11[TH] CONFERENCE
on
DYNAMICAL SYSTEMS
THEORY AND APPLICATIONS
December 5-8, 2011. Łódź, Poland

Emergent gravity in start of cosmological inflation as by product of dynamical systems mappings ?

Andrew Walcott Beckwith

Abstract: We present how a Gaussian mapping, combined with what we hope to turn into a strange attractor for re cycling prior universe matter-energy may enable quantum gravity to form. And embed it in a larger- non linear theory. The key development to be worked upon would be turning into a strange attractor the supposition R. Penrose made as to re cycling the 'history' of the universe without the necessity of a 'big crunch', i.e. a contracting universe. The nature of the attractor would be instrumental in helping us come up with conditions enabling the evolution of pre Planckian embedding of non linear ' analog reality' ('classical') physics meshing into, with an increase in degrees of freedom into 'digital reality' ('quantum mechanics') and de facto quantum gravity , at the start of Planckian space time. This Planckian space time would mark the beginning of inflation.

1. Introduction

We present a Gaussian mapping as a way to increase degrees of freedom in pre Planckian physics to Planckian physics. In addition, in tandem to a suggestion made by Penrose, 2007.we investigate what may be a dynamical systems mapping for re cycling matter "caught" by millions of black holes, in the universe, to be re cycled to the initial stages of a new big bang. The two mappings together may enable a description of how quantum gravity arises.

1.1 First , thermal input into the new universe. In terms of vacuum energy

We will briefly allude to temperature drivers which may say something about how thermal energy will be introduced into the onset of a universe. This will be the 'thermal driver' for the increase in degrees of freedom. Begin first with looking at different value of the cosmological vacuum energy parameters, in four and five dimensions [1]

$$\left|\Lambda_{5-\mathrm{dim}}\right| \approx c_1 \cdot \left(1/T^{\alpha}\right) \tag{1}$$

in contrast with the more traditional four-dimensional version of the same, minus the minus sign of the brane world theory version. as given by Park [2]

$$\Lambda_{4-\dim} \approx c_2 \cdot T^{\beta} \tag{2}$$

If one looks at the range of allowed upper bounds of the cosmological constant, the difference between what Barvinsky [3] recently predicted, and Park [2] is:

$$\Lambda_{4-\dim} \propto c_2 \cdot T^{\beta} \xrightarrow[graviton-production-as-time>t(Planck)]{} 360 \cdot m_P^2 << c_2 \cdot \left[T \approx 10^{32} K\right]^{\beta} \tag{3}$$

Right after the gravitons are released, one still sees a drop-off of temperature contributions to the cosmological constant .Then for time values $t \approx \delta^1 \cdot t_P$, $0 < \delta^1 \leq 1$ and integer n [4]

$$\frac{\Lambda_{4-\dim}}{\left|\Lambda_{5-\dim}\right|} - 1 \approx \frac{1}{n} \tag{4}$$

In terms of its import the following has been suggested in the initial phases of the big bang, with large vacuum energy $\neq \infty$ and $a\left(t^*\right) \neq 0, 0 < a\left(t^*\right) << 1$, the following relation, which violates (signal) causality, is obtained for small fluctuation $a\left(t^*\right) < l_P$ If we examine $\left|\Lambda_{5-\dim}\right| \sim c_2 T^{-\beta}$

Cosmological Λ in 5 and 4 dimensions [4]- Table 1

Time $0 \leq t << t_P$	**Time** $0 \leq t < t_P$	**Time** $t \geq t_P$
$\left|\Lambda_5\right|$ undefined, $T \approx \varepsilon^+ \rightarrow T \approx 10^{32} K$ $\Lambda_{4-\dim} \approx$ almost ∞	$\left|\Lambda_5\right| \approx \varepsilon^+$, $\Lambda_{4-\dim} \approx$ extremely large $10^{32} K > T > 10^{12} K$	$\left|\Lambda_5\right| \approx \Lambda_{4-\dim}$, T much smaller than $T \approx 10^{12} K$

We assume in this that we have, a discontinuity in the pre Planckian regime, for scale factors[4].

$$\left[\frac{a\left(t^* + \delta t\right)}{a\left(t^*\right)}\right] - 1 < (value) \approx \varepsilon^+ << 1 \tag{5}$$

Furthermore, in the transition for $0 \leq t < t_P$ the following increase in degrees of freedom is driven by thermal energy from a prior universe Starting with [5] , [6]

$$E_{thermal} \approx \frac{1}{2} k_B T_{temperature} \propto \left[\Omega_0 \breve{T}\right] \sim \tilde{\beta} \tag{6}$$

The assumption is that there is an initial fixed entropy arising, with $\overline{N}$ as a nucleated structure in short time interval as temperature $T_{temperature} \varepsilon \left(0^+, 10^{19} GeV\right)$ arrives. Then by [5],

$$[\Delta S] = [\hbar / T] \cdot \left[2k^2 - \frac{1}{\eta^2} \left[M_{Planck}^2 \cdot \left[\left[\frac{6}{4\pi} - \frac{12}{4\pi} \right] \cdot \left[\frac{1}{\phi} \right]^2 - \frac{6}{4\pi} \cdot \left[\frac{1}{\phi^2} \right] \right] \right] \right]^{1/2} \sim n_{Particle-Count} \quad (7)$$

If the inputs into the inflaton ϕ, as given by a random influx of thermal energy from temperature, we will see the particle count on the right hand side of Eq. (7) above a random creation of $n_{Particle-Count}$. The way to introduce the expansion of the degrees of freedom from nearly zero to having **N(T) ~ 10³** is to define the classical and quantum regimes of gravity as to minimize the point of the bifurcation diagram affected by quantum processes.[5] Dynamical systems modeling is employed right 'after' evolution through the 'quantum dot' regime. The diagram, would look like an application of the Gauss mapping of [5].[6]

$$x_{i+1} = \exp\left[-\tilde{\alpha} \cdot x_i^2 \right] + \tilde{\beta} \quad (8)$$

The inputs of change of iterated steps on the right hand side of Eq. (8) may indeed show increase in degrees of freedom. Change of temperature, as given , over a short distance, is [5],[6]

$$\frac{\Delta \tilde{\beta}}{dist} \cong \left(5 k_B \Delta T_{temp} / 2 \right) \cdot \frac{\overline{N}}{dist} \sim qE_{net-electric-field} \sim \textbf{change in degrees of freedom} \quad (9)$$

We would regard this as being the regime in which we see a thermal increase in temperature, up to the Planckian physics regime. If so, then we can next look at what is the feeding in mechanism from the **end of a universe, or universes**, and inputs into Eq.(8) , Eq.(9)

1.2 A new idea extending Penrose's suggestion of cyclic universes, black hole evaporation, and the embedding structure our universe is contained within

Beckwith strongly suspects that there are no fewer than N universes undergoing Penrose 'infinite expansion' [7] and all these are contained in a mega universe structure. Furthermore, each of the N universes has black hole evaporation, with the Hawking radiation from decaying black holes. If each of the N universes is defined by a partition function, we can call $\left\{ \Xi_i \right\}_{i \equiv N}^{i \equiv 1}$, then there exist an information minimum ensemble of mixed minimum information roughly correlated as about $10^7 - 10^8$ bits of information per partition function in the set $\left\{ \Xi_i \right\}_{i \equiv N}^{i \equiv 1} \Big|_{before}$, so minimum information is conserved between a set of partition functions per each universe

$$\left\{\Xi_i\right\}_{i\equiv N}^{i\equiv 1}\Big|_{before} \equiv \left\{\Xi_i\right\}_{i\equiv N}^{i\equiv 1}\Big|_{after} \tag{10}$$

However, that there is non uniqueness of information put into each partition function $\left\{\Xi_i\right\}_{i\equiv N}^{i\equiv 1}$. Furthermore Hawking radiation from the black holes is collated via a strange attractor collection in the mega universe structure to form a new big bang for each of the N universes as represented by $\left\{\Xi_i\right\}_{i\equiv N}^{i\equiv 1}$. Verification of this mega structure compression and expansion of information with a non unique venue of information placed in each of the N universes favors Ergodic mixing treatments of initial values for each of N universes expanding from a singularity beginning. The n_f value, will be used to algorithm of [8]. $S_{entropy} \sim n_f$. . How to tie in this energy expression, as in Eq. (10) will be to look at the formation of a non trivial gravitational measure which we can state as a new big bang for each of the N universes as by [9], and $n(E_i)\cdot$ the density of states at a given energy E_i for a partition function. **[9] , [10]**

$$\left\{\Xi_i\right\}_{i\equiv 1}^{i\equiv N} \propto \left\{\int_0^\infty dE_i \cdot n(E_i)\cdot e^{-E_i}\right\}_{i\equiv 1}^{i\equiv N}. \tag{11}$$

Each of the terms E_i would be identified with Eq.(11) above, with the following iteration for N universes

$$\frac{1}{N}\cdot\sum_{j=1}^{N}\Xi_j\Big|_{j-before-nucleation-regime} \xrightarrow[vacuum-nucleation-tranfer]{} \Xi_i\Big|_{i-fixed-after-nucleation-regime} \tag{12}$$

For N number of universes, with each $\Xi_j\Big|_{j-before-nucleation-regime}$ for j = 1 to N being the partition function of each universe just before the blend into the RHS of Eq. (12) above for our present universe. Also, each of the independent universes given by $\Xi_j\Big|_{j-before-nucleation-regime}$ would be constructed by the absorption of one million black holes sucking in energy**. I.e. in the end[9]**

$$\Xi_j\Big|_{j-before-nucleation-regime} \approx \sum_{k=1}^{Max}\tilde{\tilde{\Xi}}_k\Big|_{black-holes-jth-universe} \tag{13}$$

2. Analysis of the action of these two mappings on the formation of Quantum gravity

In particular, in the regime where there is a build up of temperature,[11] Eq. (14)

$$\oint [x_j, p_i] dx_k \approx -\oint p_i [x_j, dx_k] = -\beta \cdot l_P \cdot T_{j,k,l} \oint p_i dx_l \neq -\hbar\beta \cdot l_P \cdot T_{i,j,k} \qquad (14)$$

Very likely, across a causal boundary, between $\pm l_P$ across the boundary due to the causal barrier, one gets [11]

$$\oint p_i \, dx_k \neq \hbar \delta_{i,k}, \oint p_i \, dx_k \equiv 0 \qquad (15)$$

I.e.

$$\oint_{\pm l_P} p_i dx_k \Big|_{i=k} \to 0 \qquad (16)$$

If so,[23] the regime of space time, for the feed in of , prior to the introduction of QM, that [11]

$$[x_j, p_i] \neq -\beta \cdot (l_{Planck} / l) \cdot \hbar T_{ijk} x_k \quad and \quad does \quad not \to i\hbar \delta_{i,j} \qquad (17)$$

Eq. (17) in itself would mean that in the pre Planckian physics regime, and in between $\pm l_P$, QM no longer applies. What we will do is determining where Eq. (17) no longer holds via experimental data.

3. Conclusion,

We wish to summarize what we have presented in an orderly fashion. Doing so is a way of stating that Analog, reality is the driving force behind the evolution of inflationary physics

a) Pre Octonian gravity physics (analog regime of reality) features a break down of the Octonian gravity commutation relationships when one has curved space time. This corresponds, as brought up in the Jacobi iterated mapping for the evolution of degrees of freedom to a build up of temperature for an increase in degrees of freedom from 2 to over 1000. Per unit volume of space time. The peak regime of where the degrees of freedom maximize out is where the Octonian regime holds.

b) Analog physics, prior to the build up of temperature can be represented by the mappings given by Eq. (12) and Eq. (13). The first of these mappings is an ergotic mapping, a perfect mixing regime from many universes into our own present universe. This mapping requires a deterministic quantum limit as similar to what tHooft included in his embedding of Quantum physics in a larger, non linear theory [12]. This is approximated by current Pilot model build up of an embedding of QM within a more elaborate super structure**.**

In particular, in order to verify the above one may have to make analogies with detection via the proposed and planned detection systems (SEMCS and SEMCS II), for frequency ranges centering on 10^9 to 10^{10} Hz uniquely corresponds to Ω_{gw} maxima for pre-big-bang and quintessential inflation models. This for $\Omega_{gw} \sim 10^5$ as the ratio of the density of GW radiation over $\rho_C =$ critical density. Theoretically, what Eq. (12) and Eq. (13) are to develop considerations based upon different initial conditions in phase space, requiring experimental input. If what the author suspects, i.e. ergodic characteristics, along the lines of [13]

$$p_0(x) = \{1/\delta \cdot x_0\} \quad when \quad x\varepsilon \; [x_0, x_0 + \delta \cdot x]$$
$$p_0(x) = 0, \quad otherwise \tag{18}$$

We hope to get ergodic mapping structure to Eq. (12) and Eq. (13) corresponding to a probability density expression so that we can get experimental confirmation if Eq. (14) to Eq. (18) hold in the run up of pre Planckian space time, to Planckian space time physics.

References

1. Beckwith A.W. Relic High Frequency Gravitational Waves and How to Detect them, *AIP Conf.Proc.1103* 2009 pp. 571-581
2. Park D.K., Kim H., and Tamarayan S., Nonvanishing Cosmological constant of Flat Universe in Brane World Senarios, *Phys. Lett. B 535*, 2000, pp. 5- 10
3. Barvinsky A., Kamenshick A., and Yu A. Thermodyanamics From Nothing, Limiting the Cosmological Constant Landscape, *Phys.Rev.D74* , 2006, pp. 121502- 121506
4. Beckwith A.W., Implications for the Cosmological Landscape: Can Thermal Inputs from a Prior Universe Account for Relic Graviton Production? *AIP Conf. Proc.969* , 2008, pp 1091-1102
5. Beckwith A.W., Li F. Y., et. al. Is Octonian Gravity Relevant near the Planck Scale ? *Vixra.org* 2010, pp 1-18, http://vixra.org/abs/1101.0017.
6. Beckwith A.W. How to Use the Cosmological Schwinger Principle for Energy Flux, Entropy, and 'Atoms of Space-time' *Dice 2010 Proceedings, now at Vixra.org* 2010 , pp 1-10 http://vixra.org/abs/1010.0031,
7. Penrose R. Before the Big Bang. An Outrageous New Perspective and Its Implications for Particle Physics, *Proceedings of EPAC* , 2006, pp 2759-2763
8. Ng Y. J. Spacetime Foam: From Entropy and Holography to Infinite Statistics and Nonlocality, Entropy 2008, 10(4), 2008, pp 441-461
9. Alcubierre, M., *Introduction to Numerical Relativity*, Oxford, Oxford University Press, 2008
10. Beckwith, A.W. Energy content of Gravitons as a way to Quantify both Entropy and Information Generation in the Early Universe, *Journal of Modern Physics Vol. 2*, 2011, pp 58-61
11. Crowell L, *Quantum Fluctuations of Space-time*, Singapore, World Press Scientific, 2005
12. t' Hooft G, *Beyond the Quantum,* edited by Th. M. Nieuwenhuizen et al. Singapore, World Press Scientific, 2006; http://arxiv.org/PS_cache/quant-ph/pdf/0604/0604008v2.pdf
13. McCauley J.L. *Chaos, Dynamics and Fractals. An Algorithmic Approach to Deterministic Chaos* Oxford, Oxford University Press, 1993

Andrew Walcott Beckwith, Visiting scholar, Chongquing University department of physics; zip 400014, Chongquing, P.R. China**, (abeckwith@uh.edu, rwill9955b@yahoo.com)**