Exploration

A Revision of the Friedmann Cosmology (Part I)

Anthony Bermanseder*

Abstract

In this article, the author will show that the cosmological field equations can be expressed as the square of the nodal Hubble Constant and inclusive of a 'dark energy' terms often identified with the Cosmological Constant of Einstein. Substituting the Einstein Lambda with the time differential for the square of nodal Hubble frequency as the angular acceleration acting on a quantized volume of space naturally and universally replaces the enigma of the 'dark energy' with a space inherent angular acceleration component. The field equations so can be generalized in a parametrization of the Hubble Constant assuming a cyclic form, oscillating between a minimum and maximum value. The Einstein Lambda then becomes then the energy-acceleration difference between the baryonic mass content of the universe and an inherent mass energy related to the initial condition of the oscillation parameters for the nodal Hubble Constant.

Keywords: Friedmann cosmology, revision, field equation, Hubble Constant, Einstein Lambda.

1. The Parametrization of the Friedmann Equation

It is well known, that the Radius of Curvature in the Field Equations of General Relativity relates to the Energy-Mass Tensor in the form of the critical density $\rho_{critical} = 3H_o^2/8\pi G$ and the Hubble Constant H_o as the square of frequency or alternatively as the time differential of frequency df/dt as a cosmically applicable angular acceleration independent on the radial displacement.

The scientific nomenclature (language) then describes this curved space in differential equations relating the positions of the 'points' in both space and time in a 4-dimensional description called Riemann Tensor Space or similar.
This then leads mathematically, to the formulation of General Relativity in Einstein's field Equations:

$$R_{\mu\nu} - \frac{1}{2}g_{\mu\nu}\,R + g_{\mu\nu}\Lambda = \frac{8\pi G}{c^4}T_{\mu\nu}$$

for the Einstein-Riemann tensor

$$G_{\mu\nu} = R_{\mu\nu} - \frac{1}{2}Rg_{\mu\nu},$$

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and is built upon ten so-called nonlinear coupled hyperbolic-elliptic partial differential equations, which needless to say, are mathematically rather complex and often cannot be solved analytically without simplifying the geometries of the parametric constituents (say objects interacting in so called tensor-fields of stress-energy $\{T_{\mu\nu}\}$ and curvatures in the Riemann-Einstein tensor $\{G_{\mu\nu}\}$, either changing the volume in reduction of the Ricci tensor $\{R_{ij}\}$ with scalar curvature R as $\{Rg_{\mu\nu}\}$ for the metric tensor $\{g_{\mu\nu}\}$ or keeping the volume of considered space invariant to volume change in a Tidal Weyl tensor $\{R_{\mu\nu}\}$).

The Einstein-Riemann tensor then relates Curvature Radius R to the Energy-Mass tensor $E=Mc^2$ via the critical density as $8\pi G/c^4=3H_o{}^2V_{critical}.M_{critical}.c^2/M_{critical}.c^4 = 3H_o{}^2V_{critical}/c^2 = 3V_{critical}/R^2$ as Curvature Radius R by the Hubble Law applicable say to a nodal Hubble Constant $H_o = c/R_{Hubble}$.

The cosmological field equations then can be expressed as the square of the nodal Hubble Constant and inclusive of a 'dark energy' terms often identified with the Cosmological Constant of Albert Einstein, here denoted $\Lambda_{Einstein}$.

Substituting the Einstein Lambda with the time differential for the square of nodal Hubble frequency as the angular acceleration acting on a quantized volume of space however; naturally and universally replaces the enigma of the 'dark energy' with a space inherent angular acceleration component, which can be identified as the 'universal consciousness quantum' directly from the standard cosmology itself.

The field equations so can be generalised in a parametrization of the Hubble Constant assuming a cyclic form, oscillating between a minimum and maximum value given by $H_o=dn/dt$ for cycle time $n=H_ot$ and where then time t is the 4-vector time-space of Minkowski light-path $x=ct$.

The Einstein Lambda then becomes then the energy-acceleration difference between the baryonic mass content of the universe and an inherent mass energy related to the initial condition of the oscillation parameters for the nodal Hubble Constant.

$\Lambda_{Einstein} = G_oM_o/R(n)^2 - 2cH_o/(n+1)^3$ = Cosmological Acceleration - Intrinsic Universal Milgröm Deceleration as: $g_{\mu\nu}\Lambda = 8\pi G/c^4\, T_{\mu\nu} - G_{\mu\nu}$

then becomes $G_{\mu\nu} + g_{\mu\nu}\Lambda = 8\pi G/c^4\ T_{\mu\nu}$ and restated in a mass independent form for an encompassment of the curvature fine structures.

Energy Conservation and Continuity

$dE + PdV = TdS = 0$ (First Law of Thermodynamics) for a cosmic fluid and scaled Radius
$R=a.R_o$; $dR/dt = da/dt.R_o$ and $d^2R/dt^2 = d^2a/dt^2.R_o$

$dV/dt = \{dV/dR\}.\{dR/dt\} = 4\pi a^2R_o{}^3.\{da/dt\}$

$dE/dt = d(mc^2)/dt = c^2.d\{\rho V\}/dt = (4\pi R_o{}^3.c^2/3)\{a^3.d\rho/dt + 3a^2\rho.da/dt\}$

$dE + PdV = (4\pi R_o{}^3.a^2)\{\rho c^2.da/dt + [ac^2/3].d\rho/dt + P.da/dt\} = 0$ for the cosmic fluid energy-pressure continuity equation:

$$\mathbf{d\rho/dt = -3\{(da/dt)/a.\{\rho + P/c^2\}\}} \text{ ......(1)}$$

The independent Einstein Field Equations of the Robertson-Walker metric reduce to the Friedmann equations:

$$\mathbf{H^2 = \{(da/dt)/a\}^2 = 8\pi G\rho/3 - kc^2/a^2 + \Lambda/3} \text{ ......(2)}$$

$$\mathbf{\{(d^2a/dt^2)/a\} = -4\pi G/3\{\rho+ 3P/c^2\} + \Lambda/3} \text{ ......(3)}$$

for scale radius $a=R/R_o$; Hubble parameter $H = \{da/dt)/a\}$; Gravitational Constant G; Density ρ; Curvature k ; light speed c and Cosmological Constant Λ.

Differentiating (2) and substituting (1) with (2) gives (3):

$\{2(da/dt).(d^2a/dt^2).a^2 - 2a.(da/dt).(da/dt)^2\}/a^4 = 8\pi G.(d\rho/dt)/3 + 2kc^2.(da/dt)/a^3 + 0 = (8\pi G/3)\{-3\{(da/dt)/a.\{\rho + P/c^2\}\} + 2kc^2.(da/dt)/a^3 + 0$

$(2(da/dt)/a).\{(d^2a/dt^2).a - (da/dt)^2\}/a^2 = (8\pi G/3)\{-3(da/dt)/a\}.\{\rho + P/c^2\} + 2\{(da/dt)/a\}.(kc^2/a^2) +0$
$2\{(da/dt)/a\}.\{(d^2a/dt^2).a - (da/dt)^2\}/a^2 = 2\{(da/dt)/a\}\{-4\pi G.\{\rho + P/c^2\} + (kc^2/a^2)\} +0$ with $kc^2/a^2= 8\pi G\rho/3 + \Lambda/3 - \{(da/dt)/a\}^2$

$d\{H^2\}/dt = 2H.dH/dt = 2\{(da/dt)/a\}.dH/dt$
$dH/dt = \{[d^2a/dt^2]/a - H^2\} = \{-4\pi G.(\rho+ P/c^2) + 8\pi G\rho/3 + \Lambda/3 -H^2\} = -4\pi G/3(\rho + 3P/c^2) + \Lambda/3 - H^2\}$
$= -4\pi G/3(\rho + 3P/c^2) + \Lambda/3 - 8\pi G\rho/3 + kc^2/a^2 - \Lambda/3\} = -4\pi G.(\rho + P/c^2) + kc^2/a^2$

$dH/dt = -4\pi G\{\rho+P/c^2\}$ as the Time derivative for the Hubble parameter H for flat Minkowski space-time with curvature k=0

$\{(d^2a/dt^2).a - (da/dt)^2\}/a^2 = -4\pi G\{\rho+ P/c^2\} + (kc^2/a^2) + 0 = -4\pi G\{\rho + P/c^2\} + 8\pi G\rho/3 - \{(da/dt)/a\}^2 + \Lambda/3$

$\{(d^2a/dt^2)/a\} = (-4\pi G/3)\{3\rho + 3P/c^2- 2\rho\} = (-4\pi G/3)\{\rho + 3P/c^2\} + \Lambda/3 = dH/dt + H^2$
For a scale factor $a=n/[n+1] = \{1-1/[n+1]\} = 1/\{1+1/n\}$

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$a_{reset} = R_k(n)_{AdS}/R_k(n)_{dS} + ½ = n-\sum\prod n_{k-1}+\prod n_k +½$

Scale factor modulation at $N_k=\{[n-\sum\prod n_{k-1}]/\Pi n_k \} = ½$ reset coordinate

$\{dH/dt\} = a_{reset}\,.d\{H_o/T(n)\}/dt = -\,H_o^2(2n+1)(n+3/2)/T(n)^2$ for k=0

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$-H_o^2(2n+1)(n+3/2)/T(n)^2 + G_oM_o/\{R_H^3(n/[n+1])^3\}\{4\pi\} = \Lambda(n)/\{R_H(n/[n+1])\} + \Lambda/3$
$-2H_o^2\{[n+1]^2-¼\}/T[n]^2 + G_oM_o/R_H^3(n/[n+1])^3\{4\pi\} = \Lambda(n)/R_H(n/[n+1]) + \Lambda/3$
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$\mathbf{\Lambda(n)/R_H(n/[n+1]) = -\,4\pi GP/c^2 = G_oM_o/R_H^3(n/[n+1])^3 -2H_o^2/(n[n+1]^2)}$

and $\Lambda = 0$

for $-P(n) = \Lambda(n)c^2[n+1]/4\pi G_onR_H = \Lambda(n)H_oc[n+1]/4\pi G_on$
$= M_oc^2[n+1]^3/4\pi n^3R_H^3 - H_o^2c^2/2\pi G_on[n+1]^2$

For n=1.13271:............ - ($+6.696373\times10^{-11}$ J/m^3)* = (2.126056×10^{-11} J/m^3)* + (-8.8224295×10^{-11} J/m^3)*

Negative Dark Energy Pressure = Positive Matter Energy + Negative Inherent Milgröm Deceleration (cH_o/G_o)

The Dark Energy and the 'Cosmological Constant' exhibiting the nature of an intrinsic negative pressure in the cosmology become defined in the overall critical deceleration and density parameters. The pressure term in the Friedmann equations being a quintessence of function n and changing sign from positive to negative to positive as indicated.

For a present measured deceleration parameter q_{dS}=-0.5586, the DE Lambda calculates as -6.696×10^{-11} (N/m^2=J/m^3)*, albeit as a positive pressure within the negative quintessence.

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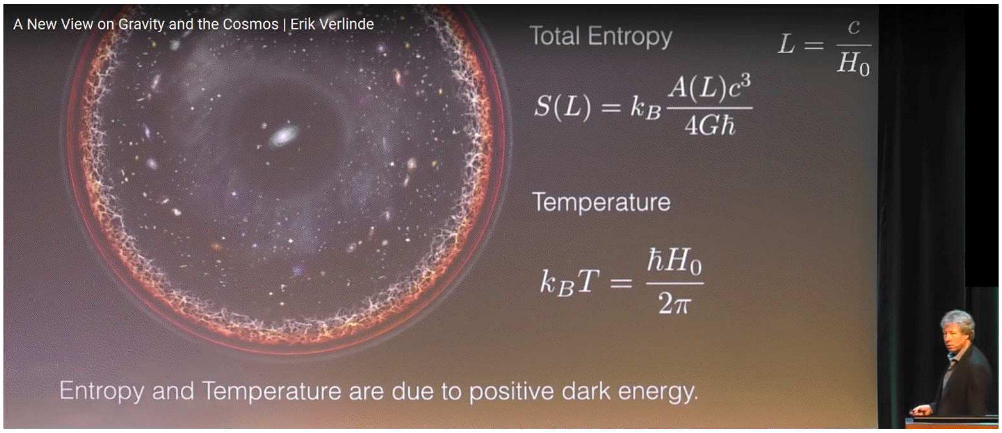

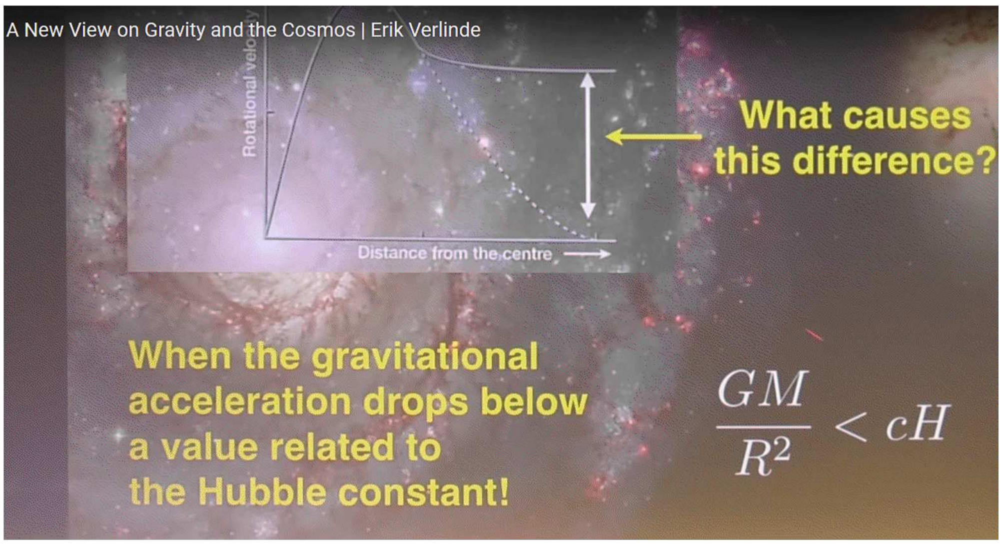

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2. Emergent Verlinde Gravity and Dark Energy as entangled Quantum Information

For the minimum Planck-Oscillator: $E_{op} = ½hf_{op} = ½m_{op}c^2 = ½kT_{op} = Mc^2/\#bits$
$=\{Mc^2.l_{planck}^2\}/\{4\pi R^2\} = \{MG_oh/8\pi^2cR^2\} = \{hg/8\pi^2c\}$
with gravitational acceleration $g = G_oM/R^2$ and $M=gR^2/G_o$ for $kT = hg/4\pi^2c$ = {String T-Duality modulation factor ζ}{hg/c}
ζ = Linearization of Compton wave matter in de Broglie wave matter = $r_{ps}/r_{ss} = \{\lambda_{ps}/2\pi\}/\{2\pi\lambda_{ss}\}$ $= \{\lambda_{ps}^2/4\pi^2\} = \{1/4\pi^2.\lambda_{ss}^2\} = 10^{-44}/4\pi^2$

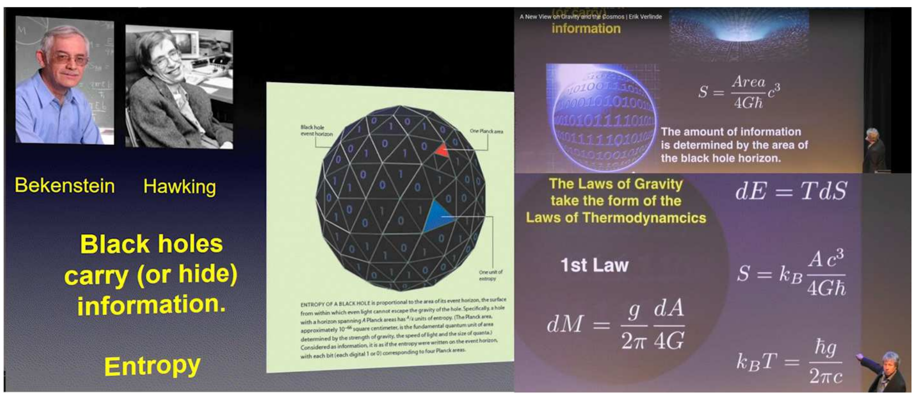
The gravitational acceleration in Quantum Relativity g as the Weyl-wormhole gravitational acceleration then is $g_{ps} = c.f_{ps}$

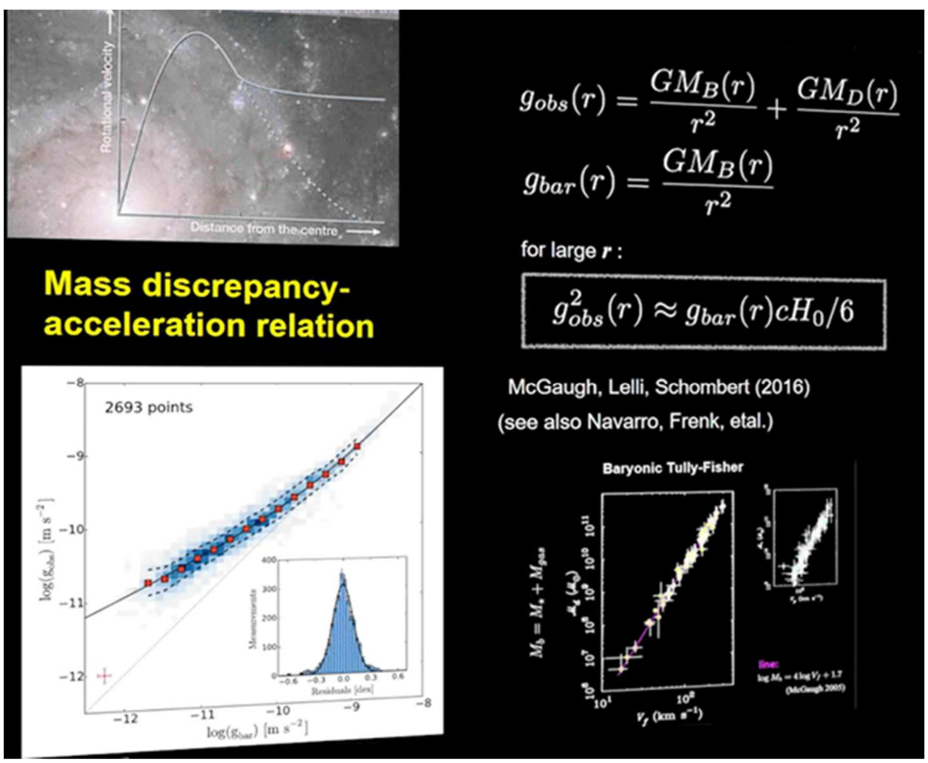
for $E_{ps} = hf_{ps} = hc.f_{ps}/c = kT_{ps} = hg_{ps}/c$ and generalizes as the Milgröm acceleration $-2cH_o/(n+1)^3$ in the cosmology in $g \propto cH_o$.

$dE = TdS$ for $c^2dM = (2\pi kT.c^3)dA/4G_oh$ for $dM = \{hgc/2\pi c\}dA/\{4G_oh\} = \{g/8\pi G_o\}dA$
$dM/dA = \{g/8\pi G_o\}$

$dS/dA = k/4l_{planck}^2 = 2\pi kc^3/4hG_o$ from Entropy $S=kA/4l_{planck}^2 = \pi c^3kA/2G_oh$ with $dS=2\pi k$ from $dE/dS = T$ and $E = \Sigma TdS = kT$ in the quantum self-state
$dM/dS = \{dM/dA\}.\{dA/dS\} = \{g/8\pi G_o\}.\{4l_{planck}^2/k\}= \{gl_{planck}^2/2\pi kG_o\} = \{hg/4\pi^2kc^3\}= \zeta\{hg/kc^3\}$

https://arxiv.org/pdf/1611.02269.pdf





3. An expanding multi-dimensional super-membraned open and closed Universe

The expansion of the universe can be revisited in a reformulation of the standard cosmology model Lambda-Cold-Dark-Matter or ΛCDM in terms of a parametrization of the standard expansion parameters derived from the Friedmann equation, itself a solution for the Einstein Field Equations (EFE) applied to the universe itself.

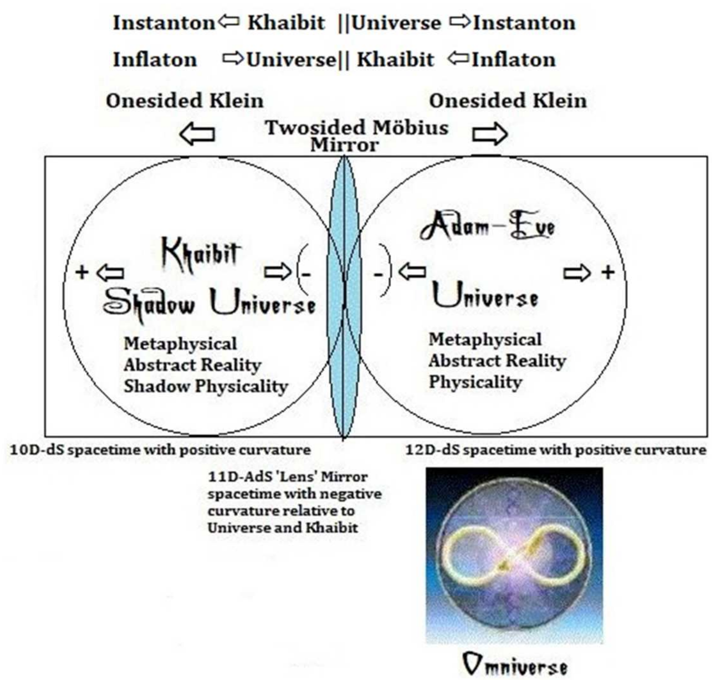
A measured and observed flat universe in de Sitter (dS) 4D-spacetime with curvature k=0, emerges as the result of a topological mirror symmetry between two Calabi Yau manifolds encompassing the de Sitter space time in a multi timed connector dimension. The resulting multiverse or brane world so defines a singular universe with varying but interdependent time cyclicities.

It is proposed, that the multiverse initiates cyclic periods of hyper acceleration or inflation to correlate and reset particular initial and boundary conditions related to a baryonic mass seedling proportional to a closure or Hubble mass to ensure an overall flatness of zero curvature for every such universe parallel in a membrane time space but co-local in its lower dimensional Minkowski space-time.
On completion of a 'matter evolved' Hubble cycle, defined in characteristic Hubble parameters; the older or first universal configuration quantum tunnels from its asymptotic Hubble Event horizon into its new inflaton defined universal configuration bounded by a new Hubble node. The multidimensional dynamics of this quantum tunneling derives from the mirror symmetry and topological duality of the 11-dimensional membrane space connecting two Calabi Yau manifolds as the respective Hubble nodes for the first and the second universal configurations.

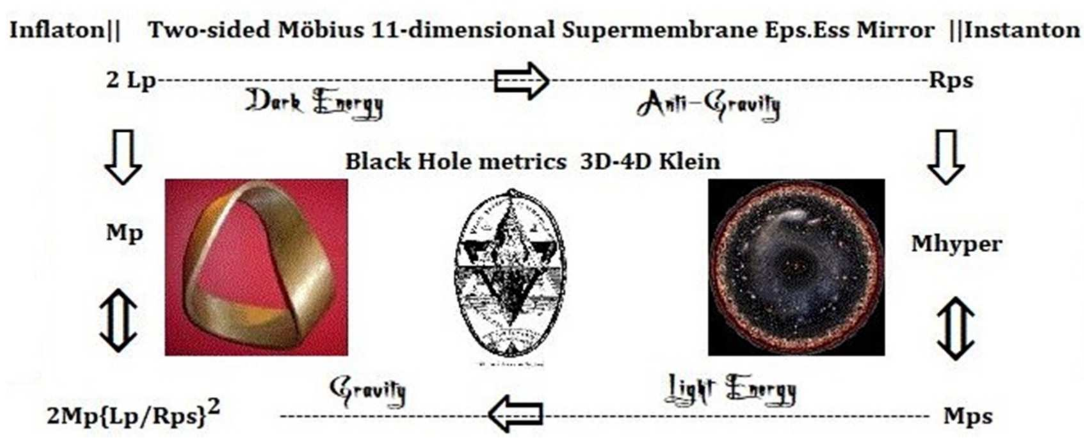
Parallel universes synchronize in a quantized protoverse as a function of the original light path of the Instanton, following not preceding a common boundary condition, defined as the Inflaton. The initial conditions of the Inflaton so change as a function of the imposed cyclicity by the boundary conditions of the paired Calabi Yau mirror duality; where the end of a Instanton cycle assumes the new initial conditions for the next cycle of the Instanton in a sequence of Quantum Big Bangs.

The outer boundary of the second Calabi Yau manifold forms an open dS space-time in 12-dimensional brane space (F-Vafa 'bulk' Omni space) with positive spheroidal curvature k=+1 and cancels with its inner boundary as a negatively curved k=-1 hyperbolic AdS space-time in 11 dimensions to form the observed 4D/10-dimensional zero curvature dS space-time, encompassed by the first Calabi Yau manifold.

A bounded (sub) 4D/10D dS space-time then is embedded in a Anti de Sitter (AdS) 11D-space-time of curvature k=-1 and where 4D dS space-time is compactified by a 6D Calabi Yau manifold as a 3-torus and parametrized as a 3-sphere or Riemann hypersphere. The outer boundary of the 6D Calabi Yau manifold then forms a mirror duality with the inner boundary of the 11D Calabi Yau event horizon and images the positive curvature in 12D-F-Vafa space in a 'convex lens' effect of 11-dimensional M-Witten spacetime.



The Symmetry of Quantum Gravitation in the Cosmology of Black Hole Physics



c^2 and h and k are fundamental constants of nature obtained from the initializing algorithm of the Mathimatia and are labeled as the 'square of lightspeed c' and 'Planck's constant h' and 'Stefan-Boltzmann's constant k' respectively. The complementary part of super membrane $E_{ps}E_{ss}$ is EssBaab. Eps-Abba is renamed as 'Energy of the Primary Source-Sink' and Ess-Baab is renamed as 'Energy of the Secondary Sink-Source'. The primary source-sink and the primary sink-source are coupled under a mode of mirror-inversion duality with Eps describing a vibratory and high energy micro-quantum quantum entanglement with Ess as a winding and low energy macro quantum energy. It is this quantum entanglement, which allows Abba to become part of Universe in the encompassing energy quantum of physicalized consciousness, defined in the magnetopolar charge.

The combined effect of the applied Schwarzschild metric then defines a Compton Constant to characterize the conformal transformation as: Compton Constant h/2πc = MpLp = MpsRps. Quantum gravitation now manifests the mass differences between Planck-mass M_p and Weyl mass M_{ps}. The Black Hole physics had transformed M_p from the definition of L_p; but this transformation did not generate M_{ps} from R_{ps}, but rather hypermass M_{hyper}, differing from M_{ps} by a factor of $\frac{1}{2}\{R_{ps}/L_p\}^2$.

Every Inflaton defines three Hubble nodes or time space mirrors; the first being the 'singularity - wormhole' configuration; the second the nodal boundary for the 4D/10D dS space-time and the third the dynamic light path bound for the Hubble Event horizon in 5D/11D AdS time-space. The completion of a 'de Broglie wave matter' evolution cycle triggers the Hubble Event Horizon as the inner boundary of the time-space mirrored Calabi Yau manifold to quantum tunnel onto the outer boundary of the space-time mirrored Calabi Yau manifold in a second universe; whose inflaton was initiated when the light-path in the first universe reached its second Hubble node.

For the first universe, the three nodes are set in time-space as $\{3.3\text{x}10^{-31}$ s; 16.88 Gy; 3.96 Ty$\}$ and the second universe, time shifted in $t_1=t_o+t$ with $t_o=1/H_o$ has a nodal configuration $\{t_o+1.4\text{x}10^{-33}$; $t_o+3{,}957$ Gy; $t_o+972.7$ Ty$\}$; the latter emerging from the time-space as the instanton at time marker t_o.

A third universe would initiate at a time coordinate $t_2=t_o+t_1+t$ as $\{1/H_o+234.472/H_o+5.8\text{x}10^{-36}$ s; $t_o+t_1+972.7$ Ty; $t_o+t_1+250{,}223$ Ty$\}$; but as the second node in the second universe cannot be activated by the light path until the first universe has reached its 3.96 trillion year marker (and at a time for a supposed 'heat death' of the first universe due to exhaustion of the nuclear matter sources); the third and following nested universes cannot be activated until the first universe reaches its n=1+234.472=235.472 time-space coordinate at 3,974.8 billion years from the time instanton aka the Quantum Big Bang.

For a present time-space coordinate of $n_{present}=1.13271$ however; all information in the first universe is being mirrored by the time-space of the AdS space-time into the dS space-time of the second universe at a time frame of $t = t_1-t_o = 19.12 - 16.88 = 2.24$ billion years and a multi-dimensional time interval characterizing the apparent acceleration observed and measured in the first universe of the Calabi Yau manifold compressed or compactified flat dS Minkowski cosmology. The solution to the Dark Energy and Dark Matter question of a 'missing mass' cosmology is described in this discourse and rests on the evolution of a multiverse in matter.

(*Continued on Part II*)

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