Emergence of Generalized F-Theory 2-Branes from SUSY Spacetime Parameters of the Discrete Incursive Oscillator

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Abstract

We simulate the emergence of 2-branes from the spacetime backcloth utilizing the Discrete Incursive Oscillator (DIO)

Keywords: Anticipation, F-Theory, Incursion, M-brane, String tension

1. Introduction – Relevant Cosmological and Superstring Context

If *anticipation* is a principle of nature it should be revealed in the laws of physics. The evolutionary search for the fundamental background independent string vacuum has been cast recently in a Twelve Dimensional (12D) form called F-Theory. Generally String Theory is still aligned with naturalistic Big Bang Cosmology not perceived as compatible with a covariant Dirac polarized vacuum essential for extended electromagnetic theory and finite photon mass, m_γ. A recently formulated highly symmetric continuous-state cosmology called the Holographic Anthropic Multiverse (HAM) utilizes a 12D energy dependent standing-wave superspace based on extensions of the Wheeler-Feynman-Cramer transactional model providing a context where scale-invariant least cosmological units of the Superspace act as a complex self-organized system. These fundamental least-unit entail a form of incursive oscillator inherent in the continuous-state topology of HAM spacetime. Simulated application of the Dubois Incursive Oscillator (DIO) is shown to produce a natural emergence of generalized F-Theory 2-branes from the superspace backcloth potentially bringing the DIO program into closer alignment with mainstream physical cosmology which may be instrumental in deriving parameters of the fundamental string vacuum, especially emergence of a new action principle driving the evolution of its self-organization.

Over the last decade the cosmology of a continuous-state Holographic Anthropic Multiverse (HAM) has been developed [1-4]. The HAM cosmology is highly ordered and symmetric such that the Euclidian-Minkowski $E_3 - \hat{M}_4$ present is a form of a harmonic oscillator, that is a virtual standing-wave topology of Higher Dimensional (HD) future-past elements. This condition is based on an extension of the Transactional Interpretation of quantum theory [5] to the topology of spacetime itself [1-4]. The transactional Interpretation is based on the Wheeler-Feynman absorber theory of radiation where events are transactions based on the interaction of future-past elements. The HAM cosmology is a form of self-organized complex system, a supposition suggesting properties generally attributed to such systems [4]. This context suggests the

Dubois Incursive Oscillator (DIO) [6-9] provides a basis for studying the harmonic properties of interest to the HAM model.

Superstring Theory, now known as M-Theory, is based essentially on one parameter, string tension, T_S

$$T_S = e/l = (2\pi\alpha')^{-1}; \tag{1}$$

where l is length of the string and α the fine structure constant. It is well known that the gauge condition is an approximation [10,11] suggesting Planck's constant $\hbar$ needs to be recalculated to satisfy the parameters of M-Theory [10-12]. Since HAM cosmology is aligned with an extension of Einstein's energy-dependent spacetime metric $\hat{M}_{3(4)}$, the Stoney e^2/c, an electromagnetic precursor to Planck's constant, [13] is the choice for studying the recalculation. The factor added to $\hbar$ is string tension T_S, where T_0 can increase the size of $\hbar$ the Larmour radius of the hydrogen atom in the small scale and lead to infinite size dimensionality cosmologically [1-4,10,11,14]. Equation (2) illustrates the basis for this distinction

$$l_P = \sqrt{\frac{\hbar}{mc}\cdot\frac{Gm}{c^2}} \qquad or \qquad l_S = \sqrt{\frac{e^2}{4\pi\varepsilon_0 mc^2}\cdot\frac{Gm}{c^2}}, \tag{2}$$

where l_P *and* l_S are the length of the Planck and Stoney respectively.

2. An Alternative Derivation of String Tension from HAM Cosmology

Recently an alternative derivation of T_S has been discovered in the context of HAM cosmology [12]. It is interesting to note that both the Schrödinger equation and Einstein's equation for geometrodynamics reduce to Newton's second Law of Motion. Newton's dimensionless second law of motion $F = ma$ is the starting point for deriving the noetic formalism. First by substituting Einstein's mass-energy relation $E = mc^2$ into Newton's second law we obtain: $F_N = E/c^2 a$ where F_N is the noetic force and E a form of self-organized energy. E is scale-invariant through all levels of HAM cosmology beginning at the highest level in the supralocal Multiverse as a hyperdimensional Wheeler Geon, a *ball* of photons of sufficient size to gravitationally self cohere [15]. At the micro level the Geon becomes synonymous with the de Broglie-Bohm quantum potential. Cosmologically this is like an 'ocean of light' [16], a super quantum potential synonymous with the unitary field. Next the derivation of the noetic equation is generalized for the holographic multiverse by taking an axiomatic approach, based in part on Eddington's large number hypothesis, to cosmological scaling that suggests all lengths in the universe are scale-invariant [17].

Beginning with the heuristic relation $c \equiv \dot{R}$ or $\dot{R} = L/t = c$ where $\dot{R}$ represents the rate of change of scale in the universe. This corresponds to the putative Hubble relation for Doppler expansion of the universe where $H_0 = \dot{R}/R$ and $a = \dot{R} \times H_o$. By

substituting $\dot{R}^2/R$ for a in the original $F_N = E/c^2 a$, for final substitution we have $F_N = E/c^2 \times \dot{R}^2/R$. Since $c = \dot{R}$ the c^2 & $\dot{R}$ terms cancel and we are left with

$$F_N = E/R \tag{3}$$

which takes the same form as equation (1) for T_S.

Note that R is a complex relativistic rotational length with standing wave properties. It is scale-invariant and becomes associated with the radii of various HD hyperspheres in the continuous-state compactification process. Any temporal slice or cross section would be considered a Cavity-QED hysteresis loop suggesting pertinent localized volumes from which energy ranges and limits can be calculated. It should be emphatically noted that Hubble discovered a cosmological redshift not a Doppler expansion of the universe. The HAM cosmology provides an alternative interpretation for redshift suggesting the possibility of profound new applications. The HAM cosmology contains the same energy of motion perceived as expansion or inflation but operationally its action is an inherent component of the relativistic properties of the continuous-state dimensional reduction compactification process.

3. Summary of Noetic Spacetime Parameters

The periodic symmetry of HAM cosmology contains an inherent beat frequency during the continuous state dimensional reduction spin-exchange compactification topological transformation which introduces energy by the holophote action of the Noetic Force F_N energy through every spacetime point into every atom during the process of dimensional transformation as $D_s \rightarrow D_t \rightarrow D_E$ [4,18,19] and as $R_U \rightarrow R_Q \rightarrow R_C$ where spatial dimensions, D_s continuously transform into temporal dimensions, D_t and into energy, D_E in a cyclical process of unitarity, R_U to quantum, R_Q to classical, R_C; a relativistic process representing an additional set of Noetic transformations: Galilean→ Lorentz-Poincairé→ Noetic [4,20]. A deficit angle occurring in the parallel transport [21] around the noetic least-unit [4,22] leads to a new model for the arrow of time, offering an explanation for why the extra dimensions are not considered sub Planckian in HAM cosmology but still unobserved [23].

From generalized examples of spacetime topology possible conditions for string propagation are illustrated for the noetic stringy vacuum, considered a form of the covariant Dirac polarized vacuum [24] so that $S_N = S_0 + S_1 + S_2 \rightarrow S_{12} \rightarrow \hat{M}_4 \times K_8 \rightarrow \hat{M}_4 \times \pm C_4$ [1-4,18,19,25]. The 12D Noetic Superspace S_N is triune, comprised of the standing wave Minkowski present $\hat{M}_4$ and two complexified future-past elements $\pm C_4$, where for the intermediate subset $\hat{M}_4 \times K_6$ the $\hat{M}_4$ is a 4D energy dependent Minkowski space and K_6 a compactified 6D torus. A realistic example is given below. First points $z \approx z+1 \approx z+e^{2i\pi/3}$ admitting Z_3

symmetry are identified in the complex z plane and three tori T_i, $i = 1,2,3$ are obtained whose product is a torus of six real dimension, three of which are complex [26], on which string propagation is considered.

From the well known symmetry groups rotations can generate discrete symmetry elements accompanied by various translation components τ parallel to a spin axis A such that n translations τ equal an integral number p of lattice translations t along the axis

$$n\tau = pt \tag{4}$$

where n and p are integers. When $p/n < 1/2$, the screw is right-handed, when $p/n \leq 1/2$, left-handed and when $p/n = 1/2$ it is zero [27-29].

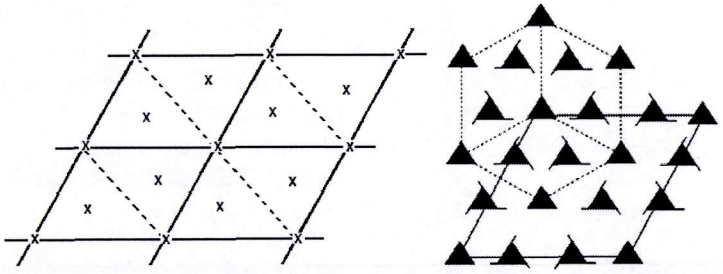

Figure 1. a) A triangular spacetime lattice in the complex plane for production of a torus T_0 with Z_3 symmetry utilized in the study of compactification in string theory. b) Elaboration of how a hexagon lattice in a) arises from the spin structure of the spacetime fabric. Solid triangles become fixed coordinates, while 'propellers' or screws have left/right handed spin axes representing field parameters for 'bumps and holes' in the Dirac sea. These spacetime structures in conjunction with the DIO putatively supports the basis for F-brane emergence.

A translation t' normal to axis A of a screw produces a translation equivalent to A' as well as nonequivalent but equal screw operations about parallel axes B and C along the perpendicular bisector of AA' at a distance $t'\cot\alpha/2$ from AA'. These screw operations accumulate along axes B and C producing screw axes parallel to A [27-29]. The resulting sets of symmetry elements are repeated by the lattice translations to constitute infinite sets of parallel axes as extrapolated from Fig. 1b into Fig. 2.

4. Parameters of the Dubois Incursive Oscillator (DIO)

Motion of a one dimensional classical harmonic oscillator is given by $q = A\sin(\omega t + \varphi)$ and $p = m\omega A\cos(\omega t + \varphi)$ where A is the amplitude and φ is the phase constant for fixed energy $E = m\omega^2 A^2/2$. For state $|n\rangle$, with $n = 0,1,2...\infty$ and with Hamiltonian $E_n = (n+1/2)\hbar\omega$ the quantum harmonic oscillator becomes

$$\langle n|q^2|n\rangle = \hbar/2m\omega\langle n|(a^\dagger a + aa^\dagger)|n\rangle = E_n/m\omega^2 \quad \text{and}$$

$$\langle n|p^2|n\rangle = 1/2(m\hbar\omega)\langle n|a^\dagger a + aa^\dagger = mE_n$$

where $a \& a^{\dagger}$ are the annihilation and creation operators, $q = \sqrt{\hbar/2m\omega}(a^{\dagger} + a)$ and $p = i\sqrt{m\hbar\omega/2}(a^{\dagger}a)$. For the 3D harmonic oscillator each equation is the same with energies $E_x = (n_x + 1/2)\hbar\omega_x$, $E_y = (n_y + 1/2)\hbar\omega_y$ and $E_z = (n_z + 1/2)\hbar\omega_z$ [30,31].

In Dubois' notation the classical 1D harmonic oscillator according to Newton's second law in coordinates *t* and *x(t)* for a mass *m* in a potential $U(x) = 1/2(kx^2)$ takes the differential form

$$\frac{d^2x}{dt^2} + \omega^2 x = 0 \qquad where \qquad \omega = \sqrt{k/m} \tag{5}$$

which can be separated into the coupled equations [6-9]

$$\frac{dx(t)}{dt} - v(t) = 0 \qquad and \qquad \frac{dv(t)}{dt} + \omega^2 x = 0. \tag{6}$$

From incursive discretization, Dubois creates two solutions

$$x(t + \Delta t) \quad v(t + \Delta t)$$

providing a structural bifurcation of the system which together produce Hyperincursion. The effect of increasing the time interval discretizes the trajectory. Numerical simulation 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 5 of the Antippa and Dubois paper [9]. This represents a background independent discretization of spacetime [7,8].

Each mode of the field of a quantum harmonic oscillator is associated with the cavity-QED dynamics, hexagon lattices in Fig. 1 of spacetime topology as it undergoes its continuous transitions . *E* is the state of energy for *n* photons. For *n* = 0 the oscillator is in the ground state, but a finite energy $1/2\hbar\omega$ of the ground state, called the zero-point energy, is still present in the region of the cavity. According to equation (7) of the quantum harmonic oscillator the field energy of the photons undergo periodic annihilation and recreation in the periodic spacetime [32].

$$E_n = (n + \frac{1}{2})\hbar\omega \tag{7}$$

The simulation is meant to demonstrate generally how the inherent periodic holophote action, flashing metaphorically like a light house beacon, injects HD geon energy into each virtual moment of the present during the continuous transformation of the Cavity-QED topology of the 12D superspace of the noetic least-unit [4] to produce the natural emergence of F-Theory 2-branes [15,16,33,34]. As an example, we illustrate one of a number of possible models of how, at the semi-classical limit from the stochastic background of the vacuum zero-point field, this energy is harmonically injected into every point and atom in spacetime by a mechanism like a 'chaotic gun' [4,33,34]. This action and the geometric-topology of the polarized vacuum is putatively suggested to generate F-branes.

Using equations for a spacetime chaotic gun developed by the Ciubotariu's [33,34] the nonlinear dynamics of the model for injecting a charged noeon, defined as the quanta of the noetic unified field, into a spacetime cavity can putatively occur as follows:

$$\dot{X} = \frac{dX}{dT} = \frac{1}{\gamma} P_x = \frac{1}{(1 + P_x^2 + P_y^2)^{1/2}} P_x, \tag{8}$$

$$\dot{P}_x = \frac{dP_x}{dT} = \Omega_c [\beta \cos(X - T) + 1] P_y, \tag{9}$$

$$\dot{P}_y = \frac{dP_y}{dT} = -\Omega_c [\beta \cos(X - T) + 1] P_x + H \cos(X - T), \tag{10}$$

Equations 8 to 10 illustrate a possible quantum model for entry of the new noetic action principle into the 3D phase space P_X, P_Y, X where unitary bosons of the Noetic field (noeons) are injected into each point or least-unit QED cavity in spacetime and every atom by a periodic 'gun-like effect' of the continuous holophote action. This process occurs in the context of continuous state spin-exchange dimensional reduction compactification inherent in the topology of Noetic Superspace which acts like a hysteresis loop [1-4]. Ciubotariu's equations combine Maxwell's equations and relativistic equations of motion for the phase space P_X, P_Y, X. The Ω terms represent the cyclotron resonant frequency of the chaotic gun effect. Infusion of the noeon Boson field, which mediates the action of self-organization and evolution, into spacetime cavities only occurs in certain preferred directions allowed by the symmetry conditions of what is called parallel transport [21] in the dimensional reduction compactification spin-exchange process [1-4].

The holophote effect appears in the Noetic cosmology because in its energy dependent spacetime metric $\hat{M}_4$, just as a periodicity of wave and particle moments occur in photon propagation through space, so does charge or energy arise in periodic moments of the Noetic least-unit transformation. Because as Wheeler demonstrated [35] 'charge is topology'. According to Wheeler lines of force in a wormhole can thread through a handle and emerge through each mouth to give the appearance of charge in an otherwise charge free spacetime [35]. Further discussion of a complex 12D space is given in [3,4,36].

5. Computer Simulated Production of the 2-Brane

From the proof of Schöenflies theorem [37] there can be no topological knots in a plane. Therefore there can be no topological torsion in a 2D reality. According to tenets of M-Theory 'matter remains on the 2-brane and gravity is free to pass between branes'. A simulated creation of an F-Theory 2-brane from the Dirac polarized vacuum [24] is demonstrated utilizing the Autodesk Chaos Software [38].

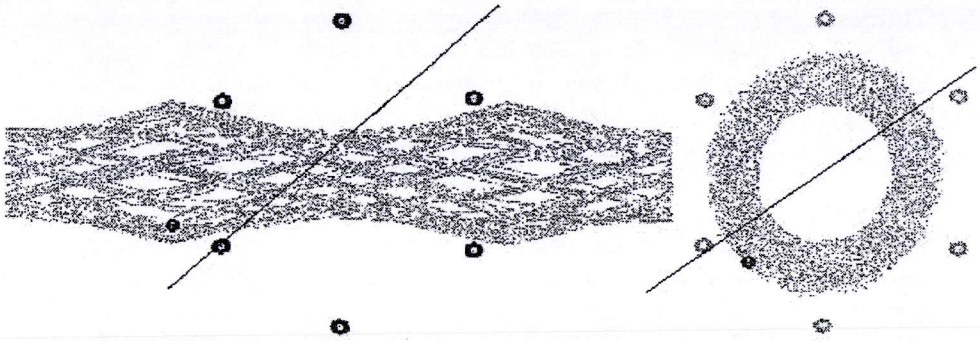

Figure 2. Two views of one form of computer simulated production of a 2-brane from parameters of the hexagonal geometry of the putative Dirac polarized vacuum. Hysteresis loop harmonic oscillation of the future-past dynamics produces branes by incursive resonance. The software simulation of 2-brane emergence from the geometry of spacetime least-units is achieved by applying a harmonic oscillator generated by the energy of the Noetic Action Principle. The oblique lines in each figure are the insertion angles and the two tiny points are the holophote injection points of noeon energy.

Table I. SPACETIME HARMONIC OSCILLATOR PARAMETERS
As Utilized in running the Autodesk Chaos Software

PARAMETER	VALUE USED	POSSIBLE RANGE
Charge	3	±500
Magnetic Capture Radius	5	0 to 20
Magnetic Field Radius	11	1 to 60
Pull Towards Center	27	±500
Frequency	33	2 to 10,000
Friction (STRING TENSION)	1.37	0 to 500

6. Conclusions

The approach presented is a work in progress, but it's initial success suggests that more comprehensive calculations and simulations will add further rigor to the results. If the theory indeed reveals a sound physical basis, a demonstration of the production of F-Theory 2-branes from more specific vacuum parameters of complexified HD space could shed light on determining the actual physical vacuum sought for M-Theory. Simulations with sufficient complexity could be developed to aid in determining the actual spin structures and geometric topology of actual matter which is one of the ultimate goals of string theory.

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