Empirical Protocols for Mediating Long-Range Coherence in Biological Systems

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Abstract. This work updates Bioelectrochem Bioenerg 41:1 (1996) 39-42, *The production of Fröhlich and Bose-Einstein coherent states in in vitro paracrystalline oligomers using phase control laser interferometry*. Delineating the framework for a fundamental model of long-range coherence in biological systems is said to rely on principles beyond parameters addressed by current physical science. Just as phenomena of quantum mechanics lay beyond tools of classical Newtonian mechanics we must now enter a 3rd regime of unified field, U_F mechanics. In this paper we present a battery of nine empirical protocols for manipulating long-range coherence in complex self-organized living systems (SOLS) in a manner surmounting the Copenhagen Interpretation of quantum uncertainty (space-quantization) thereby allowing empirical access to underlying coherent biophysical principles driving self-organization. Interestingly, while the U_F is not indicative of a 5th fundamental force in the usual phenomenal sense of quantal transfer during field interactions; it does however provide an inherent 'force of coherence' in an energyless ontological sense by a process called 'topological switching' of higher dimensional (HD) brane dynamics. It is this putative inherent property that produces long-range coherence and leads to the possibility of its direct experimental mediation.

Keywords: Long-range coherence, Quantum uncertainty principle, Complex systems, Self-organization, Unified field mechanics

Vitae: Richard L. Amoroso is Director of the Noetic Advanced Studies Institute and founding Executive Editor of the Noetic Press and Noetic Journal. Prof. Amoroso has written nearly 30 volumes and over 200 papers/chapters in 5 languages in a broad spectrum of fields ranging from Biology and Complex Systems Theory, Medicine, Philosophy of Mind and Transpersonal Psychology to Astrophysics, Cosmology and Quantum Theory. He holds a 2012 US Patent in Quantum Computing. He is an internationally renowned Symposia chairman and keynote speaker in these areas.

1. Introduction - Summary of Purpose

Sufficient theoretical insight related to a new anthropic noetic cosmology [1-37] has occurred during the 17 intervening years since the prior work [38] to design rigorous empirical protocols for isolating and manipulating fundamental parameters related to long-range coherence in biological systems. Our key premise is that the so-called Planck scale stochastic regime is not fundamental and need no longer be a barrier to the study coherent phenomena in biological systems. Since Heisenberg's 1927 discovery, the quantum uncertainty principle (four dimensional, 4D) has been by empirical definition a barrier to accessing certain kinds of complementary biophysical information. As will be shown, the simple solution is - Do something else! That is, use a different fundamental basis for biophysical 'measurement' criteria by utilizing additional degrees of freedom inherent in a noetic cosmology. Nine experimental protocols are outlined for testing postulates of the model; which if successful will lead to a standardized biophysical research platform and a new class of biosensors.

Noetic cosmology makes correspondence to 11D M-Theoretic dual Calabi-Yau mirror symmetry, $M_{10} \rightarrow M_4 \times K_6$ [39-41] albeit with the addition of a twelfth dimension to incorporate Unified Field, U_F dynamics, $M_{12} \rightarrow M_4 \times K_8 \rightarrow \hat{M}_4 \times \hat{\mathbb{C}}_4^+ \times \hat{\mathbb{C}}_4^-$ [1,23]. String Theory has struggled to discover one unique vacuum compactification from the googolplex, 10^{googol} or infinite potentia provided by additional dimensions, with Standard Model Minkowski space, M_4 as the sought resultant [39-41]. Noetic cosmology is different - All dimensionalities from 12D to 0D are cycled through continuously defined as a 'Continuous-state spin exchange dimensional reduction compactification process' that led to discovery of a unique string vacuum [1,37]. Note: The 'continuous-state' is radically different than a Big Bang singularity [1,14,33,34].

Summary of salient theoretical postulates:

- The Unified Field, U_F provides an evolutionary 'force of coherence' guiding evolution in biological systems.
- The HD U_F regime is accessible by surmounting the uncertainty principle (limitation imposed by space-quantization parameters of the Copenhagen Interpretation) by manipulating new cosmological parameters described by additional degrees of freedom related to a Large-Scale Additional Dimensionality (LSXD) version of M-Theory [37].
- Utilizing U_F parameters provides a new action principle with an inherent force of coherence acting like a 'super-quantum potential' or pilot wave [1,42-44] guiding the 'continuous-state' spin-exchange dimensional reduction compactification process of spacetime and evolution of complexity in the Self-Organized Living Systems (SOLS) it pervades [2].
- The putative unique 12D M-Theoretic regime of U_F action correlates parameters of Calabi-Yau mirror symmetry [42-44] with heretofore generally ignored properties of de Broglie-Bohm Causal and Cramer Transactional interpretations of quantum theory [42-45] and their higher dimensional (HD) extensions utilized in the new paradigm of noetic cosmology [1,37].
- This unique string vacuum forms a conformal scale-invariant covariant polarized Dirac-Einstein energy dependent spacetime metric, $\hat{M}_4 \times \pm\mathbb{C}_4$ [1,46-48] which by nature of its inherent continuous-state dimensional reduction process [1] acts as a Feynman 'synchronization backbone' [49] facilitating/simplifying empirical accessibility.
- This empirical mediation of the LSXD polarized Dirac-Einstein metric, $\hat{M}_4 \times \pm\mathbb{C}_4$ (12D) [1,3,37,46-48] can be performed by a specialized incursive form of rf-modulated Sagnac Effect resonant interference hierarchy able to surmount the uncertainty principle [1,4].

Since 1993 the so-called Elitzur-Vaidman Interaction-Free Measurement (IFM) paradigm [50-58], a procedure for detecting the quantum state of an object without a phenomenological interaction occurring with the measuring device that ordinarily collapses the quantum wave function, Ψ provides an indicia of our model suggesting it may be possible in general, as proposed here, to completely override the quantum uncertainty principle with probability, $p \equiv 1$ through utility of additional degrees

of freedom inherent in the supersymmetric regime of string/brane theory. Note: in Newtonian mechanics the universe was 3D, Einstein introduced a 4D cosmology; now the next step seems to require 12D as the minimal dimensionality for producing causal separation from $\hat{M}_4$.

The disadvantages of the IFM model is that in order to improve probability towards certainty more and more Mach-Zehnder interferometers and more and more cycles through the apparatus are required [51-53]; while our apparatus acts with a single cycle because it represents a true and complete overriding of the quantum uncertainty principle by utilization U_F dynamics [1,4]. We emphasize our position that it is impossible to violate the uncertainty principle in 4D (by empirical fact) which the IFM method is limited to. This duality in the Quantum Zeno Paradox as experimentally implemented in IFM protocols suggests a duality between the regular phenomenological quantum theory and a completed unified or ontological model beyond the formalism of the standard Copenhagen Interpretation as proposed here [59-63]. Utilizing extended theoretical elements a putative empirical protocol for producing IFM with probability $\mathrm{p} \equiv 1$ is introduced in a direct causal violation or absolute surmount of the methodology of the current 4D Copenhagen quantum Uncertainty Principle.

2. Insight into the Measurement Problem

In order to surmount quantum uncertainty and empirically access the hidden 3rd regime of reality (Classical $\rightarrow$ Quantum $\rightarrow$ Unified) new physics is required. The physical concept of fundamental interactions regards phenomenological properties of matter (Fermions) mediated by transfer of an energy-momentum field (Bosons) as described by the Galilean, or Lorentz-Poincaré groups of transformations. An interaction is defined as any action, generally a force, mediated by an energetic exchange particle such as the photon in electromagnetic interactions. Kwiat said: "*There has been some controversy and misunderstanding of the IFM system concerning what is meant by 'interaction' in the context of 'interaction-free' measurements. In particular, we stress that there must be a coupling (interaction) term in any Hamiltonian description* [63]".

Here we introduce a new ontological type of homeomorphic transformation (a holomorphic-antiholomorphic duality) that Toffoli calls a 'topological switching' [64] of what Stein calls 'topological charge' [65,66] that we propose as an empirical basis for the Micromagnetics of spacetime/matter information exchange without usual phenomenological exchange quanta. Mediation occurs instead as an 'ontological becoming' or 'being' by operation of an energyless coherently controlled resonant hierarchy of the topology of LSXD brane interactions [1,37] which is not a local Hamiltonian phenomenon but perhaps a new form of ontological U_F Lagrangian topology. Topological switching can be represented metaphorically as the perceptual switching of the central vertices of a Necker Cube when stared at.

The uncertainty principle, $\Delta x \Delta p_x \geq \hbar/2$ or $\Delta E \Delta t_x \geq \hbar/2$ by empirical definition is impossible to violate within the framework of Copenhagen phenomenology arising from operation of a 'Heisenberg Microscope'. The Stern-Gerlach experiment demonstrated this fundamental empirical fact of space-quantization produced along the *z*-axis by continuous application of a non-uniform magnetic field to atomic spin structure [67], or by Young's double-slit experiment for example. The Elitzur-Vaidman bomb-test experiment first demonstrated experimentally in 1994 [51] using a Mach-Zehnder interferometer bent this immutable law soon leading to two improved procedures: 1) Multiple recycled Measurements and 2) Multiple Interferometers improving IFM from 25% to 80%. The Mach-Zehnder interferometer uses pairs of correlated photons produced by spontaneous parametric-down conversion from a molecular crystal such as $LiIO_3$. (Photons are not entangled for a local observer unless produced by simultaneous emission) Initially in the first experiments for a 50-50 beam splitter for a one time measurement cycle the IFM probability was 25% according to Eq. (1) [51]; but for repeated measurements and/or various forms of multiple interferometers the IFM probability can be arbitrarily increased toward unity as shown in Fig. 1,

$$\eta = \frac{P(Det1)}{P(Det2) + P(Bomb)}. \qquad (1)$$

IFM probability occurs in powers of $\pi/2N$ by $P_{IFM} = [1 - 1/2(\pi/2N)^2 + ...]^{2N}$ where N is the number of beam splitters in the Mach-Zehnder interferometer. Elitzur's seminal thought experiment suggested a maximum IFM of 50%. The model was improved to 80% by a method developed by Kwiat's team with $P_{IFM} = 1 - (\pi^2/4N) + O(1/N^2)$ where in this case N is the number of photon cycles through the apparatus [51]. Elitzur and Vaidmann explained their model by the 'Many-Worlds' interpretation; whereby Cramer proposed, "*they suggest that the information indicating the presence of the opaque object can be considered to come from an interaction that occurs in a separate Everett-Wheeler (EW) universe and to be transferred to our universe through the absence of interference*" [68]. Cramer's suggestion is an interesting attempt at preservation of a perceived 'inviolate law' but we believe not indicative of physical reality; the EW interpretation only provides another indicia that more physics exists in a 3rd unified field arena beyond the regime of the Copenhagen Interpretation. A wonderful door opens here [37] because at first glimpse LSXD Calabi-Yau symmetry might appear erroneously like an EW hall of parallel universe mirror images.

For example imagine a usual 4D qubit or quantum particle in a box. In our noetic interpretation the LSXD Calabi-Yau mirror symmetric regime contains a hierarchy of conformal scale-invariant 'copies' of the original 4D quantum state not independent EW parallels [37,68-70]. Then in way of simplistic introduction in terms of our new operationally completed interpretation of quantum theory the 'mirror image of the mirror image is causally free' of the underlying uncertain 4D quantum state and is accessible by manipulating the resonance hierarchy of our empirical protocol! Many physicists have been reluctant to embrace HD or LSXD physics. We suspect success of our protocol could begin to ease this philosophical conundrum.

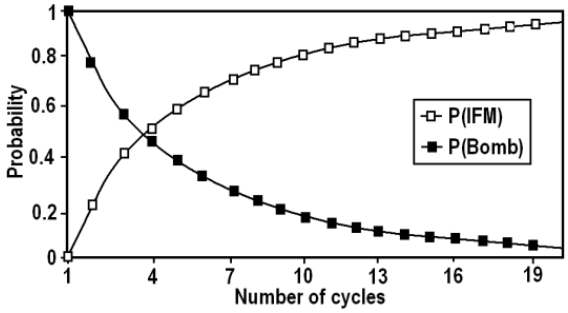

Figure 1. IFM probability arbitrarily increases toward unity by repeated cycles or multiple Mach-Zehnder interferometers. Figure adapted from [51].

In this paper a putative protocol is delineated not for another sophisticated improvement of the varied stepwise degrees of reducing the uncertainty relation by the several extant IFM protocols; but for completely surmounting the uncertainty relation directly, in a straight forward manner, for any and every single action of the experiment with probability, $p \equiv 1$. In an unexpected way our model has similarities to IFM but by using extended theory fully completes the task of uncertainty violation. One could say the new noetic protocol turns the IFM methodology upside down and inside out. The LSXD regime of the noetic protocol accesses the complete "hall of mirrors" simultaneously (ontologically) because the whole battery of IFM interferometers and multiple cycling routines is inherent in the conformal scale-invariance mirror symmetry of the LSXD regime, such that only one 'measurement' is required to achieve probability, $p \equiv 1$ when resonance is properly coupled and timed with the inherent continuous-state mirror symmetric synchronization backbone.

The methodology of this new empirical protocol is fully ontological (rather than the usual phenomenology of field interactions) because action in the LSXD regime is in causal violation of Copenhagen phenomenology not in an Everett 'many-worlds' sense but in a manner that extends to completion the de Broglie-Bohm-Vigier causal interpretation of quantum theory [1,37]. In summary the ontological basis is realized utilizing the additional degrees of freedom of a unique 12D iteration of M-Theory [1,37] along with the key supposition of conformal scale-invariance pertaining to the physicality of the dual mirror symmetric state of LSXD quantum information [37].

While considerations of the vacuum backcloth are of paramount concern for string theory, much of its putative essential parameters are ignored in the avid exploration of other details. The $p \equiv 1$ model relies heavily on the existence of an Einstein energy dependent covariant Dirac polarized vacuum [46-48] for which the Casimir effect is the best evidence, along with the Zeeman, Aharonov-Bohm and Sagnac effects and pair production as secondary evidences. Of primary concern is the basis for inclusion of extended electromagnetic theory that a polarized Dirac vacuum [71,72] supplies as a key for resonantly manipulating LSXD spacetime.

In Fig. 2a the suggestion is that the central translucent cube (bottom right) represents the region of a Cavity-QED or 3D quantum 'particle in a box' that through conformal scale-invariance remains physically real when the metaphor is carried to 12D where the 'mirror copy' becomes like a 'mirror image of a mirror image' and in that sense is causally free of the E_3 quantum state thereby open to ontological information transfer in violation of Copenhagen uncertainty. A 5D hypercube would unfold into a cross of 4D hypercubes and so on to 12D.

Beyond 4D mirror symmetry adds a complexity in that the unfolding (Fig. 2b) has a knot or Dirac twist (not shown) that is part of the gating mechanism insulating quantum mechanics form unified field mechanics [37]. In Copenhagen the 'handcuffs' are on but during the LSXD cycle the handcuffs are periodically off and thus accessible resonantly.

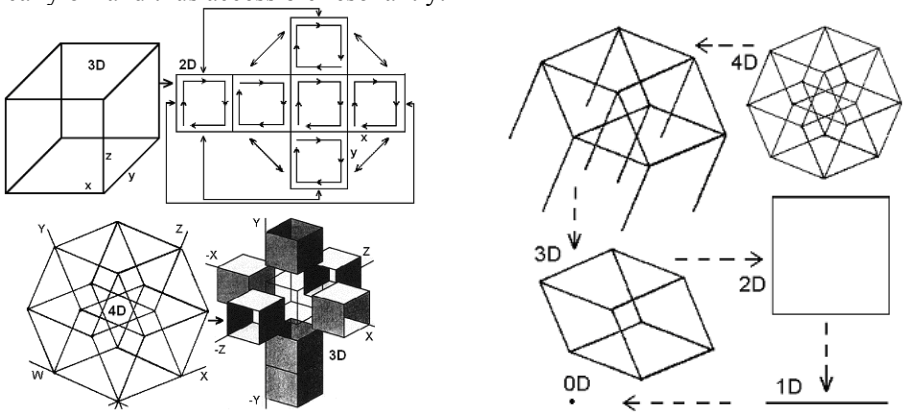

Figure 2. a) Top left, a 3D cube collapses into 6 planar 2D squares. Bottom, a 4D hypercube unfolds into a 3D cross of 8 cubes. b) Right. The dimensional reduction process from 4D to 1D.

3. New Physics from Anthropic Cosmology

Issues of the nature of the fundamental cosmological background continue to be debated with disparate views jockeying for philosophical supremacy; a scenario remaining tenable because experimental avenues for testing physics beyond the standard model have remained elusive until now. For the scientific perspective to evolve beyond the usual Copenhagen Interpretation of quantum theory requires a new cosmological paradigm. Full delineation of the new cosmology is beyond the scope of this paper, but detailed in [1-3,37]. In summary we axiomatically introduce pertinent concepts. The new noetic cosmology is required to explain, utilize and design experimental access to the new U_F regime where physical parameters for biophysical-bridging reside.

- The Planck scale can no longer be considered the most fundamental level of reality. Three regimes of reality must be addressed: Classical $\Leftrightarrow$ Quantum $\Leftrightarrow$ Unified Field; all of which cycle continuously [1-3,37].
- No 'mental' quantum state reduction exists in the usual sense of wave function collapse [2]; in terms of the de Broglie-Bohm and extended Cramer interpretations of quantum theory [42-45] a continuous evolution exists instead [1-3]. Collapse of the wavefunction reduces a quantum state to a classical state, which does not generally happen in the nonlocal flux of qualia as the locus of awareness; especially since now more pertinently qualia are not quantum phenomena per se but unified field phenomena. Quale interface with the quantum regime as part of the sensory transduction apparatus.

- The Planck scale is not an impenetrable barrier [1,4,37] even though considered so as an empirical fact demonstrated by the quantum uncertainty principle. This is a main problem with utilizing a Darwinian naturalistic Big Bang cosmology originating from a putative singularity in time as the basis for cognitive theory. In an anthropic multiverse cosmology utilizing extended quantum theory and M-Theory the answer is simply: 'do something else!' which opens physical investigation into a new U_F realm of large scale additional dimensions (LSXD) [37,73]. The anthropic multiverse is closed and finite in time, i.e. the 14.7 billion light year Hubble radius, H_R, but open and infinite in atemporal eternity [1,37]. 'Worlds without number, like grains of sand at the seashore' [74] the multiverse has room for an infinite number of nested Hubble spheres each with their own fine-tuned laws of physics [1].

Fourteen empirical protocols have been proposed [37] (9 reviewed here) for demonstrating, gaining access to and leading to a variety of experimental platforms for first hand investigation of awareness (qualia) breaking down the 1st person 3rd person barrier as called for by Nagel [75].

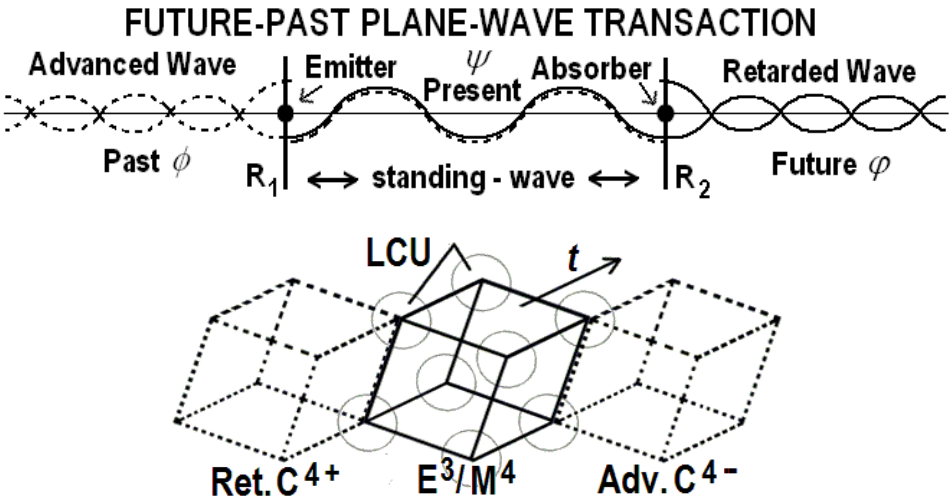

Figure 3. a) Conceptualized structure of a Cramer transaction (present state or event) where the present (simplistically) is a standing-wave of future-past potential elements. A point is not a rigid singularity (although still discrete) as in the classical sense, but has a complex structure like a mini-wormhole where R_1 & R_2 (like the frets holding the wire of a stringed instrument) represent opposite ends of its diameter. b) How observed (virtual) 3D reality arises from the infinite potentia of HD space (like a macroscopic transaction). The 'standing-wave-like' (retarded-advanced future-past) mirror symmetric elements C^{4+} / C^{4-} (where C^4 signifies 4D potentia of complex space distinguished from the realized 3D of visible space) of continuous-state spacetime show a central observed Euclidian, E_3, Minkowski, M_4 space resultant. Least Cosmological Units (LCU) governing evolution of the 'points' of 3D reality are represented by circles. The Advanced-Retarded future-past 3-cubes in HD space guide the evolution of the central cube (our virtual reality) that emerges from elements of HD space.

String theory only has one parameter, string tension, T_S fraught with the dilemma of a Googolplex (10^{googol}) or infinite number of vacuum possibilities. Utilizing the Eddington, Dirac, and Wheeler large number hypothesis [1] we derived an alternative derivation of T_S leading to one unique string vacuum and what we call the 'continuous-state hypothesis' an alternative to the expansion/inflation parameters of Big Bang cosmology [1,37]. Simplistically the perceived inflation energy of Big Bang cosmology postulated as a Doppler expansion from a primordial *ex nihilo* temporal singularity, instead according to the noetic continuous-state hypothesis, is localized in an 'eternal present' as if in permanent 'gravitational free-fall'[1,37]. Since we are relativistically embedded in and made out of matter this condition means that all objects (in our 3D virtual reality) exist (in HD) as if they were in gravitational 'free-fall'. This is better explained by two other interpretations of quantum theory generally ignored by the physics community because they are myopically considered to add nothing. That of the de Broglie-Bohm Causal Interpretation [42-44] and the Cramer Transactional Interpretation [45]; where spacetime and the matter within it (all matter is made of de Broglie waves) are created-annihilated and recreated over and over as part of the perceived arrow of time and creation of our 3D reality as a resultant from HD infinite potentia as a 'standing-wave' (Fig. 3) [1,37].

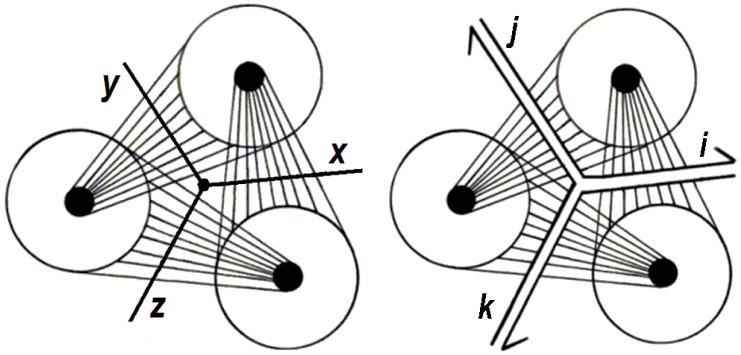

Figure 4. Conceptualization of the cosmological Least-Unit (LCU) tessellating space which like quark confinement cannot exist alone. a) Current view of a so-called point particle or metric *x,y,z* vertex. The three large circles are an LCU array slice. It is a form of close-packed spheres forming a 3-torus; missing from the illustration are an upper and bottom layer covering the *x,y,z* vertex and completing one fundamental element of an LCU complex. The field lines emanating from one circle to another represent the de Broglie-Bohm concept of a quantum 'pilot wave or potential' governing evolution. b) Similar to a) but drawn with a central 'Witten string vertex' [76] and relativistic quantum field potentials (lines) guiding its evolution in spacetime. The Witten vertex is not a closed singularity and because of its open structure provides a key element to the continuous-state process and rotation of the Riemann sphere cyclically from zero to infinity which represents rotational elements of the HD exciplex brane topology.

The problem has to do with the nature of a point or 3D vertex in physical theory [37]. What extended versions of de Broglie-Bohm and Cramer bring to the table is a basis for defining a fundamental 'point' that instead of being rigidly fixed classically (Fig. 4a) is continuously transmutable (Fig. 4b) as in string theory. This represents in essence the elevation of the so-called wave-particle duality for quanta to a Principle of continuous-state cosmology. What this does is cancel the troubling infinites in the standard model of particle physics in a natural way rather than by use of a mathematical gimmick called renormalization. We also build the continuous-state hypothesis around an object in string theory called the Witten Vertex [76] (Fig. 4b after noted M-Theorist David Witten). This means that when certain parameters (compactification, dimensional reduction etc.) associated with the Riemann sphere reach a zero-point; the Riemann sphere relativistically rotates back to infinity and so on continuously (Reminiscent of how water waves operate). The HD branes of so-called Calabi-Yau mirror symmetry are forms of Riemann 3-spheres or Kahler manifolds [41]. Instead of the insurmountable Plank foam, the gate keeper in this cosmology is an array of least cosmological units (LCU) [1,9,77] of which part (like the tip of an iceberg) resides in our virtual 4-space and the other part resides in the HD (12D) regime of M-Theory. These LCU exciplex gates govern mediation of the U_F in the coherent ordering of the life principle of SOLS embedded in localized spacetime.

3.1. *Spacetime Exciplex - U_F Noeon Mediator*

The spacetime exiplex or 'excited complex' of least cosmological units (LCU) is key to mediation of the U_F life principle of consciousness. In the usual 4D interpretation of quantum theory limited by the uncertainty principle, virtual quanta in the zero point field wink in and out of existence limited to the Planck time, 10^{-43} s. For the noetic spacetime exiplex the situation is radically different. The duality of its HD structure (i.e. living in both local 4-space and nonlocal 8-space) allows it to remain in an excited state in 4-space never fully coupling with the Planck-scale ground state. This holophote interaction emits a noeon (exchange unit of the U_F) into every point (and thus atom) in spacetime (providing the life principle) and interaction with brain dendrons etc. for example as the flow of qualia as a form of superradiance.

Kowalski discovered that photon emission occurs only after electrons complete full Bohr orbits [78,79]. We apply this as a general principle for emission during rotation of the complex Calabi-Yau Riemann sphere which acts like a pinwheel-like scoop bringing in the next topologically switched hysteresis loop of psychon-brain interaction energy.

The exciplex concept as defined in engineering parlance is an 'excited complex' or form of excimer - short for excited dimer in chemistry nomenclature used to describe an excited, transient, combined state, of two different atomic species (like XeCl) that dissociate back into the constituent atoms rather than reversion to some ground state after photon emission. An excimer is a short-lived dimeric or heterodimeric molecule formed from two species, at least one of which is in an electronic excited state. Excimers are often diatomic and are formed between two atoms or molecules that would not bond if both were in the ground state. The lifetime of an excimer is very short, on the order of nanoseconds. Binding a larger number of excited atoms form Rydberg clusters extending the lifetime which can exceed many seconds. An Exciplex is also defined as an electronically excited complex, 'non-bonding' in the ground state. For example, a complex formed by the interaction of an excited molecular entity with a ground state counterpart of a different structure. When it hits ground a photon or quasiparticle soliton is emitted. In Noetic Cosmology we have adapted the exciplex concept as a tool to describe the LCU gating mechanism between the quantum regime and the regime of the U_F. The exciplex LCU gate is key to understanding interaction of the life principle with SOLS and the basis for developing empirical tests. The general equations for a putative spacetime exciplex are:

$$G^* + G^* \Leftrightarrow Z^*; \quad Z^* + m_\gamma \Leftrightarrow X^*$$

$$X^* - m_\gamma \xrightarrow{emission} Z^* \quad or \; G^* \tag{1}$$

$$X^* + m_\gamma \rightarrow Z^* \quad or \quad G^*$$

where as seen in Fig. 5a G is the ZPF ground state, Z intermediate cavity excited states and X the spacetime C-QED (Cavity-Quantum Electrodynamics) exciplex coupling. The numerous configurations plus the large variety of photon frequencies absorbed allow for a full absorption-emission equilibrium spectrum. We believe the spacetime exciplex model also has sufficient parameters to allow for the spontaneous emission of protons by a process similar to the photoelectric effect but from HD spacetime C-QED brane spallation rather than from a charged metallic surface. Not having a sufficient spacetime vacuum proton creation mechanism led to the downfall of Steady-State cosmology.

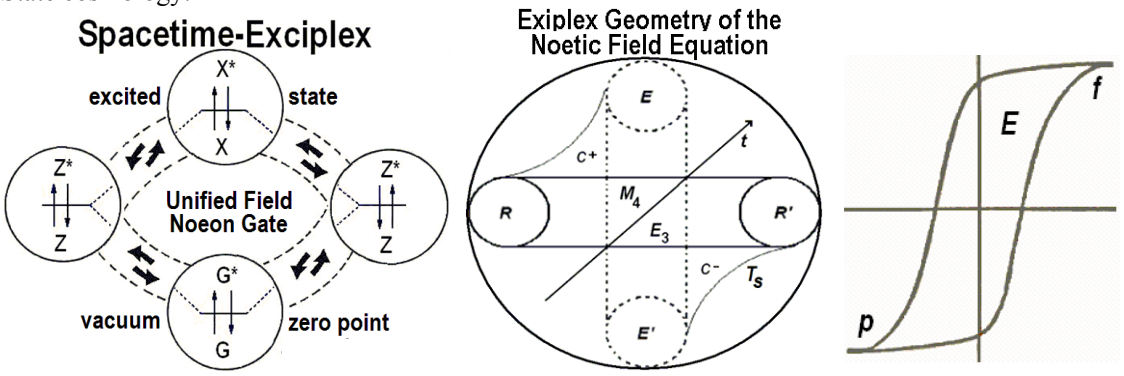

Figure 5. a) The geometry of the 'spacetime exciplex' (excited complex), a configuration of spacetime LCUs that act like a holophote laser pumping mechanism of U_F noeon energy and also how coherence of the U_F interacts with 3D compactified states in dendrons or microtubules for example. Locally the exciplex acts like an oscillating 'cootie catcher' [80]. b) Geometric representation of the Noetic Unified Field Equation, $F_{(N)} = E/R$ for an array of cosmological LCUs. Solid lines represent extension, dotted lines field. Where $F_{(N)}$ is the anthropic or coherent force of the U_F driving self-organization, total E equals the c) hysteresis loop energy of the hypervolume, R is the scale-invariant rotational radius of the action and the domain wall (curves) string tension, T_0.

The new U_F basis centers on defining what is called a Least Cosmological Unit (LCU) [1,37,77] tiling the spacetime backcloth. An LCU (Fig. 4) conceptually parallels the unit cell that builds up crystal structure. The LCU entails the next evolutionary step for the basis of a point particle [37] and has two main functions; It is the raster from which matter arises, and is a central mechanism that mediates the syntropic gating of life principle parameters of the U_F. Syntropy is the negentropy process of expelling entropy by the teleological action of SOLS.

The LCU change from the current concept of a fixed Planck scale point (Fig. 4a) to what is called a Witten string vertex [76] (Fig. 4b) is a form of Riemann sphere (model of the extended complex-plane with points at zero and infinity for stereographic projection to the Euclidean plane) cyclically opening into the LSXD regime of the U_F. Behind the current view of $\hbar$ (Planck's constant) as a barrier of stochastic foam is a coherent topology with the symmetry of a spin raster comprised of LCUs [1,37].

3.2. *Quantum Phenomenology Versus Noetic Field Ontology*

There is a major conceptual change from Quantum Mechanics to Unified Field Mechanics. The 'energy' of the U_F is not quantized and thus is radically different from other known fields. Here is what troubled Nobelist Richard Feynman: ″...maybe nature is trying to tell us something new here, maybe we should not try to quantize gravity... Is it possible that gravity is not quantized and all the rest of the world is?" [81]. It turns out that not only is gravity not quantized but neither is the noeon energy of the U_F which is a step deeper than gravity.

Here is one way to explain it. In a usual field like electromagnetism, easiest for us to understand because we have the most experience with it, field lines connect to adjacent point charges. The quanta of the fields force is exchanged along those field lines (in this case photons). We perceive this as occurring in 4-space (4D). It is phenomenological. This is the phenomenon of fields. For topological charge as in the U_F with properties related to consciousness; the situation is vastly different. The fields are still coupled and there is tension between them but no phenomenological energy (i.e. field quanta) is exchanged. This is the situation in the ontological case. The adjacent branes "become" each other as they overlap by a process called 'topological switching'. This is not possible for the 4-space field because they are quantized resultants of the HD topological field components. The HD 'units' (noeons) are free to "mix" ontologically as they are not resolved into points.

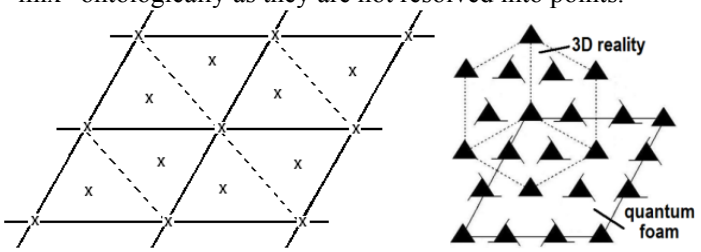

Figure 6. a) 2D view of the LCU tiling of the spacetime backcloth (Fig. 4). b) Projective geometry topologically giving rise to higher dimensionality (here the Fig. 4a 2D view extended to 3D). The triangles with tails represent the trefoil knots in Fig. 7 and the naked triangles the resultant cyclic point or fermionic vertex quantum state in 3-space (Spheres in Fig. 3b).

The metric still has points, or it might be better to say coordinates; but in HD super space they are unrestricted and free to interact by topological switching which is not the case for an "event" in 4-space. Whereas this singular quality (basis of our perceived reality) does not exist in the HD regime (U_F) of infinite potentia! So if the U_F is not quantized how can there be a force which is mediated by the exchange of quanta? Firstly the U_F does not provide a 5th force as one might initially assume; instead the ontological 'presence' of the U_F provides a 'force of coherence' which is based on 'topological charge'. It helps to consider this in terms of perception. If one looks along parallel railroad tracks they recede into a point in the distance, a property of time and space. For the unitary evolution of consciousness [2] this would break the requirement of coherence. For the U_F which is outside of local time and space, a cyclical restoring force is applied to our *res extensa* putting it in a *res cogitans* mode. The exciplex mechanism [37] guides rotation of the Witten vertex Riemann spheres to maintain a consistent level of periodic coherence (parallelism). It is a relativistic U_F process. The railroad tracks do not recede into a point. The Riemann sphere flips (our perception) beforehand.

The U_F provides an inherent force of coherence just by its cyclical presence. This means that it is ontological in its propagation or 'interaction'. The railroad tracks remain parallel and do not recede to a point as in the 3-D phenomenological realm where forces are mediated by a quantal energy exchange. Another way of looking at this is that the 3-D observer can only look at one page of a book

at a time while the HD observer (Godlike) can see all pages continuously (time-like). The LCU space-time exciplex is a mechanism allowing both worlds to interact nonlocally.

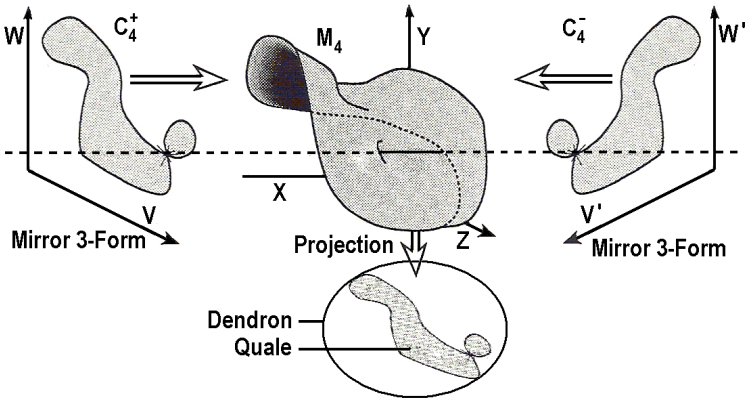

Figure 7. Complex HD Calabi-Yau mirror symmetric 3-forms, C_4 become embedded in Minkowski space, M_4 and the U_F energy of this resultant is projected into brain dendrons as a continuous stream of evolving (evanescing) superradiant qualia. This represents the lower portion only that embeds in local spacetime; there is an additional duality above this projection embedded in the infinite potentia of the U_F from which it arises (Fig.9).

Most are familiar with the 3D Necker cube (center of Fig. 2b is like a Necker cube) that when stared at central vertices topologically reverse. This is called topological switching. There is another paper child's toy called a 'cootie catcher' [80] that fits over the fingers and can switch positions. What the cootie catcher has over the Necker cube is that it has an easier to visualize a defined center or vertex switching point. So in the LCU exiplex spacetime background we have this topological switching which represents the frame that houses the gate which is the lighthouse with the rotating light on top.

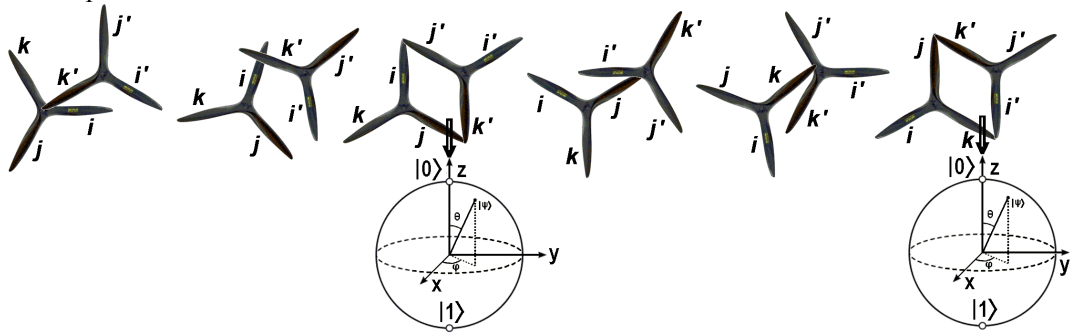

Figure 8. Locus of nonlocal HD mirror symmetric Calabi-Yau 3-tori (here technically depicted quaternionic trefoil knots) spinning relativistically and evolving in time. Nodes in the cycle are sometimes chaotic and sometimes periodically couple into resultant (faces of a cube) quantum states in 3-space depicted in the diagram as Riemann Bloch spheres. An animated version of Fig.7.

Now inside the structure there is also a 'baton passing'. The baton is like the lens that the light shines through but only at the moment of transfer (or coupling). In the HD U_F regime the 'light' is always on omni-directionally but only 'shines' into 3-space when the gate is open during the moment of baton passing. In addition to baton passing there is also a form of 'leap-frogging'. The leap-frogging represents wave-particle duality (remember we elevated it to a principle of cosmology). The leaping moment represents the wave, and the crouched person being leapt over is the particulate moment. The particle moment acts like a domain wall and no light passes when its orientation is aligned towards the 3-D world resultant. This is also an important aspect of the gating mechanism. This is of course a relativistic process such that the 'beat frequency' keeps SOLS well lit with the teleological anthropic 'light of life'.

The trefoil knot (in Fig. 8 drawn as a Planck scale quaternion vertices) is holomorphic to the circle. Since energy is conserved we may ignore the complexity of the HD symmetries and use the area of the circle for the noeon hysteresis loop (Fig. 5c), in this case a 2D resultant as a 2-sphere quantum

state as the coupling area of one psychon to a dendron. This idea is further conceptualized in Fig. 6 illustrating how a 3D object emerges from close-packed spacetime LCUs.

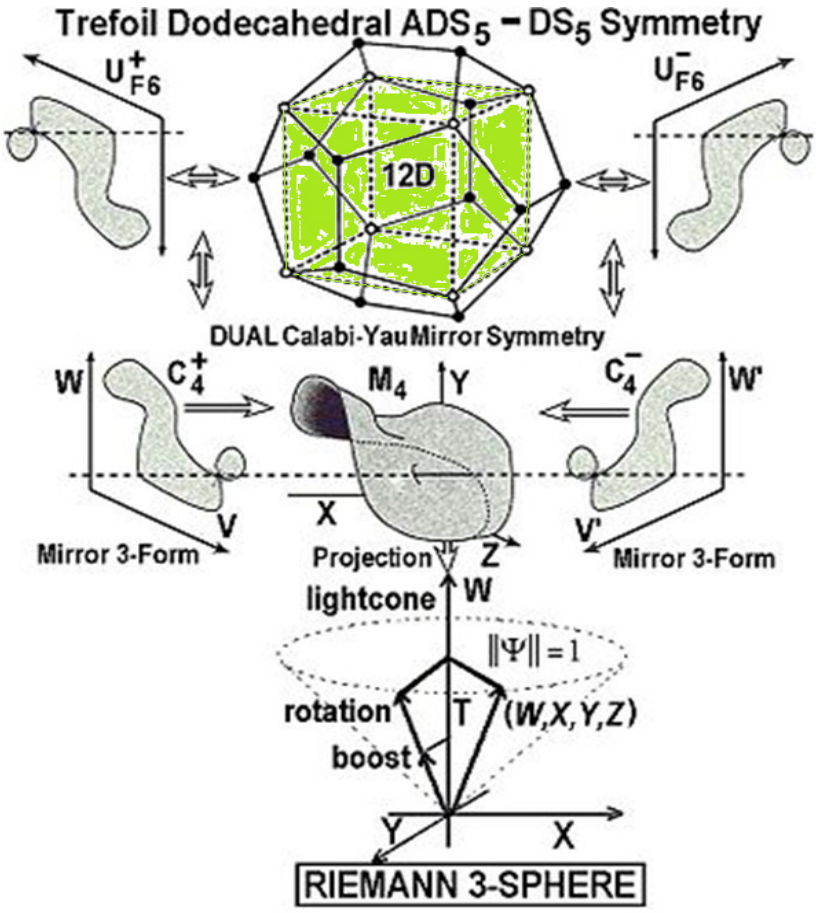

Figure 9. Completion of Figs. 7 & 8 illustrating full extension to an HD relativistic quantum state in continuous-state dual Calabi-Yau mirror symmetric HAM cosmology with Dodecahedral involute properties, as well as the continuous-state exciplex 'hysteresis loop' of noeon injection (not shown) as far as currently understood. The Bloch 2-sphere representation is also replaced with an extended Riemann 4-sphere resultant with sufficient parameters to surmount the uncertainty principle representing a unique M-Theoretic model of 'Continuous-State' U_F dynamics as it relates to NFT and its putative exchange quanta of the U_F - the noeon.

4. Empirical Tests of Noetic Cosmology Summarized: Long-Range Coherence

Viable experimentation will lead to new consciousness research platforms for studying fundamental syntropic properties of living systems. We have proposed fourteen tests of NFT; in this paper we summarize the main experimental protocol to test the noetic teleological 'life-principle' hypotheses. Note: Not all of the experiments relate directly to mediation of the life principle; but since the life-principle is putatively an aspect of the U_F, all of the experiments manipulate the new physical regime of the U_F or importantly mediate the 'gating mechanism' by which access is gained, thus facilitating mind-body research in addition to M-Theory and nuclear physics.

4.1 *Summary of Experimental Protocols*

If experimentation proves viable a new class of biophysical research platform for studying fundamental properties of the spacetime vacuum as it relates to long-range coherence in living systems. We summarize eight derivatives of the main experimental protocol to test the LSXD continuous-state Long-Range Coherence hypotheses:

1. Basic Experiment - Fundamental test that the concatenation of new NFT U_F principles is theoretically sound. A laser oscillated rf-pulsed vacuum resonance hierarchy is set up to interfere with the periodic (continuous-state) structure of the inherent 'beat frequency' of a Dirac polarized spacetime vacuum exciplex to detect the new coherence principle associated with a cyclical holophote entry of the U_F into 4-space. This experiment 'pokes a hole in spacetime' in order to bring the energy of the U_F into a detector. The remaining protocols are variations of the parameters of this experiment. See Figs. 10 & 11.
2. Bulk Quantum Computing - Utilizing protocol (1) Bulk Scalable Universal QC can be achieved by superseding the quantum uncertainty principle. (see [1,4,37] for details) Programming and data I/O are performed without decoherence by utilizing the inherent mirror symmetry properties that act like a 'synchronization backbone' [1,37,49] whereby 'LSXD copies' of the local 3-space quantum state are causally free (measureable without decoherence) at a specific resonance node in the continuous-state conformal Calabi-Yau symmetry cycle hierarchy.
3. Protein Conformation - (similar to discussion in [38]). Utilizing more macroscopic aspects of protocols (1 & 2) dual Hadamard quantum logic gates are set as a Cavity-QED spacetime cellular automata [1,38] experiment to facilitate conformational propagation in the prion protein from normal cellular form, PrP^{C} to the pathological, PrP^{Sc} form by noeon bombardment with the 'force of coherence' of the U_F.
4. Manipulating a special case of the Lorentz Transformation [37,78,79] - Aspects of a spacetime exciplex model [2,10] in terms of restrictions imposed by Cramer's Transactional Interpretation [45] on mirror symmetry can be used for the putative detection of virtual tachyon-tardyon interactions in *zitterbewegun* [30].
5. Extended Quantum Theory - Test of causal properties of de Broglie-Bohm-Vigier quantum theory by utility of the U_F holophote effect (protocol 1 parameters) as a 'super quantum potential' to summate by constructive interference the density of de Broglie matter waves [1].
6. Coherent Control of Quantum Phase - Additional test of the de Broglie-Bohm interpretation for existence of a nonlocal 'pilot wave - quantum potential' for manipulating the phase 'space quantization' in the double slit experiment by controlling which slit quanta passes through. Application to quantum measurement and transistor lithography refinement.
7. Manipulating Spacetime LCU Structure - (similar to protocol 6) Test of conformal scale-invariant properties of the putative Dirac conformal polarized vacuum, a possible 'continuous-state' property related to an arrow of time [27,37] (Also similar to basic experiment, but more advanced).
8. Testing for and Manipulating Tight Bound States (TBS) - (similar to protocol 4) Vigier [10] has proposed TBS below the 1st Bohr orbit in the Hydrogen atom. Utilizing tenets of the original hadronic form of string theory [37] such as a variable string tension, T_S where the Planck constant, $\hbar$ is replaced with a version of the original Stoney, $\lambda\!\!\!^{-}$ [1,37] where $\hbar$ is an asymptote never reached and instead oscillates from virtual Planck to the Larmor radius of the hydrogen atom, i.e. the so-called Planck scale is a restriction imposed by the limitations of the Copenhagen Interpretation and is not a fundamental physical barrier. LSXD exist putatively behind the barrier of uncertainty and the oscillation of the Planck constant is part of the exciplex gating mechanism [37]. Key to operation of this experiment is what we have termed a 'couple-punch'. Utilizing relativistic quantum field theory (RQFT) at the moment of spin-spin coupling or spin-orbit coupling an rf pulse is kicked at various nodes harmonically set to coincide with putative phases in the cycle between local and LSXD TBS properties. [37]
9. Test for the noetic Unique String Vacuum - Until now the structure of matter has been explored by building ever bigger supercolliders like the CERN LHC. If the LSXD access model in terms of a Dirac covariant polarized energy dependent vacuum proves correct utilizing the inherent conformal scale-invariant mirror symmetry properties of de Broglie matter waves will allow examining various cross sections in the structure of matter in symmetry interactions during cyclic continuous-state future-past annihilation-creation modes of matter in the LCU tessellated spacetime metric without the need for supercolliders.

There are a number of very specific postulated cosmological properties required in order to perform these experiments [1,37].

4.2. *Review of Key Experimental Details*

To empirically gain access to the U_F, regime one must pass through the so-called Planck scale stochastic barrier. In order to do this one must violate the heretofore sacrosanct quantum uncertainty principle. Since by definition the standard methods of quantum theory produce the uncertainty principle; the simple solution is to do something else! Because of the great success of gauge theory physicists have ignored the existence of a Dirac polarized vacuum because they believe its existence would violate gauge principles. The methods of gauge theory however are only an approximation suggesting that there is additional new physics. Next we outline the general method for accessing the higher dimensional superspace of the U_F. Technical details can be found in references [1,4,37].

Postulates introduced in this paper are utilized; in general the de Broglie-Bohm and Cramer (TI) interpretations of quantum theory, the Dirac polarized vacuum, the Sagnac affect [1,42-49], the unique string vacuum derived from HAM cosmology and the special class of Calabi-Yau mirror symmetry conditions.

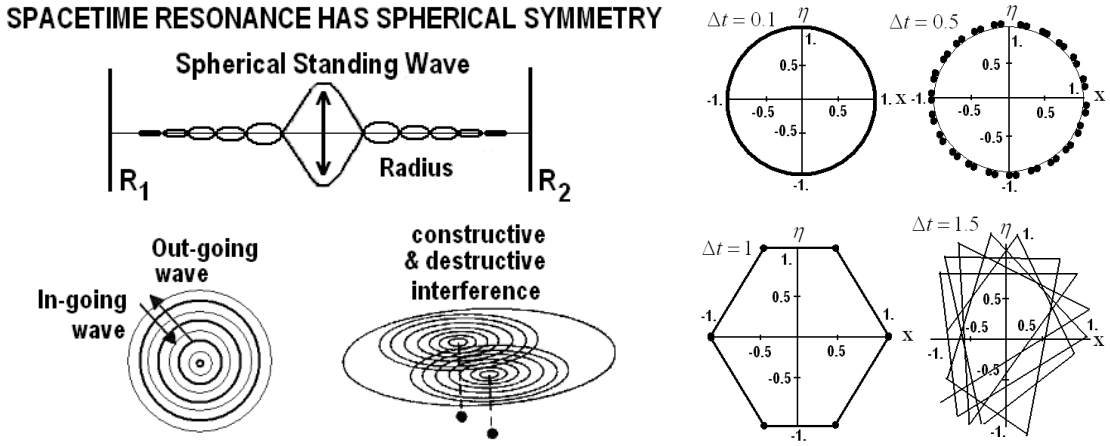

Figure 10. The Dirac polarized vacuum has hyperspherical symmetry. a) Top left, metaphor for TI standing-wave present showing future-past elements, R_1, R_2, eleven of twelve dimensions suppressed for simplicity. b) Bottom left, top view of a) 2D spherical standing-wave; c) Bottom left right portion, manipulating the relative quantum/brane phase of oscillations creates nodes of destructive and constructive interference. d) Right, Four numerical simulations of the phase space trajectory of the Dubois *superposed incursive oscillator* based on coordinates and velocities $x_n = 1/2[x_n(1) + x_n(2)]$ $v_n = 1/2[v_n(1) + v_n(2)]$ is shown in the figure for values of $\Delta\tau = \omega t$ equal to 0.1, 0.5, 1.0 and 1.5. Initial conditions are $\chi_0 = 1, \eta_0 = 0 \,\&\, \tau_0 = 0$ with total simulation time $\tau = \omega t = 8\pi$. Figure 10b adapted from [82].

It is important to recall one of our main proposals concerning the wave structure of matter and that space-time is created, annihilated and recreated continuously. If one throws a stone in a pool of water concentric ripples occur. If one drops two stones into the water, regions of constructive and destructive interference occur. This is essentially how our resonant hierarchy operates as shown in Fig. 10c. The basic idea of the radio frequency or rf-modulated resonance hierarchy is as follows: in the first tier (Fig. 11a) a radio frequency is chosen to oscillate the electrons in the atom or molecule chosen in such a way that the nucleons will resonate. This is related to the principles of nuclear magnetic resonance (NMR). This couples electrons to the magnetic moment of the nucleons in tier 2. By the principles of relativistic quantum field theory (RQFT) tiers one and two undergo resonant coupling to the beat frequency of the fabric of space-time. The multitier cumulative interaction of tears 1, 2 and 3 by application of the incursive oscillator can be set to destructively or constructively interfere with the annihilation or creation operators of space-time.

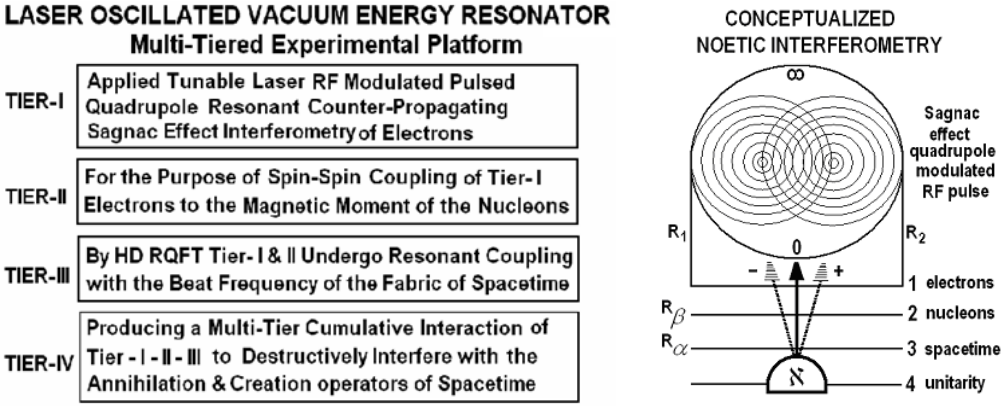

Figure 11. a) Design elements of the Noetic Interferometer postulated to constructively-destructively interfere with the topology of the spacetime manifold to manipulate the unified field. The first three tiers set the stage for the critically important 4th tier which by way of an incursive oscillator punches a hole in the fabric of spacetime creating a holophote or lighthouse effect of the U_F into the experimental apparatus momentarily missing its usual coupling node into a biological system. **b)** Conceptualized Witten vertex Riemann sphere cavity-QED multi-level Sagnac effect interferometer designed to 'penetrate' space-time to emit the 'eternity wave, $\aleph$ ' of the unified field. Experimental access to vacuum structure or for surmounting the uncertainty principle can be done by two similar methods. One is to utilize an atomic resonance hierarchy and the other a spacetime resonance hierarchy. The spheroid is a 2D representation of a HD complex Riemann sphere able to spin-flip from zero to infinity continuously.

A final essential component of the vacuum interferometer is called an incursive oscillator [82] which acts as a feedback loop on the arrow of time [37]. Parameters of the Dubois incursive oscillator are also required for aligning the interferometer hierarchy with the beat frequency of spacetime by $x(t+\Delta t)\ \ v(t+\Delta t)$. Critically the size of Δt correlates with the size of the 'hole' to be punched in spacetime which also correlates with the wavelength, λ of the rf-resonance pulse.

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