

## Abstract

Should a large number of universes form in the False de Sitter Vacuum, universes formed by these singularities in the de Sitter space will emit highly energetic flux which would then be observable from other universes. These are termed Gamma Ray bursters with energetics greater than an entire universe for those bursters found at cosmological distances under this postulation. This hypothesis extends the Copernican revolution placing our universe as one among many others. A mathematically derived hypothetico – deductive model for Comparative Cosmology would permit testing of hypotheses between such diverse universe formations. This hypothesis of multiple universe formation as evidenced in highly energetic gamma ray bursts accounts for a.) The isotropic distribution of these gamma ray bursts, b.) their highly energetic nature, c.) and their diverse spectroscopic signature, also d.) their microsecond to ~1000 seconds duration according to a time dilation hypothesis for the densely energetic field of our universe, where other

hypotheses regarding the origin of these bursts does not account for these gamma ray bursts within a coherent theoretical framework.

Condensation in a False de Sitter Vacuum:

Comparative Cosmology

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The origin of the time field must lie in the relationship between energy and gravitation. According to Weyl's (1952) work, energy has inertia according to the formula:

$$m = \frac{E_0}{c^2}$$

where  $m$  = mass,  $E$  = energy,  $c$  = velocity of light, and exerts a

gravitational field following:

$$[G]_i^k = T_i^k$$

where  $T_i^k$  denotes the tensor-density of total energy and  $[G]_i^k$  is the field action of gravitation. Given this as the case, the initial explosion which rendered the cosmos the way it is

according to the "Big Bang" theory of cosmic evolution must have generated a gravitational field of near infinite value whose expression in an n-dimensional analysis would be field generative. Several time-like dimensions it is here posited, have as their expression an extended tensor such as is found in the Lee-Yang vector field and isotropy of the universe (Dicke, 1982), for electro-magnetism under Mach's hypothesis which states that distant objects influence all other objects—here explicated as an effect of extended tensor fields of all types. Positing that there exist tensors of this nature generated at the point origin of the universe, we may imagine an orthogonal time field—thus: (Dicke,1968): "There exists a coordinate system, time orthogonal such that the metric tensor has the form such that the expression for interval is:

$$\frac{1}{c^2} ds = - \frac{a}{(1 + kv^2)^2} [(dx^1)^2 + (dx^2)^2 + (dx^3)^2] dt^2$$

This describes a system of coordinates such that galaxies, in the mean, occupy fixed points  $x^1 \dots x^3$ , but that the mesh of this three-dimensional coordinate system keeps expanding with time distance (measured in time units) being

proportional to  $\underline{a}$ , a function of time.” The time coordinate  $t$  is sometimes called cosmic time. It would be measured by a clock on one of those idealized galaxies, stationary in the coordinate mesh. The three-dimensional sub-spaces with  $t^4$  constant are of a constant curvature (a function of time). As an easily visualizable example of a curved space, consider a two-dimensional surface. A two-dimensional surface of constant curvature may be a spherical surface (positive curvature), a plane (zero curvature), or a hyperbolic surface (negative curvature). There are also three different types of three-dimensional spaces of constant curvature, namely, positive, zero, and a negative curvature.

In this system of analysis the time field would remain fixed and of a constant curvature whilst the other dimensions maintained their curvature (as a function of time). The binding properties of this field would be ascribable to its gravitational origin as extension of A. Einstein's *The Foundation of the Generalized Theory of Relativity* (1920), and the derivation of the Schwarzschild singularity described in Part I of this paper at times:  $t_0, t_1, t_2, \dots, t_n$  at the point origin of the universe.

The universal constant,  $\underline{c}$ , could be attributed, according to the special and generalized theories of relativity, to the binding properties of the time field which inheres to our spatio-temporal continuum. Other universes, if such exist, would then have different values for  $\underline{c}$  if the original energy derived from the initial explosion differed from universe to universe. The reduction in speed of a photon from a possibly nearly infinite velocity to  $c$  would indicate the binding properties of the field. To the degree that the speed of light is a finite, though very large value in proportion to  $T_i^k$  [the tensor density of total energy in the original point of infinite pressure, density and temperature] we find:

$$\frac{T_i^k}{c} = [G]_i^k$$

where  $[G]_i^k$  is the field action of gravitation of the time field(s).

In a similar manner the interaction of the postulated time-like dimensional fields should from their geometrical interaction result in the quantal/wave dynamical structures of leptons, hadrons, and their constituent relative mass, spin and combinational properties. Armand Wyler (1969) has

shown the merits of this approach in his derivation of  $\alpha = e/\lambda$  ( $\alpha =$  fine structure constant) in terms only of simple rational powers of integers and  $\pi$ . His results agree with the experimental value of  $\alpha$  within one-half part per million, that is for within one-third of a standard deviation. Also, Wyler has published in *Comptes Rendus* of the Academy of Sciences (1971), the ratio of the mass of the proton to the mass of the electron is just  $6\pi^5$  which value agrees with experiment.

Within the first paper the seven-dimensional group  $O(5, 2)$  is considered. Five of these dimensions are real rotations, and the other two dimensions, called pseudo-rotations are time-like. The ratio of the volume elements for the seven-dimensional group and for the subgroup for the five real dimensions: the result,

$$(9/8\pi^4) (\pi^5/2 \cdot 5!)^{1/4}$$

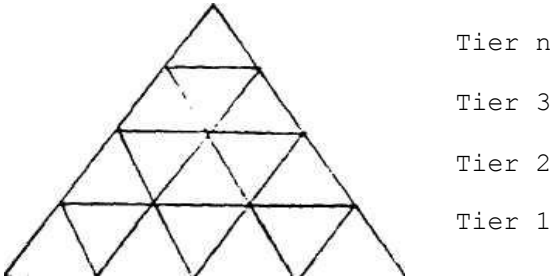
was equated to  $\alpha$ . This simple closed-form expression yields a value of  $\alpha = 137.03608245$ . This value parallels the detailed analysis of the fundamental physical constants by Barry Taylor (1969). It equals 137.03602 with an uncertainty of 21 in the last digits. A similar prediction for

the ratio of the mass of the proton to the mass of the electron gives a value of 1836.118. The current experimental value given by Taylor, Parker and Langenberg is 1836.109, having an uncertainty of 11 in the last digits.

These results suggest underlying symmetries such that a stochastic ordering found in set theory notation (Kuhn & MacKinnon), THEOREM, if B,H,C, and W then an equilibrium exists.

PROOF. The proof uses a labeling of the vertices of subdivisions of quantal numbers, spin, charge, mass, etc. by integers from  $[1, \dots, n]$ . For simplicity use regular subdivisions (see [3]) of degree  $d = 1, 2, \dots$ . The figure below illustrates the case of  $n = 3$  and  $d = 4$ .

TABLE 1



If in any ordered set of physical objects a stochastic ordering exists which can be given a quantal description, then a wave dynamical description of a soliton in an extended tensor field for physical objects such as leptons and hadrons could be given variable widths, e.g. values according to empirical measurement (see Table 1). The dimensionality requisite to explain such an array would extend the analysis of Armand Wyler and refine his observations of mathematical relationships from the point of view of an  $n$ -dimensional geometry. Empirical statistical programs using oblique, i.e. non-orthogonal solutions—should then resolve into conceptually simple geometrical formulae as found in Armand Wyler's mathematical discoveries. The postulation of an  $n$ -dimensional geometry with several time-like dimensions is consistent with a multi-dimensional field theoretic approach to quantal structures. A discussion of this in relation to Albert Einstein's work is included later in this paper.

This approach to quantal structures is also consistent

with the grand unified theories (GUT) now in vogue (discussion of which follows) where, however, this formulation should yield, in accordance with Herman Weyl's conception, a single equation which describes all phenomena of the physical universe. The derivation of such an equation would follow from the assumption that observable events are produced by a combination of vectors, as here postulated, fields, where every resultant can be calculated to within the probability of error inherent in the linear sum of the matrix of resultants. Thus, for example, a computer program which combines vectors for wave analysis could be applied to field effects, thus eliminating the necessity of locating a particle in time and space. Thus, the probability curve which describes the likelihood of finding a particle within a four-dimensional geometry is replaced by wave dynamical field equations. In this way, the probability relations found in quantum mechanics can be replaced with equations which yield exact predictions at the sub-atomic level within the limits of the errors of measurement of the analytical techniques available.

Higher order geometries proposed by Einstein (1950),

with the original six tensor equations to determine four dimensions would then achieve resolution as was originally thought via substitution of dimensional attributes, charge, spin, mass (i.e. color, strangeness, combinatorial characteristics, etc.) as problems in stochastic ordering to elucidate via an hierarchical, wave dynamical analysis the fundamental constants and proportions found in nature. Should this resolve into the geometrical values found by Armand Wyler, then it would confirm the essentially geometrical and field nature of Einsteinian relativity. From this kind of analysis the essential unity of gravitational forces with electromagnetism, the weak and strong inter-atomic binding force and through the postulation of a dense tensor field of a gravitational nature the generation of the phenomenon of clock-measured time would become apparent.

The electro-weak theory (EW), of Salaam and Weinberg which relates the electro-magnetic and weak interactions under the gauge group  $SU(2) \times U(1)$  would be interpretable within the broader conceptual framework of a geometrical model. As J. G. Taylor (1979) indicates . . .

"EW theory is not really a unified theory; the relative strengths of the interaction in the SU(2) and U1 parts of the gauge group has to be obtained from experiment." In the supergroup theories, particularly those of Ecclestone (1980) there are six (6) extra dimensions whose only evidence is the Higgs boson structure. These extra dimensions are required to be of a time-like nature instead of the space-like ones heretofore. "Each new generation of particles requires a further two time-like dimensions for its description; at present there are therefore six extra time-like dimensions alongside our present one and the associated three space-like dimensions . . . Each generation of leptons and quarks (the first being e,  $\nu_e$ , u, d, and the second  $\mu$ ,  $\nu_\mu$ , C, S, the third  $\tau$ ,  $\nu_\tau$ , t and b can be fitted into the 16-dimensional representation of SU(S|1), which is then reducible to the 15-dimensional representation of SU(5). "SU(s|1) may thus be considered the smallest supergroup which can properly unify the strong, electromagnetic and weak interactions" (Taylor, 1979) .

The reality of fields which can extend in a vacuum independently of particulate matter first envisioned by

Faraday and later made the subject of Maxwell's laws of electrodynamics using differential equations for the electric field, makes understandable the phenomenon of particles as singularities in a field of a given nature.

As Albert Einstein (1950) has noted, "A consistent field theory requires continuity of all elements of the theory, not only in time but also in space. Hence the material particle has no place as a fundamental concept in a field theory." To quote further from the works of Einstein (1938), "We shall show in this paper that the gravitational equations for empty space are in fact sufficient to determine the motion of matter represented as point singularities in the field."

Essentially what is stated here is that field theoretic notions consistent with the generalized theory of relativity should have greater aesthetic and symmetrically descriptive power in regards to physical phenomena. Thus Einstein states, "Since the theory of general relativity implies the representation of physical reality by a continuous field, the concept of particles or material points cannot play a fundamental part, nor can the concept of motion. The particle can only appear in a limited region in space in which

the field strength or the energy density is particularly high." The interaction of fields and energy packets in a "wavicle" sense should then, using the Riemannian metric with the tensor,  $R_{ik} = 0$ , provide a powerful tool for dimensional analysis. To adumbrate this point Einstein (1950) states: "I do not see any reason to assume that the heuristic significance of the principle of general relativity is restricted to gravitation and that the rest of physics can be dealt with separately on the basis of special relativity, with the hope that later on the whole may be fitted consistently in a general relativistic scheme."

A finite dimensional analysis which "saves the phenomenon" of the generalized theory of relativity, should then replace the grand unified theories, as mentioned above, with a single equation which (à la Weyl) (we may assume this model overcomes the mathematical difficulties inherent in "renormalization" in Quantum Electro-Dynamics and higher-dimensional analysis) then yields a deterministic wave dynamical model for sub-atomic radiational phenomena of all types. This theory, therefore, has as a

central hypothesis a field interpretation of all types of attractive and repulsive forces. Since anti-matter exists in the universe in exact symmetry with all manifestations of ordinary matter, it must also be postulated that one (or more) of the time-like dimensions of this n-dimensional space is in polar opposition to ordinary space-time.

Thus it is stated, "Although electrodynamics agrees with experiment to extraordinary degrees of accuracy, the agreement is attained by a trick, disfiguring the theory. This ugliness shows that a new theory is required, one that might well 'have determinism in the way that Einstein wanted.'" (Heibron, 1982) If fields of tensor density sufficient to account for the propagation of ponderable bodies exist within a spherical universe, making the universe an expanding singularity in de Sitter space, we must consider the laws of physics within a static massive spherical shell. Thus from Brans & Dicke (1961):

"It is well known that the interior Schwarzschild solution is flat and can be expressed in a coordinate system Minkowskian in the interior. Also, according to general relativity, all Minkowskian coordinate systems are

equivalent and the mass and radius of the spherical shell have no discernible effects upon the laws of physics as they are observed in the interior. Apparently the spherical shell does not contribute in any discernible way to inertial effects in the interior."

A model of a theory incorporating elements of Mach's principle has been given by Sciama (1953). Dicke (1961) arguing from dimensional principles with the assumption of the validity of Mach's Principle, which is the gravitational effect of distant accelerated matter (Sciama, 1953) on a fixed laboratory in Dicke's interpretation, the gravitational constant  $G$  is related to the mass distribution in a uniform expanding universe in the following way:

$$GM/Rc^2 \sim 1$$

where  $M$  stands for finite mass of the visible (i.e. causally related) universe, and  $R$  stands for the radius of the boundary of the visible universe.

This equation concerning inertial reaction carries with it an interesting implication: "Consider a test body falling towards the sun. In a coordinate system, not chosen that the object is not accelerating, the gravitational pull of the sun

may be considered as balanced by another gravitational pull, the inertial reactions. Note that the balance is not disturbed by doubling of all gravitational forces."

Thus we may postulate extended and energetic tensor fields of all types whose geometry of a finite number of coordinates determines the singularities which are those entities identified as particulate mass. N-dimensional geometries which are adopted to express a set of coordinate conditions comprehensive enough to unambiguously identify a spatial coordinate system, have a physical manifestation as fields of gravitation, electromagnetism, the weak and strong interatomic binding forces, and as expressed in a tensor field interpretation of clock-measured time. Within this n-dimensional mapping whorls of energy concentration are observed as galaxies and nebulae. Clouds and gravitationally-induced concentrations of clouds, i.e. stars, may be compared to the whorled configuration of cloud masses seen in hurricanes (typhoons) from the perspective of satellite photometry. (The phenomenon of human sentience is thus the remarkable event of a portion of this universe becoming aware of its own origination and

location within the spatio-temporal coordinates of our universe.)

Since galactic spirals, nebulae, quasars and other material structures are postulated vortices in a finite dimensional field structure where space has a certain tensor density at each dimensionally defined coordinate, this physical model conforms to Mach's principle. From an historical perspective it also follows the conceptual model of Renee Descartes, where "space is the essence of bodily substance." Matter consists of vortices in an aether, thus Descartes explains, "This primary matter, forced into a certain quantity of motion divinely bestowed, falls into a series of whirlpools of vortices, in which the visible bodies such as planets and terrestrial objects are carried around or impelled toward certain central points by the laws of vortical motion" (Bartt, 1932).

The hope of Descartes to realize physical reality within a set of geometrical principles, lost in the work of Sir Isaac Newton, was realized in the thoroughly geometrical physics of Albert Einstein. To think, as Descartes did, in dimensions was also an integral part of Einstein's

"Generalized Theory of Relativity." Essentially what has been proposed in this postulation is an extension of Einstein and Weyl's multi-dimensional field theoretic model to the realm of sub-atomic quantal description as well as to that puzzling phenomenon we commonly refer to as time.

## Part II

Osmer's (1982) observation of decreased density of quasar's distribution beyond the limits of Seyfert galaxies and other objects whose recessional velocity is close to  $c$  indicates that the universe may have an outer limit at  $\geq 15$  billion light years radius. Richard Gott, in his article "Creation of Open Universes from de Sitter Space," (1982), has shown how a potentially infinite number of universes may form in an extremely hot ( $5 \times 10^{31} \text{K}$ ) and exceedingly dense ( $3 \times 10^{93}$  grams per cubic centimeter) (Waldrop, 1982) de Sitter space. Using  $\Lambda$  (Einstein's cosmological constant), de Sitter space forms event horizons which in turn emit Hawking radiation where  $p_{\text{obs}} = p_{\text{Haw}}$  ( $p = \text{density}$ ) at the hyperboloid boundary of the event horizon. Since the

universe has an event horizon it must emit Hawking radiation as Hawking describes in "Black Hole Explosions?" (1974).

Hawking indicates "that any black hole will create and emit particles such as neutrons or photons at just the rate that one would expect if the black hole was a body with a temperature of  $(\hbar/2\pi) (\lambda/2\kappa) \approx 10^{-6} (M\theta/M)$  where  $\kappa$  is the surface gravity of the black hole (Bardeen, et al., 1973).

Scattering of these particles follows "the annihilation operators for outgoing scalar particles, can be expressed as a linear combination of the ongoing annihilation and creation operators  $a_i$  and  $a_i^\dagger$

$$b_i = \sum_j [\bar{\alpha}_{ij} a_j - \beta_{ij} a_j^\dagger]$$

where  $b_i$  is the annihilation operator for outgoing scalar particles and  $\beta_{ij}$  "are a complete orthonormal family of complex valued solutions of the wave equation  $\nabla_{ab} g^{ab} = 0$  which are asymptotically ingoing and positive frequency--they contain only positive frequencies on past null infinity I. The position-independent operators  $a^\wedge$  are interpreted as annihilation and creation operators respectively for incoming scalar particles (Hawking, 1974).

Furthermore, it is stated: "The total number of outgoing particles created in the frequency range  $\omega \rightarrow \omega + d\omega$  is  $d\omega |B_{\omega\omega}|^2 d\omega$ . From the above expression it can be seen that this is infinite. By considering outgoing wave packets which are peaked at a frequency  $\omega_0$  and at late retarded times one can see that this infinite number of particles corresponds to a steady rate of emission at late retarded times" (Hawking, 1974). In further elaborating this finding Hawking notes "... the number of particles emitted in this wave packet mode is  $(\exp(2\pi\omega/k)-1)^{-1}$  times the number of particles that would have been absorbed from a similar wave packet incident on the black hole from  $\Gamma$ . But this is just the relation between absorption and emission cross sections that one would expect from a body with a temperature in geometric units of  $\kappa/2\pi$ . Similar results hold for massless fields of any integer spin. For half integer spin one again gets a similar result except that the emission cross section is  $(\exp(2\pi\omega/k)+1)^{-1}$  times the absorption cross section as one would expect for thermal emission of fermions. These results do not seem to depend on the assumption of exact spherical symmetry which merely

simplifies the calculation."

Emission and adsorption of sub-atomic particles at the event horizon of the universe's hyperboloid bubble wall where, " $\rho_{\text{obs}} = \rho_{\text{Haw}}$  ensures a smooth transition from observer-dependent Hawking radiation to the observer-independent ( $\rho = \rho/3$ ) Hawking radiation." (Gott, 1982) ( $\rho = \text{density}$ ) It should be noted, in passing, that this result where the thermodynamical similarity between  $k$  and temperature forms from these equations, i.e.  $(\kappa/2\pi)$  may be more than an analogy and may further illustrate the mathematical observations of Armand Wyler.

The conclusion of Part I mentions quantal events' impingement from (U, Universe)  $U_2, U_3 \dots, U_n$  upon  $U_1$ . The observer within  $U_1$  though "setting  $\rho_{\text{obs}} = \rho_{\text{Haw}}$  ensures a smooth transition from observer-dependent Hawking radiation to the observer-independent ( $\rho = \rho/3$ ) Hawking radiation" (Gott, 1982). Incoming Hawking radiation, it is here posited, constitutes the high energy background scatter commonly referred to as cosmic rays. "Unruh (1976) has shown that accelerated observers in Minkowski space see Rindler-Hawking photons with a

temperature  $T = g/2\pi = 1/\pi\sigma$ : For each timelike world-line moving with the wall material one can find a de Sitter static coordinate system (Gibbons and Hawking, 1977).

$$ds^2 = - (1-\lambda r^2/3) dt^2 + dr^2 (1-\lambda r^2/3)^{-1} + r^2(d\theta^2 + \sin^2\theta d\phi^2)$$

such that the world-line is a line of constant  $\theta$ ,  $\phi$  and  $r = (r_0^2 - \sigma^2)^{1/2}$  such an observer sees Hawking photons with temperature  $T = 1/2\pi\sigma$  as Gott (1982) concludes:

"In conclusion,  $\kappa = -1$  universes may be created naturally from a de Sitter false vacuum state. These universes will have cosmological event horizons and should be filled with Hawking radiation."

A primary conclusion of this paper is that the universe bubbles formed as Gott (1982) views them by a "quantum traveling event; (where) our Universe is one of the normal vacuum bubbles," have dense tensor fields as a postulated mechanism for the induction of time measurements. The pressure (P) of fields of this and others such as would exist for electromagnetism and the weak and strong inter-atomic binding force allows the  $P/\rho$  of  $U_1$ , to balance the  $P/\rho$  of de Sitter false vacuum, ( $\rho =$  density) Universe would in this

formulation oscillate due to an interplay between expansionary (big bang) energies of origination and that of cHaw in de Sitter space. A universe such as ours would, under this postulation, oscillate from complete extension to contraction yet be eternal since time itself would be a direct product and employment of a universe's very existence. Each of the arbitrarily large but finite number of disjoint universes seen by Gott's (1982) theory might also enjoy a similar oscillatory existence.

### Part III

An arbitrarily large number of universes may form in de Sitter space. Should this be the case, then this formation may provide an optical as well as other electro-magnetic frequency signature as they should emit Hawking radiation as it is now termed. Gamma ray bursters which are of the type found at cosmological distances are deemed instances of universe formation in this analysis. (Fishman, 1995)

[http://antwrp.gsfc.nasa.gov/diamond\\_jubilee/papers/fishma](http://antwrp.gsfc.nasa.gov/diamond_jubilee/papers/fishma)

n.html

As would be expected in this postulation, their distribution is completely isotropic. Thus their formation cannot be ascribed to the distribution of galaxies or galactic clusters or other similar congeries of matter. Also, their energy flux is far greater than other luminous objects showing some quintillions of solar emittances for a period lasting from microseconds to approximately a thousand seconds,

The generation of the singularity necessary for universe formation in a probabilistic sense has origin in the highly energetic conditions found in de Sitter space. Where these conditions coincide with sufficient regularity that they form a singularity with infinite pressure, density and temperature is a mathematically predictable extension of those highly energetic conditions which are postulated to exist a priori in de Sitter space. Oscillatory reactance in an infinitely large reservoir of electrical potential creates the inverse operation of  $1/\aleph$  null, this infinite space creates the mathematical

expectation of its inverse with oscillations of electrical potential described by  $i$  (square root of minus one) it is conjectured.

Since our universe has been described as a black hole, the infinite density of the field provides for a time retardation factor thus time's progress is slow relatively to those events external to the black hole, i.e.,  $T_A > T_V$ , where  $T_A$  = our universe's time progression in contrast to  $T_V$  which is the time interval measured from  $T_A$ .

The larger  $\sim 1000$  second versus microsecond time intervals for the gamma ray burster's universe formation may be accounted for by the formation of a progressive incursion from the false de Sitter vacuum. The propagation of the field effects from de Sitter space noted here then induces black hole formation which attain the limits of their expansional integrity under this postulation followed by reaching the limits of their expansional integrity whereupon the potential barrier towards de Sitter space would weaken permitting a rent or tear to propagate in the black hole's field

properties. Thus an alternate history of Universe formation is brought forward, in contrast to the oscillatory models proposed so far, to account for the physical evidence from gamma-ray bursters.

Current observations indicate that there are ~ 300 of gamma ray bursts in a year's time. It may be emphasized that the province of this theory is limited to those gamma ray bursts of cosmological origin. No theory presented in the literature may count for the extent of energies found in these energy fluxes lasting from a few microseconds to over 1000 seconds. These energies are equivalent to all the energy sources during their time of the emission.

In this exegesis, a statistically improbable event may induce this large flux of energy. Under this postulation, an n-dimensional implosion of the constituents of de Sitter space would trigger the formation of a singularity necessary for universe formation. A similar postulation has been brought forward in the literature regarding gamma ray bursts having origin in a quark sea.

<http://uplink.space.com/showflat.php?Cat=&Board=sciastro&Number=157936&page=5&view=collapsed&sb=3&o=0&fpart=>

The statistical improbability of forming an n-dimensional implosion is distributed over an infinite reservoir of de Sitter space with a potentially infinite number of concatenations existing in this reservoir. Thus singularities of a potentially infinite quantity are generated which are visible from the essentially central location we inhabit. The essential difficulty of finding a novel energy source of these dimensions is thus accounted for.

The isotropy of these bursts is thus understood since they may appear in any location within this infinite reservoir. This location and is not dependent on preconditions found in our universe. The inhomogeneity of these bursts may be comprehended within the postulation of alternate formulations of the central constants found their universe formation such as the strength of the weak and strong interatomic binding forces as well as quark forces including

gluons. Clearly, also, the gravitational constant.  $G$ , should vary between universes under this formulation.

May we, therefore, inaugurate the new science of Comparative Cosmology and use spectral and bolometric analyses, etc., elucidating these fundamental differences in universe construction and evolution.

This science should then categorize these Gamma Ray burst into well-defined types in accordance with their relative durations. This analysis should clarify our understanding of the ontogenesis of universe determinants. We may recall for this analysis mathematical descriptions such as Hausdorff Dimension (Schelecter, 2007) which should enable us to describe these structures in a coherent mathematical description.

Thus for Comparative Cosmology we may take all the variables described throughout this work and permute them mathematically in conjunction with other relevant variables as described herein. In only a statistically insignificant number of these possibilities would life as we experience it be deemed possible. We may herald this new science of

comparative cosmology as a testing ground for  
mathematical and physical understanding of the extant  
cosmos as we extend the Copernican Revolution to the  
discovery of new universes in the context of modern  
astrophysics,

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