rise to the horizon and force fields.

# 6. Commutation of Generators

As a loop sequence of the matrices, the infrastructure consists of the self-circular commutations and constructs miraculously a pair of the tangent manifold spaces to facilitate the generalization of horizon entanglements from world planes to affine spaces, shown as the following:

$$[S_2^+, S_1^+] = +\, S_1^+ = [S_1^+, S_2^-], \qquad [S_2^+, S_1^-] = -\, S_1^- = [S_1^-, S_2^-] \tag{6.24}$$

$$[R_2^+, R_1^+] = i(\vartheta + \tilde{r}^3)s_2 = [R_1^-, R_2^-], \qquad \lim_{\tilde{r}\to 0}\,[R_1^\pm, R_2^\pm] = \mp\, i\vartheta s_2 \tag{6.25}$$

$$[S_1^+, S_1^-] = i s_2 \tag{6.26}$$

where the "−" sign implies the reverse or mirroring loop charity between the $Y^-Y^+$ manifolds. Apparently, the horizon signatures $S_1^\pm$ and the interactive signatures $R_1^\pm$ lie at a center of the core infrastructure dynamically bridging the two district activities or residual dynamics $S_2^\pm$ or $R_2^\pm$ distinctively. Phenomenally, the transform *Generator* $s_2$ plays an essential role as the natural resource tie bonding and streaming the double entanglements.

# 7. Entangling Independence

At the local environment, the relationship of their commutations and continuities can be derived as the following, respectively:

$$[S_2^+, S_2^-] = 0 \qquad \langle S_2^+, S_2^- \rangle = 0 \tag{6.27}$$

$$[R_2^+, R_2^-] = [R_1^+, R_1^-] = 0 \qquad \lim_{\tilde{r} \to 0} \langle R_2^+, R_2^- \rangle = s_0 \tilde{r}^4 + \epsilon_2 \tilde{r} \tilde{\vartheta}^2 \to 0 \tag{6.28}$$

When any two objects are commutative at zero, it implies and reveals amazingly the independence between the manifold opponents:

1. *The residual dynamics is independent to its opponent* $[S_2^+, S_2^-] = 0$ *and* $[R_2^+, R_2^-] = [R_1^+, R_1^-] = 0$ *while they jointly conserve the density flow* $\langle S_2^+, S_2^- \rangle = 0$ *and torque flow* $\lim_{\tilde{r} \to 0} \langle R_2^+, R_2^- \rangle \to 0$*, harmonizing an integrity of their environment and conserving a duality of the dynamic invariant.*
2. *The super force interaction between objects is independent to their torque commutation* $[\varepsilon_0, \varepsilon_3] = 0$ *while, under invariance of the torque transportations, they are jointly modulated by the superposing phases to maintain or preserve the transformational* $s_0$ *generator.*

$$\lim_{\tilde{r} \to 0} \langle R_1^+, R_1^- \rangle = s_0 + \epsilon_2 \tilde{r} \tilde{\vartheta}^2 \to s_0 \tag{6.29}$$

Inconceivably, the infrastructural invariant orchestrates the life-cycle generators of the double entanglements, giving rise to the horizon and force fields.

# 8. Chiral Entanglement

When an axis passes through the center of an object, the object is said to rotate upon itself locally, or spin. Furthermore, when there are two axes passing through the center of an object, the object is said to be under the entanglements of the *YinYang* duality. Remarkably, the infrastructure consists of a pair of the double rotation fields such that each of the entangling matrix $S_1^{\pm}$ or $S_2^{\pm}$ has its corresponding normalized *Eigenvectors* ($|S_n^{\pm}\psi - \lambda I| = 0$, $S_n^{\pm}\psi = \lambda\psi$), respectively:

$$S_2^+, S_1^- \mapsto \psi^L = \begin{pmatrix} 1 \\ -i \end{pmatrix}^{\circlearrowright} \qquad \textit{: Left-hand chirality} \qquad (6.30)$$

$$S_1^+, S_2^- \mapsto \psi^R = \begin{pmatrix} 1 \\ +i \end{pmatrix}^{\circlearrowleft} \qquad \textit{: Right-hand chirality} \qquad (6.31)$$

Together, the $S_1^+ + S_2^-$ matrix of virtual supremacy produces the left-hand eigenvector or (6.14) while the $S_1^- + S_2^+$ matrix of physical supremacy severs the right-hand eigenvector or (6.15). With respect to the whole-cycle of the spin-up and spin-down potentials, the "$-i$" sign represents the left-hand chiral in the $Y^+$ manifold, and the "$+i$" sign depicts the right-hand chiral in the $Y^-$ manifold. Therefore, spin chirality is a type of the virtual $Y^+$ and physical $Y^-$ transformation that object entanglements on the world lines ($\hat{\partial}_\lambda, \check{\partial}^\lambda$) consist of the residual transportations ($\hat{\partial}^\lambda, \check{\partial}_\lambda$) of the $Y^-Y^+$ spinors, reciprocally, such that the nature materializes the spinors 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 (6.1), it takes in 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 infrastructure (6.10) of a whole system yields the parity conservation by maintaining and entangling the double duality reciprocally and simultaneously.

# 9. Tilde-Gamma and Chi Matrices

Considering the mirroring effects $-f^*(z^*)$ between manifolds, the (6.2) matrices institutes an infrastructure,

$$\tilde{\gamma}^\nu \equiv \begin{pmatrix} \{S_1^-, S_2^+\} \\ -\{S_1^+, S_2^-\}^* \end{pmatrix} \qquad \tilde{\gamma}_\nu \equiv \begin{pmatrix} \{S_1^+, S_2^-\} \\ -\{S_1^-, S_2^+\}^* \end{pmatrix} \tag{6.32}$$

$$\tilde{\gamma}^\nu = \left[ \begin{pmatrix} s_0 & 0 \\ 0 & -s_0 \end{pmatrix}_0, -i \begin{pmatrix} 0 & s_1 \\ s_1 & 0 \end{pmatrix}_1, i \begin{pmatrix} 0 & s_2 \\ s_2 & 0 \end{pmatrix}_2, \begin{pmatrix} 0 & s_3 \\ -s_3 & 0 \end{pmatrix}_3 \right] \tag{6.33}$$

$$\tilde{\gamma}_\nu^- = -\eta^- \tilde{\gamma}^\nu \qquad \{S_1^-, S_2^+\} = \{S_1^+, S_2^-\}^* \tag{6.34}$$

Simply extended by the mirroring chirality $-(S_n^\pm)*$, the tilde-gamma matrices $\tilde{\gamma}^\nu$ represent the upper-row of one manifold dynamic stream $\{\hat{\partial}^\lambda, \check{\partial}^\lambda\}$ and the lower-row for its opponent $\{\hat{\partial}_\lambda, \check{\partial}_\lambda\}$.

In parallel to the tilde-gamma matrices, one can contract another superposed tilde-chi matrices $\tilde{\chi}^\nu$ representing (6.9) a set of the mirroring spiral torque tensors.

$$\tilde{\chi}^\nu = \left[ \tilde{r} \begin{pmatrix} \epsilon_0 & 0 \\ 0 & -\epsilon_0 \end{pmatrix}_0, -i\tilde{\vartheta} \begin{pmatrix} 0 & \epsilon_1 \\ \epsilon_1 & 0 \end{pmatrix}_1, i\tilde{\vartheta} \begin{pmatrix} 0 & \epsilon_2 \\ \epsilon_2 & 0 \end{pmatrix}_2, \tilde{r} \begin{pmatrix} 0 & \epsilon_3 \\ -\epsilon_3 & 0 \end{pmatrix}_3 \right] \tag{6.35}$$

$$\tilde{\chi}_\nu = -\eta^- \tilde{\chi}^\nu \qquad \{R_1^-, R_2^+\} = \{R_1^+, R_2^-\}^* \tag{6.36}$$

Each of the $\tilde{\chi}_\nu^\pm$ matrices is a set of the vector matrices with the upper-row for one infrastructural stream and the lower-row for its opponent manifold. Together, they further descend into its higher dimensional manifold. The $\chi_\mu^\pm$ fields are a pair of the torque-graviton potentials.

# 10. Superphase Fields at Second Horizon

At the loop entanglements $\phi^+(\hat{x}) \rightleftharpoons \varphi^-(\check{x})$, the processes operate the particle fields in forms of transformations $S_i^{\pm}$, torque representations $R^{\mu}{}_{\nu}$ and $R_{\mu}{}^{\nu}$, and *Gauge* potentials $A_\nu \mapsto eA_\nu/\hbar$ for electrons and $A^\nu \mapsto eA^\nu/\hbar$ for positrons. Consequently, we have the total effective fields in each of the respective manifolds:

$$\check{\partial}_\lambda \phi^- + \hat{\partial}_\lambda \varphi^+ = \dot{x}_\nu \tilde{\zeta}_\nu \left[ \begin{pmatrix} \partial_\nu \\ \partial^\nu \end{pmatrix}' \pm i\frac{e}{\hbar} \begin{pmatrix} A_\nu \\ A^\nu \end{pmatrix}' \right] \psi^- \quad : \psi^- = \begin{pmatrix} \phi^- \\ \varphi^+ \end{pmatrix} \tag{6.37}$$

$$\check{\partial}_\lambda = \dot{x}_\nu \left( S_2^- + R_2^- \right) \left( \partial_m + i\frac{e}{\hbar} A_\nu \right), \qquad \hat{\partial}_\lambda = \dot{x}_\nu \left( S_1^+ + R_1^+ \right) \left( \partial^\mu - i\frac{e}{\hbar} A^\mu \right)$$

$$\hat{\partial}^\lambda \phi^+ + \check{\partial}^\lambda \varphi^- = \dot{x}^\nu \tilde{\zeta}^\nu \left[ \begin{pmatrix} \partial^\nu \\ \partial_\nu \end{pmatrix}' \mp i\frac{e}{\hbar} \begin{pmatrix} A^\nu \\ A_\nu \end{pmatrix}' \right] \psi^+ \quad : \psi^+ = \begin{pmatrix} \phi^+ \\ \varphi^- \end{pmatrix} \tag{6.38}$$

$$\hat{\partial}^\lambda = \dot{x}^\nu \left( S_2^+ + R_2^+ \right) \left( \partial^m - i\frac{e}{\hbar} A^\nu \right), \qquad \check{\partial}^\lambda = \dot{x}^\nu \left( S_1^- + R_1^- \right) \left( \partial_\mu + i\frac{e}{\hbar} A_\mu \right)$$

$$\tilde{\zeta}^\nu = \tilde{\gamma}^\nu + \tilde{\chi}^\nu \qquad \tilde{\zeta}_\nu = \tilde{\gamma}_\nu + \tilde{\chi}_\nu \tag{6.39}$$

The potential $\psi^-$ or $\psi^+$ implies each of the loop entanglements is under its $Y^-$ or $Y^+$ manifold, respectively. The first equation represents the horizon potentials at the local $\check{\partial}_\lambda \varphi^-$ of the $Y^-$ manifold and the transformation $\hat{\partial}_\lambda \phi^+$ from its $Y^+$ opponent. Likewise, the second equation corresponds to the horizon potentials at the local $\hat{\partial}^\lambda \phi^+$ of the $Y^+$ manifold and the transformation $\check{\partial}^\lambda \varphi^-$ from its $Y^-$ opponent. To collapse the above equations together, we have a duality of the states expressed by or degenerated to the classical formulae:

$$\check{\partial}\psi^- \equiv \check{\partial}_\lambda \phi^- + \hat{\partial}_\lambda \varphi^+ \equiv \dot{x}_\nu \tilde{\zeta}_\nu D_\nu \psi^- \qquad : D_\nu = \partial_m + i\frac{e}{\hbar} A_m \tag{6.41}$$

$$\hat{\partial}\psi^+ \equiv \hat{\partial}^\lambda \phi^+ + \check{\partial}^\lambda \varphi^- \equiv \dot{x}^\nu \tilde{\zeta}^\nu D^\nu \psi^+ \qquad : D^\nu = \partial^\nu - i\frac{e}{\hbar} A^\nu \tag{6.42}$$

To our expectation, the $A_\nu$ and $A^\nu$ fields are a pair of the electro-photon potentials. Intuitively, both photons and gravitons are the outcomes or products of a duality of the double entanglements.

# 11. Worksheet of Boost Entanglements

The *Infrastructural Boost Generators*, $s_\kappa$ group, consist of the distinct members, shown by a set of the 2x2 matrices as the following:

$$s_\kappa = \left[ \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}_0, \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}_1, \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}_2, \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}_3 \right] \tag{6.44}$$

Their entanglements have the following commutations:

$$[s_0, s_1] = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}_0 \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}_1 - \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}_1 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}_0 = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} - \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} = 0$$

$$[s_0, s_2] = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}_0 \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}_2 - \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}_2 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}_0 = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} - \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} = 0$$

$$[s_0, s_3] = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}_0 \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}_3 - \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}_3 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}_0 = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} - \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} = 0$$

$$[s_1, s_2] = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}_1 \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}_2 - \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}_2 \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}_1$$

$$= \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} - \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} = 2 \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} = -2s_3$$

$$[s_2, s_3] = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}_2 \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}_3 - \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}_3 \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}_2$$

$$= \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix} - \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} = -2 \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} = -2s_1$$

$$[s_3, s_1] = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}_3 \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}_1 - \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}_1 \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}_3$$

$$= \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} - \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} = 2 \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} = 2s_2$$

Therefore, the boost generators constitutes the commutation of Infrastructure, given by the following:

$$[S_2^+, S_1^+] = \begin{pmatrix} 1 & -i \\ i & 1 \end{pmatrix} \begin{pmatrix} -1 & -i \\ -i & 1 \end{pmatrix} \text{-} \begin{pmatrix} -1 & -i \\ -i & 1 \end{pmatrix} \begin{pmatrix} 1 & -i \\ i & 1 \end{pmatrix} = \begin{pmatrix} -1 & -i \\ -i & 1 \end{pmatrix} - \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix} = S_1^+$$

$$[S_2^+, S_1^-] = \begin{pmatrix} 1 & -i \\ i & 1 \end{pmatrix}\begin{pmatrix} -1 & i \\ i & 1 \end{pmatrix} - \begin{pmatrix} -1 & i \\ i & 1 \end{pmatrix}\begin{pmatrix} 1 & -i \\ i & 1 \end{pmatrix} = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix} - \begin{pmatrix} -1 & i \\ i & 1 \end{pmatrix} = -S_1^-$$

$$[S_2^+, S_2^-] = \begin{pmatrix} 1 & -i \\ i & 1 \end{pmatrix}\begin{pmatrix} 1 & i \\ -i & 1 \end{pmatrix} - \begin{pmatrix} 1 & i \\ -i & 1 \end{pmatrix}\begin{pmatrix} 1 & -i \\ i & 1 \end{pmatrix} = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix} - \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix} = 0$$

$$[S_1^+, S_1^-] = \begin{pmatrix} -1 & -i \\ -i & 1 \end{pmatrix}\begin{pmatrix} -1 & i \\ i & 1 \end{pmatrix} - \begin{pmatrix} -1 & i \\ i & 1 \end{pmatrix}\begin{pmatrix} -1 & -i \\ -i & 1 \end{pmatrix} = \begin{pmatrix} 1 & -i \\ i & 1 \end{pmatrix} - \begin{pmatrix} 1 & i \\ -i & 1 \end{pmatrix} = 2is_2$$

$$[S_1^-, S_2^-] = \begin{pmatrix} -1 & i \\ i & 1 \end{pmatrix}\begin{pmatrix} 1 & i \\ -i & 1 \end{pmatrix} - \begin{pmatrix} 1 & i \\ -i & 1 \end{pmatrix}\begin{pmatrix} -1 & i \\ i & 1 \end{pmatrix} = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix} - \begin{pmatrix} -1 & i \\ i & 1 \end{pmatrix} = -S_1^-$$

$$[S_1^+, S_2^-] = \begin{pmatrix} -1 & -i \\ -i & 1 \end{pmatrix}\begin{pmatrix} 1 & i \\ -i & 1 \end{pmatrix} - \begin{pmatrix} 1 & i \\ -i & 1 \end{pmatrix} - \begin{pmatrix} -1 & -i \\ -i & 1 \end{pmatrix} = \begin{pmatrix} -1 & -i \\ -i & 1 \end{pmatrix} - \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix} = S_1^+$$

$$[S_2^+, S_2^-] = \begin{pmatrix} 1 & -i \\ i & 1 \end{pmatrix}\begin{pmatrix} 1 & i \\ -i & 1 \end{pmatrix} - \begin{pmatrix} 1 & i \\ -i & 1 \end{pmatrix}\begin{pmatrix} 1 & -i \\ i & 1 \end{pmatrix} = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix} - \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix} = 0$$

# 12. Worksheet of Torque Entanglements

The *Infrastructural Torque Generators*, $\epsilon_\kappa$ group, consist of the distinct members, shown by a set of the 2x2 matrices as the following:

$$\epsilon_\kappa = \tilde{r}\left[\begin{pmatrix}0&1\\1&0\end{pmatrix}_0,\begin{pmatrix}0&0\\0&-1\end{pmatrix}_1,\begin{pmatrix}0&0\\0&1\end{pmatrix}_2,\frac{1}{\tilde{r}^2}\begin{pmatrix}0&1\\1&0\end{pmatrix}_3\right] \tag{6.50}$$

Their entanglements have the following commutations:

$$[\epsilon_2,\epsilon_3] = \begin{pmatrix}0&0\\0&1\end{pmatrix}_2\begin{pmatrix}0&1\\1&0\end{pmatrix}_3\frac{1}{\tilde{r}} - \begin{pmatrix}0&1\\1&0\end{pmatrix}_3\begin{pmatrix}0&0\\0&1\end{pmatrix}_2\frac{1}{\tilde{r}} = \begin{pmatrix}0&0\\1&0\end{pmatrix}\frac{1}{\tilde{r}} - \begin{pmatrix}0&1\\0&0\end{pmatrix}\frac{1}{\tilde{r}} = \frac{1}{\tilde{r}}s_2$$

$$[\epsilon_2,\epsilon_0] = \begin{pmatrix}0&0\\0&1\end{pmatrix}_2\begin{pmatrix}0&1\\1&0\end{pmatrix}_0\tilde{r}^2 - \begin{pmatrix}0&1\\1&0\end{pmatrix}_0\begin{pmatrix}0&0\\0&1\end{pmatrix}_2\tilde{r}^2 = \begin{pmatrix}0&0\\1&0\end{pmatrix}\tilde{r}^2 - \begin{pmatrix}0&1\\0&0\end{pmatrix}\tilde{r}^2 = \tilde{r}^2 s_2$$

$$[\epsilon_2,\epsilon_1] = \begin{pmatrix}0&0\\0&1\end{pmatrix}_2\begin{pmatrix}0&0\\0&-1\end{pmatrix}_1\tilde{r}^2 - \begin{pmatrix}0&0\\0&-1\end{pmatrix}_1\begin{pmatrix}0&0\\0&1\end{pmatrix}_2\tilde{r}^2 = \begin{pmatrix}0&0\\0&-1\end{pmatrix}\tilde{r}^2 - \begin{pmatrix}0&0\\0&-1\end{pmatrix}\tilde{r}^2 = 0$$

$$[\epsilon_3,\epsilon_0] = \begin{pmatrix}0&1\\1&0\end{pmatrix}_3\begin{pmatrix}0&1\\1&0\end{pmatrix}_0\frac{1}{\tilde{r}} - \begin{pmatrix}0&1\\1&0\end{pmatrix}_0\begin{pmatrix}0&1\\1&0\end{pmatrix}_3\frac{1}{\tilde{r}} = \begin{pmatrix}1&0\\0&1\end{pmatrix}\frac{1}{\tilde{r}} - \begin{pmatrix}1&0\\0&1\end{pmatrix}\frac{1}{\tilde{r}} = 0$$

$$[\epsilon_1,\epsilon_0] = \begin{pmatrix}0&0\\0&-1\end{pmatrix}_1\begin{pmatrix}0&1\\1&0\end{pmatrix}_0\tilde{r}^2 - \begin{pmatrix}0&1\\1&0\end{pmatrix}_0\begin{pmatrix}0&0\\0&-1\end{pmatrix}_1\tilde{r}^2$$

$$= \begin{pmatrix}0&0\\-1&0\end{pmatrix}\tilde{r}^2 - \begin{pmatrix}0&-1\\0&0\end{pmatrix}\tilde{r}^2 = -\tilde{r}^2 s_2$$

$$[\epsilon_1,\epsilon_3] = \begin{pmatrix}0&0\\0&-1\end{pmatrix}_1\begin{pmatrix}0&1\\1&0\end{pmatrix}_3\frac{1}{\tilde{r}} - \begin{pmatrix}0&1\\1&0\end{pmatrix}_3\begin{pmatrix}0&0\\0&-1\end{pmatrix}_1\frac{1}{\tilde{r}}$$

$$= \begin{pmatrix}0&0\\-1&0\end{pmatrix}\frac{1}{\tilde{r}} - \begin{pmatrix}0&-1\\0&0\end{pmatrix}\frac{1}{\tilde{r}} = -\frac{1}{\tilde{r}}s_2$$

Therefore, the spiral generators constitutes the commutation and continuity of Infrastructure, given by the following:

$$R_1^\pm R_1^\mp = \epsilon_3^2\tilde{r}^2 + \epsilon_1^2\tilde{\vartheta}^2 \qquad : R_1^\pm = \epsilon_3\tilde{r} \mp i\epsilon_1\tilde{\vartheta},\ R_2^\pm = \epsilon_0\tilde{r} \pm i\epsilon_2\tilde{\vartheta}$$

$$R_1^\pm R_2^\pm = \epsilon_3\epsilon_0\tilde{r}^2 \pm i(\epsilon_3\epsilon_2 - \epsilon_1\epsilon_0)\tilde{r}\tilde{\vartheta} \pm \epsilon_1\epsilon_2\tilde{\vartheta}\tilde{\vartheta}$$

$$R_2^\pm R_1^\pm = \epsilon_0\epsilon_3\tilde{r}^2 \mp i(\epsilon_2\epsilon_3 - \epsilon_0\epsilon_1)\tilde{r}\tilde{\vartheta} \pm \epsilon_2\epsilon_1\tilde{\vartheta}\tilde{\vartheta}$$

$$[R_1^+, R_2^+] = [\epsilon_3,\epsilon_0]\tilde{r}^2 + i\big([\epsilon_3,\epsilon_2] - [\epsilon_1,\epsilon_0]\big)\tilde{r}\vartheta + [\epsilon_1,\epsilon_2]\vartheta\vartheta = -i(\vartheta + \tilde{r}^3)s_2 \xrightarrow[\tilde{r}\to 0]{\lim} -i\vartheta s_2$$

$$[R_1^-, R_2^-] = [\epsilon_3, \epsilon_0]\tilde{r}^2 - i\big([\epsilon_3, \epsilon_2] - [\epsilon_1, \epsilon_0]\big)\tilde{r}\vartheta + [\epsilon_1, \epsilon_2]\vartheta\vartheta = +\, i(\vartheta + \tilde{r}^3)s_2 \xrightarrow[\tilde{r}\to 0]{\lim} +\, i\vartheta s_2$$

$$[R_1^+, R_2^+] + [R_1^-, R_2^-] = 0$$

$$\langle R_1^+, R_1^- \rangle = \epsilon_3^2\tilde{r}^2 + \epsilon_1^2\tilde{\vartheta}^2 = s_0 + \epsilon_2\tilde{r}\tilde{\vartheta}^2$$

$$\langle R_2^+, R_2^- \rangle = \epsilon_0^2\tilde{r}^2 + \epsilon_2^2\tilde{\vartheta}^2 = s_0\tilde{r}^4 + \epsilon_2\tilde{r}\tilde{\vartheta}^2$$

# Horizon of Spacetime

## CHAPTER VII

From two-dimension of the yin yang world planes, a physical infrastructure is incepted by the third horizon and given rise to have the extra freedom of the rotational coordinates as a three-dimensional space. Integrated with the virtual time dimension, the *manifold* is evolved into and emerged as the well-known *Spacetime* of tetrad-dimensions.

As expected, the gravitation fields of *Spacetime* result in the principle of the central-singularity.

# 1. Physical Horizon

At motion dynamics of the second horizon, the tangent of the scalar density fields constructs the vector fields. As an astonishing consequence, under the two-dimensions of the world planes, the horizon generator $s_1$ incepts a freedom of the extra dimensions into the physical or virtual world, respectively giving rise to the third horizon:

$$s_1(2) = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \mapsto \begin{pmatrix} 0 & 1 \\ 1 & s_1(3) \end{pmatrix}, \qquad s_1(3) = \begin{pmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{pmatrix} \tag{7.1}$$

By means of transformation between the manifolds, the matrix $s_1$ functions as *Generators* giving rise to the three-dimensional space. Simultaneously, by means of the transportation, the residual freedom of the $s_2$ matrix rotating itself into three-dimensions of the spatial manifolds: *SO*(3).

$$s_2(2) = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \mapsto \begin{pmatrix} 0 & -1 \\ 1 & s_2(3) \end{pmatrix}, \qquad s_2(3) = \begin{pmatrix} 0 & -1 & 1 \\ 1 & 0 & -1 \\ -1 & 1 & 0 \end{pmatrix} \tag{7.2}$$

Together, a pair of the matrices, $s_1$ and $s_2$, institutes the third horizon and constructs an infrastructure in four-dimensions: $SU(2) \times SO(3)$.

# 2. Pauli Matrices

Apparently, the *Infrastructural Generators* can contract alternative matrices that might extend to the physical topology. Among them, one popular set is shown as the following:

$$\sigma_\kappa = \left[ \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}_0, \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}_1, \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}_2, \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}_3 \right] \tag{7.3}$$

$$\sigma_0 = s_0 \qquad \sigma_1 = s_1 \qquad \sigma_2 = i s_2 \qquad \sigma_3 = -s_3 \qquad \sigma_n^2 = I \tag{7.3a}$$

$$[\sigma_a, \sigma_b]^- = 2i\varepsilon_{cba}^- \sigma_c \qquad [\sigma_a, \sigma_b]^+ = 0 \qquad : a, b, c \in (1,2,3) \tag{7.3b}$$

known as *Pauli* spin matrices, introduced in 1925 [23]. In this definition, the residual spinors $S_2^\pm$ are extended into the physical states toward the interpretations for the decoherence into a manifold of the four-dimensional spacetime-coordinates of physical reality.

# 3. Gamma and Chi Matrices

Aligning to the topological comprehension, we extend the gamma-matrix $\gamma^\nu$, introduced by *W. K. Clifford* in the 1870s [24], and chi-matrix $\chi^\nu$ for physical coordinates.

$$\gamma^\nu = \left[ \begin{pmatrix} \sigma_0 & 0 \\ 0 & -\sigma_0 \end{pmatrix}_0, \begin{pmatrix} 0 & \sigma_1 \\ -\sigma_1 & 0 \end{pmatrix}_1, \begin{pmatrix} 0 & \sigma_2 \\ -\sigma_2 & 0 \end{pmatrix}_2, \begin{pmatrix} 0 & \sigma_3 \\ -\sigma_3 & 0 \end{pmatrix}_3 \right] \tag{7.4a}$$

$$\chi^\nu = \left[ r \begin{pmatrix} \epsilon_0 & 0 \\ 0 & -\epsilon_0 \end{pmatrix}_0, \vartheta \begin{pmatrix} 0 & \epsilon_1 \\ -\epsilon_1 & 0 \end{pmatrix}_1, i\vartheta \begin{pmatrix} 0 & \epsilon_2 \\ -\epsilon_2 & 0 \end{pmatrix}_2, r \begin{pmatrix} 0 & -\epsilon_3 \\ \epsilon_3 & 0 \end{pmatrix}_3 \right] \tag{7.4b}$$

$$\zeta^\nu = \gamma^\nu + \chi^\nu \qquad \zeta_\nu = \gamma_\nu + \chi_\nu \tag{7.4}$$

The superphase $\mathrm{d}\vartheta$ of polar coordinates extends into the circumference-freedom $\mathrm{d}\vartheta \mapsto \mathrm{d}\theta \pm i \sin\theta \, \mathrm{d}\phi$ of sphere coordinates.

$$\mathrm{d}\vartheta^2 \mapsto (\mathrm{d}\theta + i \sin\theta \, \mathrm{d}\phi)(\mathrm{d}\theta - i \sin\theta \, \mathrm{d}\phi) = \mathrm{d}\theta^2 + \sin^2\theta \, \mathrm{d}\phi^2 \tag{7.5}$$

Similar to *Pauli* matrices, the gamma $\gamma^\nu$ and chi $\chi^\nu$ matrices are further degenerated into a spacetime manifold of the physical reality. To collapse the (6.41, 6.42) equations together, we have a duality of the states expressed by or degenerated to the formulae of event operations:

$$\check{\partial} = \check{\partial}_\lambda + \hat{\partial}_\lambda = \dot{x}_\nu \zeta_\nu D_\nu = \dot{x}_\nu \; \zeta_\nu \Big( \partial_\nu + i \frac{e}{\hbar} A_\nu + \tilde{\kappa}_2^- \partial_\nu A_\mu + \cdots \Big) \tag{7.6a}$$

$$\hat{\partial} \equiv \hat{\partial}^\lambda + \check{\partial}^\lambda = \dot{x}^\mu \zeta^\mu D^\mu = \dot{x}^\mu \zeta^\mu \Big( \partial^\mu - i \frac{e}{\hbar} A^\mu - \tilde{\kappa}_2^+ \partial^\mu A^\nu - \cdots \Big) \tag{7.6b}$$

Accordingly, all terms have a pair of the irreducible and complex quantities that preserves the full invariant and streams a duality of the $Y^-$ and $Y^+$ loop $\hat{\partial}^\lambda \hookrightarrow \hat{\partial}_\lambda \rightleftharpoons \check{\partial}^\lambda \hookleftarrow \check{\partial}_\lambda$ entanglements.

# 4. Fields at Second Horizon

As the superphase function from the second to third horizon, the vector field $A^\nu$ bonds and projects its potentials superseding with its conjugators, arisen by or acting on its opponent $A_\nu$ through a duality of reciprocal interactions dominated by boost $\tilde{\gamma}$ and twist $\tilde{\chi}$ fields, evolution into the second ($\tilde{\zeta} \mapsto \zeta$) horizon. Under the $Y^-$ or $Y^+$ primary, the event operates the third terms of (7.6) in a pair of the relativistic entangling fields:

$$F_{\nu\mu}^{-n} = \left(\zeta_\nu \partial_\nu A_\mu - \zeta^\mu \partial^\mu A^\nu\right)_n = -F_{\mu\nu}^{+n} \qquad : \tilde{F}_{\nu\mu}^{\pm n}(\tilde{\zeta}) \mapsto F_{\mu\nu}^{\pm n}(\zeta) \tag{7.7}$$

The tensor $F_{\nu\mu}^{\pm n}$ is the transform and torque fields at second horizon. The transform and transport tensors naturally consist of the antisymmetric field components and construct a pair of the superphase potentials in world planes, giving rise to the third horizon fields, emerging the four-dimensional spacetime, and producing the electromagnetism and gravitation fields.

Introduced in the 1920s, the *Friedmann–Lemaître–Robertson–Walker* (FLRW) [25] metric attempts a solution of *Einstein's* field equations of general relativity. Aimed to the gravitational inverse-square law, the research discovered that the desired outcome leads to the polar coordinates on a world plane:

$$\mathrm{d}\Sigma^2 = \mathrm{d}r^2 + S_k(r)^2\,\mathrm{d}\vartheta^2 \qquad : \mathrm{d}\vartheta^2 = \mathrm{d}\theta^2 + \sin^2\theta\,\mathrm{d}\phi^2 \tag{7.18}$$

$$S_k(r) = \begin{cases} \sin\left(r\sqrt{k}\right)/\sqrt{k}, & k > 0 \\ r, & k = 0 \\ \sinh\left(r\sqrt{|k|}\right)/\sqrt{k}, & k < 0. \end{cases} \tag{7.19}$$

Apparently, it represents the virtual (k<0) and physical (k>0) of the “hyperspherical coordinates” bridged by the polar coordinate system (k=0), which emerges into the third horizon to gain the extra two-coordinates. Therefore, it evidently supports a proof to our full description of the evolutional process coupling the horizons between the two-dimensional *World Planes* and the three-dimensional physical spacetime manifold.

# 5. Fields at Third or Higher Horizons

Generally, a spacetime of the third horizon is manifested and given rise from the second horizon to gain the extra freedom and evolution into three-dimensions of a physical space. The event operation of *Spacetime Evolution* is mathematically describable through transitioning functions from the tilde-zeta-matrices of the first horizon to the zeta-matrices $\tilde{\zeta} \mapsto \zeta$ of the second horizon, to the Lorentz-matrices $\zeta \mapsto L_\nu^\pm$ of the third horizon. Dependent on their $Y^-Y^+$ commutations or continuities through the tangent curvatures of potentials, the entangling processes develop the dark fluxions of fields, forces and entanglements to evolve the physical spacetime, prolific ontology, and eventful cosmology.

Giving rise to the third horizon, the (7.1, 7.2) generators contract with the $\zeta$ infrastructure and evolve into the four-dimensional matrices $SU(2)_{s_1} \times SO(3)_{s_2}$, shown by the following:

$$J_1 = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1 \\ 0 & 0 & 1 & 0 \end{pmatrix}, \quad J_2 = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \end{pmatrix}, \quad J_3 = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix} \tag{7.10}$$

$$K_1 = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}, \quad K_2 = \begin{pmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}, \quad K_3 = \begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{pmatrix} \tag{7.11}$$

$$L_\nu^- = K_\nu + iJ_\nu \qquad\qquad L_\nu^+ = K_\nu - iJ_\nu \tag{7.12a}$$

$$[J_1, J_2]^- = J_3 \qquad [K_1, K_2]^- = -J_3 \qquad [J_1, K_2]^- = K_3 \tag{7.12b}$$

known as *Generator* of the *Lorentz* group, discovered since 1892 [26] or similar to *Gell-Mann* matrices [27]. Conceivably, the $K_\nu$ or $J_\nu$ matrices are residual $\{\hat{\partial}^\lambda, \check{\partial}_\lambda\}$ or rotational $\{\hat{\partial}_\lambda, \check{\partial}^\lambda\}$ components, respectively. During the transitions between the horizons, the redundant degrees of freedom is developed and extended from superphase $\vartheta$ of world-planes into the extra physical coordinates (such as $\theta$ and $\phi$ in).

For the field structure at the third or higher horizons, a duality of reciprocal interactions dominated by boost $\gamma$ and twist $\chi$ fields is developed into the third ($\zeta \mapsto L$) horizon.

$$F_{\nu\mu}^{-n}(L) = \left(L_{\nu\mu}^- \partial_\nu A_\mu - L_{\mu\nu}^+ \partial^\mu A^\nu\right)_n \qquad : F_{\nu\mu}^{\pm n}(\zeta) \mapsto F_{\mu\nu}^{\pm n}(L) \tag{7.13}$$

$$T_{\nu\mu}^{-n}(L) = \left(L_{\nu\mu}^- \partial_\nu V_\mu - L_{\mu\nu}^+ \partial^\mu V^\nu\right)_n \qquad : F_{\nu\mu}^{\pm n}(L) \mapsto T_{\mu\nu}^{\pm n}(L) \tag{7.14}$$

Under the $Y^-$ or $Y^+$ primary, the event operates the third terms of (7.6) in a pair of the relativistic entangling fields.

# 6. Physical Torque Singularity

Descendent from the world planes with the convention coordinates $\{r, \theta, \varphi\}$, a physical coordinate system is further extended its metric elements of $ds^2 = dr^2 + r^2(d^2\theta + sin^2 d\varphi^2)$ in a physical $\mathscr{R}^3$ space. The redundant degrees has its freedom of $\{\theta, \varphi\}$ coordinates with the metric and its inverse elements of:

$$\breve{g}_{\nu\mu} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & r^2 & 0 \\ 0 & 0 & r^2 sin^2\theta \end{pmatrix}, \qquad \breve{g}^{\nu\mu} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & r^{-2} & 0 \\ 0 & 0 & r^{-2} sin^{-2}\theta \end{pmatrix} \tag{7.15}$$

The *Christoffel* symbols of the sphere coordinates become the matrices:

$$\Gamma^-_{r\nu\mu} = \Gamma^{-r}_{\nu\mu} = \begin{pmatrix} 0 & 0 & 0 \\ 0 & -r & 0 \\ 0 & 0 & -rsin^2\theta \end{pmatrix} \tag{7.16a}$$

$$\Gamma^{-\theta}_{\nu\mu} = \begin{pmatrix} 0 & \frac{1}{r} & 0 \\ \frac{1}{r} & 0 & 0 \\ 0 & 0 & -sin\theta cos\theta \end{pmatrix}, \qquad \Gamma^{-\varphi}_{\nu\mu} = \begin{pmatrix} 0 & 0 & \frac{1}{r} \\ 0 & 0 & cot\theta \\ \frac{1}{r} & cot\theta & 0 \end{pmatrix} \tag{7.16b}$$

$$\Gamma^-_{\theta\nu\mu} = r^2 \Gamma^{-\theta}_{\nu\mu}, \qquad \Gamma^-_{\varphi\nu\mu} = r^2 sin^2\theta \Gamma^{-\varphi}_{\nu\mu} \tag{7.16c}$$

Apparently, the divergence of the spiral torque fields has the *r*-dependency, expressed by the divergence in spherical coordinates:

$$\nabla \cdot R^-_1 = \frac{1}{r^2}\frac{\partial}{\partial r}(r^2 \Gamma^{-r}_{\nu\mu}) + \frac{1}{rsin\theta}\left[\frac{\partial}{\partial \theta}(sin\theta \Gamma^{-\theta}_{\nu\mu}) + \frac{\partial}{\partial \varphi}(\Gamma^{-\varphi}_{\nu\mu})\right] \tag{7.17}$$

When the $r$-coordinate aligns to the superposition $\tilde{r}$, the three-dimensions of a physical space has its redundant degrees of freedom $\{\theta, \varphi\}$ such that the torque transportation becomes *r*-dependent inversely proportional to the square of distance or appears as the gravitational singularity. Therefore, one spatial dimension on the world planes evolves its physical world into the extra two-coordinates with a rotational *Central-Singularity*. This nature of physical-supremacy characterizes forces between objects and limits their interactive distances. As an associative affinity, this principle of the central-singularity, for examples, operates the gravitational attractions between the mass bodies, or gives weight to physical objects in residence.

At the second horizon, conservation of light is sustained by its electromagnetic fields $F^{\pm n}_{\nu\mu}$ and transported by its companion partner: torque $\tilde{\Upsilon}^{\pm n}_{\nu\mu}$ fields. At the third horizon, given rise to, $\chi^{\nu} \mapsto L_{\nu}^{\pm}$, the freedom of the extra rotations, the world planes are further evolved into Spacetime manifolds, where the torque $\Upsilon_{\nu\mu}^{\pm n}$ fields are transited to gravitational $\Upsilon_{\nu\mu}^{\pm n}(\tilde{\chi}^{\nu}) \mapsto \Upsilon_{\mu\nu}^{\pm n}(L_{\nu}^{\pm})$ forces with a central-singularity. Therefore, at the inauguration of mass enclave appearing as if there were from nothing, the entanglement of the superphase fluxions exerts a pair of the gravitational fields in a spacetime manifold.

# Quantum Fields

CHAPTER

At the first horizon the individual behaviors of objects or particles are characterized by their timestate functions of $\varphi_n^+$ or $\phi_n^-$ in the first $W_a$ horizon. This horizon scopes out the first degree of *World Equation*, confined by its neighborhoods of the ground and second horizons. Due to the duality nature of virtual and physical coexistences, particle fields appear as quantization in mathematics, known as *Quantum* Fields.

A homogeneous system is defined such that the source of the fields appears as a point object and has the uniform properties 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 torsion. Mathematically, homogeneity is commutative under invariance, as all components of the equation have the same degree of value, each of these components has a trace of diagonal elements and is scaled to different values for the cumulative distribution. Under this environment, an observer is positioned external to or outside of the objects.

For a heterogeneous system, the horizon fields is at a situation where the duality of virtual annihilation and physical reproduction are balanced to form the mass enclave. It stretches the surface with oscillating angular momentum, represented by the off-diagonal elements of tensors.

Finally, it exposes mass formation during the quantum harmonic oscillations between the horizons, which remarkably reveals *Embody Structure of Mass Enclave* and gives rise to the gravitation fields at the principle of the central-singularity.

# 1. Quantum Field Equations

At the first horizon, the individual behaviors of objects or particles are characterized by their timestate functions of $\phi_n^+$ or $\phi_n^-$ in the $W_a$ equations. Due to the nature superphase modulation of virtual and physical coexistences, particle fields appear as quantization in mathematics.

Under a steady environment of the energy fluxions $W_n^\pm$, the equations (5.34) and (5.35) can be reformulated into the compact forms for the $Y^+$ supremacy of the entanglements: *the $Y^+$ Quantum Field Equations*

$$\frac{-\hbar^2}{2E_n^+}\hat{\partial}_\lambda\hat{\partial}_\lambda\phi_n^+ - \frac{\hbar}{2}\left(\hat{\partial}_\lambda - \check{\partial}^\lambda\right)\phi_n^+ + \frac{\hbar^2}{2E_n^+}\check{\partial}_\lambda\left(\hat{\partial}_\lambda - \check{\partial}^\lambda\right)\phi_n^+ = \frac{W_n^+}{c^2}\phi_n^+ \tag{8.1}$$

$$\frac{\hbar^2}{2E_n^-}\check{\partial}^\lambda\check{\partial}^\lambda\varphi_n^- - \frac{\hbar}{2}\left(\check{\partial}^\lambda - \hat{\partial}_\lambda\right)\varphi_n^- + \frac{\hbar^2}{2E_n^-}\left(\check{\partial}_\lambda - \hat{\partial}_\lambda\right)\check{\partial}^\lambda\varphi_n^- = \frac{W_n^+}{c^2}\varphi_n^- \tag{8.2}$$

$$\kappa_1 = \hbar c^2/2 \qquad \kappa_2 = \pm(\hbar c)^2/(2E_n^\mp) \qquad W_n^\pm = c^2 E_n^\pm \tag{8.3}$$

where $E_n^\pm$ is an energy state of a virtual object or a physical particle. It emerges that the bi-directional transformation has two rotations one with left-handed $\phi_n^+ \mapsto \phi_n^L$ acting from the $Y^+$ source to the $Y^-$ manifold, and the other right-handed $\varphi_n^- \mapsto \phi_n^R$ reacting from the $Y^-$ back to the $Y^+$ manifold. Both fields are alternating into one another under a parity operation with relativistic preservation.

The entanglement of $Y^+$-supremacy represents one of the important principles of natural governances - *Law of Conservation of Virtual Creation and Annihilation:*

1. *The operational action $\hat{\partial}^\lambda$ of virtual supremacy results in the physical effects as the parallel and reciprocal reactions or emanations $\check{\partial}_\lambda$ in the physical world;*
2. *The virtual world transports the effects $\hat{\partial}_\lambda\hat{\partial}_\lambda$ emerging into or appearing as the creations of the physical world, even though the bi-directional transformations seem balanced between the commutative operations of $\hat{\partial}_\lambda$ and $\check{\partial}^\lambda$; and*
3. *As a part of the reciprocal processes, the physical world transports the reactive effects $\check{\partial}^\lambda\check{\partial}_\lambda$ concealing back or disappearing as annihilation processes of virtual world.*

As a set of the universal laws, the events incepted in the virtual world not only generate its opponent reactions but also create the real-life objects in the physical world. The obvious examples are the formations of the elementary particles that a) the antiparticles in a virtual world generate the physical particles through their opponent duality of the event operations; b) by carrying and transitioning the informational massages, particles and antiparticles grow into real-life objects vividly in a physical world and maintain their living entanglement; c) recycling objects of a physical world as one of continuity processes for virtual-life streaming.

As a reciprocal process, another pair of the equations (5.36) and (5.37) simultaneously formulates the following components for the $Y^-$ supremacy of entanglements: *the* $Y^-$ *Quantum Field Equations*

$$\frac{\hbar^2}{2E_n^-}\check{\partial}^\lambda\check{\partial}_\lambda\phi_n^- - \frac{\hbar}{2}\left(1+\frac{\hbar}{E_n^-}\hat{\partial}^\lambda\right)\left(\check{\partial}_\lambda - \hat{\partial}^\lambda\right)\phi_n^- = \frac{W_n^-}{c^2}\phi_n^- \tag{8.4}$$

$$\frac{-\hbar^2}{2E_n^+}\hat{\partial}^\lambda\hat{\partial}^\lambda\varphi_n^+ - \frac{\hbar}{2}\left(1-\frac{\hbar}{E_n^+}\check{\partial}^\lambda\right)\left(\hat{\partial}^\lambda - \check{\partial}_\lambda\right)\varphi_n^+ = \frac{W_n^-}{c^2}\varphi_n^+ \tag{8.5}$$

The $Y^-$ parallel entanglement represents another essential principle of $Y^-$ natural behaviors - *Law of Conservation of Physical Animation and Reproduction*:

1. *The operational action $\check{\partial}_\lambda$ of physical supremacy results in their conjugate or imaginary effects of animations because of the parallel reaction $\hat{\partial}^\lambda$ in the virtual world;*
2. *Neither the actions nor reactions impose their final consequences $\check{\partial}^\lambda\check{\partial}^\lambda$ on their opponents because of the parallel mirroring residuals for the horizon phenomena of reproductions $\hat{\partial}^\lambda\hat{\partial}^\lambda$ during the symmetric fluxions;*
3. *There are one-way commutations of $\check{\partial}^\lambda\check{\partial}_\lambda$ in transporting the events of the physical world into the virtual world asymmetrically. As a part of the reciprocal processes, the virtual world replicates $\hat{\partial}^\lambda$ the physical events during the mirroring $\hat{\partial}^\lambda\check{\partial}_\lambda$ processes in the virtual world.*

As another set of laws, the events initiated in the physical world must leave a life copy of its mirrored images in the virtual world without the intrusive effects in the virtual world. In other words, the virtual world is aware of and immune to the physical world. In this perspective, continuity for a virtual-life streaming might become possible as a part of recycling or reciprocating a real-life in the physical world.

# 2. Dirac Equation

In mathematical formulations of entanglements, we redefine the energy-mass conversion in the forms of virtual complexes as the following:

$$E_n^{\mp} = \pm imc^2 \qquad : \hbar\omega \rightleftharpoons mc^2 \tag{8.6}$$

where $m$ is the rest mass. Compliant with a duality of *Universal Topology* $W = P \pm iV$, it extends *Einstein* mass-energy equivalence, introduced in 1905 [28], into the virtual energy states as one of the essential formulae of the topological framework.

Intrinsically heterogeneous, one of the characteristics of spin is that the events in the $Y^+$ or $Y^-$manifold transform into their opponent manifold in forms of bispinors of special relativity, reciprocally. Considering the first order $\dot{\partial}$ only and applying the transformational characteristics (7.6), we add (8.1)-(8.5) together to formulate the simple compartment:

$$\frac{\hbar}{2}\left(\dot{x}_\nu \zeta_\mu D_\nu - \dot{x}^\mu \zeta^\mu D^\mu\right)\psi_n^{\pm} \mp E_n^{\pm}\psi_n^{\pm} = 0 \tag{8.7}$$

$$\psi_n^+ = \begin{pmatrix}\phi_n^+ \\ \varphi_n^-\end{pmatrix}, \qquad \overline{\psi}_n^- = \kappa\begin{pmatrix}\varphi_n^- \\ \phi_n^+\end{pmatrix}, \qquad \psi_n^- = \begin{pmatrix}\phi_n^- \\ \varphi_n^+\end{pmatrix}, \qquad \overline{\psi}_n^+ = \kappa\begin{pmatrix}\varphi_n^+ \\ \phi_n^-\end{pmatrix} \tag{8.8}$$

where $\overline{\psi}_n^{\pm}$ is the adjoint potential and $\kappa$ is a constant subject to renormalization. Ignoring the torsion fields $\chi^\mu$ and $\chi_\mu$, we have the above compact equations reformulated into the formulae:

$$\tilde{\mathscr{L}}_D^+ = \overline{\psi}_n^- \gamma^\mu\left(i\hbar c\partial^\mu + eA^\mu\right)\psi_n^+ + mc^2\overline{\psi}_n^-\psi_n^+ \to 0 \tag{8.9a}$$

$$\tilde{\mathscr{L}}_D^- = \overline{\psi}_n^+ \gamma_\nu\left(i\hbar c\partial_\nu - eA_\nu\right)\psi_n^- - mc^2\overline{\psi}_n^+\psi_n^- \to 0 \tag{8.9b}$$

where $\tilde{\mathscr{L}}_D^{\pm}$ is defined as the classic Lagrangians. As a pair of entanglements, they philosophically extend to and are known as Dirac Equation, introduced in 1925 [29]. For elementary (unit charge, massless) fermions satisfying the Dirac equation, it suffices to note their field entanglements [30]:

$$\left(\gamma^\mu D^\mu\right)\left(\gamma_\nu D_\nu\right) = D^\mu D_\nu + \frac{i}{4}[\gamma^\mu, \gamma^\nu]F_{\mu\nu}^{-n} \tag{8.10}$$

Historically, the *Dirac* equation was a major achievement and gave physicists great faith in its overall correctness.

In the limit as m → 0, the above Dirac equation is reduced to the massless particles:

$$\sigma_\mu \partial_\mu \psi = 0, \quad or \quad I_2 \frac{1}{c}\frac{\partial \psi}{\partial t} + \sigma_1\frac{\partial \psi}{\partial x} + \sigma_2\frac{\partial \psi}{\partial y} + \sigma_3\frac{\partial \psi}{\partial z} = 0 \tag{8.12}$$

known as *Weyl* equation introduced in 1918 [31].

# 3. Spinor Fields

As the function quantity from the first to second horizon, a scalar field $\phi^-$ bonds and projects its potentials superseding its surrounding space, arisen by or acting on its opponent $\varphi^+$ through a duality of reciprocal interactions dominated by Lorentz Generators. From the gamma matrix (7.4a) to Lorentz generators (7.12), the respective transformations of spinors are given straightforwardly by the matrixes of spinor $\sigma_n$ quantities [32].

$$\phi_n^L = S(\Lambda^+)\phi_n^+(\hat{x}) \qquad : (\phi_n^L)^{-1}\gamma^\mu\phi_n^L = \Lambda^+\gamma^\nu,\ \check{x} = \Lambda^+\hat{x} \tag{8.11a}$$

$$\phi_n^R = S(\Lambda^-)\varphi_n^-(\check{x}) \qquad : (\phi_n^R)^{-1}\gamma_\mu\phi_n^R = \Lambda^-\gamma_\nu,\ \hat{x} = \Lambda^-\check{x} \tag{8.11b}$$

$$S(\Lambda^\pm) = exp\left\{\frac{1}{2}\left(i\sigma_k\hat{\theta}_k \pm \sigma_m\hat{\phi}_m\right)\right\} \qquad : \Lambda^\pm = exp\left(\frac{\omega_k}{2}L_\kappa^\pm\right) \tag{8.12}$$

Each of the first terms of $S(\Lambda^\pm)$ is the transformation matrix of the two dimensional world planes, respectively. Each of the second terms of $S(\Lambda^\pm)$ is an extension to the additional dimensions for the physical freedoms. The quantities are irreducible, preserve full parity invariant with respect to the physical change $\check{\theta}_i \rightarrow -\hat{\theta}_i$ for spin-up and spin-down positrons, which has the extra freedoms and extends the two degrees from a pair of each physical dimension of the world planes.

# 4. Schrödinger Equation

For observations under an environment of $W_n^- = -ic^2V^-$ at the constant transport speed *c*, the homogeneous fields are in a trace of diagonalized tensors. From the first to the second horizon, it is dominated by the virtual time entanglement with the equation of

$$\check{\partial}_\lambda - \hat{\partial}^\lambda = \dot{x}_\nu S_2^- \partial_m - \dot{x}^m S_2^+ \partial^\nu = 2ic \begin{pmatrix} \partial_\kappa \\ -\partial^\kappa \end{pmatrix} \tag{8.13}$$

Referencing the (3.14-3.15) equations, we decode the quantum fields of (8.4, 8.5) into the following formulae:

$$-i\hbar\frac{\partial}{\partial t}\phi_n^- - \frac{i\hbar^2}{2E_n^-}\frac{\partial^2\phi_n^-}{\partial t^2} = -i\frac{(\hbar c)^2}{2E_n^-}\nabla^2\phi_n^- + V^-\phi_n^- \equiv \hat{H}\phi_n^- \tag{8.14a}$$

$$-i\hbar\frac{\partial}{\partial t}\varphi_m^+ + \frac{i\hbar^2}{2E_m^+}\frac{\partial^2\varphi_m^+}{\partial t^2} = -i\frac{(\hbar c)^2}{2E_m^+}\nabla^2\varphi_m^+ + V^-\varphi_m^+ \equiv \hat{H}\varphi_m^+ \tag{8.14b}$$

where $\hat{H}$ is known as the classical *Hamiltonian* operator, introduced in 1834 [19]. For the first order of time evolution, it emerges as the *Schrödinger* equation, introduced in 1926 [33].

$$-i\hbar\frac{\partial}{\partial t}\psi = \hat{H}\psi \qquad\qquad \hat{H} \equiv -i\frac{(\hbar c)^2}{2E_n^-}\nabla^2 + V^- \tag{8.15}$$

The $Y^-Y^+$ entanglement of the (8.14) equations can be integrated into the following formulae:

$$-i\hbar\Big\langle\frac{\partial}{\partial t}\Big\rangle_{mn}^- - \frac{\hbar^2}{2mc^2}\Big[\frac{\partial^2}{\partial t^2}\Big]_{mn}^- = \tilde{H}_{mn}^- \qquad \rightarrow \qquad -i\hbar\frac{\partial}{\partial t} = \hat{H} \tag{8.16a}$$

$$\tilde{H}_{mn}^- \equiv -\frac{\hbar^2}{2m}\big\langle\nabla^2\big\rangle_{mn}^- + 2V^-\big(\phi_n^-\varphi_m^+\big) \tag{8.16b}$$

where the bracket $\langle\ \rangle_{mn}^\pm$ and $[\ ]_{mn}^\pm$ are given by (3.17-3.21) of fluxion entanglements. Remarkably, it reveals that the entanglement lies at the second order of the virtual time commutation $[\partial^2/\partial t^2]_{mn}^-$ of the event operations.

# 5. Pauli Theory

In the gauge fields, a particle of mass *m* and charge *e* can be extended by the vector potential $\mathbf{A}$ and scalar electric potential $\phi$ in the form of $A^{\nu} = \{\phi, \mathbf{A}\}$ such that the (8.15) equation is conceivable by (7.6) as the following gauge invariant:

$$-i\hbar\zeta^0 D^{\kappa}\varphi^+ = -\frac{\hbar^2}{2m}(\zeta^r D^r)(\zeta^r D^r)\varphi^+ + \hat{V}\varphi^+ \quad : D^{\nu} = D^{\kappa} + D^r \tag{8.17a}$$

$$D^{\kappa} = \partial^t - i\frac{e}{\hbar}\phi, \qquad D^r = \partial^r - i\frac{e}{\hbar}\mathbf{A} \qquad : A^{\nu} = \{\phi, \mathbf{A}\} \tag{8.17b}$$

Since $\gamma^r = (\sigma_x, \sigma_y, \sigma_z) \equiv \boldsymbol{\sigma}$, the *Schrödinger* Equation (8.15) becomes the general form of Pauli Equation, formulated by *Wolfgang Pauli* in 1927 [34]:

$$i\hbar\frac{\partial}{\partial t}|\varphi^+\rangle = \left\{\frac{1}{2m}\left[\boldsymbol{\sigma}\cdot\left(\mathbf{p} - e\mathbf{A}\right)\right]^2 + e\phi + \hat{V}\right\}|\psi\rangle \equiv \check{H}|\varphi^+\rangle \tag{8.18}$$

$$\mathbf{p} = -i\hbar\partial^r, \qquad \boldsymbol{\sigma} = (\sigma_x, \sigma_y, \sigma_z) \qquad : \chi^{\nu} \mapsto 0,\ \partial^t = -\partial_t \tag{8.19}$$

where **p** is the kinetic momentum. The *Pauli* matrices can be removed from the kinetic energy term, using the *Pauli* vector identity:

$$(\boldsymbol{\sigma}\cdot\mathbf{a})(\boldsymbol{\sigma}\cdot\mathbf{b}) = \mathbf{a}\cdot\mathbf{b} + i\boldsymbol{\sigma}\cdot(\mathbf{a}\times\mathbf{b}) \qquad : \gamma^r = (\sigma_x, \sigma_y, \sigma_z) \equiv \boldsymbol{\sigma} \tag{8.20}$$

to obtain the standard form of *Pauli Equation* [35],

$$i\hbar\frac{\partial}{\partial t}|\psi\rangle = \left\{\frac{1}{2m}\left(\mathbf{p} - e\mathbf{A}\right)^2 - \frac{e\hbar}{2m}\boldsymbol{\sigma}\cdot\mathbf{B} + \tilde{V}\right\}|\psi\rangle \equiv \check{H}|\psi\rangle \tag{8.21}$$

where $\mathbf{B} = \nabla\times\mathbf{A}$ is the magnetic field and $\tilde{V} = \hat{V} + e\phi$ is the total potential including the horizon potential $e\phi$. The *Stern–Gerlach* term, $e\hbar\boldsymbol{\sigma}\cdot\mathbf{B}/(2m)$, acquires the spin orientation of atoms with the valence electrons flowing through an inhomogeneous magnetic field [36]. As a result, the above equation is implicitly observable under the $Y^+$ characteristics. The experiment was first conducted by the *German* physicists *Otto Stern* and *Walter Gerlach*, in 1922. Analogously, the term is responsible for the splitting of quantum spectral lines in a magnetic field anomalous to *Zeeman* effect, named after *Dutch* physicist *Pieter Zeeman* [37] in 1898.

Considering a pair of the wave function observed externally at a constant speed, the diagonal elements of (8.1, 8.2) has the potential density $\Phi_c^+ = \varphi^-\phi^+$of light transporting massless waves, conserving to a constant, and maintaining its continuity states of current density.

$$\partial_\mu J_c^\mu \mapsto \frac{\partial \rho_c^+}{\partial t} + \mathbf{u}^+ \nabla \cdot \mathbf{j}_c^+ = 0 \qquad : J_c^\mu = \left(c\rho^+, \mathbf{j}^+\right) \tag{8.23}$$

$$\rho_c^+ = \frac{\hbar}{2E^+} \partial_t \Phi_c^+, \qquad \mathbf{j}_c^+ = \frac{\hbar c}{2E^+} \mathbf{u}^+ \nabla \Phi_c^+ \qquad : \Phi_c^+ = \varphi^- \phi^+ \tag{8.24}$$

This continuity equation is an empirical law expressing charge neutral conservation. It implies that a pair of photons is transformable or convertible into a pair of the electron and positron or vice versa.

# 6. Mass Acquisition and Annihilation

As a duality of evolution, consider *N* harmonic oscillators of quantum objects. The energy spectra operates between the virtual wave and physical mass oscillating from one physical dimension on world planes into three dimensional *Hamiltonian* of *Schrödinger Equation* in spacetime dimensions, shown by the following:

$$\tilde{H} = \sum_{n=1}^{N} \frac{\hat{p}_n^2}{2m} + \frac{1}{2} m \omega_n^2 r_n^2 \qquad : \hat{p}_n = -i\hbar \frac{\partial}{\partial r_n} \tag{8.25}$$

Developed by *Paul Dirac* [34], the "ladder operator" method introduces the following operators:

$$\tilde{H} = \sum_{n=1}^{N} \hbar \omega_n \left( \tilde{a}_n^{\pm} \tilde{a}_n^{\mp} \mp \frac{1}{2} \right) \qquad : \tilde{a}_n^{\mp} = \sqrt{\frac{m\omega_n}{2\hbar}} \left( r_n \pm \frac{i}{m\omega_n} \hat{p}_n \right) \tag{8.26}$$

Under the $Y^-$ supremacy, $\tilde{a}_n^+$ is the creation operation for the wave-to-mass of physical animation, while $\tilde{a}_n^-$ is the reproduction operation for mass-to-wave of virtual annihilation. Intriguingly, the solution to the above equation can be either one-dimension *SU*(2) for ontological evolution or three-dimension for spacetime at the *SU*(3) horizon.

$$\varphi_n^+(r_n) = \frac{1}{\sqrt{2^n \, n!}} \left( \frac{m\omega_n}{\pi\hbar} \right)^{1/4} e^{-\frac{m\omega_n r_n^2}{2\hbar}} H_n\Big( \sqrt{\frac{m\omega_n}{\hbar}} r_n \Big) \tag{8.27}$$

$$\phi_{nlm}^-(r_n, \theta, \phi) = N_{nl} r^l e^{-\frac{m\omega_n}{2\hbar} r_n^2} L_n^{(l+1/2)} \Big( \frac{m\omega_n}{\hbar} r_n^2 \Big) Y_{lm}\big(\theta, \phi\big) \tag{8.28a}$$

$$N_{nl} = \left[ \Big( \frac{2\nu_n^3}{\pi} \Big)^{1/2} \frac{2^{n+2l+3} \, n! \, \nu_n^l}{(2n + 2l + 1)!} \right]^{1/2} \qquad : \nu_n \equiv \frac{m\omega_n}{2\hbar} \tag{8.28b}$$

The $H_n(x)$ is the *Hermite* polynomials, detail by *Pafnuty Chebyshev* in 1859 [38]. The $N_{nl}$ is a normalization function for the enclaved mass at the third horizon. Named after *Edmond Laguerre* (1834-1886), the $L_k^{\nu}(x)$ are generalized *Laguerre* polynomials [39] for the energy embody dynamically. Introduced by *Pierre Simon de Laplace* in 1782, the $Y_{lm}(\theta, \phi)$ is a spherical harmonic function for the freedom of the extra rotations or the basis functions for *SO*(3). Apparently, the classic normalizations are at the second horizon for $\varphi_n^+$ and the third horizon for $\phi_{nlm}^-$.

Based on *Embody Structure of Mass Enclave* at the n=0 ground level $H_0 = L_0 = Y_{00} = 1$, the energy potentials embody the full mass enclave $\phi_n^- \varphi_n^+ \propto m$ that splits between the potential $\varphi_n^+ \propto m^{1/4}$ in the second horizon and $\phi_n^- \propto m^{3/4}$ in the third horizon. The density emerges from the second to third horizon for the full-mass acquisition:

$$\rho^- \approx \phi_0^- \varphi_0^+ = 2\frac{m\omega}{\pi\hbar} exp\left[ -\frac{m\omega}{2\hbar}(r_s^2 + r_w^2)\right] \tag{8.29a}$$

$$\phi_0^- = 2\left(\frac{m\omega}{\pi\hbar}\right)^{3/4} e^{-\frac{m\omega}{2\hbar}r_s^2}, \qquad \varphi_0^+ = \left(\frac{m\omega}{\pi\hbar}\right)^{1/4} e^{-\frac{m\omega r_w^2}{2\hbar}} \tag{8.29b}$$

where the radius $r_s$ or $r_w$ is the interactive range of the strong or weak forces, respectively. Therefore, the energy embodies its mass enclave in a process from its ¼ to ¾ core during its evolution of the second to third horizon, progressively. Vice versa for the annihilation.

Remarkably, the operations represent not only a duality of the creation and annihilation, but also the seamless transitions between the virtual world planes and the real spacetime manifold. For example, The Sun is the star at the center of the solar system between the virtual and physical worlds. The Sun rotates in the quantum layers with the innermost 1/4 (or higher to include the excited levels at n>0) of the core radius at the second and lower horizons. Between this core radius and 3/4 of the radius, it forms a "radiative zone" for energy embodied at the full mass enclave by means of photon radiation. The rest of the physical zone is known as the “convective zone” for massive outward heat transfer.

# 7. Speed of Light

At an event $\lambda = t$, the observable light speed in a free space or vacuum has the relativistic effects of transformations. A summation of the right-side of the four (6.2) equations represents the motion fluxions:

$$\mathbf{f}_c^+ = \psi_c^- \begin{pmatrix} \hat{\partial}^\nu \\ \check{\partial}^\nu \end{pmatrix}' \psi_c^+ = \psi_c^- \dot{x}^\nu \tilde{\gamma}^\nu \begin{pmatrix} \partial^\nu \\ \partial_\nu \end{pmatrix}' \psi_c^+ \mapsto C_{\nu\mu}^+ \psi_c^- \nabla \psi_c^+ \qquad (8.30a)$$

$$\mathbf{f}_c^- = \psi_c^+ \begin{pmatrix} \check{\partial}_\nu \\ \hat{\partial}_\nu \end{pmatrix}' \psi_c^- = \psi_c^+ \dot{x}_\nu \tilde{\gamma}_\nu \begin{pmatrix} \partial_\mu \\ \partial^\mu \end{pmatrix}' \psi_c^- \mapsto C_{\nu\mu}^- \psi_c^+ \nabla \psi_c^- \qquad (8.30b)$$

where the equations are mapped to the three-dimensions of a physical space at the second horizon ($\tilde{\gamma} \mapsto \gamma$). For the potential fields $\psi_c^\pm = \psi_c^\pm(r) exp(i\vartheta^\pm)$ at massless in the second horizon, we derive the *C*-matrices for the speed of light:

$$C_{\nu\mu}^+ = \dot{x}^\nu \gamma^\nu e^{-i\vartheta}, \qquad C_{\nu\mu}^- = \dot{x}_\nu \gamma_\nu e^{i\vartheta} \qquad : \vartheta = \vartheta^- - \vartheta^+ \qquad (8.31)$$

where the quanta $\vartheta$ is the superphase, and $\nu \in (1,2,3)$. Remarkably, the speed of light is characterized by a pair of the above $Y^- Y^+$ matrices, revealing the intrinsic entanglements of light that constitutes of transforming γ-fields and superphase modulations. Philosophically, no light can propagate without the internal dynamics, which is described by the off-diagonal elements of the *C*-matrices. Applying to an external object, the quantities can be further characterized by the diagonal elements of the *C*-matrices at the r-direction of world lines, shown by the following:

$$C_{rr}^\pm = c e^{\mp i\vartheta} \qquad : \textit{Speed of Light} \ = |C_{rr}^\pm| = c \qquad (8.32)$$

As expected, the speed of light is generally a non-constant matrix, representing its traveling dynamics sustained and modulated by the $Y^- Y^+$ superphase entanglements. Because the constituent elements of the γ-matrices are constants, the amplitude of the *C*-matrices at a constant *c* is compliant to and widely known as a universal physical constant. The speed *C*-matrix applies to all massless particles and changes of the associated fields travelling in vacuum or free-space, regardless of the motion of the source or the inertial or rotational reference frame of the observer.

# 8. Speed of Gravitation

Similar to the motion fluxions of light, one has the fluxions of gravitational fields in a free space or vacuum:

$$\mathbf{f}_g^+ = \psi_g^- \begin{pmatrix} \hat{\partial}^\nu \\ \check{\partial}^\nu \end{pmatrix}' \psi_g^+ = \psi_g^- \dot{x}^\nu \tilde{\chi}^\nu \begin{pmatrix} \partial^\nu \\ \partial_\nu \end{pmatrix}' \psi_g^+ \mapsto G_{\nu\mu}^+ \psi_g^- \nabla \psi_g^+ \quad (8.33)$$

$$\mathbf{f}_g^- = \psi_g^+ \begin{pmatrix} \check{\partial}_\nu \\ \hat{\partial}_\nu \end{pmatrix}' \psi_g^- = \psi_c^+ \dot{x}_\nu \tilde{\chi}_\nu \begin{pmatrix} \partial_\mu \\ \partial^\mu \end{pmatrix}' \psi_g^- \mapsto G_{\nu\mu}^- \psi_g^+ \nabla \psi_g^- \quad (8.34)$$

Unlike the light transformation seamlessly at massless, the uniqueness of gravitation is at its massless transportation of the $\chi$-matrices from the second horizon potential $\psi_g^+ = \psi_g(r) exp(i\vartheta)$ of world planes into the third horizon potential $\psi_g^- = \psi_{nlm}(r_n, \theta, \phi)$ of the *L*-matrices of spacetime manifolds for its massive gravitational attraction. At inception of the mass enclave in the second horizon, the *G*-matrices are free of its central-singularity $r \to 0$, and result in

$$G_{\nu\mu}^+ = \lim_{r\to 0} (x^\nu \dot{x}^\nu \chi^\nu e^{-i\vartheta}) = x^\nu \dot{x}^\nu \epsilon_3 e^{-i\vartheta} = c_g s_1 e^{-i\vartheta} \quad (8.35)$$

$$G_{\nu\mu}^- = \lim_{r\to 0} (x_\nu \dot{x}_\nu \chi_\nu e^{i\vartheta}) = x_\nu \dot{x}_\nu \epsilon_3 e^{i\vartheta} = c_g s_1 e^{i\vartheta} \quad (8.36)$$

$$Speed\ of\ Gravitation\ = |G_{\mu\nu}^\pm| = c_g \qquad : \mu \neq \nu \quad (8.37)$$

Remarkably, the gravitational speed $c_g$ is a constant similar to the speed of light, but propagating orthogonally in the off-diagonal elements. Interrupting with mass objects at the third horizon, the gravitation becomes gravity that exerts a force inversely proportional to a square of the distance. Apparently, gravity has the same characteristics of the quantum entanglement.

# 9. Invariance of Flux Continuity

At both of the boost and twist transformations at a constant speed, the (8.1, 8.2) equations obey the time-invariance, transform between virtual and physical instances, and transport into the third horizon *SU*(3). For the external observation, the diagonal elements can be converted into a pair of dynamic fluxions of the $Y^-Y^+$ energy flows:

$$\hbar^2 \check{\partial}_\lambda \check{\partial}^\lambda \phi_n^+ = 2E_n^- E_n^+ \phi_n^+ \rightarrow \frac{1}{c^2}\frac{\partial^2 \phi_n^+}{\partial t^2} - \nabla^2 \phi_n^+ = 2\frac{E_n^- E_n^+}{(\hbar c)^2}\phi_n^+ \tag{8.39}$$

$$\hbar^2 \hat{\partial}_\lambda \hat{\partial}_\lambda \varphi_n^- = 2E_n^- E_n^+ \varphi_n^- \rightarrow \frac{1}{c^2}\frac{\partial^2 \varphi_n^-}{\partial t^2} + \nabla^2 \varphi_n^- = 2\frac{E_n^- E_n^+}{(\hbar c)^2}\varphi_n^- \tag{8.40}$$

where the (3.14-3.15) equations are applied. It extends and amends the Klein–Gordon equation, introduced in 1926 [40], by a factor of 2. Adding $\varphi_n^-$ times the first equation and $\phi_n^+$ times the second equation, one has an observable flux-continuity of the $Y^+$-primacy entanglement.

$$\Diamond_n^+ = 2\frac{E_n^- E_n^+}{(\hbar c)^2}\varphi_n^- \phi_n^+ \qquad : \Diamond_n^+ \equiv \left\langle \frac{1}{c^2}\frac{\partial^2}{\partial t^2} \right\rangle_n^+ - \left[\nabla^2\right]_n^+ \tag{8.41}$$

Correspondingly, the diagonal elements of the (8.4, 8.5) equations can be similarly reformulated to the similar $Y^-$ flux-continuity.

$$\Diamond_n^- = 2\frac{E_n^- E_n^+}{(\hbar c)^2}\varphi_n^+ \phi_n^- \qquad : \Diamond_n^- \equiv \left\langle \frac{1}{c^2}\frac{\partial^2}{\partial t^2} \right\rangle_n^- + \left[\nabla^2\right]_n^- \tag{8.42}$$

Together, they represent a flux propagation of the $Y^-Y^+$ entanglements:

$$\Diamond_n \equiv \Diamond_n^+ + \Diamond_n^- = 4\frac{E_n^- E_n^+}{(\hbar c)^2}\Phi_n \qquad : \Phi_n = \frac{1}{2}\left(\varphi_n^- \phi_n^+ + \varphi_n^+ \phi_n^-\right) \tag{8.43}$$

Amazingly, it reveals that an integrity of entanglements lies at the continuity of virtual time and the commutators of physical space.

In reality, the above flux-continuities are a pair of virtual and physical energies in each of the asymmetric entanglements to give rise to the strong forces at higher horizons of *SU*(2) and *SU*(3). Therefore, under a trace of the diagonalized tensors, we can represent a pair of the *Lagrangians* as a duality of the area flux-continuities:

$$\mathscr{L}_{Flux}^{\pm SU1} \equiv \Diamond_n^\pm = 2\frac{E_n^- E_n^+}{(\hbar c)^2}\Phi_n^\pm \qquad : \Phi_n^\pm = \varphi_n^\mp \phi_n^\pm \tag{8.44}$$

$$\mathscr{L}^{SU1}_{Flux} = \lozenge^+_n + \lozenge^-_n = 4\frac{E^-_n E^+_n}{(\hbar c)^2}\Phi_n \qquad : \Phi_n = \frac{1}{2}\left(\Phi^+_n + \Phi^-_n\right) \qquad (8.45)$$

The area flow of energy, $4E^-_n E^+_n/(\hbar c)^2$, represents a pair of the irreducible density units $E^-_n E^+_n$ that exists alternatively between the physical-particle $E^-_n$ and virtual-wave $E^+_n$ states.

# General Symmetric Dynamics

## CHAPTER IX

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*, they are fully describable by the mathematical framework of the dual manifolds.

This chapter 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 scalar 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 dual world planes. As a result, it constitutes the general symmetric fields of gravitation, electromagnetism and thermodynamics.

# 1. Symmetric World Equation

Symmetry is the laws of natural conservations that a system is preserved or remains unchanged under some transformation or transportation. 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, the $Y^-Y^+$ 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 steaming of entanglements at zero net momentum.*
4. *Both of the $Y^-Y^+$ symmetries have the laws of conservation consistently and distinctively, which orchestrate their local continuity respectively and harmonize each other dynamically.*

For the symmetric fluxions, the entangle invariance requires that their fluxions are conserved at zero net momentum. The formulae (4.13) represented by the first item $\kappa_1\langle\dot{\partial}_{\lambda^1}\rangle_s^{\pm}$ of above *World Equations* institute the density fluxions of second horizon. Meanwhile, the formulae expressed by the second item $(\kappa_2\dot{\partial}_{\lambda^2})\langle\dot{\partial}_{\lambda^1}\rangle_s^{\pm}$ raise the fields of third horizon. For both of these horizons, the continuity equations are the derivatives to the flux densities $\dot{\partial}_{\lambda}\rho_{\phi}^{\pm}$ of the scalar fields:

$$\langle\dot{\partial}_{\lambda^1}\rangle_s^{+} = \dot{\partial}\rho_{\phi}^{+} = \langle\dot{x}\partial\rangle_s^{+} = \varphi_n^{-}\dot{x}^{\nu}\partial^{\nu}\phi_n^{+} + \phi_n^{+}\dot{x}_{\nu}\partial_{\nu}\varphi_n^{-} \tag{9.1}$$

$$\langle\dot{\partial}_{\lambda^1}\rangle_s^{-} = \dot{\partial}\rho_{\phi}^{-} = \langle\dot{x}\partial\rangle_s^{-} = \varphi_n^{+}\dot{x}_{m}\partial_{m}\phi_n^{-} + \phi_n^{-}\dot{x}^{m}\partial^{m}\varphi_n^{+} \tag{9.2}$$

As a pair of the reciprocal fluxions, they are consisted of the scalar density fields symmetrically. For example, the well-known fluxion fields are laws of conservation and continuity equations of photon, electromagnetism, graviton, and gravitation forces. Apparently, the first and second horizons are characterized by the scaler potential densities.

For the third item $(\kappa_3\dot{\partial}_{\lambda^3})\langle\dot{\partial}_{\lambda^2}\rangle_v^{\pm}$ of *World Equations*, the horizon is consisted of the vector potential density $V^{\mp}$ associated with its vector potentials $V_{\mu}^{\mp} = -\dot{\partial}\phi^{\mp}$ and $\Lambda_{\mu}^{\mp} = -\dot{\partial}\varphi^{\mp}$ such that the $Y^-$ and $Y^+$ flux densities become the productions of a set of scalars and vector potential fields.

$$\langle \dot{\partial}_{\lambda^2} \rangle_v^+ = \dot{\partial}\rho_v^+ = \langle \dot{x}\partial \rangle_v^+ = -\left(\varphi_n^- \dot{x}^\nu \partial^\nu V_\mu^+ + \phi_n^+ \dot{x}_\nu \partial_\nu \Lambda_\mu^-\right) \tag{9.3}$$

$$\langle \dot{\partial}_{\lambda^2} \rangle_v^- = \dot{\partial}\rho_v^- = \langle \dot{x}\partial \rangle_v^- = -\left(\varphi_n^+ \dot{x}_m \partial_m V_\mu^- + \phi_n^- \dot{x}^m \partial^m \Lambda_\mu^+\right) \tag{9.4}$$

In other worlds, the third and *forth horizons* are characterized by the vector potential densities $\rho_v^\pm$ as well as accompanied by its scaler potentials. As horizon in process, the events continuously give rise to the fifth item $(\kappa_4 \dot{\partial}_{\lambda^4})\langle \dot{\partial}_{\lambda^3} \rangle_M^\pm$ of *World Equation* that the densities become the production of a scalar $\phi_n^\pm$ or $\varphi_n^\pm$ and a matrix $\tilde{M}_{\mu\iota}^\mp = -\dot{\partial}V_\mu^\mp$ or $\tilde{W}_{\mu\iota}^\mp = -\dot{\partial}\Lambda_\mu^\mp$ potential fields. At a similar fashion, the *fourth and fifth horizon* are consisted of the matrix potential densities $\rho_M^\pm$ associated with its scaler potential field. In mathematical view, *World Equations* are summation of a set of the fluxion fields, each defines a horizon by extending an order of the tensor: order-zero for scalar, order-one for vector, order-two for matrix, and so on.

# 2. Second Universal Equations

From the equations (5.38), we constitute a commutation of the $Y^+$ fluxion of density continuity $\dot{\partial}_\lambda \mathbf{f}_v^+ = \kappa_f \langle \hat{\partial}_\lambda \hat{\partial}_\lambda, \check{\partial}^\lambda \check{\partial}^\lambda \rangle_v^+$ in the dynamic equilibrium $\mathbf{g}_a^- = 0$ of a symmetric system:

$$\dot{\partial}_\lambda \mathbf{f}_v^+ = \kappa_2 \langle \hat{\partial}_\lambda \hat{\partial}_\lambda, \check{\partial}^\lambda \check{\partial}^\lambda \rangle^+ = \langle W_0 \rangle^+ - \kappa_1 \left[ \check{\partial}^{\lambda_2} - \hat{\partial}_{\lambda_2} \right]_v^+ + \kappa_2 \left\langle \check{\partial}_{\lambda_3} \left( \check{\partial}^{\lambda_2} - \hat{\partial}_{\lambda_2} \right) \right\rangle_v^+ + \mathbf{g}_a^- / \kappa_g^- \tag{9.5}$$

$$\kappa_1 = \frac{\hbar c^2}{2}, \qquad \kappa_2 = -\frac{(\hbar c)^2}{2E^+}, \qquad \mathbf{g}_0^+ = \frac{\langle W_0^+ \rangle}{\hbar c} \tag{9.6}$$

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 $\dot{\partial}_\lambda \mathbf{f}_v^+ = \langle \hat{\partial}_\lambda \hat{\partial}_\lambda, \check{\partial}^\lambda \check{\partial}^\lambda \rangle_v^+$ 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 asymmetric element $\zeta^\nu \mapsto L_\nu^+$ embeds the bidirectional reactions $\hat{\partial}_\lambda$ and $\check{\partial}^\lambda$ entangling between the $Y^- Y^-$ manifolds asymmetrically.

In a parallel fashion, the equation (5.39) under the dynamic equilibrium $\mathbf{g}_a^+ = 0$ can be rewritten to institute $Y^-$ fluxion of density continuity $\dot{\partial}_\lambda \mathbf{f}_v^- = \kappa_f \langle \check{\partial}_\lambda \check{\partial}_\lambda, \hat{\partial}^\lambda \hat{\partial}^\lambda \rangle_v^-$ of the symmetric formulation:

$$\dot{\partial}_\lambda \mathbf{f}_s^- = \kappa_2 \left\langle \check{\partial}_\lambda \check{\partial}_\lambda, \hat{\partial}^\lambda \hat{\partial}^\lambda \right\rangle^- = \langle W_0^- \rangle + \kappa_1 \left[ \check{\partial}_{\lambda_1} - \hat{\partial}^{\lambda_1} \right]_s^- + \kappa_2 \left\langle \check{\partial}_{\lambda_1} \left( \hat{\partial}^{\lambda_2} - \check{\partial}^{\lambda_2} \right) \right\rangle_s^- + \mathbf{g}_a^+ / \kappa_g^+ \tag{9.7}$$

$$\kappa_1 = \frac{\hbar c^2}{2}, \qquad \kappa_2 = \frac{(\hbar c)^2}{2E^-} \qquad \mathbf{g}_0^- = \frac{\langle W_0^- \rangle}{\hbar c} \tag{9.8}$$

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. respectively. The entangle bracket $\langle \check{\partial}_\lambda \check{\partial}_\lambda, \hat{\partial}^\lambda \hat{\partial}^\lambda \rangle_v^- = \dot{\partial}_\lambda \mathbf{f}_v^-$ of the general 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 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 (9.5) and continuity (9.7) at the third horizon, where a bulk system of $N$ particles aggregates into macroscopic domain associated with thermodynamics.

# 3. Acceleration Tensors

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

$$\mathbf{g}_a^- / \kappa_g^- = \left(\hat{\partial}_\lambda \hat{\partial}_\lambda - \check{\partial}^\lambda \check{\partial}^\lambda\right)_v^+ + \zeta^+ \qquad : \zeta^+ = \left(\hat{\partial}_{\lambda_2} \check{\partial}^{\lambda_2} - \hat{\partial}_{\lambda_2} \check{\partial}_{\lambda_3}\right)_v^+ \tag{9.9}$$

$$\mathbf{g}_a^+ / \kappa_g^+ = \left(\check{\partial}_\lambda \check{\partial}_\lambda - \hat{\partial}^\lambda \hat{\partial}^\lambda\right)^- + \zeta^- \qquad : \zeta^- = \left(\check{\partial}^{\lambda_2} \hat{\partial}^{\lambda_1} - \hat{\partial}^{\lambda_2} \check{\partial}_{\lambda_1}\right)_v^- \tag{9.10}$$

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.

At a view of the symmetric system (9.5) 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 (9.5) and (9.7) is generic or universal, it is called *Second Universal Field Equations,* representing the conservations of symmetric dynamics, and of asymmetric motions at a macroscopic 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 $\mathbf{g}_a^\pm = 0$.

$$\bar{\mathbf{g}}^+ = \mathbf{g}^+ - \mathbf{g}_0^+ = \frac{1}{\hbar c} \dot{\partial}_\lambda \bar{\mathbf{f}}_v^+ = \frac{c}{2} \left[\hat{\partial}_\lambda - \check{\partial}^\lambda\right]_v^+ - \frac{\hbar c}{2E^+} \left\langle \check{\partial}_\lambda \left(\check{\partial}^\lambda - \hat{\partial}_\lambda\right) \right\rangle_v^+ \tag{9.11}$$

$$\bar{\mathbf{g}}^- = \mathbf{g}^- - \mathbf{g}_0^- = \frac{1}{\hbar c} \dot{\partial}_\lambda \bar{\mathbf{f}}_v^- = \frac{c}{2} \left[\check{\partial}_\lambda - \hat{\partial}^\lambda\right]_v^- + \frac{\hbar c}{2E^-} \left\langle \check{\partial}_\lambda \left(\hat{\partial}^\lambda - \check{\partial}^\lambda\right) \right\rangle_v^- \tag{9.12}$$

defined as a system without asymmetric entanglements or symmetric dynamics that does not have the asymmetric flex transportation spontaneously.

# 4. Yin Transform Fields

As the function quantity from the second to third horizon, a vector field $V_\nu$ forms and projects its potentials to its surrounding space, arisen by or acting on its opponent potential $\varphi^+$ through a duality of reciprocal interactions dominated by Lorentz Generators [41]. Under the $Y^-$ primary given by the generator of (7.10, 7.11), the event processes institute and operate the entangling fields:

$$\check{T}^{-n}_{\mu\nu} \equiv \frac{\hbar c}{2E^-}\langle \hat{\partial}^\lambda - \check{\partial}^\lambda \rangle^-_\gamma \mapsto \frac{\hbar c}{2E^-}\langle \dot{x}^\mu L^+_\mu \partial^\mu - \dot{x}^\nu L^-_\nu \partial_\nu \rangle^-_\nu \tag{9.13}$$

$$\check{T}^{-n}_{\mu\nu} = \begin{pmatrix} 0 & \beta_1 & \beta_2 & \beta_3 \\ -\beta_1 & 0 & -e_3 & e_2 \\ -\beta_2 & e_3 & 0 & -e_1 \\ -\beta_3 & -e_2 & e_1 & 0 \end{pmatrix}_\times + \xi_\nu = \begin{pmatrix} 0 & \mathbf{B}^-_q \\ -\mathbf{B}^-_q & \frac{\check{\mathbf{b}}}{c} \times \mathbf{E}^-_q \end{pmatrix} + \xi_\nu \tag{9.13a}$$

$$\beta_\alpha = \check{T}^{-n}_{0\alpha} \qquad \varepsilon^-_{iam} e_i = \check{T}^{-n}_{m\alpha} \qquad \xi_\nu = (\check{T}^{-n}_{\nu\nu})_d \tag{9.13b}$$

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: $\check{T}^{+n}_{\mu\nu} = -\check{T}^{-n}_{\mu\nu}$ 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.

# 5. Yang Transform Fields

In the parallel fashion above, the event processes generate the reciprocal entanglements of the $Y^{+}$ commutation of the vector $V^{\nu}$ and scalar $\varphi^{-}$ fields, shown by the following equations:

$$\hat{T}^{+n}_{\mu\nu} \equiv \frac{\hbar c}{2E^{+}}\langle \hat{\partial}_{\lambda} - \check{\partial}^{\lambda} \rangle^{+}_{\gamma} \mapsto \frac{\hbar c}{2E^{+}}\langle \dot{x}_{\mu} L^{+}_{\mu} \partial^{\mu} - \dot{x}^{\nu} L^{-}_{\nu} \partial_{\nu} \rangle^{+}_{\nu} \qquad (9.14)$$

$$\hat{T}^{+n}_{\nu\alpha} = \begin{pmatrix} 0 & d^1 & d^2 & d^3 \\ -d^1 & 0 & h^3 & -h^2 \\ -d^2 & -h^3 & 0 & h^1 \\ -d^3 & h^2 & -h^1 & 0 \end{pmatrix}_{\times} + \xi^{\nu} = \begin{pmatrix} 0 & \mathbf{D}^{+}_{q} \\ -\mathbf{D}^{+}_{q} & \frac{\mathbf{u}}{c^2} \times \mathbf{H}^{+}_{q} \end{pmatrix} + \xi^{\nu} \qquad (9.14a)$$

$$d^{\alpha} = \hat{T}^{+n}_{0\alpha} \qquad \varepsilon^{+}_{\nu\alpha\mu} h^{\nu} = c^2 \hat{T}^{+n}_{\mu a} \qquad \xi^{\nu} = (\hat{T}^{-n}_{\nu\nu})_{d} \qquad (9.14b)$$

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

# 6. 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 $\partial^{\mu}$ and $\partial_{m}$, 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:

$$\check{\Upsilon}^{-a}_{\mu\nu} \equiv \frac{\hbar c}{2E^{-}}\left\langle \hat{\partial}^{\lambda} - \check{\partial}^{\lambda} \right\rangle^{-}_{\chi} \mapsto \begin{pmatrix} 0 & \mathbf{B}^{-}_{g} \\ -\mathbf{B}^{-}_{g} & \frac{\check{\mathbf{b}}}{c} \times \mathbf{E}^{-}_{g} \end{pmatrix} = -\,\check{\Upsilon}^{+a}_{\nu\mu} \tag{9.15}$$

$$\hat{\Upsilon}^{+a}_{\nu\mu} \equiv \frac{\hbar c}{2E^{+}}\langle \hat{\partial}_{\lambda} - \check{\partial}^{\lambda} \rangle^{+}_{\chi} \mapsto \begin{pmatrix} 0 & \mathbf{D}^{+}_{g} \\ -\mathbf{D}^{+}_{g} & \frac{\mathbf{u}}{c^{2}_{g}} \times \mathbf{H}^{+}_{g} \end{pmatrix} = -\,\hat{\Upsilon}^{-a}_{\mu\nu} \tag{9.16}$$

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.

# 7. Symmetric Fluxions

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 (9.13, 9.15) into symmetric (9.12) fluxion, we have the matrix formula in a pair of the vector formulation for the internal fields:

$$\frac{\hbar c}{2E^-}\left\langle \check{\partial}_\lambda\left(\hat{\partial}^\lambda - \check{\partial}^\lambda\right)\right\rangle_v^- = c\left(ic_\kappa\partial_\kappa \quad \mathbf{u}^-\nabla\right)\begin{pmatrix} 0 & \mathbf{B}^- \\ -\mathbf{B}^- & \frac{\check{\mathbf{b}}}{c}\times\mathbf{E}^- \end{pmatrix} \tag{9.17}$$

$$\mathbf{B}^- = \mathbf{B}_q^- + \mathbf{B}_g^- \qquad\qquad \mathbf{E}^- = \mathbf{E}_q^- + \frac{c}{c_g}\mathbf{E}_g^- \tag{9.18}$$

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 (9.11) generates acceleration tensor $\bar{\mathbf{g}}^+$ under virtual primacy for the off-diagonal (9.14) $\hat{T}_{\mu\nu}^{+a}$ and (9.16) $\hat{\Upsilon}_{\mu\nu}^{+a}$ elements. At the third horizon, one has the matrix formula in another pair of the vector formulation for the internal fields :

$$-\frac{\hbar c}{2E^+}\left\langle \check{\partial}_\lambda\left(\check{\partial}^\lambda - \hat{\partial}_\lambda\right)\right\rangle_v^+ = c\check{\partial}_\lambda\mathbf{F}^+ \qquad : \check{\partial}_{\lambda=t} = \left(ic\partial_\kappa \quad \mathbf{u}^-\nabla\right) \tag{9.19}$$

$$\mathbf{F}^+ = \kappa_x^+\begin{pmatrix} 0 & \mathbf{D}_q^+ + \mathbf{D}_g^+ \\ -\mathbf{D}_q^+ - \mathbf{D}_g^+ & \frac{\mathbf{u}_q}{c^2}\times\mathbf{H}_q^+ + \frac{\mathbf{u}_g}{c_g^2}\times\mathbf{H}_g^+ \end{pmatrix} \tag{9.20}$$

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.

# 8. Horizon Forces

Apparently, the field of equation (9.19) 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:

$$\mathbf{F}_q^+ = Q\mu_e\left(c^2\mathbf{D}_q^+ + \mathbf{u}_q \times \mathbf{H}_q^+\right) \qquad : \kappa_q^+ = Qc^2\mu_e,\ \ c^2 = \frac{1}{\varepsilon_q\mu_q} \tag{9.22}$$

$$\mathbf{F}_g^+ = M\mu_g\left(c_g^2\mathbf{D}_g^+ + \mathbf{u}_g \times \mathbf{H}_g^+\right) \qquad : \kappa_g^+ = Mc_g^2\mu_g,\ c_g^2 = \frac{1}{\varepsilon_g\mu_g} \tag{9.23}$$

where $Q$ is a charge, *M* is a mass, $\varepsilon_q$ or $\varepsilon_g$ is the permittivity, $\mu_q$ or $\mu_g$ is the permeability of the materials.

In a free space or vacuum, the constitutive relation (9.22) results in a summation of electric and magnetic forces:

$$\mathbf{F}_q = Q\left(\mathbf{E}_q^- + \mathbf{u}_q \times \mathbf{B}_q^-\right) \qquad : \mathbf{D}_q^+ = \varepsilon_e\mathbf{E}_q^-, \quad \mathbf{B}_q^- = \mu_e\mathbf{H}_q^+ \tag{9.24}$$

Because the fluxion force $\dot{\partial}_\lambda \bar{\mathbf{f}}_s^+$ (9.10) is proportional to $(\hat{\partial}_\lambda - \check{\partial}^\lambda)$, the force is statistically aggregated from or arisen by *Dirac Spinors* (8.7), symmetrically. Known as *Lorentz Force*, discovered in 1889 [42], it was first formulated by James Clark Maxwell in 1865 [43], then by Oliver Heaviside in 1889 [44], and finally by Hendrick Lorentz in 1891 [45]. Traditionally, the Lorentz law describes the electromagnetic interactions by the force acting on a moving point charge in the presence of electromagnetic fields. A particle of charge $Q$ moving with velocity $\mathbf{u}$ in its induction of an electric field $\mathbf{E}_c^-$ and a magnetic field $\mathbf{B}_c^-$ experiences a force $\mathbf{F}_q^+$. A positively charged particle is accelerated in the same linear orientation as the $\mathbf{E}_c^-$ field, but will curve perpendicularly to both the instantaneous velocity vector $\mathbf{u}$ and the $\mathbf{B}_c^-$ field according to the right-hand rule.

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

$$\mathbf{F}_g = M\mu_g\left(c_g^2\mathbf{D}_g^+ + \mathbf{u}_g \times \mathbf{H}_g^+\right) = M\left(\mathbf{E}_g^- + \mathbf{u}_g \times \mathbf{B}_g^-\right) \tag{9.25}$$

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

# 9. General Symmetric Fields

Balanced at the steady states, integrality of the virtual and physical environment is generally at constant or $\mathbf{g}_0^{\pm} = 0$. Since the $Y^+$ asymmetric accelerator $\mathbf{g}_a^+$ is under eternal states normalizable to zero $0^+$, a pair of the $Y^+$ and $Y^-$ continuity of the equations (9.11-9.12) institutes a general expression of conservations of symmetric dynamics:

$$\frac{\hbar c}{2E^-}\left\langle \check{\partial}_\lambda\left(\hat{\partial}^\lambda - \check{\partial}^\lambda\right)\right\rangle_v^- = \bar{\mathbf{g}}^- - \frac{c}{2}\left[\check{\partial}_\lambda - \hat{\partial}^\lambda\right]_v^- = 0^+ \tag{9.26}$$

$$-\frac{\hbar c}{2E^+}\left\langle \check{\partial}_\lambda\left(\check{\partial}^\lambda - \hat{\partial}_\lambda\right)\right\rangle_v^+ = \bar{\mathbf{g}}^+ - \frac{c}{2}\left[\hat{\partial}_\lambda - \check{\partial}^\lambda\right]_v^+ \equiv \mathbf{J}_x \tag{9.27}$$

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 $\mathbf{J}_x$:

$$\mathbf{J}_x \equiv \mathbf{J}_q^- - \mathbf{J}_g^- \qquad : \mathbf{J}_q^- = \left\{\mathbf{u}_q \rho_q, \mathbf{J}_q\right\},\ \mathbf{J}_g^- = 4\pi G\left\{\mathbf{u}_g \rho_g, \mathbf{J}_g\right\} \tag{9.28}$$

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.

Sourced by the virtual time operation $\lambda = t$, the dark fluxion of $Y^-$ boost fields has the conservation equation: $\check{\partial}_\lambda \bar{\mathbf{f}}_\times^- = 0$. Combined with (9.17), the equation (9.26) is equivalent to a pair of the expressions:

$$\left(\mathbf{u}_q \nabla\right) \cdot \mathbf{B}_q^- + \left(\mathbf{u}_g \nabla\right) \cdot \mathbf{B}_g^- = 0 \tag{9.29}$$

$$\frac{\partial}{\partial t}\left(\mathbf{B}_q^- + \mathbf{B}_g^-\right) + \left(\frac{\mathbf{u}_q}{c}\nabla\right) \times \mathbf{E}_q^- + \left(\frac{\mathbf{u}_g}{c_g}\nabla\right) \times \mathbf{E}_g^- = 0 \tag{9.30}$$

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

Continuing to operate (9.19) through the time events $\lambda = t$, sustained by the resources (9.28), the derivative $\check{\partial}_{\lambda=t}$ to the fields evolves and gives rise to the dynamics of next horizon, derived by the $Y^+$ field equation (9.27):

$$\mathbf{u}_q \nabla \cdot \mathbf{D}_q^+ + \mathbf{u}_g \nabla \cdot \mathbf{D}_g^+ = \mathbf{u}_q \rho_q - 4\pi G \mathbf{u}_g \rho_g \tag{9.31}$$

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

$$= \mathbf{J}_q - 4\pi G \mathbf{J}_g + \mathbf{H}_q^+ \cdot \left( \frac{\mathbf{u}_q}{c} \nabla \right) \times \frac{\mathbf{u}_q}{c} + \mathbf{H}_g^+ \cdot \left( \frac{\mathbf{u}_g}{c_g} \nabla \right) \times \frac{\mathbf{u}_g}{c_g} \tag{9.32}$$

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.

At the constant speed, a set of the formulations above is further simplified to and collected as:

$$\nabla \cdot \left( \mathbf{B}_q^- + \eta \mathbf{B}_g^- \right) = 0^+ \qquad : \eta = c_g / c \tag{9.33}$$

$$\nabla \cdot \left( \mathbf{D}_q^+ + \eta \mathbf{D}_g^+ \right) = \rho_q - 4\pi G \eta \rho_g \tag{9.34}$$

$$\nabla \times \left( \mathbf{E}_q^- + \mathbf{E}_g^- \right) + \frac{\partial}{\partial t} \left( \mathbf{B}_q^- + \mathbf{B}_g^- \right) = 0^+ \tag{9.35}$$

$$\nabla \times \left( \mathbf{H}_q^+ + \mathbf{H}_g^+ \right) - \frac{\partial}{\partial t} \left( \mathbf{D}_q^+ + \mathbf{D}_g^+ \right) = \mathbf{J}_q - 4\pi G \mathbf{J}_g \tag{9.36}$$

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.

# 10. Electromagnetism

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.

At the constant speed *c* and $\zeta^{\mu} \to \gamma^{\mu}$, the *General Symmetric Fields* (9.33-9.36) emerge in a set of classical equations:

$$\nabla \cdot \mathbf{B}_q = 0 \qquad : \mathbf{B}_q \equiv \mathbf{B}_q^- \qquad (9.37)$$

$$\nabla \cdot \mathbf{D}_q = \rho_q \qquad : \mathbf{D}_q \equiv \mathbf{D}_q^+ \qquad (9.38)$$

$$\nabla \times \mathbf{E}_q + \frac{\partial \mathbf{B}_q}{\partial t} = 0 \qquad : \mathbf{E}_q \equiv \mathbf{E}_q^- \qquad (9.39)$$

$$\nabla \times \mathbf{H}_q - \frac{\partial \mathbf{D}_q}{\partial t} = \mathbf{J}_q \qquad : \mathbf{H}_q \equiv \mathbf{H}_q^+ \qquad (9.40)$$

Known as *Maxwell's Equations*, discovered in 1820s [43]. The first or second equation is known as *Gauss*'s *Law [46]* for magnetism or electric flux, respectively. The third is *Michael Farads*'s *Law* [47] for induction, discovered in 1831. Traditionally, they are the basic laws of electromagnetism predicting how a magnetic field will interact with an electric circuit to produce an electromotive force. This phenomenon, called electromagnetic induction, is the fundamental operating principle of transformers, inductors, and many types of electrical motors, generators and solenoids. At the speed at a constant, the fourth equation is simplified to and known as *Ampère*'s *Circuital Law* [48], discovered in 1823. Traditionally, Ampère's law with *Maxwell*'s addition describes how the magnetic field "circulates" around electric currents and time varying electric fields. It states that for any closed loop path, the sum of the length elements times the magnetic field in the direction of the length element is equal to the permeability times the electric current enclosed in the loop. The magnetic field in space around an electric current is proportional to the electric current which serves as its source, similar to the electric field in space is proportional to the charge which serves as its source.

Following the $Y^{-}Y^{+}$ principle, the magnetic field in space is subject to time virtually associated with its physical opponent of the electric field such that, together, they serves as commutation resources, entangling in the dual manifold spaces in form of massless waves and in messaging or transporting events at light speed. 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.

# 11. Coulomb's Force

Taking a spherical surface in the integral form of (9.38) at a radius r, centered at the point charge Q, we have the following formulae in a free space or vacuum:

$$\mathbf{E}(\mathbf{r}) = \frac{Q}{4\pi\varepsilon_0}\frac{\hat{\mathbf{r}}}{r^2} \qquad : \mathbf{F}(\mathbf{r}) = q\mathbf{E}(\mathbf{r}) \qquad (9.41)$$

known as *Coulomb*'s force, discovered in 1784 [49]. An electric force may be either attractive or repulsive, depending on the signs of the charges.

# 12. Gravitational Fields

For the charge neutral objects, the equations (9.33, 9.36) become a group of the pure *Gravitational Fields*, shown straightforwardly by:

$$\left(\mathbf{u}_g \nabla\right) \cdot \mathbf{B}_g^- = 0 \tag{9.42}$$

$$\mathbf{u}_g \nabla \cdot \mathbf{D}_g^+ = -4\pi G \mathbf{u}_g \rho_g \tag{9.43}$$

$$\frac{\partial}{\partial t}\mathbf{B}_g^- + \left(\frac{\mathbf{u}_g}{c_g}\nabla\right) \times \mathbf{E}_g^- = 0 \tag{9.44}$$

$$\frac{\mathbf{u}_g \cdot \mathbf{u}_g}{c_g^2}\nabla \times \mathbf{H}_g^+ - \frac{\partial \mathbf{D}_g^+}{\partial t} = -4\pi G \mathbf{J}_g + \mathbf{H}_g^+ \cdot \left(\frac{\mathbf{u}_g}{c_g}\nabla\right) \times \frac{\mathbf{u}_g}{c_g} \tag{9.45}$$

At the constant speed, these equations can be reduced to and coincide closely with *Lorentz invariant theory* of gravitation, introduced in 1893 [50].

For the charge neutral objects, the equations (9.42) become straightforwardly as:

$$\nabla^2 \psi_g^+ = 4\pi G \rho_g \qquad : \mathbf{D}_g^+ = -\nabla \psi_g^+ \tag{9.46}$$

$$\mathbf{F}^- = -m \nabla \psi_g^+ = mG\rho_g \frac{\mathbf{b}_r}{r^2} \tag{9.47}$$

known as *Newton's Law* of Gravity [46] 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.

# Thermodynamics

## CHAPTER X

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

# 1. Equilibrium of Thermodynamics

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 $N$,

$$\Omega(E) = \prod \Omega(E_n) = \prod \frac{N!}{N_n^{\pm}!(N - N_n^{\pm})!} \qquad : N_n^{\pm} = \frac{E_n}{|E_n^{\pm}|} \tag{10.1}$$

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

$$S(E) = \sum_n S(E_n) = -k_B \sum_n \log \frac{N!}{(N_n^{\pm})!(N - N_n^{\pm})!} \tag{10.2}$$

where $k_B$ is ***Boltzmann*** constant [51]. For large $N$, there is an accurate approximation to the factorials as the following:

$$log\,(N!) = N \log(N) - N + \frac{1}{2}\log(2\pi N) + \Re(1/N) \tag{10.3}$$

known as the *Stirling's* formula, introduced 1730s [52]. Therefore, the entropy is simplified to:

$$S(N_n^{\pm}) = -k_B N\Big[\Big(1 - \frac{N_n^{\pm}}{N}\Big)\log\Big(1 - \frac{N_n^{\pm}}{N}\Big) + \frac{N_n^{\pm}}{N}\log\Big(\frac{N_n^{\pm}}{N}\Big)\Big] \tag{10.4}$$

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 risen by its entropy as the following:

$$\frac{1}{T} \equiv \sum_n \frac{\partial S_n}{\partial E_n} = \sum_n \frac{\mp i k_B}{E_n^{\pm}} \log\Big(\frac{N E_n^{\pm}}{E_n} - 1\Big) \qquad : k_B T \in (0, \pm\, i E_n^{\pm}) \tag{10.5}$$

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.

$$E_n = N E_n^{\pm} h_n = \frac{N E_n^{\pm}}{e^{\pm i E_n^{\pm}/k_B T} + 1} = k_B T N_n^{\pm} \log\Big(\frac{N}{N_n^{\pm}} - 1\Big) \tag{10.6}$$

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

# 2. Horizon Factor of State Probability

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:

$$h_n^{\pm} = \frac{N_n^{\pm}}{N} = \frac{1}{e^{\pm \beta E_n^{\pm}} + 1} \qquad : \beta = \frac{i}{k_B T} \qquad (10.7)$$

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 $ict$.

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:

$$p_n^{\pm} = \frac{h_n^{\pm}}{\sum h_\nu} = \frac{e^{\pm \beta E_n^{\pm}}}{Z} \qquad : Z \equiv \sum\nolimits_\nu e^{\pm \beta E_\nu^{\pm}} = \frac{e^{\pm \beta E_\nu^{\pm}/2}}{1 - e^{\pm \beta E_\nu^{\pm}}} \qquad (10.8)$$

known as the *Boltzmann* distribution [51], or the canonical ensemble, introduced in 1877. The average energy in a mode can be expressed by the partition function:

$$\tilde{E}^{\pm} = -i \frac{d \log(Z)}{d\beta} = \pm \frac{iE_n^{\pm}}{2} \pm \frac{iE_n^{\pm}}{e^{\pm \beta E_n^{\pm}} - 1} \qquad : E_n^{\pm} = \mp imc^2 \qquad (10.9)$$

As $T \rightarrow 0$, 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.

# 3. Thermodynamics

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:

$$\mu = -\sum_n \left(\frac{\partial E_n}{\partial N_n^{\pm}}\right)_{S,V} = k_B T \sum_n \frac{1 - \left(1 - N_n^{\pm}/N\right)\log\left(N/N_n^{\pm} - 1\right)}{\left(1 - N_n^{\pm}/N\right)}$$

$$= -\sum_n \left[E_n^{\pm} - k_B T\left(1 + e^{\pm\beta E_n^{\pm}}\right)\right] \quad (10.10)$$

Its heat capacity can be given by the following definition:

$$C_V \equiv \sum_n \left(\frac{\partial E_n}{\partial T}\right)_{V,N_n^{\pm}} = k_B \sum_n \frac{N\left(E_n^{\pm}\right)^2 e^{\pm\beta E_n^{\pm}}}{\left[k_B T\left(e^{\pm\beta E_n^{\pm}} + 1\right)\right]^2} \quad (10.11)$$

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.

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

$$dS = \frac{\partial S}{\partial E} dE + \frac{\partial S}{\partial E}\frac{\partial E}{\partial V} dV + \frac{\partial S}{\partial E}\sum_n \left(\frac{\partial E}{\partial N_n^{\pm}} dN_n^{\pm}\right)$$

$$= \frac{1}{T}\left(dE + PdV - \sum_n \mu_n dN_n^{\pm}\right) \qquad \because \frac{1}{T} = \frac{\partial S}{\partial E}, \; P = \left(\frac{\partial E}{\partial V}\right)_T \quad (10.12)$$

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.

# 4. 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:

$$S_\rho = -k_s \int \rho_\psi dV = -k_s \int \frac{d\rho_E - Td\rho_s - \sum_i \mu_i d\rho_{n_i}}{T\rho_s + \sum_i \mu_i \rho_{n_i} - (P + \rho_E)} dV \qquad (10.13)$$

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

$$Y^- : d\rho_E^- = Td\rho_s^- + \sum_i \mu_i d\rho_{n_i}^- \qquad (10.14)$$

$$Y^+ : P + \rho_E^+ = T\rho_s^+ + \sum_i \mu_i \rho_{n_i}^+ \qquad (10.15)$$

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.

# 5. Equilibrium of Bulk Density

At the second horizon, the operator $\partial_\mu$ can be defined by reference to the 2-tuple coordinates of *Thermodynamic Space* as a duality of the z-manifolds by the following:

$$z_m \in \check{z}\{z_0, z_1\} \in Y^-\{\mathbf{r} + i\beta\} \qquad : z_0 = \beta \equiv i/(k_B T) \tag{10.16}$$

$$z^\mu \in \hat{z}\{z^0, z^1\} \in Y^+\{\mathbf{r} - i\beta\} \qquad : z^0 = -z_0, \mathbf{r} \mapsto V \tag{10.17}$$

For the density equation of *World Equation* (5.18), we acquire an entropy $S_T$ of the energy density, $\rho_T = \rho_n^+(\hat{z}, \lambda)\rho_n^-(\check{z}, \lambda)$, at the equilibrium as the following:

$$S_T = -\int \rho_T d\Gamma = -k_T \int d\Gamma \left( W_0^T + \kappa_1 \dot{\partial}_{\lambda_1} + \kappa_2 \dot{\partial}_{\lambda_2} \dot{\partial}_{\lambda_1} \cdots \right) \rho_n^+(\hat{z}, \lambda)\rho_n^-(\check{z}, \lambda) d\Gamma \tag{10.18}$$

where $\rho^-$ and $\rho^+$ are the $Y^-$ and $Y^+$ fields of the thermal density at a macroscopic state. Because of the macro effects, for $Y^-Y^+$ fields of density $\rho^-$ and $\rho^+$ in macroscopic state, their system density has the equivalences similar to (4.18). Based on the principle of entropy extrema requires $\delta S_\psi = 0$ at fixed end-states, we similarly derive the Motion Operations of thermodynamic fields similar to the equations of (4.3) and (4.4). The same mathematical framework can be applied for formulations of the equations of (6.1) and (6.6), which derives the thermodynamic density equations in the following form:

$$\kappa_2 \left( \dot{z}_\kappa^2 \partial_\kappa^2 + \dot{z}_r^2 \nabla^2 \right) \rho_n^+ = W_n^T \rho_n^+ \qquad : W_n^T = i c_\rho^2 \hat{U}(\mathbf{r}, \beta_0) \tag{10.19}$$

$$\left( -2\dot{z}_\kappa \kappa_1 \partial_\kappa + 3\kappa_2 \dot{z}_\kappa^2 \partial_\kappa^2 + \kappa_2 \dot{z}_r^2 \nabla^2 \right) \rho_n^- = W_n^T \rho_n^- \qquad : \dot{z}_m = \{ic_\rho, c_\rho\}, \beta_0 \equiv i/(k_B T_0) \tag{10.20}$$

Under the first and second orders at the constant speed $c_\rho$, they give rise to the horizon temperature during the $Y^-Y^+$ evolutions of the entanglements and form thermodynamics characterized by the formulae:

$$h_\beta \frac{\partial^2 \rho^+}{\partial \beta^2} = \hat{H}\rho^+ \qquad : \kappa_2 = i h_\beta, \hat{H} \equiv -h_\beta \nabla^2 + \hat{U}(\mathbf{r}, \beta_0) \tag{10.21}$$

$$-i\frac{\partial \rho^-}{\partial \beta} + 3h_\beta \frac{\partial^2 \rho^+}{\partial \beta^2} = \hat{H}\rho^- \qquad : \kappa_1 = \frac{c_\rho}{2}, \beta = i/(k_B T) \tag{10.22}$$

where $h_\beta$ is named as the horizon constant of thermodynamics. The above equation is known as Bloch density equation introduced in 1932 [56].

The formula of equation (10.21) illustrates that the $Y^+$ harmonic oscillations produce thermal reactions to maintain the $Y^-$ thermodynamics of equation (10.22). The thermal operator of $\partial^2/\partial\beta^2$ appears as part of the internal energy that gives rise to the bulk dynamics along with kinetic energy and its horizon constant $h_\beta$. As a thermal horizon of dynamic equations for $Y^-Y^+$ densities, the operator communicates a parametrized relationship of $h_\beta$ between a quantum state constant of $\hbar$, and a thermal variable of $\beta = i/k_B T$. Therefore, during the thermal and space evolutions, the bulk density of physical dynamics rises from each other's opponent of reciprocal fields into macroscopic scope. As macro objects, a bulk system is a result of $Y^-Y^+$ entanglements in thermodynamics, as a duality of flux continuity for the current densities.

# BlackBody Radiations

CHAPTER XI

Every physical body spontaneously and continuously emits electromagnetic, lightwave and gravitational radiation. At near thermodynamic equilibrium, the emitted radiation is closely described by either 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 wave-propagation of light and entangling-transportation of gravitation. Since a blackhole acts like an ideal blackbody as it reflects no light and absorbs full gravitation.

# 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 (10.7), *Planck* derived in 1900 [53, 54] that an area entropy $S_A$ of radiance of a blackbody is given by frequency at absolute temperature *T.*

$$S_A(\omega_c, T) = \frac{\hbar\omega_c^3}{4\pi^3c^2k_BT}\left(e^{\hbar\omega_c/k_BT} - 1\right)^{-1} \simeq \frac{\omega_c^2}{4\pi^3c^2} \tag{11.1}$$

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.

# 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 [57], 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:

$$S_A(\omega_g, T) = \frac{c_g^3}{4\hbar G} \qquad (11.2)$$

where *G* is the gravitational constant, known as *Bekenstein-Hawking* radiation, introduced in 1974 [58-59]. This formula is applicable to generate *Graviton* in gravitational radiations.

# 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:

$$\hat{E}^2 = \hat{\mathbf{P}}^2 + 4m^2c^4 \quad \rightarrow \quad \left(\hat{\mathbf{P}} + i\hat{E}\right)\left(\hat{\mathbf{P}} - i\hat{E}\right) = 4E_n^+E_n^- \tag{11.3}$$

$$\hat{E} = -i\hbar\partial_t, \qquad \mathbf{P} = ic\hat{\mathbf{p}}, \qquad \hat{\mathbf{p}} = -i\hbar\nabla \tag{11.4}$$

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:

$$\frac{1}{c^2}\frac{\partial^2\Phi_n^-}{\partial t^2} - \nabla^2\Phi_n^- = 4\frac{E_n^-E_n^+}{\left(\hbar c\right)^2}\Phi_n^- \tag{11.5}$$

Therefore, besides the (8.43), we demonstrate an alternative approach to derive and amend the *Klein–Gordon* equation, introduced in 1926 [60] or manifestly *Lorentz* covariant symmetry [61] described as that the feature of nature is independent of the orientation or the boost velocity of the laboratory through spacetime.

# 4. Conservation 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 (8.45) for the potential radiations in a free space or vacuum, or the law of conservation of the area fluxions:

$$S_A = \lozenge_n = 4\frac{E_n^- E_n^+}{(\hbar c)^2}\Phi_n \qquad (11.6)$$

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 $\Phi_n$ 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.

# 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 [54]. 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 (11.1) and mass annihilation (8.29), an area energy fluxion of the potentials is equivalent to the entropy of the electro-photon radiations in thermal equilibrium and mass annihilation:

$$S_{A1}(\omega_c, T) = 4\left(\frac{\omega_c^2}{4\pi^3c^2}\right) = \eta_c\left(\frac{\omega_c}{c}\right)^2 \qquad : \eta_c = \pi^{-3} \qquad (11.7)$$

where the factor 4 of the first entropy is given by (3.38) 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 (8.29), an area density is equivalent to the entropy of the dark radiations in thermal equilibrium during the mass acquisition:

$$S_{A2}(\omega_c, T) = 2\frac{m\omega_c}{\pi c} = \eta_h\left(\frac{\omega_c}{c}\right)^2 \qquad : \eta_h = \frac{2}{\pi} \qquad (11.8)$$

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

$$S_A(\omega_c, T) = S_{A1}(\omega_c, T) + S_{A2}(\omega_c, T) \mapsto 4\frac{E_c^- E_c^+}{(\hbar c)^2} \qquad (11.9)$$

$$E_c^{\pm} = \mp\frac{i}{2}\hbar\omega_c \qquad \eta_c = \pi^{-3} = 3.22\,\%,\ \eta_h = \frac{2}{\pi} = 63.7\,\% \qquad (11.10)$$

Introduced at 20:00 August 19 of 2017, the coupling constant at $\eta_c$ or $\eta_h$ 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.

# 6. Wave–Particle Duality

Since light exhibits wave–particle duality, its properties must acquire characteristics of both waves and particles. A duality of the energy formations of light has both of its convertible form to physical $mc^2$ and its transportable form at virtual $\hbar\omega$. It is conservation of energy $\hat{E}^2 = \hat{\mathbf{P}}^2 + 4m^2c^4$ and invariance of momentum $\mathbf{P} = ic\hat{\mathbf{p}} \mapsto \mp i\hbar c\mathbf{k}$ that maintain the light transformable between a duality of virtual and physical states. Together, it derives a pair of irreducible virtual unit $\pm\hbar\omega$, known as *Planck–Einstein* relation [54,55] as well as a physical unit $mc^2$. The property of light becomes a complex form of virtual and physical duality as the following:

$$\tilde{E}_c^{\mp} = \hbar\omega \pm 2imc^2 \qquad : \hbar\omega \rightleftharpoons mc^2 \qquad (11.11)$$

named as ***Photon Energy*** - a fundamental property of light. As a constant, a photon defines an irreducible unit of energy state either at virtual $\hbar\omega$ or at physical $mc^2$, but not at both. The photon's wave and quanta qualities are two observable aspects of a single phenomenon, which obey law of conservation of energy as the following:

$$\left(\hat{\mathbf{P}} + i\hat{E}\right)\left(\hat{\mathbf{P}} - i\hat{E}\right) = 4E_n^+E_n^- \qquad : \hat{E} = -i\hbar\partial_t, \quad \mathbf{P} = ic\hat{\mathbf{p}}, \quad \hat{\mathbf{p}} = -i\hbar\nabla \qquad (11.12)$$

where $\mathbf{p}$ is the momentum vector. In the center of entanglement, the colliding duality has no net momentum. Whereas a single photon always has momentum, conservation of momentum (equivalently, transformation invariance) requires that at least two photons be created for entanglement, with zero net momentum.

For example, in a free space, a light traveling the 2-dimensional manifolds $\{r, \pm ict\}$ of the world planes has the two wave functions, respectively and simultaneously $\Phi_c \propto exp\left(\mp\frac{i}{\hbar c}(m_c c^2 t \pm \hbar\omega r)\right)$. They carry quantities that might be simulated by spin angular momentum. From the conservation of energy $E_c \mapsto \hbar\omega$, it appears that the magnitude of its spin were $\hbar$ at the component measured along its direction of motion. This is because the total $E_c$ energy includes both photon energies for the dual manifolds. There are two possible helicities $\pm\hbar$, called right-handed and left-handed, correspond to the two possible circular polarization states of the photons.

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.

# 7. Conservation of Light

Since light waves of the potential density are conserved as a constant, 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 following characteristics:

1. *Light remains constant and conserves over time during its transportation.*
2. *Light is consisted of virtual energy duality as its irreducible unit: photon.*
3. *Light has at least two photons for entanglement at zero net momentum.*
4. *Light transports and performs a duality of virtual waves and real objects.*
5. *A light energy of potential density neither can be created nor destroyed.*
6. *Light transforms from one form to another carrying potential messages.*
7. *Without an energy supply, no light can be delivered to its surroundings.*
8. *The net flow across a region is sunk to or drawn from physical sources.*

Therefore, the above equation is named as the ***Law of Conservation of Light***. This conservation law is rigorously derived by a direct consequence of $Y^-$ fluxion continuity balanced at $Y^+$ time translation symmetry and supplied by the physical resource $\tilde{E}_c^-$.

# 8. 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 (11.5) 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* (11.2) radiation.

$$S_A(\omega_g, T) = 4\left(\frac{c_g^3}{4\hbar G}\right) = 4\frac{E_g^- E_g^+}{(\hbar c_g)^2} \quad \rightarrow \quad E_g^{\pm} = \mp \frac{i}{2}\sqrt{\hbar c_g^5 / G} \qquad (11.13)$$

where the number 4 is factored for a dual-state system, given by (3.38). 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:

$$E_g^{\pm} = \mp \frac{i}{2} E_p \quad : E_p = \sqrt{\hbar c_g^5 / G} \qquad (11.14)$$

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.

# 9. Conservation of Gravitation

Similar to acquisition of *conservation of light*, graviton waves of the potential density are conserved at a speed $c_g$,, representing the characteristics of gravitational states with the following characteristics:

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 flexion 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.*

Therefore, the above equation is named as the ***Law of Conservation of Gravitation,*** discovered at 0:00am August 21, 2017, Washington DC USA.

At the assumption of the constant speed $c_g$ of an average speed for its torque torsion, this conservation law is rigorously derived by a direct consequence of $Y^-$ fluxion continuity balanced at $Y^+$ time translation symmetry. Its fundamental principle is the $Y^-Y^+$ transportation coordinators that generates matrixes of a *torque tensors* as a duality of the twist rotations.

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.

# 10. 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, introduced by Isaac Newton in 1718 [62], 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.

# 11. 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:

1. *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* [63].
2. *Moduli fields, introduced by Bernhard Riemann in 1857* [64]*, are scalar field of global minima, occurring in supersymmetric systems. The first restriction of a moduli space, found in 1979 by Bruno Zuni* [65]*, 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* [66-67].

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 [1], 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 [2].

Since the evolution processes of the mass inauguration is between the second and third horizons, the scalar fields are massless instances under the virtual supremacy dominant at the first and second horizons. In addition, the scalar potentials are the gauge fields, operated by the superphase modulation and subjected to the event actions. Conceivably and strikingly, the scalar fields behaves or known as *Dark Energy*.

# Asymmetric Dynamics

## CHAPTER XII

In reality, the laws of nature strike aesthetically harmonics a duality not only between $Y^{-}Y^{+}$ symmetries, but also among symmetry and asymmetry. Because of the $Y^{-}Y^{+}$ duality, a symmetric system is naturally consisted of asymmetric ingredients or symmetric constituents. Symmetry exists in one horizon can be simultaneously asymmetric in the other without breaking its original ground symmetric system that coexists with its reciprocal opponents. An almost absurdly finely tuned universe is a miracle of the asymmetry and symmetry together that gives rise to the next horizon where a new symmetry is advanced and composed at another level of consistency and perpetuation. Similar to the $Y^{-}Y^{+}$ flux commutation and continuities of potential densities, a duality of symmetry and asymmetry represents the cohesive and progressive evolutions aligning with the working of the hierarchy topology of our nature.

In physics, we define two types of asymmetric dynamics: *Ontology* for the massless objects, and *Cosmology* for massive matters with the further interrelations as the following:

1. *Because of the massless phenomena or dark objects, Ontology is intrinsic, evolutionary, dominant and explicit at the first and second horizons. As the actions of the scalar potential fields, it characterizes interrelationships of the living types, properties, and the natural entities that exist in a primary domain of being, becoming, existence, or reality. It compartmentalizes the informational discourse or theory required for sets of formulation and establishment of the relationships between creation and reproduction, and between animation and annihilation.*
2. *Cosmology is the living behaviors, motion dynamics, and interrelationships of the large scale natural matter or*

> *supernovae that exist in the evolution and eventual trends of the universe as a whole. At the third horizon and beyond, the vector potentials compartmentalizes the infrastructural discourse or theory required for sets of formulation and constitution of the relationships between motion and dynamics, and between universal conformity and hierarchy.*

The scope of this chapter is at where, based on *universal symmetry*, a set of formulae is constituted of, given rise to and conserved for ontological and cosmological horizons *asymmetrically*. Through the performances of the $Y^-Y^+$ symmetric actions, laws of conservation and continuity determine the asymmetric properties of interruptive transformations, dynamic transportations, entangle commutations, photon, graviton or dark fields of *Ontology* and stellar galaxy evolutions of *Cosmology*.

# 1. Asymmetric World Equations

Asymmetry is an event process capable of occurring at a different perspective to its symmetric counterpart. The natural characteristics of the $Y^{-}Y^{+}$ asymmetry have the basic properties as the following:

1. *Associated with its opponent potentials of scalar fields, an asymmetric system is a dark fluxion flowing dominantly in one direction without its mirroring or equivalent fluxion from the other, although the interaction is a pair of $Y^{-}Y^{+}$ entanglements.*
2. *The scalar fields are virtual supremacy at the first and second horizons, where objects are the massless instances, actions or operations, known as dark energy. Conceivably, an asymmetric structure of physical system is always accompanied or operated by the dark energies.*
3. *Asymmetry is a part of components to the symmetric fluxions of the underlining transform and transport infrastructure cohesively and persistently aligning with its systematic symmetry.*
4. *As a duality of asymmetry, the $Y^{-}$ or $Y^{+}$ anti-asymmetry is another part of components for the dual asymmetric fluxions of the base infrastructure consistently aligning with the underlying $Y^{-}$ or $Y^{+}$ symmetry.*
5. *Both of the $Y^{-}$ and $Y^{+}$ asymmetries have the laws of conservation consistently and perpetually, that orchestrate their respective continuity locally and harmonize each other's movements externally in progressing towards the next level of symmetry.*

The *World Equations* of (4.12) can be updated and generalized in term of a pair of the $Y^{-}$ and $Y^{+}$ asymmetric scalar fields, vector fields, matrix fields, and higher orders of the tensor fields, shown straightforwardly as or named as the third *World Equations*:

$$W = k_w \int d\Gamma \sum_n h_n \left\{ \kappa_1 \langle \dot{\partial}_\lambda \rangle_s^{\pm} + (\kappa_2 \dot{\partial}_\lambda) \langle \dot{\partial}_\lambda \rangle_s^{\pm} + (\kappa_3 \dot{\partial}_\lambda) \langle \dot{\partial}_\lambda \rangle_V^{\pm} + (\kappa_4 \dot{\partial}_\lambda) \langle \dot{\partial}_\lambda \rangle_M^{\pm} \cdots + W_n^{\pm} \right\} \qquad \textit{(12.1a)}$$

$$W = k_w \int d\Gamma \sum_n h_n \left\{ \kappa_1 ( \dot{\partial}_\lambda \rangle_s^{\pm} + (\kappa_2 \dot{\partial}_\lambda) ( \dot{\partial}_\lambda \rangle_s^{\pm} + (\kappa_3 \dot{\partial}_\lambda) ( \dot{\partial}_\lambda \rangle_V^{\pm} + (\kappa_4 \dot{\partial}_\lambda) ( \dot{\partial}_\lambda \rangle_M^{\pm} \cdots + W_n^{\pm} \right\} \qquad \textit{(12.1b)}$$

where $\kappa_n$ is the coefficient of each order n of the $\lambda^n$ event, $h_n$ is the horizon factor of thermal dynamics. The symbol $\langle\ )^{\mp}$ implies asymmetry of a $Y^{-}$-supremacy or a $Y^{+}$-supremacy with the lower index $\langle\ )_S^{\mp}$ for scaler fields, $\langle\ )_V^{\mp}$ for vector fields and $\langle\ )_M^{\mp}$ for matrix tensors.

Because the above equations constitute a pair of the scalar density fields: $\varrho_{\phi}^{\pm} = \phi^{\pm}\ \varphi^{\mp}$ as one-way fluxion density without a symmetric engagement from its reciprocal pair, they defines the density fields as $Y^{-}$-asymmetry or $Y^{+}$-asymmetry, complementarily.

For asymmetric evolutions or acceleration forces, the underlying system of the symmetric commutations and continuities do not change, but the motion dynamics of the world lines as a whole changes. In this view, the $Y^{-}Y^{+}$ entanglements are independent or superposition at each of the "internal" or "ontological" primacy during their formations. Obviously, asymmetry occurs when a fluxion flows without a correspondence to its mirroring opponent. Their expressions can be formulated by the asymmetric brackets:

$$\left\langle \dot{\partial}_{\lambda^1}\right)_s^+ = \dot{\partial}\varrho_{\phi}^+ = \langle \dot{x}\partial\rangle_s^+ = \varphi_n^- \dot{x}^\nu \partial^\nu \phi_n^+ \qquad \left\langle \dot{\partial}_{\lambda^1}\right)_s^- = \dot{\partial}\varrho_{\phi}^- = \langle \dot{x}\partial\rangle_s^- = \varphi_n^+ \dot{x}_m \partial_m \phi_n^- \qquad (12.2)$$

$$\left\langle \dot{\partial}_{\lambda^2}\right)_v^+ = \dot{\partial}\varrho_{v}^+ = \langle \dot{x}\partial\rangle_v^+ = -\,\varphi_n^- \dot{x}^\nu \partial^\nu V_\mu^+ \qquad \left\langle \dot{\partial}_{\lambda^2}\right)_v^- = \dot{\partial}\varrho_{v}^- = \langle \dot{x}\partial\rangle_v^- = -\,\varphi_n^+ \dot{x}_m \partial_m V_\mu^- \qquad (12.3)$$

Obviously, asymmetry occurs when a fluxion flows without a correspondence of its mirroring opponent. In reality, as a one-way streaming of a supremacy, an $Y^{-}$ or $Y^{+}$ asymmetric fluxion is always consisted of, balanced with, and conserved by its conjugate potentials as a reciprocal opponent, resulting in motion dynamics, creation, annihilation, animation, reproduction, etc.

As a part of the symmetric components, fluxions not only are stable and consistent but also can dictate its own system's fate by determining its dynamic motion lines taken on the world planes. Therefore, the two entanglers have the freedom to control each of their own operations, asynchronously, independently and cohesively - another stunning example of the workings of the remarkable nature of our universe.

# 2. Conservation of Asymmetric Fluxions

For asymmetric fluxions, the entangling invariance requires that their fluxions are conserved with motion acceleration, operated for creation and annihilation, or maintained by reactive forces. Normally, the divergence of $Y^-$ fluxion is conserved by the virtual forces $0^+$ and the divergence of $Y^+$ fluxion is balanced by physical motion of dynamic curvature. Together, they maintain each other's conservations and commutations cohesively, reciprocally or complementarily.

Under the environment of both $Y^-Y^+$ manifolds for a duality of fields, the event $\lambda$ initiates its parallel transport and communicates along a direction at the first tangent vectors of each $Y^+$ and $Y^-$ curvatures. Following the tangent curvature, the event $\lambda$ operates the effects transporting $(\check{\partial}^\lambda, \hat{\partial}_\lambda)$ into its opponent manifold through the second tangent vectors of each curvature, known as *Normal Curvature or* perpendicular to the fist tangent vectors. The scalar communicates are defined by the *Commutator* and continuity *Bracket* of the (3.17-3.21) equations. From two pairs of the scalar fields (12.2-3), asymmetric fluxions consist of and operate a pair of the commutative entanglements consistently and perpetually. Similar to the derivative of the formulae (9.5) and (9.7), the $Y^-Y^+$ acceleration fields contrive a pair of the following commutations, equivalent to equations (9.9, 9.10),

$$\mathbf{g}_x^- / \kappa_g^- = \left[\hat{\partial}_\lambda \hat{\partial}_\lambda, \check{\partial}^\lambda \check{\partial}^\lambda\right]_x^- + \zeta^+ \qquad : \zeta^+ = \left(\hat{\partial}_\lambda (\check{\partial}^\lambda - \check{\partial}_\lambda)\right\rangle^+ \tag{12.4}$$

$$\mathbf{g}_x^+ / \kappa_g^+ = \left[\check{\partial}_\lambda \check{\partial}_\lambda, \hat{\partial}^\lambda \hat{\partial}^\lambda\right]_x^+ + \zeta^- \qquad : \zeta^- = \left(\hat{\partial}^\lambda (\check{\partial}^\lambda - \check{\partial}_\lambda)\right\rangle^- \tag{12.5}$$

where the index x refers to the scalar or vector potentials, and $\left[W_0\right]^\mp = 0$. Named as the Third *Universal Field Equations*, introduced at 2:00am September 3rd 2017 Washington, DC USA, the general formulae is balanced by a pair of commutation of the asymmetric $Y^-Y^+$ entanglers $\zeta^\mp$ that constitutes the laws of conservations universal to all types of $Y^-Y^+$ interactive motions, curvatures, dynamics, forces, accelerations, transformations, and transportations on the world lines of the dual manifolds. Therefore, these two equations above outline and define the *General Asymmetric Equations*.

For convenience of expression, it is articulated by each of four distinctive conceptions that deliver the *Laws of Conservation and Commutation Equations* characterizing universal evolutions as each of the above subjects, namely: i) *Creation,* ii) *Reproduction,* iii) *Animation*, and iv) *Annihilation*. A consequence of these laws of conservations and commutations is that the perpetual motions, transformations, or transportations on the world line curvatures can exist only if its motion dynamics of energies are conserved, or that, without virtual symmetric and asymmetric fluxions, no system can deliver unlimited time of movements throughout its surroundings. Carried out by equations of (12.4, 12.5), each of the *Laws of Conservation of Asymmetric Dynamics* is presented in the next two chapters.

# 3. Asymmetric Horizons

As the horizon quantity of an object, a vector field forms and projects its motion potentials to its surrounding space, arisen by or acting on its opponent through a duality of reciprocal interactions. Because of the vector transportation, both of the boost and spiral communications give rise to various tensors of the horizon fields aligned with the motions of dynamic curvatures and beyond. When an object has a rotation on the antisymmetric manifolds of the world $\{\mathbf{r} \pm i\mathbf{k}\}$ planes, the event naturally operates, constitutes or generates Torsions, twisting on the dual dynamic resources and appearing as the Centrifugal or Coriolis compulsion on the objects such as triplets of particles, earth, and solar system. At the third horizon, acting upon the vector fields of $\zeta^\mu D^\mu$ and $\zeta_\nu D_\nu$, the event operates and gives rise to the tangent curvatures and vector rotations of the communications, defined by the commutators of the (3.23-3.24) equations.

At the second horizon of the event evolution processes, the local tangent curvature of the potential vectors through the next tangent vector of the curvature, the $\lambda$ events of the above $\hat{\partial}$ and $\check{\partial}$ operations, give rise to the *Third Horizon Fields*, shown by the ontological expressions:

$$\check{\partial}_\lambda \check{\partial}_\lambda \psi^- = \dot{x}_m \left(\partial_m - \overset{-}{\Gamma}{}^{s}_{nm}\right) \dot{x}_s \partial_s \psi^- \tag{12.6}$$

$$\hat{\partial}^\lambda \hat{\partial}^\lambda \psi^+ = \dot{x}^\nu \left(\partial^\nu - \overset{+}{\Gamma}{}^{\sigma}_{m\nu}\right) \dot{x}^\sigma \partial^\sigma \psi^+ \tag{12.7}$$

For mathematical convenience, the zeta-matrices are hidden and implied by the mappings to the derivatives of $\dot{x}^\nu$ and $\dot{x}^\nu$ as the relativistic transformations.

$$\hat{\partial}^\lambda : \dot{x}^\nu \mapsto \hat{\partial}_\lambda : \dot{x}_a \zeta^\nu \qquad\qquad \check{\partial}_\lambda : \dot{x}_m \mapsto \check{\partial}^\lambda : \dot{x}^\alpha \zeta_m \tag{12.8}$$

The events operate the local actions in the tangent space of the scalar fields relativistically, where the scalar fields are given rise to the vector fields and its vector fields are further given rise to the matrix fields.

In a parallel fashion, through the tangent vector of the third curvature, the events of the full $\hat{\partial}$ and $\check{\partial}$ operation continuously entangle the vector fields and gives rise to the next horizon fields, shown by the cosmological formulae:

$$\check{\partial}_\lambda \check{\partial}_\lambda V_m = \dot{x}_\nu \left(\partial_\nu - \overset{-}{\Gamma}{}^{n}_{\mu\nu}\right) \dot{x}_n \left(\partial_n V_m - \overset{-}{\Gamma}{}^{s}_{mn} V_s\right) \tag{12.9}$$

$$\hat{\partial}^\lambda \hat{\partial}^\lambda V^\mu = \dot{x}^n \left(\partial^n - \overset{+}{\Gamma}{}^{\nu}_{mn}\right) \dot{x}^\nu \left(\partial^\nu V^\mu - \overset{+}{\Gamma}{}^{\sigma}_{\mu\nu} V^\sigma\right) \tag{12.10}$$

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

# 4. Ontological Commutations

For entanglement between $Y^-Y^+$ manifolds, considering the parallel transport of a *Scalar* density of the fields $\rho=\psi^+\psi^-$ around an infinitesimal parallelogram. The chain of this reactions can be interpreted by (12.6, 12.7) to formulate a commutation framework of *Physical Ontology*. This entanglement consists of a set of the unique fields, illustrated by the following components of the *entangling commutators,* respectively:

$$\left[\check{\partial}_\lambda\check{\partial}_\lambda, \hat{\partial}^\lambda\hat{\partial}^\lambda\right]_s^- = \dot{x}_\nu\dot{x}_m\left(P_{\nu m} + G_{m\nu}^{\sigma s}\right) \tag{12.11}$$

$$P_{\nu m} \equiv \frac{1}{\dot{x}_\nu\dot{x}_m}\left[(\dot{x}_\nu\partial_\nu)(\dot{x}_m\partial_m), (\dot{x}^\nu\partial^\nu)(\dot{x}^m\partial^m)\right]_s^- \tag{12.12}$$

$$G_{m\nu}^{\sigma s} = \frac{1}{\dot{x}_\nu\dot{x}_m}\left[\dot{x}^\nu\overset{+}{\Gamma}{}^\sigma_{m\nu}\dot{x}^\sigma\partial^\sigma, \dot{x}_m\overset{-}{\Gamma}{}^s_{nm}\dot{x}_s\partial_s\right]_s^- \tag{12.13}$$

$$\left[\hat{\partial}_\lambda\hat{\partial}_\lambda, \check{\partial}^\lambda\check{\partial}^\lambda\right]_s^+ : \quad (\hat{\partial}^\lambda, \dot{x}^\nu) \mapsto (\hat{\partial}_\lambda, \dot{x}_a\zeta^\nu), \ (\check{\partial}_\lambda, \dot{x}_m) \mapsto (\check{\partial}^\lambda, \dot{x}^\alpha\zeta_m) \tag{12.14}$$

The *Ricci* curvature $P_{\nu\mu}$ is defined on any pseudo-*Riemannian* manifold as a trace of the *Riemann* curvature tensor, introduced in 1889 [15-16]. The $G_{m\nu}^{s\sigma}$ is a *Connection Torsion*, a rotational stress of the transportations.

Considering a system $\zeta \mapsto \gamma$ in a free space or vacuum at the constant speed, the above equations become at the motion dynamics:

$$\mathbf{g}_s^-/\kappa_s^- \equiv \left[\check{\partial}_\lambda\check{\partial}_\lambda, \hat{\partial}^\lambda\hat{\partial}^\lambda\right]_s^- = \dot{x}_\nu\dot{x}_m\left(\frac{R}{2}g_{\nu m} + G_{m\nu}^{\sigma s}\right) \quad : \{\phi^-, \varphi^+\} \tag{12.15}$$

$$P_{\nu m} = R_{\nu m} = \frac{R}{2}g_{\nu m} \tag{12.16a}$$

$$R_{\nu m} = \left[(\dot{x}_\nu\partial_\nu)(\dot{x}_m\partial_m), (\dot{x}^\nu\partial^\nu)(\dot{x}^m\partial^m)\right]_s^- \equiv R_{\nu m}(\hat{\partial}^\lambda, \check{\partial}_\lambda) \tag{12.16b}$$

$$G_{m\nu}^{s\sigma} = \overset{+}{\Gamma}{}^s_{m\nu}\partial^s - \overset{-}{\Gamma}{}^\sigma_{nm}\partial_\sigma \equiv G_{m\nu}^{s\sigma}(\hat{\partial}^\lambda, \check{\partial}_\lambda) \tag{12.17}$$

Like the metric itself, the *Ricci* tensor *R* is a symmetric bilinear form on the tangent space of the manifolds. Both $R_{\nu m}$ and $G_{m\nu}^{\sigma s}$ are the residual tensors with the local derivatives $\{\hat{\partial}^\lambda, \check{\partial}_\lambda\}$. Similarly, its counterpart exists as the following:

$$\mathbf{g}_s^+/\kappa_s^+ \equiv \left[\hat{\partial}_\lambda\hat{\partial}_\lambda, \check{\partial}^\lambda\check{\partial}^\lambda\right]_s^+ = \dot{x}_\nu\dot{x}_m\left(\tilde{R}_{\nu m} + \tilde{G}_{\nu m}^{s\sigma}\right) \quad : \{\phi^+, \varphi^-\} \tag{12.18}$$

$$\tilde{R}_{\nu m} = R_{\nu m}(\hat{\partial}_\lambda, \check{\partial}^\lambda) \qquad \tilde{G}_{\nu m}^{\sigma s} = G_{\nu m}^{\sigma s}(\hat{\partial}_\lambda, \check{\partial}^\lambda) \tag{12.19}$$

$$\hat{\partial}_\lambda = X^\sigma{}_\nu\partial^\sigma, \qquad \check{\partial}^\lambda = X_\sigma{}^\nu\partial_\sigma \tag{12.20}$$

where the *Ricci* curvature $R_{\nu m}$ and connection torsion $G^{s\sigma}_{\nu m}$ are mapped to the event transformations $\{\hat{\partial}_\lambda, \check{\partial}^\lambda\}$. Both $\tilde{R}_{\nu m}$ and $\tilde{G}^{s\sigma}_{m\nu}$ are the interactive tensors with the relativistic derivatives $\{\hat{\partial}_\lambda, \check{\partial}^\lambda\}$. The curvature measures how movements ($\dot{x}$ and $\ddot{x}$) under the $Y^-Y^+$ *Scalar Fields* $\{\phi^-, \varphi^+\}$ and $\{\phi^+, \varphi^-\}$ are balanced with the inherent stress $G^{s\sigma}_{m\nu}$ during a parallel transportation between the $Y^-Y^+$ manifolds. The equation represents the $Y^-Y^+$ *Scalar Commutation of Residual Entanglement.*

In cosmology, the vector communications under physical primacy generally involve both boost and spiral movements entangling between the $Y^-Y^+$ manifolds. Considering the parallel transport around an infinitesimal parallelogram under the dual *Vector* fields of $V^\mu$ and $V_m$, the entanglements are given by (12.9, 12.10) as the following formulae:

$$\left[\check{\partial}_\lambda \check{\partial}_\lambda, \hat{\partial}^\lambda \hat{\partial}^\lambda\right]^-_v = \dot{x}_\nu \dot{x}_n \left(P_{\nu n} - R^\sigma_{n\nu s} + G^{s\sigma}_{n\nu} + C^{s\sigma}_{n\nu}\right) \tag{12.21}$$

$$P_{\nu n} = \frac{1}{\dot{x}_\nu \dot{x}_n}\left[(\dot{x}_\nu \partial_\nu)(\dot{x}_n \partial_n),\ (\dot{x}^n \partial^n)(\dot{x}^\nu \partial^\nu)\right]^-_v \tag{12.22}$$

$$R^\sigma_{n\nu s} = \frac{1}{\dot{x}_\nu \dot{x}_n}\left[\dot{x}_\nu \partial_\nu (\dot{x}_n \overset{-}{\Gamma}{}^s_{\nu n}),\ \dot{x}^n \partial^n (\dot{x}^\nu \overset{+}{\Gamma}{}^\sigma_{n\nu})\right]^-_v \tag{12.23}$$

$$G^{s\sigma}_{n\nu} = \frac{1}{\dot{x}_\nu \dot{x}_n}\left[\dot{x}^\nu \overset{+}{\Gamma}{}^\sigma_{n\nu} \dot{x}_n \partial_n,\ \dot{x}_n \overset{-}{\Gamma}{}^s_{\nu n} \dot{x}^\nu \partial^\nu\right]^-_v \tag{12.24}$$

$$C^{s\sigma}_{n\nu} = \frac{1}{\dot{x}_\nu \dot{x}_n}\left[\dot{x}_\nu \overset{-}{\Gamma}{}^\alpha_{n\nu} \dot{x}_n \overset{-}{\Gamma}{}^s_{\nu n},\ \dot{x}^n \overset{+}{\Gamma}{}^a_{\nu n} \dot{x}^\nu \overset{+}{\Gamma}{}^\sigma_{n\nu}\right]^-_v \tag{12.25}$$

$$\left[\hat{\partial}_\lambda \hat{\partial}_\lambda, \check{\partial}^\lambda \check{\partial}^\lambda\right]^+_v : \quad (\hat{\partial}^\lambda, \dot{x}^\nu) \mapsto (\hat{\partial}_\lambda, \dot{x}_a \zeta^\nu),\ (\check{\partial}_\lambda, \dot{x}_m) \mapsto (\check{\partial}^\lambda, \dot{x}^\alpha \zeta_m) \tag{12.26}$$

The matrix $P_{\nu n}$ is defined as the *Growth Potential*, an entanglement capacity of the dark energies; $R^\sigma_{n\nu s}$ as *Transport Curvature*, a routing track of the communications; $G^{s\sigma}_{n\nu}$ as *Connection Torsion*, a stress energy of the transportations; and $C^{s\sigma}_{n\nu}$ as *Entangling Connector,* a connection of dark energy dynamics. Therefore, this framework represents a foundation of physical cosmology at the horizon commutations.

# 5. Cosmological Commutations

Consider an object observed externally and given by the (12.9, 12.10) equations that actions of the commutation are dominant towards the residual entanglement $\left[\check{\partial}_\lambda \check{\partial}_\lambda, \hat{\partial}^\lambda \hat{\partial}^\lambda\right]_v^-$. Following the similar commutation infrastructure of the above equations, the event operations contract directly to the manifold communications and the commutation relations of equation (12.21, 12.26) are simplified to:

$$\left[\check{\partial}_\lambda \check{\partial}_\lambda, \hat{\partial}^\lambda \hat{\partial}^\lambda\right]_v^- = \dot{x}_n \dot{x}_\nu \left( \frac{R}{2} g_{n\nu} - R^\sigma_{n\nu s} + G^{\sigma s}_{n\nu} + C^{s\sigma}_{n\nu} \right) \tag{12.27}$$

$$R_{\nu m} = \left[ (\dot{x}_\nu \partial_\nu)(\dot{x}_m \partial_m), (\dot{x}^\nu \partial^\nu)(\dot{x}^m \partial^m) \right]_s^- = \frac{R}{2} g_{\nu m} \tag{12.28}$$

$$R^\mu_{n\nu\sigma} = -\left( \partial_\nu \overset{-}{\Gamma}{}^\mu_{a\sigma} \partial_a \overset{+}{\Gamma}{}^\mu_{\nu\sigma} + \overset{-}{\Gamma}{}^\rho_{a\sigma} \overset{+}{\Gamma}{}^\mu_{\nu\rho} - \overset{+}{\Gamma}{}^\rho_{\nu\sigma} \overset{-}{\Gamma}{}^\mu_{a\rho} \right) \equiv R^\mu_{n\nu\sigma}(\hat{\partial}^\lambda, \check{\partial}_\lambda) \tag{12.29}$$

$$G^{s\sigma}_{n\nu} = \overset{+}{\Gamma}{}^s_{n\nu} \partial^s - \overset{-}{\Gamma}{}^\sigma_{\nu n} \partial_\sigma \equiv G^{s\sigma}_{n\nu}(\hat{\partial}^\lambda, \check{\partial}_\lambda) \tag{12.30}$$

$$C^{s\sigma}_{n\nu} = \overset{-}{\Gamma}{}^s_{m\nu} \overset{+}{\Gamma}{}^\sigma_{\nu n} - \overset{+}{\Gamma}{}^\sigma_{\nu n} \overset{-}{\Gamma}{}^s_{m\nu} \equiv C^{s\sigma}_{n\nu}(\hat{\partial}^\lambda, \check{\partial}_\lambda) \tag{12.31}$$

$$\left[\hat{\partial}_\lambda \hat{\partial}_\lambda, \check{\partial}^\lambda \check{\partial}^\lambda\right]_v^+ = \dot{x}_n \dot{x}_\nu \left( \tilde{R}^-_{n\nu} - \tilde{R}^\sigma_{n\nu s} + \tilde{G}^{s\sigma}_{n\nu} + \tilde{C}^{s\sigma}_{n\nu} \right) \tag{12.32}$$

$$\tilde{R}^-_{\nu m} = R^-_{\nu m}(\hat{\partial}_\lambda, \check{\partial}^\lambda),\ \tilde{R}^\sigma_{n\nu s} = R^\sigma_{n\nu s}(\hat{\partial}_\lambda, \check{\partial}^\lambda) \ \ : \hat{\partial}_\lambda = L^+_{\sigma\sigma} \partial^\sigma \tag{12.33}$$

$$\tilde{G}^{s\sigma}_{\nu m} = G^{s\sigma}_{\nu m}(\hat{\partial}_\lambda, \check{\partial}^\lambda),\ \tilde{C}^{s\sigma}_{\nu m} = C^{s\sigma}_{\nu m}(\hat{\partial}_\lambda, \check{\partial}^\lambda) \ \ : \check{\partial}^\lambda = L^-_{\sigma\sigma} \partial_\sigma \tag{12.34}$$

where $L^\mp_{\sigma\sigma}$ is the *Lorentz* group (7.12). More precisely, the event presences of the $Y^-Y^+$ dynamics manifests infrastructural foundations and transportations of the potential, curvature, stress, torsion, and contorsion, which give rise to the interactional entanglements through the center of an object by following its geodesics of the underlying virtual and physical commutations. Generally, transportations between $Y^-Y^+$ manifolds are conserved dynamically.

# 6. Classical General Relativity

For a statically frozen or inanimate state, the two-dimensions of the world line can be aggregated in the expression $R^{\sigma}_{n\nu s} \mapsto R_{n\nu}$, $C^{s\sigma}_{n\nu} \mapsto C_{n\nu}$ and $G^{s\sigma}_{n\nu} \mapsto G_{n\nu}$. Therefore, the above equation formulates *General Relativity*:

$$G_{n\nu} = R_{n\nu} - \frac{1}{2} R g_{n\nu} \qquad : \left[\check{\partial}^{\lambda}\check{\partial}^{\lambda}, \hat{\partial}_{\lambda}\hat{\partial}_{\lambda}\right]^{+}_{\nu} = 0,\ C_{n\nu} = 0 \qquad (12.35)$$

$$or \qquad R_{\mu\nu} + \Lambda g_{\mu\nu} = \tfrac{1}{2} R g_{\mu\nu} + G_{\mu\nu} \qquad : \left[\check{\partial}^{\lambda}\check{\partial}^{\lambda}, \hat{\partial}_{\lambda}\hat{\partial}_{\lambda}\right]^{+}_{\nu} = \Lambda g_{\mu\nu},\ G_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu} \qquad (12.36)$$

known as the *Einstein* field equation [17], discovered in November 1915. The theory had been one of the most profound discoveries of the 20th-century physics to account for general commutation in the context of classical forces. Philosophically, it represents the spacetime commutator $\left[\check{\partial}^{\lambda}\check{\partial}^{\lambda}, \hat{\partial}_{\lambda}\hat{\partial}_{\lambda}\right]^{+}_{\nu} = \Lambda g_{\mu\nu}$ is entangling statically at the constant or zero, meaning a frozen or inanimate universe.

Thirty-four years after Einstein's discovery of *General Relativity*, he claimed, "The general theory of relativity is as yet incomplete .... We do not yet know with certainty, by what mathematical mechanism the total field in space is to be described and what the general invariant laws are to which this total field is subject." Next year in 1950, he restated "... all attempts to obtain a deeper knowledge of the foundations of physics seem doomed to me unless the basic concepts are in accordance with general relativity from the beginning." [68]. It turns out to be impossible to find a general definition for a seemingly simple property such as a system's total mass (or energy). The main reason is that the gravitational field—like any physical field—must be ascribed a certain energy, but that it proves to be fundamentally impossible to localize that energy [69]. Apparently, for a century, the philosophical interpretation had remained a challenge or unsolved, until this *Universal Topology* was discovered in 2016, representing an integrity of philosophical and mathematical solutions to extend further beyond general relativity to include the obvious phenomenons of cosmological photon and graviton transportation, blackhole radiation, and dark energy modulation.

In 1955, *Einstein* stated that "...the essential achievement of general relativity, namely to overcome 'rigid' space (i.e. the inertial frame), is only indirectly connected with the introduction of a *Riemannian* metric. The directly relevant conceptual element is the 'displacement field' $\Gamma^{l}_{ik}$, which expresses the infinitesimal displacement of vectors. It is this which replaces the parallelism of spatially arbitrarily separated vectors fixed by the inertial frame (i.e. the equality of corresponding components) by an infinitesimal operation. This makes it possible to construct tensors by differentiation and hence to dispense with the introduction of ‘rigid’ space (the inertial frame). In the face of this, it seems to be of secondary importance in some sense that some particular Γ field can be deduced from a *Riemannian* metric...” [17]. In this special case, stress tensor $G^{\mu}_{\nu\sigma}$ of an object vanishes from or immune to its external fields while its internal commutations conserve a contorsion tensor of $T^{\mu}_{\sigma\nu}$ as a part of the life entanglements:

$$T^{\mu}_{\sigma\nu} = \bar{\Gamma}^{\mu}_{\sigma\nu} - \overset{+}{\Gamma}{}^{\mu}_{\sigma\nu} \qquad : G^{\mu}_{\nu\sigma} \mapsto T^{\mu}_{\sigma\nu}\partial_{\nu} = \left(\bar{\Gamma}^{\mu}_{\sigma\nu} - \overset{+}{\Gamma}{}^{\mu}_{\sigma\nu}\right)\partial_{\nu} \qquad (12.37)$$

This extends the meaning to and is known as *Élie Cartan Torsion*, proposed in 1922 [17]. Besides spin generators, this tensor carries out the additional degrees of freedom for internal communications.

# 7. Classical Physical Cosmology

During 1920s, *Alexander Friedmann, Georges Lemaître, Howard Robertson and Arthur Walker* (FLRW) derived a set of equations that govern the universe the expansion of space in all directions (isotropy) and from every location (homogeneity) within the context of general relativity. The FLRW model declares the cosmological principle as that a universe is in homogeneous, isotropic, and filled with ideal fluid [70]. For a generic synchronous metric in that universe, a solution to *Einstein's* field equation in a spacetime is expressed as a pair of the *Friedmann* equations with *Hubble* parameter:

$$ds^2 = (cdt)^2 - a(t)^2\Big[\frac{dr^2}{1-kr^2} + r^2(d\theta^2 + \sin^2\theta\, d\phi^2)\Big] \tag{12.38}$$

$$\frac{3}{c^2}\left(\frac{\dot{a}}{a}\right)^2 + 3\frac{k}{a^2} = \Lambda + \frac{8\pi G}{c^2}\rho \tag{12.39}$$

$$\frac{2}{c^2}\frac{\ddot{a}}{a} + \frac{1}{c^2}\left(\frac{\dot{a}}{a}\right)^2 + \frac{k}{a^2} = \Lambda - \frac{8\pi G}{c^4}p \tag{12.40}$$

$$v_r = H(t_0)D, \qquad H(t) \equiv \frac{\dot{a}}{a} \qquad : H_0 = H(t_0),\ v_r = c\Big(1 - \frac{\lambda_{emit}}{\lambda_{emit}}\Big) \tag{12.41}$$

In cosmological observation, the movement rate of the universe is described by the model of time-dependent *Hubble* parameter $H(t)$ to describe a galaxy at distance D given by *Hubble Law*: $v_r = H_0 D$. For a constant cosmological constant $\Lambda$, the equation (12.39) includes a single originating event, the mass density $\rho$. This is what appear as if that the universe were not an explosion but the abrupt appearance of expanding spacetime metric.

Philosophically, limited in its decoherence interpretations or physical existence only, a duality of the physical-virtual dynamics and their event interweaving have been hidden in our current physics. Therefore, the hypothetical model of *Big Bang* has the apparent blindness to the following artifacts:

1. *Cosmological field equation - Evidenced by the observable universe empirically, the Einstein's field equation (12.36) is incomplete, because the outright equations must interpret the obvious characteristics or emissions of cosmic waves from gravitons, photons, dark or quantum energies. Lack of a profound philosophy and limited by the free-fall thought experiments, the newborn equation has been improperly led to unrealistic interpretations and especially carried on to its inherit models: Friedmann equations.*

2. *Horizon structure - Although the FLRW (1.2-1.4) is well developed to align with the conceptual horizons between the regimes of world planes and spacetime, a physical reality is hardly modeled as a hierarchical structure, wherein every possible outcome is not realized or rising from horizons, gracefully. For example, states of matter are aged or timeworn from the two-dimensional coordinates on World Planes to the tetrad-coordinates on Spacetime Manifolds, but may not be uniformly on both.*
3. *Single metric - Similar to the entire practice of current physics, almost all theories have sticked to one choice of a single metric (+ – – –) regardless of the other (– + + +), although both are discovered since 1908* [7]*. Consequently, any behaviors with the two "relative states" is "collapsed" at its physical state with the same collapsed or static outcome, or simply without interweaving dynamics.*
4. *Cosmic waves - Including all wavelength of lightwaves, the cosmic wave background can be either electromagnetic radiation or dark energy emission, or both. Without sufficient empirical or philosophical verifications, it becomes an inconceivable hypothesis that electromagnetic radiation be a remnant from an early stage of the universe when the universe began.*
5. *Cosmic Singularity and Inflation - Since natural principles of the universe is ambiguous or enigmatic in current physics, it might be superfluous in deliberating the affection to what means to the early universe dating to the epoch of recombination. Especially under the inexplicable philosophy, one has invented an incredible burst expansion at temperatures from 100 nonillion ($10^{32}$) Kelvin down to 1 billion ($10^{9}$) Kelvin, imagined inflation of the universe, and attempted to reconcile the cosmic data with the Big Bang hypothesis from the flawed foundation of singularity.*

Apparently, the current approaches have resulted in and limited itself towards the decoherence interpretations or physical existence only. Without the most distinctive features of the universe, it deviates significantly from the *Universe Topology* of the horizon hierarchy and of the $Y^{-}Y^{+}$ interwoven operations that lies at the heart of all life streams of events, instances or objects, essential to the workings of our universe. More critically, the current physics has the total ignorance to the basic principles of the *Operational Events between the virtual and physical* reality.

# 8. Asymmetric Field Equations

The asymmetric commutation is operated by one of the interpretable, residual features exchanging the information carried by the scalar fields (12.4)-(12.5):

$$\left[\check{\partial}_\lambda \check{\partial}_\lambda, \hat{\partial}^\lambda \hat{\partial}^\lambda\right]_s^- = -\left(\hat{\partial}^\lambda(\check{\partial}^\lambda - \check{\partial}_\lambda)\right)_s^- \qquad : \{\phi^-, \varphi^+\} \qquad (12.42)$$

$$\left[\hat{\partial}_\lambda \hat{\partial}_\lambda, \check{\partial}^\lambda \check{\partial}^\lambda\right]_s^+ = -\left(\hat{\partial}_\lambda(\check{\partial}^\lambda - \check{\partial}_\lambda)\right)_s^+ \qquad : \{\phi^+, \varphi^-\} \qquad (12.43)$$

where the index s refers to the scalar potentials. The first equation is the physical animation and reproduction of asymmetric ontology, and the second equation is the virtual creation and annihilation of asymmetric ontology. As a general expectation, the asymmetric motion of ontology features that i) *Residual Entanglement* closely resembles the objects under a duality of the real world; and ii) *Transformational Dynamics* operates the processes under the event actions. As a notation, this chapter was introduced at September 9th of 2018.

From definitions of the $\gamma^\nu$-*Matrices* (7.4), one can convert each of the right-side equations of the above asymmetric scalar entanglers explicitly under the second horizon at the constant speed:

$$\mathcal{O}_{\nu m}^{+\sigma} \equiv -\zeta^0 \partial^\sigma \left(\zeta_2 \partial_\nu - \zeta_3 \partial_m\right)_s^- \qquad : \{\phi^-, \varphi^+\} \qquad (12.44)$$

$$\mathcal{O}_{\nu m}^{-\sigma} \equiv -\zeta^1 \partial^\sigma \left(\zeta_2 \partial_\nu - \zeta_3 \partial_m\right)_s^+ \qquad : \{\phi^+, \varphi^-\} \qquad (12.45)$$

The $\mathcal{O}_{\nu m}^{\pm\sigma}$ is the $Y^+$ or $Y^-$ ontological modulators. Illustrated by equations of (12.15, 12.18), the ontological dynamics can now be fabricated in the covariant form of asymmetric ontology:

$$\frac{R}{2} g_{\nu m} + G_{\nu m}^{\sigma s} = \mathcal{O}_{\nu m}^{+\sigma} \qquad : \zeta_\nu = \gamma_\nu + \chi_\nu \qquad (12.46)$$

$$\tilde{R}^{\nu m} + \tilde{G}_{\nu m}^{\sigma s} = \mathcal{O}_{\nu m}^{-\sigma} \qquad : \zeta^\nu = \gamma^\nu + \chi^\nu \qquad (12.47)$$

Named as *Ontological Field Equations*, the first equation at the $Y^-$-supremacy is affiliated with the *physical Annihilation of Ontological processes*. The second equation at the $Y^+$-supremacy is the conservation inherent in the *Virtual Creation of Ontological processes*. Apparently, the creation processes are much more sophisticated because of the message transformations, relativistic commutations, and dynamic modulations.

With the scalar potentials, the $Y^\pm$ events conjure up the entanglements of eternal fluxions as a perpetual streaming for residual motions traveling on curvatures of the world lines, which is the persistence of an object without deviation in its situation of movements at its state and energies. The term $\mathcal{O}_{\nu m}^{-\sigma}$ or $\mathcal{O}_{\nu m}^{+\sigma}$ implies the left- or right-hand helicity and modulations balanced to its opposite motion curvatures. Classically, the term "residual" is described by or defined as: an object is not subject to any net external forces and moves at conservation of energy fluxions on the world planes, relativistically. This means that an object continues its $Y^{-}Y^{+}$ interweaving at its current states superposable until some interactions or modulations causes its state or energy to change.

Considering the *Infrastructural Matrices* $\zeta = \gamma + \chi$, $\gamma^0\gamma^\nu = \gamma^\nu$, $\gamma^1\gamma^2 = i\gamma^3$ and $\gamma^1\gamma^3 = i\gamma^2$ one can convert the $\zeta$-matrix explicitly into the asymmetric scalar entanglers, shown by the following:

$$\mathcal{O}_{\nu\mu}^{+\sigma} = \Diamond^{+} - i\begin{pmatrix} 0 & -\frac{\partial}{c\partial t}\mathbf{D}_a^{+} \\ \nabla\cdot\mathbf{D}_a^{+} & \nabla\times\mathbf{H}_a^{+}/c \end{pmatrix} \tag{12.48}$$

$$\mathcal{O}_{\nu m}^{-\sigma} = \begin{pmatrix} 0 & -\frac{\partial}{c\partial t}\mathbf{B}_a^{-} \\ \nabla\cdot\mathbf{B}_a^{-} & -\nabla\times\mathbf{E}_a^{-}/c \end{pmatrix} - i\Diamond^{-} \tag{12.49}$$

where the $\mathbf{D}_a^{+}$, $\mathbf{E}_a^{-}$, $\mathbf{B}_a^{-}$ and $\mathbf{H}_a^{+}$ fields are the intrinsic modulations in the form of a duality of asymmetry and antiasymmetry cohesively.

$$\gamma^0\partial^\sigma\left(\gamma_2\partial_\nu\right\rangle_s^{-} + \chi^0\partial^\sigma\left(\chi_2\partial_\nu\right\rangle_s^{-} = ic\begin{pmatrix} 0 & -\frac{\partial}{\partial t}\mathbf{D}_a^{+} \\ c\nabla\cdot\mathbf{D}_a^{+} & \nabla\times\mathbf{H}_a^{+} \end{pmatrix} \tag{12.50}$$

$$\gamma^1\partial^\sigma\left(\gamma_3\partial_m\right\rangle_s^{+} + \chi^1\partial^\sigma\left(\chi_3\partial_m\right\rangle_s^{+} = c\begin{pmatrix} 0 & -\frac{\partial}{\partial t}\mathbf{B}_a^{-} \\ c\nabla\cdot\mathbf{B}_a^{-} & -\nabla\times\mathbf{E}_a^{-} \end{pmatrix} \tag{12.51}$$

$$\Diamond^{+} = \gamma^0\partial^\sigma\left(\gamma_3\partial_m\right\rangle_s^{-} = \left(\frac{1}{c^2}\frac{\partial^2}{\partial t^2}\right\rangle^{-} - \left(\nabla^2\right\rangle^{-} \tag{12.52}$$

$$\Diamond^{-} \equiv -i\gamma^1\partial^\sigma\left(\gamma_2\partial_\nu\right\rangle_s^{+} = \left(\frac{1}{c^2}\frac{\partial^2}{\partial t^2}\right\rangle^{+} - \left(\nabla^2\right\rangle^{+} \tag{12.53}$$

Apparently, the ontological process, $\left(\partial^\nu + ieA^\nu/\hbar\right)$ and $\left(\partial_\nu - ieA_\nu/\hbar\right)$ is primarily the superphase $A^\nu$ and $A_\nu$ operations as the resource supplier or modular of the off-diagonal matrices for the asymmetric dynamics. Meanwhile, it generates the light and gravitational waves $\Diamond^{\pm}$ from their diagonal elements. The $Y^{-}Y^{+}$ events conjure up the entanglements of eternal fluxions as another perpetual streaming for transportations on the world-line curvatures. The torque transportation between the complex manifolds of the $Y^{-}Y^{+}$ world planes redefines the rotational quantities of how commutations between the dual spaces are entangled under the conjugation framework in two referential frames traveling at a consistent velocity with respect to one another. These equations are the transport dynamics affiliated with the physical *Reproduction and Animation* of the ontological processes. At the constant speed $\mathbf{u}^{\pm} = \mp c$, the ontological dynamics implies the two-dimensional motion curvatures be operated at the second horizon giving rise to the third horizon and transporting the entangling forces $\tilde{\chi}^{\nu} \mapsto \chi^{\nu}$ at the four-dimensional spacetime manifold.

# 9. Ontological Dynamics

At a free space or vacuum, the above equations derives the commutative formulae:

$$\frac{R}{2}\mathbf{g}^- + \mathbf{G} = \mathbf{O}^+ \qquad : \mathbf{g}^- = g_{\nu m'} \quad \mathbf{G} = G^{\sigma s}_{\nu m'} \quad \mathbf{O}^+ = \mathcal{O}^{+\sigma}_{m\nu} \qquad (12.54)$$

$$\tilde{\mathbf{R}}^+ + \tilde{\mathbf{G}} = \mathbf{O}^- \qquad : \tilde{\mathbf{R}}^+ = \tilde{R}^{\nu m}, \quad \tilde{\mathbf{G}} = \tilde{G}^{\sigma s}_{\nu m'} \quad \mathbf{O}^- = \mathcal{O}^{-\sigma}_{m\nu} \qquad (12.55)$$

As expected, the ontological *gamma*- and *chi*-fields are similar to or evolve into electromagnetic fields and gravitational fields. As the processes of the nature of being, the equations (12.44, 12.45) uncoil explicitly the compacted covariant formulae. Generally, the above conservation of ontological dynamics describe the following principles:

1. *The ontological dynamics is conserved and carried out by the area densities for creations or annihilations, which serve as Law of Conservation of Ontology.*
2. *In the world planes, the curvature $R$ and stress tensor $G^{\sigma s}_{\nu m}$ is dynamically sustained during the asymmetric modulations over a spiral gesture of movements.*
3. *Without the Riemannian curvature $\mathfrak{R}^{\pm} = 0$, it indicates that the system (such as a galaxy) is spiraling on the world lines and entangling through a modulation of the $\mathbf{O}^{\pm}$ matrix between the $Y^-Y^+$ manifolds at the second horizons.*
4. *Operated and maintained by the superphase potentials, the conservation of energy fluxions supplies the resources, modulates the transform, and transports potential messages or forces, alternatively.*
5. *The commutation fields of the superphase potentials transform and entangle between manifolds as the resource propagation of the asymmetric dynamics.*
6. *The torque fields of the superphase potentials transport and entangle between manifolds as the force generators of the ontological processes of motion dynamics.*

Apparently, it represents that the resources are composited of, supplied by or conducted with the residual activators and motion modulators primarily in the virtual world. It implies that, in the physical world, the directly observable parameters are the coverture $R$, stress tensor $\mathbf{G}$ and wave propagation $\Diamond^{\pm}$. Aligning with the dual world-lines of the universal topology, the commutation of energy fluxions animates the resources, modulates messages of the potential transform and transports while performing actions or reactions.

Connected to the $Y^-$ or $Y^+$ entanglement, the dynamic accelerations $\mathbf{g}_s^{\pm}$ of ontology are given by (12.42) and (12.42) as the following expression:

$$\mathbf{g}_s^-/\kappa_g^- = \left[\check{\partial}_\lambda \check{\partial}_\lambda, \hat{\partial}^\lambda \hat{\partial}^\lambda\right]_s^- - \mathbf{O}^+ \qquad : \kappa_g^- = \frac{\hbar c}{2E^-} \tag{12.56}$$

$$\mathbf{g}_s^+/\kappa_g^+ = \left[\hat{\partial}_\lambda \hat{\partial}_\lambda, \check{\partial}^\lambda \check{\partial}^\lambda\right]_s^+ - \mathbf{O}^- \qquad : \kappa_g^+ = \frac{\hbar c}{2E^+} \tag{12.57}$$

where $\kappa_g = 1/(\hbar c)$ is a constance. For a system, its core center may absorb the objects when $\mathbf{g}_s^+ > 0$ and emits objects at $\mathbf{g}_s^+ < 0$. To maintain the stability at $\tilde{\mathbf{g}}_s = \mathbf{g}_s^+ + \mathbf{g}_s^-$, the accelerations of a system might be conserved: $\mathbf{g}_s^+ + \mathbf{g}_s^- = 0$ and usually has to balance both a black core absorbing energies and a white core exert energies. Because the resources are primarily supplied by the virtual world where operates the residual activators and motion modulators, any life activities appear to be favorable towards the $Y^+$ deceleration $\mathbf{g}_s^+ < 0$ for mass emission and balanced by the $Y^-$ accelerations $\mathbf{g}_s^- > 0$, known as *Hubble's* Law [71]. In other words, the energy conservation implies that the light emission at the second horizon might always be observable as the redshift or dispersive waves under a third horizon, which, however, is not *Doppler* shift [72]. The conservation of virtual and physical dynamics balances the expansion or reduction of the universe at the scale of both virtual and physical spaces. It is a property of the entire universe as a whole rather than a phenomenon that applies just to one part of the universe observable physically.

# 10. Horizon Field Equations

Since the ontological dynamics at the second horizon is on world planes with two-dimensional coordinates, the trace of the diagonal elements of the equation (12.54 or 12.55) can be extracted and shown by the following:

$$\frac{\ddot{a}}{a} + \left(\frac{\dot{a}}{a}\right)^2 + \frac{kc^2}{a^2} = ic^2 S_A + \frac{8\pi G}{c^2}(\rho c^2 - p) \quad : S_A = Tr(\mathcal{O}_d^-) \tag{12.58}$$

$$R = -2\left[\frac{1}{c^2}\frac{\ddot{a}}{a} + \frac{1}{c^2}\left(\frac{\dot{a}}{a}\right)^2 + \frac{k}{a^2}\right],\ G_{tt} = \frac{8\pi G}{c^2}\rho,\ G_{rr} = \frac{8\pi G}{c^2}p \tag{12.59}$$

Named as *Horizon Field Equation*, it serves as conservation of the second horizon. One can further rewrite it to the following:

$$H_2^2 + H_2 H_3 + \frac{kc^2}{a^2} = ic^2 S_A + \frac{8\pi G}{c^2}(\rho c^2 - p) \quad : H_2 = \frac{\dot{a}}{a},\ H_3 = \frac{\ddot{a}}{\dot{a}} \tag{12.60}$$

where $H_2$ or $H_3$ is named the second or third horizon function, respectively. Representing the arisen ratios, these horizon functions extend the classical *Hubble* parameter $H_2$ into a hierarchy of the natural topology of universe. Because, *Horizon Functions* are a collection of the complex states, it implies an eternal yinyang-steady state universe in form of a spiral galaxy that dynamically orchestrates the mass, density, photon, graviton, thermodynamics, weak and strong forces, packed all together.

At near the third horizon, the curvature *k* might be zero. The horizon field equation becomes a quadratic equation, resolvable for the second horizon function $H_2$. Solving the quadratic equation $H_2^2 + H_3 H_2 - K_2 = 0$, one has the roots for the second horizon function $H_2$ to extend the classical *Hubble* parameter as he following:

$$H_2 = \frac{1}{2}\left(-H_3 \pm \sqrt{H_3^2 + 4K_2}\right) \tag{12.61}$$

$$K_2 \equiv K_2(\omega, T) = ic^2 S_A + \frac{8\pi G}{c^2}(\rho c^2 - p) \tag{12.62}$$

Accordingly, because $K_2$ is a complex function at the second horizon, the scalar metric $a(t)$ is a complex function, representing a harmonic duality of the $Y^- Y^+$ interwoven dynamics for life streams entangling on both of *World Planes*. Therefore, the equation (12.58) is contradict to the hypothesis that the universe described by the equation (12.39) implies abrupt appearance of expanding spacetime metric.

# 11. Yin Cosmic Dynamics

At the third horizon or higher, the energy potentials embodied at the mass enclave conserve the asymmetric commutations as one of the transient astronomical events and features propagation of the curvature dynamics carried by the vector fields, shown by a pair of the commutative equations:

$$\left[\check{\partial}_\lambda\check{\partial}_\lambda, \hat{\partial}^\lambda\hat{\partial}^\lambda\right]_v^- = -\left(\hat{\partial}^\lambda(\check{\partial}^\lambda - \check{\partial}_\lambda)\right\rangle_v^- \qquad : \{\phi^-, V^+\} \qquad (12.63)$$

$$\left[\hat{\partial}_\lambda\hat{\partial}_\lambda, \check{\partial}^\lambda\check{\partial}^\lambda\right]_v^+ = -\left(\hat{\partial}_\lambda(\check{\partial}^\lambda - \check{\partial}_\lambda)\right\rangle_v^+ \qquad : \{\phi^+, V^-\} \qquad (12.64)$$

where the index *v* refers to the vector potentials. The first equation is the physical dynamics of cosmology, and the second equation is the virtual motion dynamics.

Aligning with the continuously arising horizons, the events determine the derivative operations through the vector potentials giving rise to the matrix fields for further dynamic evolutions at the $Y^+$-supremacy. From definitions of the *Lorentz-matrices* (7.13-7.14), one can convert the right-side equation (12.63) of the asymmetric vector entanglers explicitly into the following formulae, similar to the derivation of equation (12.52):

$$\Lambda_{\nu m}^{+\sigma} = \Diamond^+ - i\begin{pmatrix} 0 & -\frac{\partial}{c\partial t}\mathbf{D}_v^+ \\ \nabla\cdot\mathbf{D}_v^+ & \nabla\times\mathbf{H}_v^+/c \end{pmatrix} \qquad (12.65)$$

where the lower index $v$ indicates the vector potentials, the $\mathbf{D}_v^+$ and $\mathbf{H}_v^+$ fields are the intrinsic modulations in the form of a duality of asymmetry and antiasymmetry cohesively. The $\Lambda_{\nu\mu}^{+\sigma}$ is the $Y^+$ cosmological modulator that extends the classic cosmological constant to the matrix. Illustrated by equations of (12.27), the motion dynamics can now be fabricated in the covariant form of asymmetric equation:

$$\mathscr{R}_{\nu ms}^{-\sigma} + \Lambda_{\nu m}^{+\sigma} = \frac{R}{2}g_{\nu m} + G_{\nu m}^{s\sigma} + C_{\nu m}^{s\sigma} \qquad (12.66a)$$

$$\mathfrak{R}^- + \boldsymbol{\Lambda}^+ = \frac{R}{2}\mathbf{g}^- + \mathbf{G} + \mathbf{C}^- \qquad : \boldsymbol{\Lambda}^+ \equiv \Lambda_{\nu m}^{+\sigma} \qquad (12.66b)$$

The *Riemannian* curvature $\mathfrak{R}^- \equiv \mathscr{R}_{\nu m\mu}^{-\sigma}$ associates the metric $\mathbf{g}^-$, relativistic stress $\mathbf{G}$ and contorsion $\mathbf{C}$ tensors to each world-line or spacetime points of the $Y^-$ manifolds that measures the extent to the metric tensors from its locally isometric to its opponent manifold or, in fact, conjugate to each other's metric. Apparently, the dark dynamics is the sophisticated processes with the message transformations, relativistic commutations, and dynamic modulations that operate the physical motion curvature. This equation servers as

*Law of Conservation of $Y^-$ Cosmological Motion Dynamics*, introduced at 17:16 September 7th 2017 that the $Y^-$ fields of a world-line curvature are constituted of and modulated by asymmetric fluxions, given rise from the $Y^+$ vector potential fields not only to operate motion geometry, but also to carry out messages for reproductions and animations. It implies that the virtual world supplies energy resources in the forms of area fluxions, and that the cosmological modulator $\mathbf{\Lambda}^+$ has the intrinsic messaging secrets of the dark energy operations, further outlined in the following statement:

1. *During the $Y^-Y^+$ entanglements between the world planes, the asymmetric potentials dynamically operate spacetime curvatures $\mathfrak{R}^-$ and supply the area energy at a horizon rising from symmetric fluxions of vector potentials.*
2. *The $Y^-$ motion curvature $\mathfrak{R}^-$, stress $\mathbf{G}$ and contorsion $\mathbf{C}$ dynamically balance the transformation and transportation through the asymmetric fluxions entangling between the dual manifolds.*
3. *The $Y^-$ asymmetric motions are internally adjustable or dynamically operated through the potentials of the $Y^+$ modulator $\mathbf{\Lambda}^+$ through the energy fluxions. In other words, a cosmic system is governed by the modulator $\mathbf{\Lambda}^+$ symmetrically and the commutation asymmetrically.*
4. *The $\mathbf{\Lambda}^+$ modulator evolves, generates and gives rise to the further horizons which integrate with the dynamic forces, motion collations, or symmetric entanglements.*
5. *Remarkably as its resources of symmetric counterpart, it associates the diagonal components that embed and carryout the horizon radiations, wave transportations, as well as the force generators spontaneously.*
6. *The trace of moderation tensor $Tr(\mathbf{\Lambda}_d^+)$ is observable externally and might be dependent only to the frequency and temperature $\Lambda_d(\omega, T)$ in a free space. As expected, the smaller the $\Lambda_d$ as a constant, the greater stability the universe.*
7. *Besides, the antisymmetric strength $\mathbf{D}_v^+$ and twisting $\mathbf{H}_v^+$ fields of the asymmetric $\mathbf{\Lambda}^+$ components are a part of the propagational entanglements throughout the system intrinsically, resourcefully, modularly, and gracefully.*

Usually, the matrix $\mathbf{\Lambda}^+$ institutes dynamic modulations internally while its asymmetric area fluxions and the reactors are observable externally to the system.

# 12. Yang Cosmic Dynamics

In a parallel fashion, by following the same approach, we can fabricate compactly the contravariant formula at the $Y^-$-modulation and its conservation inherent in the *Virtual Dark Dynamics*.

$$\tilde{\mathscr{R}}^{+\sigma}_{\nu m\mu} + \Lambda^{-\sigma}_{\nu m} = \tilde{R}_{\nu m} + \tilde{G}^{\sigma s}_{\nu m} + \tilde{C}^{\sigma s}_{\nu m\mu} \tag{12.67a}$$

$$\tilde{\mathfrak{R}}^+ + \mathbf{\Lambda}^- = \tilde{\mathbf{R}} + \tilde{\mathbf{G}} + \tilde{\mathbf{C}} \qquad : \mathbf{\Lambda}^- \equiv \Lambda^{-\sigma}_{\nu m} \tag{12.67b}$$

$$\Lambda^{-\sigma}_{\nu m} = \begin{pmatrix} 0 & -\frac{\partial}{c\partial t}\mathbf{B}^-_\nu \\ \nabla \cdot \mathbf{B}^-_\nu & -\nabla \times \mathbf{E}^-_\nu / c \end{pmatrix} - i\diamondsuit^- \tag{12.68}$$

where the $\mathbf{B}^-_\nu$ and $\mathbf{E}^-_\nu$ fields are the intrinsic modulations in the form of a duality of asymmetry and antiasymmetry cohesively. The matrices are associated with the Lorenz-group at the third or higher horizon. The above equation also serves as *Law of Conservation of $Y^+$ Cosmological Field Dynamics* that associates curvature, stress and contorsion with commutator of area fluxions:

1. *At a horizon rising from commutations of vector potentials, this equation describes the outcomes between the internal entanglements and motion behaviors observable externally to the system though the $Y^-$ modulation $\mathbf{\Lambda}^-$ of the activator.*
2. *The motion annihilation of metric $\mathbf{g}^+$, stress $\tilde{\mathbf{G}}$ and connector tensors $\tilde{\mathbf{C}}$ conserve the Riemannian curvature $\mathfrak{R}^+$ travelling over the world lines or spacetime and entangling through the actor $\mathbf{\Lambda}^-$ matrix between the $Y^-Y^+$ manifolds at the third or higher horizons.*
3. *The $Y^+$ motion curvature $\mathfrak{R}^+$, stress $\tilde{\mathbf{G}}$ and contorsion $\tilde{\mathbf{C}}$ dynamically balancing the transportation through the asymmetric fluxions may radiate the lightwaves, photons and gravitons associated with its symmetric counterpart.*
4. *The fluxion is entangling the vector potentials to propagate the resource modulator $\mathbf{\Lambda}^-_\nu$ of the antisymmetric strength $\mathbf{B}^-_\nu$ and twisting $\mathbf{E}^-_\nu$ fields, conservatively and consistently.*
5. *The internal continuity of energy fluxion might be hidden and convertible to and interruptible with its $Y^+$ opponent fields for the dynamic entanglements reciprocally throughout and within the system.*

6. *The $\mathbf{\Lambda}_d^-$ is asymmetric fluxion for the force generator, classically known as the spontaneous symmetry breaking. As expected, the symmetry can be evolved gracefully for activities such that the entire system retains symmetry.*
7. *The asymmetric and anti-asymmetric strength $\mathbf{E}_v^-$ and twisting $\mathbf{B}_v^-$ fields of the off-diagonal $\mathbf{\Lambda}^-$ components are a part of the propagational entanglements throughout the system intrinsically, resourcefully, modularly, and gracefully.*

At the $Y^-$-supremacy, the asymmetric forces or acceleration is logically affiliated with the *virtual dynamics* while its physical motion curvature is driven by the $Y^+$-supremacy of the virtual world.

For the accelerations at non-zero $\mathbf{g}_v^\pm \neq 0$, one has the following expression, similar to (12.56-12.57) of the ontological accelerations:

$$\mathbf{g}_v^- / \kappa_g^- = \left( \check{\partial}_\lambda \check{\partial}_\lambda - \hat{\partial}^\lambda \hat{\partial}^\lambda \right)_v^- + \mathbf{\Lambda}^+ \qquad : \kappa_g^- = \frac{\hbar c}{2E^-} \tag{12.69}$$

$$\mathbf{g}_v^+ / \kappa_g^+ = \left( \hat{\partial}_\lambda \hat{\partial}_\lambda - \check{\partial}^\lambda \check{\partial}^\lambda \right)_v^+ + \mathbf{\Lambda}^- \qquad : \kappa_g^+ = \frac{\hbar c}{2E^+} \tag{12.70}$$

where $\mathbf{g}_v^-$ or $\mathbf{g}_v^+$ is a normalized acceleration of cosmology. As a duality, a galaxy center may have a mixture of a black core absorbing objects and a white core radiating the photons and gravitons. For a blackhole, its core center may absorb the objects in order to maintain its activities for its motion stability of annihilation. Reciprocal to a blackhole, a galaxy center may have more radiations instead of absorbing objects, which results in a brightness of its core to stabilize its highly functioning activators and operating modulators - the nature of the mysterious dark energy.

# 13. Cosmic Redshift

At the second horizon, the electromagnetic radiation is neglectable for photon emissions. The lights wave emissions are predominantly at the second horizon, where the redshift becomes irrelevant to the motion dynamics of a physical object at the third horizon. This is contradict to the hypothesis that universe is expanding from the primordial "Big Bang". In fact, the redshift implies the dark energy was and has been continuously operating the physical dynamics at the ontological regime, a process of which is always accompanied by radiations of lightwaves and emissions of gravitations. As expected, the time-lapse of wave dispersion is equivalent to or always “expanding” that is the known characteristics of the virtual world imposing or exposing on the physical world.

In case of the spacetime redshift, the emitting object appears as expanding due to the energy conversion between the physical and virtual regime with time-lapse. This is a Doppler-like effect [72] relevant to the speed of the galaxy or star without changing dynamics of cosmological continuity over world-planes [73]. Because the rate of action time changes or “expends” between the transmission, it will affect the received wavelength under the same scope of regime. Apparently, the spacetime redshift is a measure of the conservation that the universe has undergone between the virtual time when the light was physically emitted and the real space when it was physically received.

Besides the cosmic redshirt between the light emitting and receiving, a property of the mass annihilation or inauguration has no-singularity in the virtual event operations of the universe. The entire universe is orchestrated as a whole rather than a phenomenon that applies just to one part of the universe or from the physical observation only. Therefore, our astronomers shall bid farewell to the model of “Big Bang theory”.

# Field Evolutions

CHAPTER

Under *Universal Topology* $W^{\mp} = P \pm iV$, a duality of the potential entanglements lies at the heart of all event operations as the natural foundation giving rise to and orchestrating relativistic transformations for photons and spiral transportations for gravitons. In addition, the superphase modulation conducts laws of evolutions and horizon of conservations, and maintains field entanglements of coupling weak and strong forces compliant to quantum chromodynamics and *Standard Model* of particle physics. It extends the unified physics stunning at exceptional remarks of the ontological specifics:

Law of “Two Implicit Loops of Triple Explicit Entanglements” exhibits that the horizon evolution fields in physical regime unifies the classical weak, strong, gravitational and electromagnetic forces, integrated with the well-known formulae of Yang-Mills action, Gauge Invariance, Chromodynamics, Field Breaking, and Standard Model of particle physics. Convincinglysee, it uncovers a holistic equation - *General Horizon Infrastructure of Quantum Evolutions.*

As a part of horizon evolutions, the nature comes out and conceals the characteristics of *Strong Forces* of *Field Breaking* during the field evolution of interactions crossing the multiple horizons that unifies fundamentals of the classically known natural forces: electromagnetism, weak, strong and graviton.

Under a general prediction of this theory, particles are created and operated by a set of the time-dependent fields that the superphase events evolve and modulate the dynamic horizons and field curvatures in microscopies, named as *Quantum Ontology*.

Consistently landing on classical and extending to modern physics, this manuscript uncovers a series of the groundbreaking philosophy and mathematics accessible and tested to by the countless artifacts of modern physics.

# 1. Field Evolutions

When an event gives rise to the states crossing each of the horizon points, an *evolution* process takes place. One of such actions is the field loops $(\partial^\nu A^\mu - \partial_\mu A_\nu)_{jk}$ that incept a superphase process into the physical world from the virtual $Y^+$ regime where a virtual instance is imperative and known as a process of creations or annihilations. Because it is a world event incepted on the two dimensional planes $\{\mathbf{r} \mp i\mathbf{k}\}$ residually, the potential fields of massless instances can transform, transport and emerge the mass objects symmetrically into the physical world that extends the extra two-dimensional freedom. Within the second horizon, this virtual evolution is *implicit* until it embodies as an energy enclave of the acquired mass, and associates with strong nuclear and gravitational energy in the next horizon.

As a duality of nature, its counterpart is another process named the $Y^-$ *Explicit Reproduction* $(\dot{x}_\nu D_\nu)_j \wedge (\dot{x}^\mu D^\mu)_k$. It requires a physical process of the $Y^-$ reaction or annihilation for the *Animation*. Associated with the inception of a $Y^+$ spontaneous evolution, the actions of the $Y^-$ *Explicit* reproduction are normally sequenced and entangled as a chain of reactions to produce and couple the weak electromagnetic and strong gravitational forces symmetrically in massive dynamics between the second and third horizons.

At the second horizon of the event evolution processes, the gauge fields yield the holomorphic superphase operation, continue to give rise to the next horizons, and develop a complex event operation in term of an infinite sum of operations:

$$\check{\partial} = \dot{x}_\nu \zeta_\nu D_\nu = \dot{x}_\nu \zeta_\nu \partial_\nu + i \dot{x}_\nu \zeta_\nu \big(\Theta_\nu + \tilde{\kappa}_2^- \dot{\Theta}_{\mu\nu} + \cdots\big) \tag{13.1a}$$

$$\Theta_\nu = \frac{\partial \vartheta(\lambda)}{\partial x_\nu}, \qquad \dot{\Theta}_{\nu\mu} = \frac{\partial A_\mu}{\partial x_\nu} - \frac{\partial A_\nu}{\partial x_\mu} = F_{\nu\mu}^{-n}, \qquad \tilde{\kappa}_2^- = 1/2 \tag{13.1b}$$

$$\hat{\partial} = \dot{x}^\nu \dot{\zeta}^\nu D^\nu = \dot{x}^\nu \zeta^\nu \partial^\nu - i \dot{x}^\nu \zeta^\nu \big(\Theta^\nu + \tilde{\kappa}_2^+ \dot{\Theta}^{\nu\mu} + \cdots\big) \tag{13.2a}$$

$$\Theta^\nu = \frac{\partial \vartheta(\lambda)}{\partial \lambda}, \qquad \dot{\Theta}^{\nu\mu} = \frac{\partial A^\mu}{\partial x^\nu} - \frac{\partial A^\nu}{\partial x^\mu} = F_{\nu\mu}^{+n}, \qquad \tilde{\kappa}_2^+ = (\tilde{\kappa}_2^-)^* \tag{13.2b}$$

The superphase $\Theta^\nu$ is under a series of the event $\lambda$ actions, giving rise to horizon of the vector potentials $F_{\nu\mu}^{\pm n}$. Therefore, the second and third horizon fields are emerged and unfold into the following expressions:

$$\check{\partial} = \dot{x}_\nu \zeta_\nu D_\nu = \dot{x}_\nu \zeta_\nu \partial_\nu + i \dot{x}_\nu \zeta_\nu \big(\frac{e}{\hbar} A_\nu + \tilde{\kappa}_2^- F_{\nu\mu}^{+n} + \cdots\big) \tag{13.3a}$$

$$\hat{\partial} = \dot{x}^{\nu}\dot{\zeta}^{\nu}D^{\nu} = \dot{x}^{\nu}\zeta^{\nu}\partial^{\nu} - i\dot{x}^{\nu}\zeta^{\nu}\left(\frac{e}{\hbar}A^{\nu} + \tilde{\kappa}_2^{+}F_{\nu\mu}^{-n} + \cdots\right) \qquad (13.3b)$$

where $e$ is a coupling constant of the bispinor fields. Naturally, defined as the event operation or similar to the classical *Spontaneous Breaking*, it involves the evolutional and symmetric processes of the natural *Creation* and its complement duality known as *Annihilation*.

# 2. Ontological Evolutions

From the first type of *World Equations* (4.8-4.9), the virtual superphase events under both of the $Y^- Y^+$ reactions $\psi^\pm$ evolve their density of the circular process, simultaneously:

$$\hat{W}_n = \left[\psi^+(\hat{x},\lambda) + \kappa_1^+ \hat{\partial}\psi^+(\hat{x},\lambda)\cdots\right]\left[\psi^-(\check{x},\lambda) + \kappa_1^- \check{\partial}\psi^-(\check{x},\lambda)\cdots\right]$$

$$= \psi^+\psi^- + k_J J_s + k_\wedge\left(\hat{\partial}\psi^+\right) \wedge \left(\check{\partial}\psi^-\right) \qquad (13.4a)$$

$$J_s = \frac{\hbar c^2}{2E^-}\left(\psi^+\check{\partial}\psi^- + \psi^-\hat{\partial}\psi^+\right) = \left\{ic\rho, \mathbf{J}\right\} \qquad (13.4b)$$

where $k_J$ or $k_\wedge$ is constant. The first term $\psi^+\psi^-$ is the ground density, and the second term is the probability current or flux $J_s$. Apparently, the third term constructs the horizon interactions. Since the tensor product has two symmetric types, the tensors react upon each other, symbolized by the wedge product $\wedge$ as the following:

$$\left(\hat{\partial}\psi_j^+\right) \wedge \left(\check{\partial}\psi_k^-\right) = \left(\dot{x}^\mu \zeta^\mu D^\lambda \psi_j^+\right) \wedge \left(\dot{x}_\nu \zeta_\mu D_\lambda \psi_k^-\right)$$

$$= \dot{x}^\mu \zeta^\mu\left(\partial^\mu - i\frac{e}{\hbar}A^\mu - \tilde{\kappa}_2^+ F_{\mu\nu}^{+n}\right)\psi_j^+ \wedge \dot{x}_\nu \zeta_\nu\left(\partial_\nu + i\frac{e}{\hbar}A_\nu + \tilde{\kappa}_2^- F_{\nu\mu}^{-n}\right)\psi_k^- \qquad (13.5)$$

The symbol $j,k \in \{a,b,c\}$ indicates a loop chain of triple particles. The equation (13.4) is named as *Horizon Equations of Ontological Evolutions.*

As a part of infrastructure of universe, the principle of the chain of least reactions in nature is for three particles to form a loop. Confined within a triplet group, the particles jointly institute a double streaming entanglement with the three action states, illustrated in Figure 13a, introduced in June 6th of 2018.

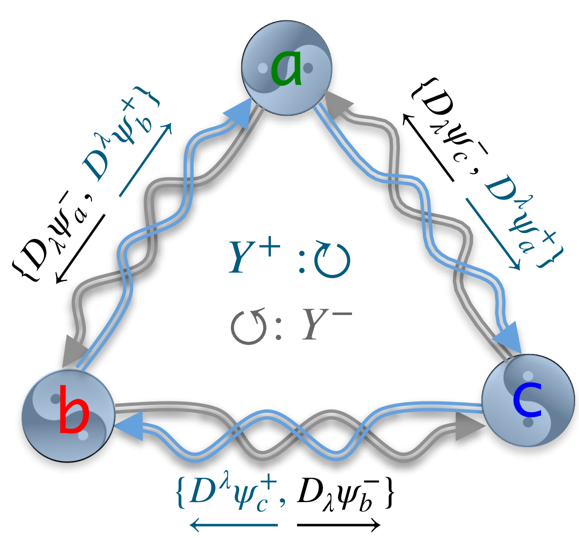



*Figure 13a: Two Implicit Loops of Triple Explicit Entanglements*

Therefore, the actions of double wedge circulations $\wedge$ in the above figure have the natural interpretation of the entangling processes:

$$\circlearrowleft: \ (D_\lambda \psi_a^- \to D_\lambda \psi_b^- \to D_\lambda \psi_c^-)^{\urcorner} \qquad : \textit{Right-hand Loop} \tag{13.6}$$

$$\circlearrowright: \ {}^{\ulcorner}(D^\lambda \psi_b^+ \leftarrow D^\lambda \psi_c^+ \leftarrow D^\lambda \psi_a^+) \qquad : \textit{Left-hand Loop} \tag{13.7}$$

$$\{D_\lambda \psi_a^-, D^\lambda \psi_b^+\}, \{D_\lambda \psi_b^-, D^\lambda \psi_c^+\}, \{D_\lambda \psi_c^-, D^\lambda \psi_a^+\} \qquad : \textit{Triple States} \tag{13.8}$$

Acting upon each other, the triplets are streaming a pair of the $Y^- Y^+$ *Double-Loops* implicitly, and the *Triple States* of entanglements explicitly.

# 3. Evolutional Equations

The *Ontological Evolutions* can be conveniently expressed in forms of *Horizon Lagrangians* of virtual creation and physical reproduction. Considering the second orders of the $\psi_n^-$ and $\psi_n^+$ times into (8.1-8.5) equations, and substituting them into the Lagrangians (3.41), respectively, one comes out with the quantum fields that extend a pair of the first order Dirac equations of (8.9) into the second orders in the forms of Lagrangians respectively:

$$\tilde{\mathscr{L}}_s^{\pm} = -\frac{1}{c^2}\left[\hat{\partial}^\lambda\hat{\partial}^\lambda, \check{\partial}_\lambda\check{\partial}_\lambda\right]_s^{\pm} \tag{13.9}$$

$$\tilde{\mathscr{L}}_s^{+} = \overline{\psi}_n^-\big(i\frac{\hbar}{c}\zeta^\mu D^\mu + m\big)\psi_n^+ - \frac{1}{c^2}\overline{\psi}_n^-\zeta^\mu\check{\partial}_\lambda\hat{\partial}_\lambda\psi_n^+ \tag{13.9a}$$

$$\tilde{\mathscr{L}}_s^{-} = \overline{\psi}_n^+\big(i\frac{\hbar}{c}\zeta_\nu D_\nu - m\big)\psi_n^- - \frac{1}{c^2}\overline{\psi}_n^+\zeta_\nu\hat{\partial}_\lambda\check{\partial}^\lambda\psi_n^- \tag{13.9b}$$

As a pair of dynamics, it defines and generalizes a duality of the interactions among spinors, electromagnetic and gravitational fields. The nature of the commuter $[\hat{\partial}_\lambda\check{\partial}^\lambda, \check{\partial}_\lambda\hat{\partial}_\lambda]^{\pm}$ is the horizon interactions (13.5) with the mapping $\hat{\partial}_\lambda\check{\partial}^\lambda \mapsto (\dot{x}^\mu\zeta^\mu D^\lambda\hat{\psi}) \wedge (\dot{x}^\nu\zeta^\nu D_\lambda\check{\psi})$. Applying the transform conversion (7.6), we generalize the above equations for a group of the triplet quarks in form of a set of the classic Lagrangians:

$$\tilde{\mathscr{L}}_h^a = \tilde{\mathscr{L}}_s^+ + 2\tilde{\mathscr{L}}_s^- = \mathscr{L}_D^{-a} + \big(\overline{\psi}_c^-\frac{\dot{x}_\nu}{c}\zeta^\nu D^\lambda\psi_a^+\big) \wedge \big(\overline{\psi}_b^+\frac{\dot{x}^\mu}{c}\zeta_\mu D_\lambda\psi_a^-\big) \tag{13.10}$$

$$\tilde{\mathscr{L}}_h^a \equiv \mathscr{L}_D + \mathscr{L}_\psi + \mathscr{L}_W + \mathscr{L}_F + \mathscr{L}_M \qquad : \psi_k^+\psi_j^- \to 1 \tag{13.11}$$

$$\mathscr{L}_D \equiv \overline{\psi}_k^{\pm} i\frac{\hbar}{c}\zeta^\mu D_\nu\psi_j^{\mp} \mp m_j \qquad : j,k \in \{a,b,c\} \tag{13.12}$$

$$\mathscr{L}_\psi = -\frac{1}{c^2}\big(\overline{\psi}_c^-\dot{x}_\nu\zeta^\mu\partial^\mu\psi_a^+\big)\big(\overline{\psi}_b^-\dot{x}^\mu\zeta_\nu\partial_\nu\psi_a^-\big) \qquad : \dot{x}^\nu\dot{x}^\mu = c^2 \tag{13.13}$$

$$\mathscr{L}_C = \frac{e}{2\hbar}\big\langle \zeta_\nu A_\nu\zeta^\mu F_{\mu\nu}^{+n}, \zeta^\mu A^\mu\zeta_\nu F_{\nu\mu}^{-n}\big\rangle_{jk}^- \qquad : \tilde{\kappa}_2^+ = \tilde{\kappa}_2^- = \frac{1}{2} \tag{13.14}$$

$$\mathscr{L}_F = i\frac{e}{\hbar}\big[\zeta^\nu\partial^\nu(\zeta_\mu A_\mu), \zeta_\mu\partial_\mu(\zeta^\nu A^\nu)\big]_{jk}^- - \frac{e^2}{\hbar^2}\big(\zeta^\mu A^\mu\zeta_\nu A_\nu\big)_{jk} \tag{13.15}$$

$$\mathscr{L}_M = \frac{i}{2}\big[\zeta^\nu\partial^\nu(\zeta_\nu F_{\nu\mu}^{-n}), \zeta_\mu\partial_\mu(\zeta^\mu F_{\mu\nu}^{+n})\big]_{jk}^- - \frac{1}{4}\big(\zeta^\nu F_{\nu\mu}^{+n}\big)_j\big(\zeta_\mu F_{\mu\nu}^{-n}\big)_k \tag{13.16}$$

where the Lagrangians are normalized at $\psi_k^+\psi_j^- = 1$. The fine-structure constant $\alpha = e^2/(\hbar c)$ arises naturally in coupling horizon fields. The $\mathscr{L}_\psi$ has the kinetic motions under the second horizon, the forces of which are a part of the horizon transform and transport effects characterizable explicitly when observed externally to the system. The $\mathscr{L}_D$ is a summary of Dirac equations over the triple quarks. The $\mathscr{L}_C$ is the bounding or coupling force between the horizons. The $\mathscr{L}_F$ has the actions giving rise to the electromagnetic and gravitational fields of the third horizon. Similarly, the $\mathscr{L}_M$ has the actions giving rise to the next horizon.

At the infrastructural core of the evolution, it implies that a total of the three states exists among two $\tilde{\mathscr{L}}_s^-$ and one $\tilde{\mathscr{L}}_s^+$ dynamics to compose an integrity of the dual fields, revealing naturally the particle circling entanglement of three "colors" [74], uncoiling the event actions [75], and representing an essential basis of the "global gauge." The *Standard Model*, developed in the mid-1960-70s [76] breaks various properties of the weak neutral currents and the *W* and *Z* bosons with great accuracy.

Specially integrated with the superphase potentials, our scientific evaluations to this groundwork of *Evolutional Equations* (13.10) might promote a way towards concisely exploring physical nature, universal messages, and beyond.

# 4. Yang-Mills Theory

Considering $\zeta^\mu \to \gamma^\mu$ and ignoring the higher orders and the coupling effects, we simplify the $\mathscr{L}_F$ and $\mathscr{L}_M$ for the $Y^+$ streaming of (13.15, 13.16):

$$\mathscr{L}_F(\gamma) \approx -\frac{e^2}{\hbar^2}\left(\gamma^\mu A^\mu \gamma_\nu A_\nu\right)_{jk} \equiv -\frac{1}{4}W^{+j}_{\mu\nu}W^{-k}_{\nu\mu} \tag{13.17}$$

$$\mathscr{L}_M(\gamma) \approx -\frac{1}{4}\left(\gamma^\nu F^{+n}_{\nu\mu}\gamma_\mu F^{-n}_{\mu\nu}\right)_{jk} = -\frac{1}{4}F^{+j}_{\nu\mu}F^{-k}_{\mu\nu} \tag{13.18}$$

At the second horizon, the $\zeta^\mu \to \gamma^\mu$ is contributed to the weak isospin fields $W^{+j}_{\mu\nu}W^{-k}_{\nu\mu}$ of coupling actions. Meanwhile, at the third horizon, the gamma $\gamma^\mu$ fields are converted and accord to the hypercharge $F^{+j}_{\nu\mu}F^{-k}_{\mu\nu}$ actions of electroweak fields. Therefore, the *Lagrangian* $\tilde{\mathscr{L}}^a_h$ becomes $\tilde{\mathscr{L}}^a_h \approx \mathscr{L}_D + \mathscr{L}_F + \mathscr{L}_M \equiv \mathscr{L}^a_Y$, which, in mathematics, comes out as *Quantum Electrodynamics* (*QED)* that extends from a pair of the first order *Dirac* equations (8.7) to the second orders in the form of a *SU*(2) + *SU*(3) *Lagrangian*:

$$\mathscr{L}^a_Y \equiv \left(\bar{\psi}^{\mp}_j i \frac{\hbar}{c}\gamma^\nu D_\nu \psi^{\pm}_i\right)_{jk} - \frac{1}{4}F^{+j}_{\nu\mu}F^{-k}_{\mu\nu} - \frac{1}{4}W^{+j}_{\mu\nu}W^{-k}_{\nu\mu} \tag{13.19}$$

where $j, k \in \{a, b, c\}$ is the triplet particles. When the strong torque of gravitation fields are ignored, the above equation is known as *Yang-Mills* theory, introduced in 1954 [77]. As one of the most important results, *Yang–Mills* theory represents *Gauge Invariance*:

1. *The classic Asymptotic Freedom from a view of the physical coordinates;*
2. *A proof of the confinement property in the presence of a group of the triple-color particles; and*
3. *Mass acquisition processes symmetrically from the second to third horizon, describable by the (8.27, 8.28) equations.*

Since the quanta of the superphase fields is massless with gauge invariance, *Yang–Mills* theory represents that particles are semi-massless in the second horizon, and acquire their full-mass through evolution of the full physical horizon. Extended to the philosophical interpretation, it represents mathematically: conservation of *Double Loops of Triple Entanglements*, or law of *Conservation of Evolutions of Ontology* philosophically illustrated by Figure 13a.

# 5. Gauge Invariance

The magic lies at the heat of the horizon process driven by the entangling action $\varphi_n^- \check{\partial}^\lambda \hat{\partial}_\lambda \phi_n^+$, which gives rise from the ground and second horizon *SU*(2)×*U*(1) implicitly to the explicit states *SU*(2) through the evolutional event operations, The horizon force is symmetrically conducted or acted by an ontological process as a part of the evolutional actions that give rise to the next horizon *SU(3*). Under a pair of the event operations, an evolutional action creates and populates a duality of the quantum symmetric density $\psi_n^+ \psi_n^-$ for the entanglements among spins, field transforms, and torque transportations. Evolving into the *SU(3)* horizon, the gauge symmetry is associated with the electro-weak and graviton-weak forces to further generate masses that particles separate the electromagnetic and weak forces, and embrace with the strong coupling forces globally. The first order of the commutators is the gauge field:

$$\mathscr{L}_F(\gamma) = i\frac{e}{\hbar}\left[\gamma_\mu \partial_\mu (\gamma^\nu A_a^\nu), \gamma^\nu \partial^\nu (\gamma_\mu A_\mu^a)\right]^- - \frac{e^2}{\hbar^2}\left(\gamma_\mu A_\mu^b \gamma^\nu A_c^\nu\right) \tag{13.20}$$

As the gamma $\gamma^\nu$ function is a set of the constant matrices, it might be equivalent in mathematics to the *Gauge Invariance* of *Standard Model*:

$$\mathscr{L}_F(\gamma) \mapsto F_{\nu\mu}^a = \partial_\nu A_\mu^a - \partial_\mu A_\nu^a + g_\gamma f_\gamma^{abc} A_\nu^b A_\mu^c \tag{13.21}$$

where the $F_{\nu\mu}^a$ is obtained from potentials $eA_\mu^n/\hbar$, $g_\gamma$ is the coupling constant, and the $f_\gamma^{abc}$ is the structure constant of the gauge group *SU*(2), defined by the group generators [76] of the *Lie* algebra. From the given *Lagrangians* $\mathscr{L}_C$ and $\mathscr{L}_M$ in term of the gamma $\zeta^\nu$ matrix*,* one can derive to map the equations of motion dynamics, expressed by the following

$$\partial^\mu(\zeta^\mu F_{\mu\nu}^a) + g f^{abc} \zeta^\mu A_\mu^b \zeta_\nu F_{\mu\nu}^c = -J_\nu^a \tag{13.22}$$

where $J_\nu^a$ is the potential current. Besides, it holds an invariant principle of the double-loop implicit entanglements, or known as a *Bianchi or Jacobi* identity [78-79]:

$$(D_\mu F_{\nu\kappa})^a + (D_\kappa F_{\mu\nu})^b + (D_\nu F_{\kappa\mu})^c = 0 \tag{13.23}$$

$$[D_\mu, [D_\nu, D_\kappa]] + [D_\kappa, [D_\mu, D_\nu]] + [D_\nu, [D_\kappa, D_\mu]] = 0 \tag{13.24}$$

As a property of the placement of parentheses in a multiple product, it describes how a sequence of events affects the result of the operations. For commutators with the associative property $(xy)z = x(yz)$, any order of operations gives the same result or a loop of the triplet particles is gauge invariance.

# 6. Quantum Chromodynamics

Given the rise of the horizon from the scalar potentials to the vectors through the tangent transportations, the *Lagrangian* above can further give rise from transform-primacy $\zeta^\nu \approx \gamma^\nu$ at the second horizon $\gamma^\nu F^{\pm n}_{\nu\mu}$ to the strong torque at the third horizon, where the chi $\zeta^\nu \approx \chi^\nu$ fields correspond to the strength tensors $\chi^\nu F^{\pm n}_{\nu\mu}$ for the spiral actions of superphase modulation. Once at the third horizon, the field forces among the particles are associated with the similar gauge invariance of the $\gamma^\nu \to \chi^\nu$ transportation dynamics, given by (13.12) $\mathscr{L}_D$ and (13.15) for $G^a_{\nu\mu} \equiv \mathscr{L}_F(\chi)$ as the following:

$$\mathscr{L}_{QCD}(\chi) = \bar{\psi}^-_n\left(i\frac{\hbar}{c}\gamma_\nu D_\nu - m\right)\psi^+_n - \frac{1}{4}G^n_{\nu\mu}G^n_{\nu\mu} + \mathscr{L}_{CP}(\chi) \qquad (13.25)$$

$$G^a_{\nu\mu} = i\frac{e}{\hbar}\left[\chi_\mu\partial_\mu(\chi^\nu A^\nu_a), \chi^\nu\partial^\nu(\chi_\mu A^a_\mu)\right]^- - \frac{e^2}{\hbar^2}\left(\chi_\mu A^b_\mu \chi^\nu A^\nu_c\right) \qquad (13.26)$$

where c is the strong coupling. Coincidentally, this is similar to the quark coupling theory, the *Standard Model* [80], known as classical *QCD,* discovered in 1973 [81]. Philosophically, the torque chi-matrix of gravitational fields plays an essential role in kernel interactions, appearing as a type of strong forces. It illustrates that the carrier particles of a force can radiate further carrier particles during the rise of horizons. The interactions, coupled with the strong forces, are given by the term of *Dirac* equation under the spiral torque of chi-matrix:

$$\mathscr{L}_{CP}(\chi) = i\frac{\hbar}{c}\left(\bar{\psi}^+_n\chi_\nu D_\nu\psi^-_n\right)_{jk} \mapsto -\frac{e}{c}\left(\bar{\psi}^+_n\chi_\nu A_\nu\psi^-_n\right)_{jk} \qquad (13.27)$$

Mathematically, *Quantum Chromodynamics* (QCD) is an abelian gauge theory with the symmetry group *SU(3)*×*SU(2)*×*U(1)*. The gauge field, which mediates the interaction between the charged spin-1/2 fields, involves the coupling fields of the torque, hypercharge and gravitation, classically known as Gluons - the force carrier, similar to photons. As a comparison, the gluon energy for the spiral force coupling with quantum electrodynamics has a traditional interpretation of Standard Model

$$\mathscr{L}_{CP} = ig_s\left(\bar{\psi}^+_n\gamma^\mu G^a_\mu T^a\psi^-_n\right)_{jk} \qquad : \chi_\nu A^a_\nu \mapsto \gamma^\mu G^a_\mu T^a \qquad (13.28)$$

where $g_s$ is the strong coupling constant, $G^a_\mu$ is the 8-component *SO(3)* gauge field, and $T^a_{ij}$ are the $3 \times 3$ *Gell-Mann* matrices [82], introduced in 1962, as generators of the *SU(2)* color group.

# 7. Time-Independent Evolutions

For a physical system in spatial evolution at any given time, the equation (8.20) can be used to abstract the *Evolutional Equations* (13.5) and its *Lagrangians* (13.10) to a set of special formulae:

$$\tilde{\mathscr{L}}_h^a = \tilde{\mathscr{L}}_s^+ + 2\tilde{\mathscr{L}}_s^- = \mathscr{L}_D^{-a} + \overline{\psi}_j\left(\hat{\partial} \wedge \check{\partial}\right)\psi_k \qquad : \nu, \mu \in \{1,2,3\} \tag{13.29}$$

$$\hat{\partial} \wedge \check{\partial} = \dot{x}^\mu \dot{x}_\nu\left(\hat{D} \cdot \check{D} + i\zeta^\mu \cdot \hat{D} \times \check{D}\right) \qquad : \tilde{\zeta}^\nu \mapsto \zeta^\nu = \gamma^\nu + \chi^\nu \tag{13.30}$$

$$\hat{D} \cdot \check{D} = \left(\partial^\mu - i\frac{e}{\hbar}A^\mu - \frac{1}{2}F_{\mu\nu}^{+n}\cdots\right) \cdot \left(\partial_\nu + i\frac{e}{\hbar}A_\nu + \frac{1}{2}F_{\nu\mu}^{-n}\cdots\right) \tag{13.31}$$

$$\hat{D} \times \check{D} = \left(\partial^\mu - i\frac{e}{\hbar}A^\mu - \frac{1}{2}F_{\mu\nu}^{+n}\cdots\right) \times \left(\partial_\nu + i\frac{e}{\hbar}A_\nu + \frac{1}{2}F_{\nu\mu}^{-n}\cdots\right) \tag{13.32}$$

Introduced at August 26th of 2018, this concludes a unification of the spatial horizon and operations of the quantum fields philosophically describable by the two implicit loops $\hat{D} \times \check{D}$ of triple explicit $\hat{D} \cdot \check{D}$ entanglements, concisely and fully pictured by Figure 13a.

# 8. Conservation of Antiparticle Entanglement

In physics, the loop entanglement of Figure 13a involves a reciprocal pair of both normal particles and antiparticles. This consistency preserves their momentum while changing their quantum internal states. It states that a matrix R, acting on two out of three objects, satisfies the following equation

$$(R \otimes \mathbf{1})(\mathbf{1} \otimes R)(R \otimes \mathbf{1}) = (\mathbf{1} \otimes R)(R \otimes \mathbf{1})(\mathbf{1} \otimes R) \qquad : e^{i\vartheta} \mapsto e^{-i\vartheta} \qquad (13.33)$$

where R is an invertible linear transformation on world planes, and *I* is the identity. Under the yinyang principle of $Y^{-}\{e^{i\vartheta}\} \mapsto Y^{+}\{e^{-i\vartheta}\}$, a quantum system is integrable with or has conservation of the particle-antiparticle entanglement or philosophically *Law of Conservation of Antiparticle Entanglement*. Classically, the above equation is known as Yang–Baxter Equation, introduced by C. N. Yang in 1968, and R. J. Baxter in 1971.

# 9. Forces of Field Breaking

Under the principle of the *Universal Topology*, the weak and strong force interactions are characterizable and distinguishable under each scope of the horizons. Philosophically, the nature comes out with the ***Law of Field Evolutions*** concealing the characteristics of *Horizon Evolutions*:

1. *Forces are not transmitted directly between interacting objects, but instead are described and interrupted by intermediary entities of fields.*
2. *Fields are a set of the natural energies that appear as dark or virtual, streaming their natural intrinsic commutations for living operations, and alternating the $Y^-Y^+$ supremacies consistently throughout entanglement.*
3. *At the second horizon SU(2), a force is incepted or created by the double loops of triple entanglements. The $Y^+$ manifold supremacy generates or emerges the off-diagonal elements of the potential fields embodying mass enclave and giving rise to the third horizon, a process traditionally known as Weak Interaction.*
4. *As a natural duality, a stronger force is reproduced dynamically and animated symmetrically under the $Y^-$ supremacy, dominated by the diagonal elements of the field tensors.*
5. *Together, both of the $Y^-Y^+$ processes orchestrate the higher horizon, composite the interactive forces, redefine the simple symmetry group U(1)×SU(2) ×SU(3), and obey the entangling invariance, known as Ontological Evolution.*
6. *An integrity of strong nuclear forces is characterizable at the third horizon of the tangent vector interactions, known as gauge SU(3).*
7. *Entanglement of the alternating $Y^-Y^+$ superphase processes in the above actions can prevail as a chain of reactions that gives rise to each of the objective regimes.*

The field evolutions have their symmetric constituents with or without singularity. The underlying laws of the dynamic force reactions are invariant at both of the creative transformation and the reproductive generations, shown by the empirical examples:

a) *At the second horizon, the elementary particles mediate the weak interaction, similar to the massless photon that interferes the electromagnetic interaction of gauge invariance. The Weinberg–Salam theory [83], for example, predicts* *that, at lower energies, there emerges the photon and the massive W and Z bosons [78]. Apparently, fermions develop from the energy to mass consistently as the creation of the evolution process that emerges massive bosons and follows up the animation or companion of electrons or positrons in the SU(3) horizon.*

b) *At the third horizon, the strong nuclear force holds most ordinary matter together, because, for example, it confines quarks into composite hadron particles such as the proton and neutron, or binds neutrons and protons to produce atomic nuclei. During the reactive animations, the strong force inherently has such a high strength that it can produce new massive particles. If hadrons are struck by high-energy particles, they give rise to new hadrons instead of emitting freely moving radiation. Known as the classical color confinement, this property of the strong force is the reproduction of the explicit evolution process that produces massive hadron particles.*

Normally, forces are composited of three correlatives: weaker forces of the off-diagonal matrix, stronger forces of the diagonal matrix, and coupling forces between the horizons. To bring together the original potentials and to acquire the root cause of the four known forces beyond the single variations of the *Lagrangian*, the entangling states in a set of *Lagrangians* (13.10-13.16) establish apparently the foundation to orchestrate triplets into the field interactions between the $Y^{-}Y^{+}$ double streaming among the color confinement of triplet particles. Coupling with the techniques of the *Implicit Evolution, Explicit Breaking* and *Gauge Invariance*, the four quantum fields (8.1-8.5) embed the ground foundations and emerge the evolutional intrinsics of field interactions for the weak and strong forces. Together, the terminology of *Field Breaking* and its associated *Invariance* contributes to a part of *Horizon Evolutions*.

# 10. Field Breaking of Mass Acquisition

Operating on the states of various types of particles, the creation process embodies an energy enclave acquiring mass from the quantum oscillator system; meanwhile, it unfolds the hyperspherical coordinates to expose its extra degree of freedom in ambient space. In a similar fashion, the annihilation operates a concealment of an energy enclave back to the oscillator system of the world planes.

G*iving rise to* the horizon *SU*(3), the processes of mass acquisition and annihilation function as and evolve into a sequential processes of the energy enclave as the strong mass forces in the double streaming of three entangling procedures (Figure 13a), known as a chain of reactions:

1. *At the second horizon SU(2) under the gauge invariance, the gauge symmetry incepts the evolution actions implicitly:*

$$D_\nu = \partial_\nu + i\sqrt{\lambda_2/\lambda_0}\phi_c^-, \qquad D^\nu = \partial^\nu - i\sqrt{\lambda_2/\lambda_0}\varphi_a^+ \tag{20.1}$$

2. *Extending into the third horizon, the mass acquisition (8.28) is proportional to* $m\omega/\hbar$ *during the potential breaking, spontaneously:*

$$\Phi_n^+ \mapsto \varphi_b^+ - \sqrt{\lambda_0}D^\nu\varphi_c^+/m\,, \;\; \Phi_n^- \mapsto \phi_a^- + \sqrt{\lambda_0}D_\nu\phi_b^-/m \tag{20.2}$$

Therefore, the potentials (8.45) of the *SU*(1) actions result in a form of *Lagrangian* forces at *SU*(2):

$$\mathscr{L}_{Force}^{SU1} \mapsto \mathscr{L}_{ST}^{SU2} \;\; \rightarrow \;\; \Phi_n^+\Phi_n^- \mapsto \lambda_0 D^\nu\varphi_b^+ D_\nu\phi_a^- - m^2\varphi_c^+\phi_b^- \tag{20.3}$$

3. *Combining the above evolutional breaking, the interruption force is further emerged into a rotational SO(3) regime:*

$$\mathscr{L}_{ST}^{SU3} = \kappa_f\Big(\lambda_0(\partial^\nu\varphi_b^+)(\partial_\nu\phi_a^-) - m^2\phi_{bc}^2 + \lambda_2\phi_{bc}^2\phi_{ca}^2\Big) \tag{20.4}$$

where $\kappa_f$ or $\lambda_i$ is a constant. The $\phi_{bc}^2 = \phi_b^-\varphi_c^+$ or $\phi_{ca}^2 = \phi_c^-\varphi_a^+$ is the breaking or evolutional fields of density.

4. *With the gauge invariance among the particle fields* $\phi_n \mapsto (v + \phi_b^+ + i\phi_a^-)\big/\sqrt{2}$*, this strong force can be eventually developed into Yukawa interaction, introduced in 1935 [84], and Higgs field, theorized in 1964 [85].*

In summary, a weak force interruption between quarks becomes the inceptive fabricator, which evolves into the horizon dynamics of triplet quarks embodied into a oneness of the mass enclave, known as the strong forces, observable at the collapsed states of the diagonal matrix external to its physical massive interruption. For example, a strong interaction between triplet-quarks and gluons with symmetry group *SU(3)* makes up composite hadrons such as the proton, neutron and pion.

# 11. Strong Forces

Since the coupling $\mathscr{L}_C$ between the horizons is also extendable to the strong forces, the total force at the third horizon become the following:

$$\mathscr{L}^{SU3}_{Force} = \mathscr{L}_{QCD}(\chi) + \mathscr{L}^{SU3}_{ST} + \mathscr{L}_C(\chi) + \mathscr{L}_M(\chi) \quad (20.5)$$

$$\mathscr{L}_C(\chi) = \frac{e}{2\hbar}\left\langle \chi_\nu A_\nu \chi^\mu F^+_{\mu\nu}, \chi^\mu A^\mu \chi_\nu F^-_{\nu\mu}\right\rangle^-_{jk} \quad (20.6)$$

$$\mathscr{L}_M(\chi) = \frac{i}{2}\left[\partial^\nu(\chi_\nu F^-_{\nu\mu}), \partial_\mu(\chi^\mu F^+_{\mu\nu})\right]^-_{jk} - \frac{1}{4}\left(\chi^\nu F^+_{\nu\mu}\right)_j\left(\chi_\mu F^-_{\mu\nu}\right)_k \quad (20.7)$$

As a part of the creation processes for the inception of the physical horizons, the potentials start to enclave energies, acquire their masses and emerge the torque forces at *r*-dependency. Besides, it develops the *SU(3)* gauge group obtained by taking the triple-color charge to refine a local symmetry. Since the torque forces generate gravitation, singularity emerges at the full physical horizon at *SU*(3) regime and beyond, arisen by the extra two-dimensional freedom of the rotational coordinates.

# 12. Fundamental Forces

Classically, roughly four fundamental interactions are known to exist:

1. *The gravitational and electromagnetic interactions, which produce significant long-range forces whose effects can be seen directly in everyday life, and*
2. *The weak and strong interactions, which produce forces at minuscule, subatomic distances and govern nuclear interactions.*

Generally in the forms of matrices, the long range forces are the effects of the diagonal elements of the field matrixes while the short range forces are those off-diagonal components. Transitions between the primacy ranges are smooth and natural such that there is no singularity at the second horizon transitioning between the physical and virtual regimes. Because of the freedom of the rotational coordinates in the third horizon, those diagonal components become singularity and the strong binding forces build up the horizon infrastructure seamlessly.

Finally, we have landed at the classical *QCD, Standard Model* and classic *Spontaneous Breaking* for the field evolution of interactions crossing the multiple horizons, and unified fundamentals of the known natural forces: electromagnetism, weak, strong and torque generators (graviton). Theses forces are symmetric or in the loop interruptions in nature. The general relativity of asymmetric dynamic forces is further specified by the chapter below.

# 13. Commutation of Ontological Evolutions

For entanglement between $Y^{-}Y^{+}$ manifolds, considering the parallel transport of a *Scalar* density of the fields $\rho=\psi^{+}\psi^{-}$ around an infinitesimal parallelogram. The chain of these reactions can be interpreted by the commutation framework (12.15) integrated with the gauge potential (2.8-2.9) for *Physical Ontology*. At the third horizon for asymmetric dynamics, the ontological expressions (12.6, 12.7) have the gauge derivatives:

$$\check{\partial}_{\lambda}\check{\partial}_{\lambda}\psi^{-} = \dot{x}_{m}\left(D_{m} - \overset{-}{\Gamma}{}^{s}_{nm}\right)\dot{x}_{s}D_{s}\psi^{-} \qquad : D_{\nu} = \partial_{\nu} + i\Theta_{\nu} \qquad (21.1)$$

$$\hat{\partial}^{\lambda}\hat{\partial}^{\lambda}\psi^{+} = \dot{x}^{\nu}\left(D^{\nu} - \overset{+}{\Gamma}{}^{\sigma}_{m\nu}\right)\dot{x}^{\sigma}D^{\sigma}\psi^{+} \qquad : D^{\nu} = \partial^{\nu} - i\Theta^{\nu} \qquad (21.2)$$

where the $Y^{-}$ and $Y^{+}$ superphase fields are defined by:

$$\Theta^{\nu} = \frac{e}{\hbar}A^{\nu}, \qquad \Theta_{\nu} = \frac{e}{\hbar}A_{\nu} \qquad (21.3)$$

Similar to derive the equation (12.11), this gauge entanglement consists of a set of the unique fields, illustrated by the evolutional components of the entangling commutators:

$$\left[\hat{\partial}^{\lambda}\hat{\partial}^{\lambda}, \check{\partial}_{\lambda}\check{\partial}_{\lambda}\right]^{+}_{v} = \dot{x}^{\nu}\dot{x}^{m}\left(P^{+}_{\nu\mu} + G^{+\sigma s}_{m\nu} + \Theta^{+\sigma s}_{\nu m}\right) \qquad (21.4)$$

$$P^{+}_{\nu\mu} \equiv \frac{1}{\dot{x}^{\nu}\dot{x}^{m}}\left[(\dot{x}^{\nu}\partial^{\nu})(\dot{x}^{m}\partial^{m}), (\dot{x}_{\nu}\partial_{\nu})(\dot{x}_{m}\partial_{m})\right]^{+}_{s} = \frac{R}{2}g^{\nu m} \qquad (21.5)$$

$$G^{\pm\sigma s}_{m\nu} = \mp\frac{1}{\dot{x}^{\nu}\dot{x}^{m}}\left[\dot{x}^{\nu}\overset{+}{\Gamma}{}^{\sigma}_{m\nu}\dot{x}^{\sigma}\partial^{\sigma}, \dot{x}_{m}\overset{-}{\Gamma}{}^{s}_{nm}\dot{x}_{s}\partial_{s}\right]^{\pm}_{s} \qquad (21.6)$$

$$\Theta^{+\sigma s}_{\nu m} = i\Xi^{+}_{\nu m} + i\frac{e}{\hbar}F^{+}_{\nu m} - i\eth^{+s\sigma}_{m\nu} - Ⓢ^{+}_{\nu m} \qquad (21.7)$$

$$\Xi^{\pm}_{\nu m} = \mp\frac{1}{\dot{x}^{\nu}\dot{x}^{m}}\left[\dot{x}^{\nu}\Theta^{\nu}\dot{x}^{m}\partial^{m}, \dot{x}_{m}\Theta_{m}\dot{x}_{\nu}\partial_{\nu}\right]^{\pm}_{s} \qquad (21.8)$$

$$F^{\pm}_{\nu m} = \pm\frac{\hbar}{e}\frac{1}{\dot{x}^{\nu}\dot{x}^{m}}\left[\dot{x}^{\nu}\partial^{\nu}(\dot{x}^{m}\Theta^{m}), \dot{x}_{m}\partial_{m}(\dot{x}_{\nu}\Theta_{\nu})\right]^{\pm}_{s} \qquad (21.9)$$

$$\eth^{\pm s\sigma}_{m\nu} = \pm\frac{1}{\dot{x}^{\nu}\dot{x}^{m}}\left[\dot{x}^{m}\overset{+}{\Gamma}{}^{\sigma}_{\nu m}\dot{x}^{\sigma}\Theta^{\sigma}, \dot{x}_{m}\overset{-}{\Gamma}{}^{s}_{m\nu}\dot{x}_{s}\Theta_{s}\right]^{\pm}_{s} \qquad (21.10)$$

$$Ⓢ^{\pm}_{\nu m} = \pm\frac{1}{\dot{x}^{\nu}\dot{x}^{m}}\left[\dot{x}^{\nu}\Theta^{\nu}\dot{x}^{m}\Theta^{m}, \dot{x}_{m}\Theta_{m}\dot{x}_{\nu}\Theta_{\nu}\right]^{\pm}_{s} \qquad (21.11)$$

The *Ricci* curvature $R$ is defined on a pseudo-*Riemannian* manifold as the trace of the *Riemann* curvature tensors. The $G^{\pm s\sigma}_{m\nu}$ tensors are the *Connection Torsions*, the rotational stress of the transportations. The $\Xi^{\pm}_{\nu m}$ are the *Superpose Torsions*, the superphase stress of the transportations. the $F^{\pm}_{\nu\mu}$ are the skew-symmetric or antisymmetric fields, the quantum potentials of the superphase energy. The $ð_{m\nu}^{\pm s\sigma}$ are the superphase contorsion, the superposed commutation of entanglements. The $Ⓢ_{\nu m}^{\pm}$ are *Entangling Connectors,* the commutation of the superphase energy. Apparently, the superphase operations $\Theta^{\nu}$ and $\Theta_m$ as actors lie at the heart of the ontological framework for the life entanglements.

# 14. Evolutional Field Equations

Similar to derive the equation (12.46) and (12.47), the above motion dynamics of the field evolutions can be expressed straightforwardly for the asymmetric dynamics of quantum ontology,

$$\frac{R}{2}g_{\nu m} + G_{\nu m}^{-\sigma s} + \Theta_{\nu m}^{-\sigma s} = \mathcal{O}_{m\nu}^{+\zeta} \qquad (21.13)$$

$$\frac{R}{2}g^{\nu m} + G_{\nu m}^{+\sigma s} + \Theta_{\nu m}^{+\sigma s} = \mathcal{O}_{m\nu}^{-\zeta} \qquad (21.14)$$

where $\mathcal{O}_{\nu m}^{\pm\sigma}$ is the $Y^+$ or $Y^-$ ontological modulators, given by (12.48-9). The notion of quantum evolution equations is intimately tied in with another aspect of general relativistic physics. Each solution of the equation encompasses the whole history of the superphase modulations at both dark-filled and matter-filled reality. It describes the state of matter and geometry everywhere at every moment of that particular universe. Due to its general covariance combined with the gauge fixing, this *Evolutional Field Equation* is sufficient by itself to determine the time evolution of the metric tensor and of the universe over time. This is done in "1+1+2" formulations, where the world plane of one time-dimension and one spatial-dimension is split into the extra space dimensions during horizon evolutions. The best-known example is the classic ADM formalism [86], the decompositions of which show that the spacetime evolution equations of general relativity are well-behaved: solutions always exist, and are uniquely defined, once suitable initial conditions have been specified.

# 15. Curvature and Gravity of Quantum Fields

Since the ordinary quantum fields forms the basis of elementary particle physics, the *Ontological Relativity* is an excellent artifact describing the behaviors of microscopic particles in weak gravitational fields like those found on Earth [87]. Quantum fields in curved spacetime demonstrate its evolutional processes beyond mass acquisition in quantization itself, and general relativity in a curved background spacetime strongly influenced by the superphase modulations $\Theta_{\nu m}^{\pm\sigma s}$. Integrated with the above formalism, the equation (11.6) illustrates that, besides of the dynamic curvatures, the blackhole quantum fields emit a blackbody spectrum of particles known as *Bekenstein-Hawking* radiation (11.13) leading to the possibility not only that they evaporate over time, but also that it quantities a graviton. As briefly mentioned above, this radiation plays an important role for the thermodynamics of blackholes [88].

As a full theory to cover the quantum gravity, our topology represents an adequate description of the interior of blackholes, and of the very early physical world, a theory in which gravity and the associated geometry of spacetime are described in the language of quantum physics. Besides the appearance of singularities where curvature scales become microscopic ontology, it, apparently, might suppress numerous attempts to overcome the difficulties at the classic theory of quantum gravity, some examples being string theory [89] and M-theory with unrealistic six to eleven space-dimensions, the lattice theory of gravity based on the Feynman Path Integral approach and Regge Calculus [90], dynamical triangulations [91], causal sets [92] twistor models [93] or the path integral based models of quantum cosmology [94].

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Unified Field Theory

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Funded by the White House in 1993 to secure the first website of whitehouse.gov [a], Wei developed one of the top application firewalls in June 1994: Gauntlet Firewall [b], initiating the third generation firewalls [c]. Upon his successful completion of IPSec [d] research, he released the first commercial VPN product in the IT industry market in December 1994. As a pioneer of information security, Wei founded Spontaneous Networks in 1999, where he created the cloud service security on-demand transformable at the click of a button. Since then, he served as a Chief Architect in many commercial and government organizations and delivered thousands of virtual secure datacenter networks nationally and internationally. Today, he is developing the groundbreaking innovations: *Virtual Productive Forces* and next generation of *Internet Protocols*, enlightened by his recent scientific discoveries.

During the two years in 2009 and 2010, Wei received a set of books in the old classic manuscripts: Worlds in Universe. Appeared initially as the profound topology of universe in philosophy, it has gradually groundbreakings and concisely revealed the theoretical physics: i) the constitution of *Elementary Particles* including *Dark Energy* in 2013 [e], ii) *Universal Topology and Framework* in 2015, iii) *Universal and Unified Physics* in 2018 [f], iv) Framework of "*Natural Cosmology*" in 2018 [g], and v) inception of "*Ontology of Nature*" in 2019 [h].

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