Exploration

Minkowski Space & Consciousness

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ABSTRACT

In this paper the theoretical application of Minkowski metric is developed to demonstrate a potentially unifying explanation for the synapse as a Casimir phenomenon, the generation of photons from cognitive processes, and the transformation of virtual into real particles. Specific solutions reflect preconditions that could subserve the non-locality and entanglement of cerebral electromagnetic and synaptic structures of specific brain functions. It is suggested that the holographic representation and manifestations of Minkowski space within the cerebrum determines the real and virtual dualism of consciousness.

Key Words: Minkowski space, holographic space, mathematical applications, consciousness and hemisphericity, dualistic consciousness.

1. Introduction

Over the last several decades of psychological research, the primary focus was to quantify the seemingly immeasurable process that is representative of consciousness. As the endeavour proceeded researchers have described many different theories that could be used to explain the translucency of the conscious process. Initial studies utilizing the electroencephalography (EEG) and quantitative electroencephalography (QEEG) were the primary methods employed to add a tangible definition of output to the function of consciousness. Throughout the general studies we have, on the consensus, theorized that perturbations within static voltaic, and consequently energetic, equivalent fields as generated by brain activity, describes the basis for the beginning of consciousness. The general conclusion, through introspection and correlative reductionism, argued that the difference in the firing patterns of summed, or individual, action potentials was the proof behind the quantitative aspect of this theory.

The theory of the electrical source, governed by stimulation patterns of firing neurons, of consciousness had remained apparent until the introduction of the magnetic field theory as described by several authors [12-14,16-19]. Consciousness was synonymously attributed to interacting electromagnetic fields. With the inclusion of such an idea there has been various idealistic extensions trying to explain and relate the potential of the current electromagnetic theory and physiological function. Quantum mechanics have also been implemented as a particular method by which to model these effects with the intent if determining the source of

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generation (the locus) that contains the central idea that is consciousness. Even Pribram has revelled at the opportunity to use the electromagnetic proposal of consciousness in relation to the generation of simultaneous virtual particles that are identical, in nature, to those of the initially interacting real particles [4,41,42].

Pribram's elucidated manner of transference, from real to virtual forms (and vice versa) can be explained using quantum mechanics, as well as the interactions at the microscopic level producing quantum (Casimir) forces, to which he has so elegantly modeled. Schrödinger's equation has been used to describe the electromagnetic component of the brain as it approaches, or resembles, that of Pribram's holographic model. The solutions to universal contingencies, the multiple interacting waveforms, within a system approaches each other and thus reflects physical and virtual arguments of functionality [9,42]. The governing reaction, to which the quantum argument supports, is that which is based upon the interaction between colliding electromagnetic fields or particles. Alas, all the theories that have been presented to date have not generalized to identify the brain structure, or component, as the source of "consciousness generation." Nor have they upheld the integrity of the remedial ideal of specific structure function duality.

This may raise the question of, "will we ever truly define, or let alone understand, the nature of an abstract concept such as consciousness?" The simplest answer should be acquired by the greatest contribution of humanity to science, the experiment, and its corresponding accuracy in measurement. This, however, does not exist without its flaws. The greatest limit that is associated with the experiment is the level of precision of a measure that can be obtained. This is an intrinsic component of the condition of the tool of measure, also known as error. Modern instrumentation, although exceedingly sophisticated, has its limitations. Perhaps these limitations correlate to an inability to measure the phenomenon that is consciousness. The question, "will there ever be a technology that will be able to measure abstract ideas or will we remain always at the boundary, the "event horizon", of its interpretation?" arises. The author of this paper would like to stress the concept that, at this very moment, we possess, within the boundaries of our organism, that which can be used to measure the variables of a human construct responsible for the aggregation of abstract ideas. Such a tool has already been defined and implemented by Einstein known as the thought experiment. The boundaries of the thought experiment are defined as the cognitive and creative limitations of the individual thus reflecting the basis of the intrinsic contribution of the human condition. It is with the use of this particular tool, the thought experiment that I intend to provide the theory and essence of this paper.

The idea that, in nature, two contrastingly equivalent forces must occur in synchrony (such as the positive and negative) has not been considered a new idea. Einstein and Eddington had described two independent, physical, interactions that exist within the boundaries of this universe occurring in a synchronous and parallel process. Such ideas were broken into, what they described as, matter and energy [27,28]. The idea that either of the two components, matter or energy, of this dichotomy could influence the other is a portion of which this article is dedicated. Within all constructs of this universe we can always relate the concepts of matter and energy. In the case of the human brain, the structure, the equivalent example would be that of memory formation with regards to newly formed protein growth (manifested as dendritic spines or filipodia within 15 minutes after electromagnetic elicitation by stimulation), is representative of the matter component. Comparatively, consciousness would be representative of the energetic,

electromagnetic, equivalent within the proportionality of mass-energy dichotomy. Yet again we arrive to the question of, "what is consciousness?" and although the theories aforementioned result in adequate definitions I would like to extend on their ideas by relating the properties of Minkowski space. The addition of Minkowski elements would introduce a plausible solution for the function-physiology binding definition of consciousness.

The percept that microcosm reflects macrocosm was originally denoted by Eddington, who believed that the representation of the universe was no more than the reflections of the neural network that subsequently represents the brain [29,30]. From this original perception other theorists, such as Pribram and Persinger, have elaborated on the particular connectivity and relationship of microcosmic effects reflecting macrocosmic experiences. Pribram extended on Eddington's notion as the basic foundation to formulate the concept of the holographic universe. The fundamental pretence by which the holographic principal is derived, denotes that the representation of one specific object--for arguments sake let us interpret this object as a physical particle-- has both real and virtual components or solutions. These complex real and virtual solutions display coherence to solutions of Schrödinger's equation, subsequently amassing implications within Hilbert space[34,43]. Extension and involvement of Hilbert space is a necessary contingency required for hologram genesis and conservation.

Contributing to the physical-non-physical relationship in the universe, Persinger introduced the contingent expression that the "$\Sigma n = n$". This is of cosmic significance whereby the sum of the parts is equal to the whole (vice-versa) [15]. Fundamentally, this notion precludes Pribram's particulate interaction and integrates the real and holographic equivalents within (brain) space [15]. Persinger also defined and integrated the fundamental neuroquantal value of 10^{-20} J, as an integral component of macroscopic and microscopic reflections. Mechanistically, this quantum of energy is seen to effect and, as a consequence, exists within all levels of discourse between known matter boundaries and beyond [15,24]. Under these *a priori* ideas, I have contemplated the relationship between the factors that define the functions of all levels of discourse, such as Minkowski space with its congruence to microscopic, or neuronal, equivalent. Reducing the complex nature of consciousness to a quantifiable alteration within space-time contiguity would enable unification of theory. Measurable correlates may provide the relative solutions necessary to solidify the conceptual, phlogistic definition of consciousness.

2. Minkowski Space: The Relationship between Four Dimensional space and Two Dimensional Space within the Boundaries of the Brain

The primary argument for this section is the intercalated interaction of structure and function, whereby the former dictates the latter. We observe this particular concept on varying levels of discourse examining, for example, the enzyme. In reality, the orientation and the precise conformation, as depicted by the tertiary (and in some cases quaternary) structure of the enzyme results in a specific enzymatic function. If we were, for instance, to change any component of the protein we would inadvertently and ultimately change its function. This concept and definition are of little difference with regards to brain structure and consequently brain function. At present we can confidently attest that the two hemispheres, the left and the right, both have, although equivocal in complexity, different functions. This is due to the fact that, of the over 100 sulci and

gyri that compose the superficial surface of the respective hemispheric boundaries, there are only three or four that are relatively similar in structure [23].

Systematically, the delineation of the hemispheric function correlates, and can be modeled, by differential space-time mechanics [31]. Intrinsic processes of the left hemisphere flow in a serial and categorical manner occurring within a limited epoch of time. Thus, by definition and extension of function alone, the process must be able to analyze all incoming data from the outside world and generate three dimensional coordinates that are representative of the ongoing events. Consequently, the summation of the individual components of the event converges upon encoding and will ultimately be expressed within the stored experience (memory) of the individual. This function can be similarly modeled to fractal generation. The input-- the three dimensional component solutions for each point-- would result in the generation of ongoing experience. The temporal component (t_1 and t_2) enables the elicitation of an ever-changing Δt, introducing a time varying component to the functionality equation. By contrast, the right hemisphere has limitations that exist as the process of a two point, two dimensional, system. Right hemispheric function incorporates two points, the reference and a measurable value, whose subjective time reduces itself to nil. Thus the change in time over the function of the right hemisphere is $\Delta t=0$. In this manner, the right hemisphere and its underlying processes exist independent of time.

The marked differences between both hemispheres, at a glance, do not show any spatial or temporal contiguity between space-time paradigms. Relatively, they exist as separate spaces and entities disallowing any particular mathematical relationship between the left and the right descriptors of coordinated function. This author believes differently, suggesting that the mathematical contiguity exists as a special case of Minkowski space. This alternative metric of Minkowski space would result in a quantifiable and measurable correlate of consciousness. Alteration of the Minkowski metric would be derived from the reduction of four-dimensional Minkowski space to a two-dimensional model. The longitudinal mathematical application of the missing/reduced elements would successfully describe the measure of consciousness.. The resultant solutions exists as complex alterations within space-time definitions of virtual and real subunits to which we ascribe the entire, phlogistic, definition of consciousness. It is in the defined process of the respective left and the right hemispheres with which we will implement mathematical equations in order to relate four dimensional Minkowski space and two dimensional (or reduced Minkowski) space.

The categorical processing of the left hemisphere, in general, must occur within three dimensional analysis of the (structure) event occurring over a variable length of time. These temporal events evolve over ever-changing periods (durations) respectively conjugating within the time dimension. A consequence of the nature of this function formulates the idea that the categorical processing has a component of space-time and thus can be modeled as such a system. Implication of theory suggests that one can model the generated fractal points as a consequential matrix produced by a function of the Minkowski equation. Point to point temporal alterations result in ever-changing epochs producing modulations within the axiom of time. Genesis of three-dimensional points, with respective alterations in temporal lapses, would be the underlying contribution to differential descriptors of the spatial and temporal axes of space-time. Modelistically, the yield of the entire experience can be expressed as a series of three-

dimensional points with respective temporal durations that once summed or aggregated, represent the production of the fractal function.

$$ds^2 = dx_1^2 + dx_2^2 + dx_3^2 - c^2\,dt^2 \quad (1),$$

where s is the frame of the occurrence (point within fractal), dx_n= one axis of the 3-D space, c is the speed of light, and t is the time component that is associated with the generation of that point.

When we relate this equation to brain function, the values of x_1, x_2 and x_3 represent the spatial confines of the pattern (location of generated points associated with the total experience) and c^2dt^2 represents the point duration of each point within that pattern. What we must realize is that a single value output by this equation does not describe the total experience but instead models one point, or component, within the aggregate or matrix pattern, generated by the interactions of all fractal points representing the entire experience. Upon inspection of the relationship between the manifestation of one point as a part of the whole agrees with Gestalt theory by which the whole is more important than the parts. However, in the extension of the holographic argument, each component is as equally complex as the whole whereby the representation of the whole is reflected in any one part of the components. Thereby, the integrity of the whole is dependent upon all components being properly expressed in their patterned occurrence. In essence, the sum of the parts is representative of the whole and the whole is representative of each part; they cannot exist without the presence and interactions between them.

It is possible to equate consciousness to two different yet synchronous forms one which is representative of a homogenous four-dimensional processor and the other that represents a line-element function of two-dimensional space. Describing a four-dimensional function as a line ablates one unit of space and the axiom of time. A direct consequence of manipulating the space-time context of four-dimensional processing, transforms the fundamental function to that which exists as a two-dimensional mechanism. Reduction of four-dimensional function occurs in Special Relativity where two distinct processes can eliminate the necessary variables from Minkowski space resulting in a reduction of space-time boundaries. Reducing the boundary condition results in a change in the Minkowski equation that would reflect the generation of a two-point system ultimately manifesting itself as two-dimensional space. Possible reduction of four-dimensional space-time constraints would allow for the manifestation and definition of right hemispheric function. Ultimately, the underlying mechanics of the respective hemispheres governs the independent existence of consciousness. With respect to the reduction of Minkowski space, the two particular cases of Special Relativity are the case of Simultaneity (Relativity of Simultaneity) and the Twin Paradox. The equation used to define the Relativity of Simultaneity is:

$$\Delta t^1 = \gamma\left(\Delta t - \frac{\mathbf{v}\,\Delta\,\mathbf{x}}{c}\right) \quad (2),$$

where Δt' is the relative time elapse, Δt is the time of the occurrence, c is the speed of light, v is the velocity of the object, Δx is the change in space between two objects and γ is the Lorentz contraction.

The implications of the Twin Paradox Equations results in the formation of the relative equations of:

$$\Delta t^1 = \gamma \left(\Delta t - \frac{v \Delta x}{c^2}\right) \text{ and } \Delta x^1 = \gamma (\Delta x - v \Delta t) \quad (3),$$

$$\Delta t = \gamma \left(\Delta t^1 - \frac{v \Delta x^1}{c^2}\right) \text{ and } \Delta x = \gamma (\Delta x^1 - v \Delta t^1) \quad (4),$$

where Δt' is the relative time elapse, Δt is the time of the occurrence, c is the speed of light, v is the velocity of the object, Δx is the change in space between two objects, Δx' is the change in the position of the object in relative space and γ is the Lorentz contraction.

Under the presumption that for simultaneity to occur both of the following conditions must be upheld: Δx = 0 and Δt = 0. If the conditions are met such that the equation results in the generation of a Δt' = 0 and the simultaneous assumptions (Δt= 0 and Δx= 0) are met then the frame, or occurrence, is said to occur instantaneously. This satisfies that in the frame of S, if Δt = 0 and Δx = 0, generating the event occurring in frame S' would be simultaneous. The final consequences would be the reduction of Minkowski space generating two-dimensional space. In essence, the process is said to exhibit spatial and temporal equivalence denoting synchronicity and binding. The aforementioned statement is an extension of the definitive processes of entanglement originally described by Schrödinger. Presence of potentially interacting particles, as they are located in isolated systems, produces overlapping physical definitions of highly relevant and coherent states. Occupancy of any particle within a distinct frame of space will exhibit the same spatial (Δx) and temporal (Δt) components of another particle when entangled.

When two particles are submersed in an intrinsic and unifying field, and although they may be separated by a relative and measurable distance from each other, they produce functional and mechanical overlap eliciting instantaneous non-local binding [43, 44]. Synchronous hybridization of these two entities (particles) results in the generation of the "same" space-time contingencies. Application of equations 3 and 4 such that $\Delta t^1 = \Delta t$, and $\Delta x^1 = \Delta x$, produces a resultant component generating a similar reduction in Minkowski space as did the assumption of Simultaneity. The application of any cause of instantaneity contraction is always apparent in the holographic universe such that virtual and real particles occupy the same temporal and spatial boundaries. This instantaneous reaction observes spatial constraints based on the essentials of non-locality. A relative definition of non-locality aiding in the defining of the holographic representations of any system, more specifically in this case a brain system, resides in Bohmian mechanics.

The definition of holographic generation is the consequence of instantaneous interaction of highly coherent brain states generating non-local holographic informational cortical fields of consciousness interconnecting the human brain and the holographic cosmos [6-8]. Di Biase extends on the reference of non-locality as it is responsible for the instantaneous interactions between cell cosmic phenomena as the mathematical consequence of Umezawa's Quantum Field Theory [6]. To relate the non-local interaction of consciousness we target the interactions between the virtual and real spaces that are contained and maintained within brain space. When the conditions are met that we create a point of chaos, the absence of or zero point, within two axes of Minkowski space it produces the loss of an x coordinate and consequently reduces the influence of time. The reduction of Minkowski space (Equation 1) under the relativity of Simultaneity and Twin Paradox assumptions would result in:

$$ds^2 = dx_1^2 + dx_2^2 + dx_3^2 - c^2\,dt^2 \text{ where } dx_3 = 0 \text{ and } dt = 0, \text{ then:}$$

$$ds^2 = dx_1^2 + dx_2^2 + (0)^2 - c^2\,(0)^2$$

$$ds^2 = dx_1^2 + dx_2^2 \quad (5),$$

This reduces the four-coordinate system to produce a two-point system providing physical salience to right hemispheric function. By this implication, there is a re-introduction of a Δt and Δx, such that Δt and $\Delta x > 0$, then the function will regenerate. Changing the function of the right hemisphere, such that we introduce a new locality of innervation (say by changing the vectorial output of the hemisphere so that it crosses over to the left hemisphere, like under the influence of physiologically patterned magnetic fields) [23] or by changing the time domain through resonance (or disturbances of the frequency of operation through perturbating interference patterns) we alter the overall perception of space-time by re-integrating the two lost dimensions. Thus if $\Delta t>0$ and $\Delta x > 0$ then:

$$ds^2 = dx_1^2 + dx_2^2 \qquad \text{where } dx_3 > 0 \text{ and } dt > 0, \text{ then}$$

$$ds^2 = d(x_1 > 0)^2 + d(x_2 > 0)^2 + d(x_3 > 0)^2 - c^2\,d(t > 0)^2$$

$$ds^2 > 0 \quad (6),$$

Re-integration results in the formation of a single point (within the fractal matrix) exhibiting duration within Minkowski space.

Brain function is a persistent paradigm-shift of activity. Manipulation of ongoing points reflects an ever-changing pattern of consciousness within restricted brain space. Allotting the function of the independent hemispheres, we would generate related, yet distinct, frames of experience. The left hemisphere equivalent of experience can be generated by the function of an n x n four-dimensional matrix. Conversely, the right hemispheric equivalent of consciousness would be modeled by a two-dimensional matrix generating a two-dimensional framework. Thus if we are to assume that the function (S) is generating an n x n matrix (M), of four-dimensional Minkowski points or two-dimensional reduced Minkowski points, respective of either hemisphere, then the result of the experience would be:

$$df\,(x_1,x_2,x_3,t) = \frac{ds^2}{df} = (M)_{nxn} \quad (7).$$

The representation of the matrix generation can be manipulated to represent both forms of Minkowski equations, allowing for dynamic preservation of the equilibrium of consciousness. A single caveat must be maintained, much like the duality of energy and matter, that denotes maintenance of separate space-lie and space-time equilibrium must be upheld. Any change in the system, either to the underlying function of the right hemisphere or the left, that results in an alteration in underlying space-time mechanics must be compensated by an opposing change in that system. A subsequent transient manifestation of four-dimensional space within the right hemisphere would reduce the left hemipshere to a two-dimensional system. This dynamic change would adhere to the maintenance of equilibrium.

This would account for the transference and generation of right hemispheric equivalent patterns of innervation. An example of hemispheric space-time equilibria is best described as the result of interhemispheric communication via vectorial change. The pattern of formation remains as the *a priori* assumption that the regeneration of Minkowski space occurs, in the right hemisphere, when the resultant vector crosses over to the left side. The resultant vector would be generated from the spatial vectors defined by the function of the right hemisphere as a function of the separation of x_1 and x_2. If this is the case, then the idea that one of the components of Minkowski space can be defined as a two-dimensional representation may arise. That is to say, that the third component, x_3, is dependent on the location (vectorial difference) between points x_1 and x_2. However, attribution of vectorial alteration is also time dependent.

Under normal circumstances, equilibrium is maintained within respective, independent hemispheres whereby the left adheres to the influence of time and the right does not obey temporal constraints. Consequently, under these same conditions the right hemispheric equivalence of consciousness is exhibited as a two-dimensional process. When the system is disrupted in such a manner as to elicit a level of interhemipsheric communication (vectorial change) the resultant alteration in the function of the right hemisphere exhibits left hemispheric characteristics. This notion must be corrected by changes resulting in regulation of equilibrium and thus one would expect a change in the function of the left hemisphere to exhibit the characteristics of the normal functioning of the right hemisphere. Integration of vectorial change may suggest that the third spatial axis and the influence of time manifest and interact in intrinsic ways. Equations 8 - 10 would be the mathematical implications such that time and space exist in the same axial frame. In this particular instance we will equate the time associated with the vectorial distance and that underlying the Minkowski time component as being one in the same.

$$X_3 = \frac{(x2 - x1)}{(x2 + x1)} \text{ or } X_3 = \frac{(x2 + x1)}{(x2 - x1)} \quad (8),$$

This point (x_3) would be subject to the effects of time, thus introducing the time domain, generating the resultant function to be:

$$X_3 = \frac{(x2 - x1)}{(x2 + x1)} (t_2\text{-}t_1) \quad \text{or } X_3 = \frac{(x2 + x1)}{(x2 - x1)} (t_2\text{-}t_1)$$

reducing itself to be:

$$X_3 = \frac{(x2 - x1)}{(x2 + x1)} \, dt \quad \text{or } X_3 = \frac{(x2 + x1)}{(x2 - x1)} \, dt \quad (9),$$

In this particular case, if the time domain was altered such that $\Delta t = 0$ then the third dimensional point would not exist and the Minkowski equation would be subsequently reduced to:

$$ds^2 = dx_1^2 + dx_2^2 + dx_3^2 - c^2 dt^2 \text{ but } X_3 = \frac{(x2 - x1)}{(x2 + x1)} \, dt \quad \text{therefore:}$$

$$ds^2 = dx_1^2 + dx_2^2 + d[\frac{(x2 - x1)}{(x2 + x1)} \, dt \,]^2 - c^2 dt^2 \quad (10),$$

If one applies the condition of simultaneity (dt = 0) then:

$$ds^2 = dx_1^2 + dx_2^2 + d[\frac{(x2 - x1)}{(x2 + x1)} (0)]^2 - c^2 (0)^2$$

$$ds^2 = dx_1^2 + dx_2^2.$$

From the generalization of Minkowski space, and its reduction, we conclude that the function of either hemisphere generates independent solutions under mathematical applications and representations of space, resulting in the Minkowski equivalent in the left hemisphere and reduced Minkowski space (two-dimensions) in the right. The production of the spatial and temporal components, and their governing space-time fabric, is a direct relation to the function of the independent hemispheres reflective of their spatial and temporal organization and syncytium. De and Pal have argued that, under the context of binding, the most developed of which is the theory of binding by synchrony, introduces the complexities of time and consciousness that appear paradoxical [5]. The extension of this binding theory, in accordance with the reductionism of Minkowski space, produces one of the components of the principle relativity constraints. Binding by synchrony relates the co-operability and symbiotic relationship between the temporal relations of space-time and the existence of consciousness. The connectivity of intercalated reactions disrupting both temporal and spatial extents of the boundaries of Minkowski space suggests that consciousness exists as both the presence (real) and absence (virtual) of space-time contingencies. Notably, the existence of consciousness is dependent upon the hemisphere in which it is represented but maintains a dynamic equilibrium. Conceptually, consciousness exists as the presence of four-dimensional space-time within the left, yet it appears to be the lack of four-dimensional representation that constitutes consciousness within the right hemisphere. It seems that the complexity of such an abstract idea lends itself to the generation of complex identities and relations in our physically defined world.

3. The Interpretation of Consciousness and its Relation to Minkowski or Reduced-Minkowski Space-Time

Functionally independent representations of both left and right hemipsheric equivalents of consciousness are the same. The difference lies in the underlying mechanics that are used to define their processes. If we agree that consciousness is a physical process (related, synonymously and synchronously, to memory and memory formation) we may further delineate its characteristics. Perturbations in the space-time continuum, exhibited within brain field, will produce a disturbance, in such a manner, as to elicit the introduction of a Δx and Δt that will ultimately alter the equilibrated continuity of consciousness. In the quantum argument, a collapsing field of a propagating or time-varying electromagnetic field, the point of crossing-over between the generation of the magnetic field and the ablation of the electric field, equals consciousness as Δx and $\Delta t = 0$. That is to say that consciousness exists without the implications of space and time, in one form primarily represented in, but not limited to, the right hemisphere. The functional reduction of Δx and Δt results in a single axiom: a component that was once used to describe two factors of Minkowski space. Di Biase described this effect, making reference to Bohm's universal model, as the juxtaposition of space and time such that they are mixed and

folded into a single dimension, axiom, of frequencies, relative to energy, that is an implicit hidden order without space-time interactions [6].

The reduced axiom would be considered as the perpendicular extension of neuronal activity known as consciousness, or the virtual component of consciousness. Arguments can also be extended to include the sum of the three components generating waveforms within space-time. Transformations regarding cross-over, vectorial hemisphericity, are transient alterations that can only exist for periodic time frames before the system self-corrects, as previously mentioned. In this manner, consciousness is the result, or the presence, of x_3 and t as per the definition of the confines of left hemispheric action. Consequently, there is a remarkable change that occurs within the right hemisphere to maintain dichotic and independent space-time mechanics. Implications for the maintenance of both the virtual and real representations of consciousness suggest a connective duality reflective of the governing universal dichotomy. Existence of dichotomous dynamics has been introduced as a notion that has been introduced as dynamic hemispheric space-time equilibrium in earlier sections. Support for the claim that the crossover of the vectorial information from the right hemispheric process to the left hemispheric equivalent was demonstrated by Saroka and Persinger [22].

In this particular article the conceptual basis of the sensed presence, represented in the mathematical equivalent correlative information rendered by qEEG methods, derivated by sLORETA algorithms, indicated the vectorial change. In this particular manner we have altered the representation of the x_3 and t components of the left hemisphere and reduced the governing space mechanics to that which is representative of reduced-Minkowski space. Alterations in the boundary conditions, through space-time mechanistic reductions of function, generates a measurable experience related to or representative of consciousness. The activation of this bi-hemispheric manipulation of physiologically patterned weak magnetic fields would be the necessary action required to induce the cross-over and maintain the homeostasis of this elegant dualism. Experimental support of solely unilateral stimulation resulted in a decrease in the prevalence of the sensed presence experience [22,23].

Considerations of the results lead to the idea of a synchronicity of dynamic equilibrium in consciousness. Within the context of stimulation studies and connectivity theories, the suggestion would be that there is a coupling or binding (as aforementioned as synchrony of binding) process that occurs between the left and the right hemisphere. This binding process can be altered by integrating shifts in neuronal activation equivalent to hemispheric crossing over. A continuation of the theory that consciousness has a virtual and real component is the maintenance of the separate representative space-time paradigms and the preservation of both independent attributes. Thus the resulting crossing would alter the general attributes of the left hemispheric function and it, in tandem, would be reduced to adhere to two-dimensional Minkowski constraints. Consequently, cascades then alter the function and representation of the right hemispheric equivalent in such a way that the governing equation generates four-dimensional Minkowski space. The aforementioned is no more than an extended hypothesis of the experimental support and would be contingent upon dynamic equilibrium.

The pattern of cross-over is transient and does not last for eternity; data suggests the length of the experience approaches roughly 20 seconds. The proposition of the return to function, the initial point of inertial equilibrium, would be the result of the completion of this process.

Approximations using the Lorentz time dilation (equation 11) with regards to a 20 second experience would be the result of an initial stimulation of 20 milliseconds (the approximated duration of the "temporal quantum" of consciousness). This is relevant as we are assuming that the change in velocity, (of the component innervating system) would be relative to the same value that produces the dilation associated with the Compton wavelength contraction for the electron or proton. Therefore, there is a fundamental shift in the process of generation of consciousness resulting in the alteration in the boundary conditions defined by the Minkowski equation.

$$\Delta t^1 = (\Delta t)/\sqrt{(1 - (v\uparrow 2/c\uparrow 2)} \quad (11).$$

The idea is that, in order to identify the experience we must initiate the activity of the left hemisphere; there must be a cue reinstatement for equilibrium to return. The resulting effect would be the reconstitution of the original vectorial representation of the experience. Assuming that the duration for the re-constitution of the initial activity of each hemisphere is 20 msec, then, from the derivation of the Lorentz dilation, the resulting lapse in time would be 20 seconds. It is in this time frame, from the generation of the first 20 second interval of the initial cross-over to the return to ground state, (another 20 second delay) that would be the correlative time associated with the transient experience of the sensed presence. By reactivating the appropriate patterns of neuronal firing, as seen in the laboratory, spatial tracking and labelling required the activation of various neurons resulting in shifting patterns of activation [22]. Under the notion that in order to experience we must label (initiation of the left hemisphere) we subsequently reduce activation in the right hemisphere returning the vector equivalence of the pattern to its initial equilibrium. In essence, we introduce the reduced-Minkowski constraint within the right hemisphere and re-establish Minkowski space within the left hemisphere. Regardless of the case, the representation of consciousness is maintained throughout all neuronal activity as defined by the preservation of global space-time representations.

The former application resembles experimental manipulation. Under these circumstances one can make connections to changes in the function of regulation and dysequilibrium. Maintaining normal function would require a constant strain on each independent hemisphere. Unique associative functions that require global synchronicity produce and regulate the underlying space-time mechanics which are hemispherically dependent.

To begin to understand the argument of the creation and maintenance of the particular subunit of consciousness, we must understand the process of memory formation and encoding as therein lay the relationship between matter and energy. Encoding is of a categorical, left hemispheric nature, and thus can be defined as a pattern of three dimensional points and varying temporal components (Δt_1, Δt_2, Δt_3 etc…). Resulting stimulation produces long term generation of memory isolated as the production of LTP (long term potentiation) and spine (protein) formation. This is the matter equivalent of brain space obeying the universal dichotomy. Implying the theories of Einstein and Eddington, which constitutes the operation of the direct proportionality of matter and energy, ($E= mc^2$) [26, 37, 35, 27], then, if there is matter that is present, energy must follow. In this context, the energy component, of memory formation, is equivalent to the electric and magnetic pattern of the action potentials that were synonymous with the formation of the matter component (same pattern). The physical interaction of the electromagnetic component between

the patterns of spine growth, along with the re-entrant process governing the electric circuits of the brain, would maintain the electromagnetic field as it remains in the space and is representative of consciousness (energy) [31].

Consequently, understanding Faraday induction, as well as spontaneous dissipation of the electromagnetic field, then we produce the contingencies to cause a change in time. By this implication the process aforementioned must be stored in a quasi-physical manner. The latter manner will result in the manifestation of the holographic storage of the initial electromagnetic and equivalent spine growth pattern. The pattern of storage would reduce Δx and Δt in a way that Minkowski space would, consequently, be reduced to two-dimensional space. This reduction can be maintained as the definition, if the time component of storage is imaginary, as described by Hawkins with regards to reduction of the Big Bang, under the condition that the real-time component and the imaginary time component still adhere to Simultaneity.

Retrieval however, would be the result of a two-dimensional system whereby, the act of retrieval is associated with the constant flux relationship between the virtual and real spaces, acting much like the Casimir condition. Retrieval would occur such that both real and virtual representations exist in the same space, in proximity, and by which there is a constant zwitter between both virtual space-time and real space-time. It is in this sense that the pattern of induction is always available and can always be accessed without altering the confines of reduced-Minkowski space.

The argument is in accordance with Di Biase who suggested that memories and consciousness would be represented within, in addition to synaptic patterns, the holographic field that surrounds them as indicative of the simultaneity argument [6]. As well, the concept of virtual or holographic arrangement of consciousness patterns satisfies the condition that, defined by Persinger, the holographic condition must satisfy the notion that the functional unit and whole should share one identity. By manipulation of theory it is apparent that the adherence to the notion of representation is met by satisfying not one, but two conditions of identity congruent with space and the subjective value of time. This underlying synaptic function would maintain consistent genesis of Minkowski and reduced-Minkowski correlates of consciousness. By extension, normal function within brain-space maintains the underlying physical consequences of consciousness.

4. Consciousness as Physical and Measureable Processes

This next section is dedicated to the equivalence of consciousness as a measurable quantity. The quantal measure of consciousness is the output function of the right hemisphere or essentially, by definition, the lack of the Δx and Δt within the boundaries of Minkowski space. One may ask, "how is this possible?" to which one would argue that the equivalent energy associated with the release of biophotons from the right hemisphere accounts for the Δx and Δt components which is a quantifiable but indirect measure of consciousness. Physical constraints that maintain reduced-Minkowski equilibrium would contain all the necessary information associated with consciousness. Possible interface mechanisms by which equilibrium is maintained are explored as correlative measures to consciousness the largest contribution arises from biophotogenesis.

Bokkon had theorized the presence of these photons and had associated them with the processes within the brain that was the content of conscious experiences. Dreams and wakefulness may actually be derived from organized matrices of these photons [2]. Dotta has supported this argument and has provided proof that photon emission from the human brain, particularly over the right hemisphere, is associated with shifts in qualitative thinking. The photons are measured using photomultiplier tubes [20,25]. Under the presumption that the electromagnetic wave is a consequence by a moving nonzero mass containing particle then we can stimulate the materialization of photons as per the arguments of Bokkon and Dotta.

The notion that the generation of these particular packets of energy was originally denoted by Tu et al [21] as describing the nonzero mass, for allowing a third type of polarization in which, in addition to the classic perpendicular orientations of the magnetic and electric field components of the electromagnetic wave with respect to its direction of movement, there would be the emergence of a longitudinal photon. The emergent properties of the electromagnetic system, as defined by Tu, are the extension (Bokkon) and the reason for the observed (Dotta) correlative identity of a measure of consciousness. A supportive argument for the attribution of the theory of photon-derived consciousness resides in the application. The primary correlate of this argument is the concept of energy being equated to a speed squared, primarily light, multiplied by a mass. In general terms, velocity can be described as:

$$V = \frac{(x2 - x1)}{(t2 - t1)} \quad (12)$$

$$V = \frac{d\mathbf{x}}{d\mathbf{t}} \quad (13),$$

The results in the production of Δx and Δt which would constitute the variables that are missing in reduced Minkowski space. In a classical sense, equation 12 will always equate to a constant value, under the Eddington-Einstein equation, of roughly 3.0 x10^8 m/s defined as the constant *c*. Consequently, the primary descriptor of a photon, its velocity, can be reduced to be representative of a single change to position, within a unique spatial axis, and a change in time. Equating these functions we would associate the values of photon velocity to the missing values of right hemispheric reduced- Minkowski space. The uniqueness of the photon, regarding its salience through time, is that it can be representative of any number of states within real-time simultaneously.

The importance of numbers of states becomes apparent when the equation for entropy, or S=ln g (number of states) k (Boltzmann constant) and T (cosmic background temperature, i.e., about 4ºK) is applied to the context of photons. Assuming a mass in the order of 10^{52} kg for the universe and the upper limit of the rest mass of a photon to be 10^{-52} kg, there would be 10^{104} photon equivalents in the universe. The intrinsic entropic energy would be ln10^{104} or about 239 multiplied by 1.38 ·10^{-23} JT^{-1}, or, ~1.3·10^{-20} J. This value is the energy associated with the action potential of neurons as well as the order of magnitude of the energy emitted as photons inferred from the Dotta studies.

The working theory is that photons are not subject to boundaries of time and can exist across all levels of discourse within space-time boundaries. The primary proof for this is the reduction of the Lorentz equation such that, if the velocity component is equal to c, the resulting solution

would produce a denominator approaching zero. As a result an approaching zero denominator would generate a value that can approach both positive and negative infinity. An extension of this idea can be represented as a larger aggregate of entanglement whereby, spatial and temporal components of interacting photons display a high degree of coherence eliciting temporal and spatial simultaneity.

A likely aggregate to the effects of entanglement can be displayed with respect to the photogenesis of a biological longitudinal photon. Physical deviations of activity of an electron, within the spatial extent of a synapse, restrain the systematic activity. Perturbations of this isolated and restrained system within the synaptic space, would elicit changes in the surrounding field leading to electrotonic excitation and generation of a photon. A level of concordance of biophotogenesis can be modeled by quantum mechanical underpinnings reflecting Feynman's quantum electrodynamics.

According to Feynman, the symbiotic and dualistic identity of an electron and its counter-part the photon, through their creation and annihilation mechanisms, can be used to model biophoton generation. In a system, an energetically modulated electron will shed its excess energy through the creation of a photon. Comparatively, if a photon can be dissociated from an electron (created) so elegantly, it can be integrated (annihilated) into an electron exciting it. Ultimately, the nature of both independent mechanisms (creation and annihilation of a photon) would carry the exact same information although independent particles are spatially separated [46].

Biophotogenesis requires homogenous integration fo annihilation and pertubative excitation to occur. Persinger has denoted, through calculation, that the rotation of an electron around its own axis has a time component of 10^{-16} seconds [19]. As a result, he also demonstrated that a photon passing through the neuronal plasma membrane with distance of separation equal to 10^{-8}m would result in the exact same rotation time or rotation frequency as the electron. Bohm and Hiley present a supporting argument in which they associate the interaction of the photons within the cell matrix. The idea is that two coherent light waves or an incoherent and a coherent wave are penetrating into a bio-crystal (or into a liquid crystal which is similar to the living cell's matrix). Light waves can exchange their information in an associational way [8]. If the photon and a singular electron occupy the same space (membrane space) then the process of entanglement may arise in such a manner that there is a transfer of information between the two interacting forms. One of the subset components to the process of entanglement is that if the two interacting forms undergo the simultaneous representation and occupancy of the same space and time. The two forms become, essentially, the same. The relative representation of form A is superimposed onto B and vice-versa. Electron-photon coupling via synaptic entanglement maintains reduced-Minkowski function on a more fundamental level as compared to biological function. Phase shift alterations of the photon within the synaptic confines is the transferant process necessary in order to maintain space-time reduction. Coupling maintains a dynamic equilibrium that is required for two-dimensional reduction, yet it is not the only manner to establish homeostasis.

Recent literature has discussed the potential that the basis of information reflects the spin state of the electron and information is represented in the phase-shift velocities of the photon [3]. The transference of information is a situation that can, by sheer volume of electrons and photons confined to a particular space i.e. brain space, encourage the likelihood of the occurrence of the event. Within each synapse the condition arises, the Casimir effect, such that alternative

transference hypothesis can occur. The Casimir effect occurs when two non-conductive surfaces are brought to proximity, with the caveat that the size of the plates are much larger than the separation between them. If these conditions are met a phenomenon arises by which a force, of quantal proportions, is generated.

If there is any disturbance or perturbation within the generated field, the effect from the Casimir paradigm would result in spontaneous manifestations of real particles from virtual ones [32]. Addition of electrons having relative motion, will disrupt the quantum flux between the plates, either through transmitter release or electrical conduction, creating the necessary conditions for spontaneous matter aggregation. Subsequent change in angular frequency of the quantum spin of the electron prodces its own electromagnetic dipole resulting in interactions that will cause a disturbance within the Casimir field. The change in field parameters would result in the instantaneous manifestation of an energy equivalent particle that is based entirely upon the rotation, and energetic components, of the electron. Due to its reduced mass and equivalent angular frequency, one of the products of disrupting the Casimir field would be the generation of photons within the synaptic space. When this occurs then the information that is carried or represented within the spin state of the electron will be completely transferred or copied to the photon and thus represented within is summated phase shift velocities representing a sum of Δxs and Δts. Indicatively, the two processes may produce the opportunity for reception and integration of information from external non-biological sources of energy.

The interaction at this point would be reduced such that the potential for the formation of the Bose-Einstein condensate produces the lowest quantum energy state [33]. The greater the organization, the more matter. More generated matter of a particle the greater the entropic complexities. Matter is a highly organized state to which manifestation produces a negative selection pressure resulting in shifts in the entropic equilibrium. In order to maintain chaos we reduce the mass as much as possible in order to minimize the potential shifts in entropy from its equilibrium. By the definition of the formation of the Bose-Einstein condensate, we reduce the negative selection against entropy and produce the lowest quantum energy state. Thus, a universal favouring occurs for the aggregation of photons.

The complexity does not rest in the rest mass of the photon but, the energetic equivalent to matter. The summation of phase shift frequencies within the waveform is representative of a lower state of organization and it is thus favoured. The operator defining the confines of the spatial locality of the wave function of the traveling and interacting particles (defined as ∇) would represent reduced-Minkowski space constriants for the defining spatial orientation of the electron. Conversely the photon spatial confines would be reflective of the boundaries defining Hilbert space [39,40]. The intercalation of these two space-boundaries is reflective of the macrocosmic and microcosmic reflection of function and representation. Consequently the interaction between a single electron and an aggregate of numerous photons would also be proof for the notion of Σ n =n, one of the defining conditions for the generation and maintenance of the holographic model.

The flicker of the non-local electron's energy, as it passes through the membrane synapse under the influence of the Casimir effect, would react in such a manner that the change in the field energy results in the perturbation in the Casimir field. Under the reactive conditions, the Casimir effect will allow for the generation of real particle (k) from the imaginary particle *i*k such that the

Bose-Einstein condensate results in the production of a non-local, instantaneous photon which satisfies the unity of all governing quantum mechanics of the interacting electron. This would set-up the condition for the exchange of information between the electron and the photon which may undergo the integration into the cortex or voided from the locale and represented elsewhere in space. Minkowski space reduction of Δx_3 and $c^2\Delta t^2$ is the simplistic representation and transference of the energy and waveform description of the resultant photon. Measuring consciousness would be as simple as measuring the intensity of biophoton production. A single caveat remains; the information would reside in the combinatorial patterns of photonic phase-sift velocities.

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