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Understanding Cosmic Temperature, Redshift, Growth Rate and Age in Stoney Scale Black Hole Cosmology

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Keywords: mach's principle, stoney mass, black hole cosmology, cosmic growth index, cosmic growth rate, hubble potential, cosmic redshift, cosmic age, halting of cosmic expansion, final unification.

I. Introduction

Using the Hubble space telescope it has been determined that there are about 9×10^{21} stars in the observable universe. Assuming an average stellar mass based on the Sun of mass 2×10^{30} kg, the universe's visible mass can be calculated to be about $1.8\times10^{52\pm1}$ kg. Another similar estimate obtained by [2] was 2.4×10^{52} kg. A recent study has tripled the number of estimated red dwarf stars in elliptical galaxies so this may be an underestimate.

Michael E. McCulloch says [3]: For an observer in an expanding universe there is a maximum volume that can be observed, since beyond the Hubble distance the velocity of recession is greater than the speed of light and the redshift is infinite: this is the Hubble volume. Its boundary is similar to the event horizon of a black hole because it marks a boundary to what can be observed. This means that it is reasonable to assume that Hawking radiation is emitted at this boundary both outwards and inwards to conserve energy, and any wavelength that does not fit exactly within this size cannot be allowed for the inwards radiation, and therefore also for the outwards radiation. According to Hawking, the mass of a black hole is linearly related to its temperature or inversely-linearly related to the wavelength of the Hawking radiation it emits. Therefore, for a given size of the universe there is a maximum Hawking wavelength it can have and a minimum allowed gravitational mass it can have. If its mass was less than this then the Hawking radiation would have a wavelength that is bigger than the size of the observed universe and would be disallowed. The minimum mass it predicts is $(4.6\pm0.4)\times10^{52}$ kg and is encouragingly close to the observed mass of the Hubble volume. It can be called as the 'current hubble mass'. Note that by considering 'hubble volume' and 'hubble mass', distance cosmic back ground can be quantified and by finding the applications of hubble mass, Mach's principle can be implemented successfully in cosmology.

Authors published their concepts on black hole cosmology in many online journals [4-13]. In this paper by highlighting the basic short comings of modern cosmology [14] an attempt is made to review the model of black hole cosmology [15-28] in terms of cosmic redshift, CMBR redshift, cosmic growth index, cosmic growth rate and cosmic age. According to standard cosmology, since decoupling, the temperature of the cosmic background radiation has dropped by a factor of roughly 1100 due to the expansion of the universe. As

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the universe expands, the CMB photons are redshifted, making the radiation's temperature inversely proportional to a parameter called the universe's scale factor. If T_t is the temperature of the CMB and z is the observed redshift, then $T_t \cong (1+z)2.725\ \mathrm{K}$ where $(1+z)$ is known as the universal scale factor. Extending this concept, in this paper an attempt is made to re-interpret and re-understand the observed cosmic redshift in the following way. 1) If it is true that galaxy constitutes so many stars, each star constitutes so many hydrogen atoms and light is coming from the excited electron of hydrogen atom, then considering redshift as an index of 'whole galaxy' receding [29,30] may not be reasonable. 2) If light is coming from the atoms of the gigantic galaxy, then instead of wavelength difference, in terms of 'quantum of energy' redshift can also be interpreted as an index of the galactic cosmological atomic 'light emission mechanism' and emitted quantum of energy is inversely proportional to the CMB temperature. 3) According to the modern cosmological approach, bound systems like 'atoms' which are found to be the major constituents of galactic matter - will not change with cosmic expansion/ acceleration. As per the present observational data this may be true. But it might be the result of ending stage of cosmic expansion. As the issue is directly related with unification it requires lot of research in basic physics to confirm. In this regard, without considering and without analysing the past data, one can not come to a conclusion. If one is willing to think in this direction observed galactic redshift data can be considered for this type of new analysis.

In 1947 Hubble himself stated [30] that: "We may predict with confidence that the 200 inch will tell us whether the red shifts must be accepted as evidence of a rapidly expanding universe, or attributed to some new principle in nature. Whatever may be the answer, the result may be welcomed as another major contribution to the exploration of the universe."

Friedmann made two simple assumptions about the universe. They can be stated in the following way.

1. When viewed at large enough scales, universe appears the same in every direction.
2. When viewed at large enough scales, universe appears the same from every location.

In this regard Hawking says : "There is no scientific evidence for the Friedmann's second assumption. We believe it only on grounds of modesty: it would be most remarkable if the universe looked the same in every direction around us, but not around other points in the universe". This is one key point to be noted here. The term 'critical density' is the back bone of modern cosmology. At any time in the past, it is generally expressed in the following way.

$$(\rho_c)_t \cong \frac{3H_t^2}{8\pi G} \tag{1}$$

Its current expression is as follows.

$$(\rho_c)_0 \cong \frac{3H_0^2}{8\pi G} \tag{2}$$

According to standard Friedmann cosmology,

1. If matter density is greater than the critical density, universe will have a positive curvature.
2. If matter density equals the critical density, universe will be flat.
3. If matter density is less than the critical density, universe will have a negative curvature.

But by considering 'black hole geometry' as the 'eternal cosmic geometry' and by assuming 'constant light speed rotation' throughout the cosmic evolution, at any time the currently believed cosmic 'critical density' can be shown to be the cosmic black hole's eternal 'volume density'. If mass of the black hole universe is M_t, (c/H_t) is the radius of the black hole universe that rotates at light speed with angular velocity H_t, at any time in the past,

$$\frac{2GM_t}{c^2} \cong \frac{c}{H_t} \text{ and } M_t \cong \frac{c^3}{2GH_t}.$$

$$(\rho_v)_t \cong (M_t)\left[\frac{4\pi}{3}\left(\frac{c}{H_t}\right)^3\right]^{-1} \tag{3}$$

$$\cong \left(\frac{c^3}{2GH_t}\right)\left[\frac{3}{4\pi}\left(\frac{H_t}{c}\right)^3\right] \cong \frac{3H_t^2}{8\pi G} \tag{4}$$

At present,

$$(\rho_v)_0 \cong (M_0)\left[\frac{4\pi}{3}\left(\frac{c}{H_0}\right)^3\right]^{-1}$$

$$\cong \left(\frac{c^3}{2GH_0}\right)\left[\frac{3}{4\pi}\left(\frac{H_0}{c}\right)^3\right] \cong \frac{3H_0^2}{8\pi G} \tag{5}$$

Clearly speaking, when the currently believed 'critical density' itself represents the mass density of a light speed rotating black hole universe and as there is no observational or experimental evidence to Friedmann's second assumption, the density classification scheme of Friedmann cosmology must be reviewed at fundamental level. Proceeding further, the basic shortcomings of modern cosmology can be expressed as follows. For more information see the authors published self references [4-13].

1. No direct observational evidence to Friedmann's second assumption [31]. We believe it only on the grounds of modesty. Really if there was a 'big bang'

in the past, with reference to formation of the big bang as predicted by general theory of relativity and with reference to the cosmic expansion that takes place simultaneously in all directions at a uniform rate at that time about the point of big bang - 'point' of big bang can be considered as the centre or characteristic reference point of cosmic expansion in all directions. In this case, saying that there is no preferred direction in the expanding universe - may not be correct.

2. No theoretical base in considering the Hubble's constant merely as the cosmic expansion parameter. With coefficient of unity, if one is willing to consider (c/H_0) as a characteristic length, then based on elementary dimensional analysis it is very simple to show that, dimensions of H_t are rad/sec and thus with a coefficient of unity and with reference to the characteristic light speed, H_t can be considered as cosmic angular velocity. Note that, in any case if length coefficient is less than unity or greater than unity, 'Hubble length' may loose its physical identity.
3. 'Rate of decrease in current 'Hubble's constant' can be considered as a measure of current cosmic 'rate of expansion'. If rate of decrease in current 'Hubble's constant is very small and is beyond the scope of current experimental verification, then the two possible states are: a) current 'Hubble's constant is decreasing at a very slow rate and current universe is expanding at a very slow rate and b) at present there is no 'observable' cosmic expansion or acceleration. To understand the ground reality, sensitivity and accuracy of current methods of estimating the magnitude of H_0 must be improved.
4. When Friedmann's cosmology was taking its final shape, black hole physics was in its beginning stage. Recent observations confirm the light speed rotation of black holes. So far no theoretical proof is available for cosmic non-rotation. So far no experimental or observational evidence is available for super luminal rotation speed of any celestial object. By considering 'black hole geometry' as the 'eternal cosmic geometry' and by assuming 'constant light speed rotation' with Hubble constant as angular velocity, throughout the cosmic evolution, at any time the currently believed cosmic 'critical density' can be shown to be the cosmic black hole's eternal 'mass density'. If so it is possible to suggest that, there is no theoretical base in Friedmann's 'critical density' concept and the 'matter density' classification scheme.
5. If it is true that galaxy constitutes so many stars, each star constitutes so many hydrogen atoms and light is coming from the excited electron of hydrogen atom, then considering redshift as an index of 'whole galaxy' receding [29,30] may not be reasonable. Merely by estimating galaxy distance and without measuring galaxy receding speed, one cannot verify its receding speed or acceleration. (Clearly speaking: two mistakes are being possible here. i) Assumed galaxy receding speed is not being measured and not being confirmed. ii) Without measuring and confirming the galaxy receding speed, how can one say and confirm that it (galaxy) is accelerating). More over no direct observational evidence for the current cosmic acceleration and the dark energy [32,33].
6. If one is willing to accept 'Planck mass' as the characteristic beginning 'mass scale' of the expanding universe, by substituting the geometric mean mass of current hubble mass and Planck mass in the famous Hawking's black hole temperature formula automatically the observed 2.725 K can be fitted very accurately [9,10,11]. One should not ignore this coincidence. Note that, drop in current 'cosmic temperature' can be considered as a measure of the current cosmic expansion and 'rate of decrease in current cosmic temperature' can be considered as a measure of the current cosmic 'rate of expansion'. But if rate of decrease in temperature is very small and is beyond the scope of current experimental verification, then the two possible states are: a) current cosmic temperature is decreasing at a very slow rate and current universe is expanding at a very slow rate and b) at present there is no 'observable' thermal expansion and there is no 'observable' cosmic expansion. If observed CMBR temperature is 2.725 K and is very low in magnitude and is very close to absolute zero, then thinking about and confirming the 'cosmic acceleration' may not be reasonable.
7. So far no ground based experiment confirmed the existence of dark energy. There is no single clue or evidence to any of the natural physical properties of (the assumed) dark energy. If 'Dark energy' is the major outcome of the 'accelerating universe', it is very important to note that - in understanding the basic concepts of unification or other fundamental areas of physics, role of dark energy is very insignificant. If existence of dark energy is true and dark energy is supposed to have a key role in the past and current cosmic expansion, then it must have also played a key role in the beginning of cosmic evolution. In this regard no information is available in standard cosmology. It casts doubt on the existence of 'dark energy'.
8. Mach's principle is not being implemented in standard cosmology. To understand the beauty of Mach's principle, distance cosmic back ground must be quantified.

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9. No comparative and relational study in between Friedmann cosmology, Mach's principle and microscopic physical phenomena.

II. Possible Assumptions and Possible Explanation

Possible assumptions in unified cosmic physics can be expressed in the following way.

Assumption-1: With reference to the elementary charge and with mass similar to the Planck mass, a new mass unit can be constructed in the following way. It can be called as the Stoney mass.

$$(M_S)^{\pm} \cong \sqrt{\frac{e^2}{4\pi\varepsilon_0 G}} \cong 1.859272\times10^{-9}\ \text{Kg} \tag{6}$$
$$\cong 1.042975\times10^{18}\ \text{GeV/c}^2$$

Assumption-2: At any time Hubble length (c/H_t) can be considered as the gravitational or electromagnetic interaction range.

Assumption-3: At any time, H_t being the angular velocity, universe can be considered as a growing and light speed rotating primordial black hole. Thus at any given cosmic time,

$$R_t \cong \frac{2GM_t}{c^2} \cong \frac{c}{H_t} \text{ and } M_t \cong \frac{c^3}{2GH_t} \tag{7}$$

If $H_0 \cong 70$ km/sec/Mpc,

$M_0 \cong 8.8984\times10^{52}$ kg and $R_0 \cong 1.32153\times10^{26}$ m.

when $M_t \to M_S$,

$$R_S \cong \frac{2GM_S}{c^2} \text{ and } H_S \cong \frac{c}{R_S} \cong \frac{c^3}{2GM_S} \tag{8}$$

can be considered as the characteristic initial physical measurements of the universe. Here the subscript S refers to the initial conditions of the universe and can be called as the Stoney scale. Similarly

$$R_0 \cong \frac{2GM_0}{c^2} \cong \frac{c}{H_0},\ M_0 \cong \frac{c^3}{2GH_0} \text{ and } H_0 \cong \frac{c^3}{2GM_0} \tag{9}$$

can be considered as the characteristic current physical measurements of the universe.

Assumption-4: During cosmic evolution, at any time the past , in hydrogen atom emitted photon energy was always inversely proportional to the cosmic temperature. Thus past light emitted from older galaxy's hydrogen atom will show redshift with reference to the current laboratory data. There will be no change in the energy of the emitted photon during its journey from the distant galaxy to the observer.

$$\frac{E_t}{E_0} \cong \frac{\lambda_0}{\lambda_t} \cong \frac{T_0}{T_t} \tag{10}$$

Here, E_t is the energy of emitted photon from the galactic hydrogen atom and E_0 is the corresponding energy in the laboratory. λ_t is the wave length of emitted and received photon from the galactic hydrogen atom and λ_0 is the corresponding wave length in the laboratory. T_t is the cosmic temperature at the time when the photon was emitted and is T_0 the current cosmic temperature.

Assumption-5: At any given time, ratio of volume energy density and thermal energy density can be called as the cosmic growth index and can be expressed as follows.

$$\frac{3H_t^2c^2}{8\pi GaT_t^4} \cong \left[1+\ln\left(\frac{M_t}{M_S}\right)\right]^2 \cong \left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^2 \tag{11}$$
$$\cong \text{Cosmic Growth index}$$

Thus at the Stoney scale,

$$\frac{3H_S^2c^2}{8\pi GaT_S^4} \cong \left[1+\ln\left(\frac{M_S}{M_S}\right)\right]^2 \cong \left[1+\ln\left(\frac{H_S}{H_S}\right)\right]^2 \cong 1 \tag{12}$$

Assumption-6: At any given time, cosmic black hole's growth rate can be expressed as $g_t \cong \left(\frac{3H_t^2c^2}{8\pi GaT_t^4}\right)^{-1} c$. With this idea and by considering the average growth rate cosmic age can be estimated.

$$g_t \cong \text{Cosmic growth rate} \cong \frac{c}{\text{cosmic growth index}}$$
$$\cong \left(\frac{3H_t^2c^2}{8\pi GaT_t^4}\right)^{-1} c \cong \left[1+\ln\left(\frac{M_t}{M_S}\right)\right]^{-2} c \cong \left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^{-2} c \tag{13}$$

At the Stoney scale,

$$g_S \cong \left(\frac{3H_S^2c^2}{8\pi GaT_S^4}\right)^{-1} c \cong \left[1+\ln\left(\frac{M_S}{M_S}\right)\right]^{-2} c$$
$$\cong \left[1+\ln\left(\frac{H_S}{H_S}\right)\right]^{-2} c \cong c \tag{14}$$

a) *Possible Explanation for the proposed Assumptions*

To have some clarity and to have some quantitative measurements and fittings of initial and current states of the black hole universe - instead of considering 'star - black hole explosions' and 'higher dimensions', the authors of this paper focused their attention only on the old and famous Mach's principle [34], 'Hubble volume' and 'primordial evolving black holes'. Some cosmologists use the term 'Hubble volume' to refer to the volume of the observable universe. There is no perfect theory that defines the

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lower and upper limits of a massive black hole. Most of the theoretical models assume a lower mass limit close to the 'Planck mass'. Astronomers believe that black holes that are as large as a billion solar masses can be found at the centre of most of the galaxies. Here the fundamental questions to be answered are: If the galactic central black hole mass is 10 billion solar masses and density is less than 1 kg/m^3 - with such a small density and large mass, without collapsing - how it is able to hold a gigantic galaxy? What force makes the black hole stable? Recent observations confirm that, instead of collapsing, galactic central black holes are growing faster and spinning with light speed. Even though mass is too high and density is too low, light speed rotation certainly helps in maintaining black hole's stability from collapsing with maximum possible outward radial force of the magnitude close to $\left(c^4/G\right)$. Based on these points the authors propose the following picture of Black hole cosmology. Forever rotating at light speed, high temperature and high angular velocity small sized primordial cosmic black hole of mass $M_S \cong \sqrt{e^2/4\pi\varepsilon_0 G}$ gradually transforms into a low temperature and low angular velocity large sized massive primordial cosmic black hole. At any given cosmic time, for the primordial growing black hole universe, its 'Schwarzschild radius' can be considered as its characteristic possible minimum radius and 'constant light speed rotation' will give the maximum possible stability from collapsing. Here $M_S \cong \sqrt{e^2/4\pi\varepsilon_0 G}$ can be called as the mass of the primordial baby black hole universe. Here 4 important points can be stated as follows.

1. It is well known that e, c, G play a vital role in fundamental physics. With these 3 constants space-time curvature concepts at a charged particle surface can be studied. Note that the basic concept of unification is to understand the origin of 'mass' of any particle. Mass is the basic property in 'gravitation' and charge is the basic property in 'atomicity'. So far no model established a cohesive relation in between 'electric charge' and 'mass' of any 'elementary particle' or 'cosmic dust'. From physics point of view, the fundamental questions to be answered are: 1) Without charge, is there any independent existence to "mass"? 2) Without mass, is there any independent existence to "charge"? From cosmology point of view the fundamental questions to be answered are: 1) What is 'cosmic dust'? 2) Without charge, is there any independent existence to "cosmic dust"? From astrophysics point of view the fundamental questions to be answered are: 1) Without charge, is there any independent existence to 'mass' of any star? 2) Is black hole – a neutral body or electrically a neutralized body? To understand these questions the authors made an attempt to construct the above unified mass unit. It is having a long history. It was first introduced by the physicist George Johnstone Stoney [35]. He is most famous for introducing the term 'electron' as the 'fundamental unit quantity of electricity'. With this mass unit in unification program with a suitable proportionality it may be possible to represent the characteristic mass of elementary charge. It can be considered as the seed of galactic matter or galactic central black hole. It can also be considered as the seed of any cosmic structure. If 2 such oppositely charged particles annihilates, a large amount of energy can be released. If so under certain extreme conditions at the vicinity of massive stars or black holes, a very high energy radiation can be seen to be emitted by the pair annihilation of M_S. With this mass unit, proton-electron mass ratio and proton and electron rest masses can be fitted. Thus with reference to the elementary charge and electron & proton rest masses, magnitude of the gravitational constant can be fitted [4,5].
2. In theoretical physics, particularly in discussions of gravitation theories, Mach's principle is the name given by Einstein to an interesting hypothesis often credited to the physicist and philosopher Ernst Mach. The idea is that the local motion of a rotating reference frame is determined by the large scale distribution of matter. With reference to the Mach's principle and the Hubble volume, at any cosmic time, if 'Hubble mass' is the product of cosmic 'critical density' and the 'Hubble volume', then it can be suggested that, i) Each and every point in the free space is influenced by the Hubble mass, ii) Hubble volume and Hubble mass play a vital role in understanding the properties of electromagnetic and nuclear interactions and iii) Hubble volume and Hubble mass play a key role in understanding the geometry of the universe. With reference to the famous Mach's principle, 'Hubble volume' and 'Hubble mass' both can be considered as quantitative measurements of the 'distance cosmic back ground'. As a first attempt, in this paper authors proposed a semi empirical relation that connects the CMBR energy density, Hubble's constant and $\sqrt{e^2/4\pi\varepsilon_0 G}$.
3. Starting from an electron to any gigantic galaxy, rotation is a common phenomenon in atomic experiments and astronomical observations. From Newton's laws of motion and based on the Mach's principle, sitting inside a closed universe, one cannot comment whether the universe is rotating or not. We have to search for alternative means for confirming the cosmic rotation. Recent findings from the University of Michigan [36] suggest that the

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shape of the Big Bang might be more complicated than previously thought, and that the early universe spun on an axis. A left-handed and right-handed imprint on the sky as reportedly revealed by galaxy rotation would imply the universe was rotating from the very beginning and retained an overwhelmingly strong angular momentum. An anonymous referee who reviewed the paper for Physics Letters said, "In the paper the author claims that there is a preferred handedness of spiral galaxies indicating a preferred direction in the universe. Such a claim, if proven true, would have a profound impact on cosmology and would very likely result in a "Nobel prize". The consequences of a spinning universe [36-49] seem to be profound and natural. Not only that, with 'constant rotation speed' 'cosmic collapse' can be prevented and can be considered as an alternative to the famous 'repulsive gravity' concept. If so, at any time to have maximum possible stability from collapsing 'constant light speed rotation' can be considered as a constructive and workable concept.

4. Recent observations confirm black hole's light speed rotation. In 2013 February, using NASA's newly launched NuStar telescope and the European Space Agency's workhorse XMM-Newton, an international team observed high-energy X-rays released by a super massive black hole in the middle of a nearby galaxy. They calculated its spin at close to the speed of light: 670 million mph [50,51].Please note that, for any black hole even though its mass is too high and density is too low, light speed rotation certainly helps in maintaining its stability from collapsing with maximum possible outward radial force of magnitude $\left(c^4/G\right)$. At the beginning of comic evolution if rotation speed was zero and there was no big bang - definitely it will cast a doubt on the stability, existence and angular velocity of the assumed initial primordial cosmic baby black hole. Hence at the beginning also, to guess or define the angular velocity and to have maximum possible stability it is better to assume light speed rotation for the cosmic baby black hole. At present if rate of cosmic expansion is very slow, then rate of decrease in angular velocity will be very small and practically can be considered as zero. Along with (practically) constant angular velocity, at present if constant light speed rotation is assumed to be maintained then cosmic stability will be maximum and rate of change in cosmic size will be practically zero and hence this idea helps us to believe in present Hubble length along with the observed ordered galactic structures and uniform thermal energy density.

b) To Reinterpret the Hubble's constant

With a simple derivation it is possible to show that, Hubble's constant H_t represents the cosmological angular velocity. Authors presented this derivation in their published papers. Basic idea of this derivation is to express the angular velocity of any rotating celestial body in terms of its mass, radius, mass density and surface escape velocity. Assume that, a planet of mass M and radius R rotates with angular velocity ω_e and linear velocity v_e in such a way that, free or loosely bound particle of mass m lying on its equator gains a kinetic energy equal to potential energy as,

$$\frac{1}{2}mv_e^2 = \frac{GMm}{R} \tag{15}$$

$$R\omega_e = v_e = \sqrt{\frac{2GM}{R}} \text{ and } \omega_e = \frac{v_e}{R} = \sqrt{\frac{2GM}{R^3}} \tag{16}$$

i.e Linear velocity of planet's rotation is equal to free particle's escape velocity. Without any external power or energy, test particle gains escape velocity by virtue of planet's rotation. Note that if Earth completes one rotation in one hour then free particles lying on the equator will get escape velocity. Now writing $M = \frac{4\pi}{3}R^3\rho_e$,

$$\omega_e = \frac{v_e}{R} = \sqrt{\frac{8\pi G\rho_e}{3}} \text{ Or } \omega_e^2 = \frac{8\pi G\rho_e}{3} \tag{17}$$

$$\text{Density, } \rho_e = \frac{3\omega_e^2}{8\pi G} \tag{18}$$

In real time, this obtained density may or may not be equal to the actual density. But the ratio $\frac{8\pi G\rho_{real}}{3\omega_{real}^2}$ may have some physical significance. The most important point to be noted here, is that, as far as dimensions and units are considered, from equation (18), it is very clear that, proportionality constant being $\frac{3}{8\pi G}$,

$$\text{density} \propto (\text{angular velocity})^2 \tag{19}$$

Equation (18) is similar to "flat model concept" of cosmic "critical density"

$$\rho_c = \frac{3H_t^2}{8\pi G} \tag{20}$$

Comparing equations (18) and (20) dimensionally and conceptually, i.e.

$$\rho_e = \frac{3\omega_e^2}{8\pi G} \text{ with } \rho_c = \frac{3H_t^2}{8\pi G} \tag{21}$$

$$H_t^2 \to \omega_e^2 \text{ and } H_t \to \omega_e \tag{22}$$

It is very clear that, dimensions of 'Hubble's constant' must be 'radian/second'. In any physical system under study, for any one 'simple physical parameter' there will not be two different units and there will not be two different physical meanings. This is a simple clue and brings 'cosmic rotation' into picture. This is possible in a closed universe only. Cosmic models that depend on this "critical density" may consider 'angular velocity of the universe' in the place of 'Hubble's constant'. In the sense, with a great confidence 'cosmic rotation' can be included in the existing models of cosmology. Then the term 'critical density' appears to be the 'volume density' of the closed and expanding universe. Thinking in this way, considering 'black hole geometry' as the 'eternal cosmic geometry' and by assuming 'constant light speed rotation' throughout the cosmic evolution, at any time the currently believed cosmic 'critical density' can be shown to be the cosmic black hole's eternal 'volume density'. Thus based on the Mach's principle, 'distance cosmic back ground' can be quantified in terms of 'Hubble volume' and 'Hubble mass'.

c) To Reinterpret the Cosmic redshift

If one is willing to consider the proposed assumptions, in hydrogen atom emitted photon energy can be understood as follows.

1. As the cosmic time increases cosmic angular velocity and hence cosmic temperature both decrease. As a result, during cosmic evolution, in hydrogen atom, binding energy increases in between proton and electron.
2. As cosmic temperature decreases, it requires more excitation energy to break the bond between electron and the proton. In this way, during cosmic evolution, whenever it is excited, hydrogen atom emits photons with increased quantum of energy.
3. Thus past light quanta emitted from old galaxy's excited hydrogen atom will have less energy and show a red shift with reference to the current laboratory magnitude.
4. During journey light quanta will not lose energy and there will be no change in light wavelength.
5. Galactic photon energy in hydrogen atom when it was emitted can be estimated as follows.

$$E_t \cong \frac{hc}{\lambda_t} \cong \left(\frac{T_0}{T_t}\right)\left(\frac{hc}{\lambda_0}\right) \cong \left(\frac{T_0}{T_t}\right)E_0 \qquad (23)$$

Here, λ_0 is the wavelength of photon in the laboratory.

E_t is the energy of received photon when it was emitted in the distant galaxy.

E_0 is the corresponding energy of photon in the current laboratory methods.

λ_t is the wavelength of emitted and received photon when it was emitted in the distant galaxy.

T_t is the cosmic temperature at the time when the photon was emitted and is T_0 the current cosmic temperature.

In subsection 2.5 an attempt is made to understand the cosmological thermodynamic light emission mechanism in hydrogen atom in a unified approach.

d) To Reinterpret the Hubble's Law

Based on the assumptions it is possible to say that, during cosmic evolution, as the universe is growing and rotating, at any time, any galaxy will have revolution speed as well as receding speed simultaneously and both can be expressed in the following way.

$$(V_G)_{revolution} \cong \left(\frac{r}{R_t}\right)c \cong rH_t \text{ where } r \le \left(R_t \cong \frac{c}{H_t}\right) \qquad (24)$$

r is the distance between galaxy and the cosmic center and R_t is the cosmic radius at time t.

$$(V_G)_{receding} \cong \left(\frac{r}{R_t}\right)g_t \cong \left(\frac{r}{R_t}\right)\left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^{-2} c \qquad (25)$$

$$\cong \left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^{-2} rH_t \cong \left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^{-2} (V_G)_{revolution}$$

$$\frac{(V_G)_{revolution}}{(V_G)_{receding}} \cong \left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^{2} \qquad (26)$$

Please note that both the relations are independent of the observed redshift. This is for further study.

e) To Understand the Cosmological Thermodynamic light Emission Mechanism

Physicists of the particle data group say [53]: "It is very tempting to make an analogy between the status of the cosmological 'Standard Model' and that of particle physics. In cosmology there are about 10 free parameters, each of which is becoming well determined, and with a great deal of consistency between different measurements. However, none of these parameters can be calculated from a fundamental theory, and so hints of the bigger picture, 'physics beyond the Standard Model,' are being searched for with ever more ambitious experiments. Despite this analogy, there are some basic differences. For one thing, many of the cosmological parameters change with cosmic epoch, and so the measured values are simply the ones determined today, and hence they are not 'constants,' like particle masses for example (although they are deterministic, so that if one knows their values at one epoch, they can be calculated at another). Moreover, the parameter set is not as well defined as it is in the particle physics Standard Model; different researchers will not necessarily agree on which parameters should be considered as free, and the set can be extended as the quality of the data improves. In a more general sense, the cosmological 'Standard Model' is much further from the underlying 'fundamental theory,' which will ultimately provide the values of the parameters from first principles. Nevertheless, any genuinely complete 'theory of everything' must include an explanation for the values of these cosmological parameters as well as the parameters of the Standard Model of particle physics".

Current magnitude of Hubble constant [53-57] is (67.80 ± 0.77) km/sec/Mpc, (68.1 ± 1.2) km/sec/Mpc, (67.3 ± 1.2) km/sec/Mpc, (69.7 ± 2.0) km/sec/Mpc, (70.0 ± 2.2) km/sec/Mpc, (70.6 ± 3.3) km/sec/Mpc, (73.8 ± 2.4) km/sec/Mpc, and (72.5 ± 2.5) km/sec/Mpc.

In a cosmological approach with various trial-error methods, at present in hydrogen atom, if $H_0 \cong 71$ km/sec/Mpc, Bohr radius [58] can be fitted as follows.

$$\begin{aligned}(a_B)_0 &\cong \left(\frac{4\pi\varepsilon_0 G m_p^2}{e^2}\right)\left(\frac{GM_0}{c^2}\right) \cong \left(\frac{4\pi\varepsilon_0 G m_p^2}{e^2}\right)\left(\frac{c}{2H_0}\right) \\ &\cong \left(\frac{4\pi\varepsilon_0 G m_p^2}{e^2}\right)\left(\frac{c}{2H_0}\right) \cong \frac{1}{2}\left(\frac{4\pi\varepsilon_0 G m_p^2}{e^2}\right)\left(\frac{c}{H_0}\right) \\ &\cong 5.27225 \times 10^{-11} \text{ m.}\end{aligned} \quad (27)$$

$\left(\frac{e^2}{4\pi\varepsilon_0 G m_p^2}\right)$ is the electromagnetic and gravitational force ratio of proton. This relation seems to be very simple and needs no further derivation. But reasons must be explored for the factor 2. For any physicist or cosmologist it will be a very big surprise. Note that, this relation is free from the famous reduced Planck's constant,electron rest mass and other arbitrary numbers or coefficients. After simplification and considering the ground state, it is possible to express the ground state potential energy of electron in the following way.

$$\begin{aligned}(E_{\text{pot}})_0 &\cong -\left(\frac{e^2}{4\pi\varepsilon_0 G m_p^2}\right)\left(\frac{e^2 c^2}{4\pi\varepsilon_0 G M_0}\right) \\ &\cong -\left(\frac{e^2}{4\pi\varepsilon_0 G m_p^2}\right)\left(\frac{e^2}{4\pi\varepsilon_0}\right)\left(\frac{1}{2}\frac{c}{H_0}\right)^{-1} \\ &\cong -2\left(\frac{e^2}{4\pi\varepsilon_0 G m_p^2}\right)\left(\frac{e^2 H_0}{4\pi\varepsilon_0 c}\right)\end{aligned} \quad (28)$$

Here $\left(\frac{e^2 H_0}{4\pi\varepsilon_0 c}\right)$ can be called as the current Hubble potential. Characteristic ground state kinetic energy of electron can be expressed in the following way.

$$\begin{aligned}(E_{\text{kin}})_0 &\cong \left(\frac{e^2}{4\pi\varepsilon_0 G m_p^2}\right)\left(\frac{e^2 c^2}{8\pi\varepsilon_0 G M_0}\right) \\ &\cong \left(\frac{e^2}{4\pi\varepsilon_0 G m_p^2}\right)\left(\frac{e^2}{4\pi\varepsilon_0}\right)\left(\frac{c^2}{2GM_0}\right) \\ &\cong \left(\frac{e^2}{4\pi\varepsilon_0 G m_p^2}\right)\left(\frac{e^2 H_0}{4\pi\varepsilon_0 c}\right)\end{aligned} \quad (29)$$

Characteristic ground state total energy of electron can be expressed in the following way.

$$\begin{aligned}(E_{\text{tot}})_0 &\cong -\left(\frac{e^2}{4\pi\varepsilon_0 G m_p^2}\right)\left(\frac{e^2 c^2}{8\pi\varepsilon_0 G M_0}\right) \\ &\cong -\left(\frac{e^2}{4\pi\varepsilon_0 G m_p^2}\right)\left(\frac{e^2}{4\pi\varepsilon_0}\right)\left(\frac{c^2}{2GM_0}\right) \\ &\cong -\left(\frac{e^2}{4\pi\varepsilon_0 G m_p^2}\right)\left(\frac{e^2 H_0}{4\pi\varepsilon_0 c}\right)\end{aligned} \quad (30)$$

If $H_0 \cong 71$ km/sec/Mpc, $(E_{\text{tot}})_0 \cong -13.66$ eV. Based on this coincidence, this proposed new concept can be given some consideration and it can be suggested that the best value of H_0 lies in between 70 and 71 km/sec/Mpc. Unfortunately these relations seem to be independent of the reduced Planck's constant [59,60]. If one is willing to linkup these relations with the observed 'discrete' energy spectrum of the hydrogen atom, then the desired cosmological light emission mechanism can be developed in a unified picture. Considering the concept of stationary orbits and jumping nature of electron, emitted photon energy can be expressed in the following way.

$$(E_{photon})_0 \cong \left(\frac{e^2}{4\pi\varepsilon_0 G m_p^2}\right)\left(\frac{e^2 H_0}{4\pi\varepsilon_0 c}\right)\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right] \quad (31)$$

where $n_1 = n_2 \cong 1, 2, 3, ..$ and $n_2 > n_1$. The best fit of H_0 can be obtained in the following way.

$$\left.\begin{aligned}\left(\frac{e^2}{4\pi\varepsilon_0 G m_p^2}\right)\left(\frac{e^2 H_0}{4\pi\varepsilon_0 c}\right) &\cong \frac{e^4 m_e}{32\pi^2 \varepsilon_0^2 \hbar^2} \\ \text{and } H_0 \cong \frac{G m_p^2 m_e c}{2\hbar^2} &\cong 70.738 \text{ km/sec/Mpc}\end{aligned}\right\} \quad (32)$$

At any time in the past - in support of the proposed cosmological red shift interpretation, above relations can be re-expressed as follows.

$$\left(E_{\text{pot}}\right)_t \cong -\left(\frac{T_0}{T_t}\right)\left(\frac{e^2}{4\pi\varepsilon_0 G m_p^2}\right)\left(\frac{e^2c^2}{4\pi\varepsilon_0 G M_0}\right)$$
$$\cong -2\left(\frac{T_0}{T_t}\right)\left(\frac{e^2}{4\pi\varepsilon_0 G m_p^2}\right)\left(\frac{e^2 H_0}{4\pi\varepsilon_0 c}\right) \quad (33)$$

$$\left(E_{\text{kin}}\right)_t \cong \left(\frac{T_0}{T_t}\right)\left(\frac{e^2}{4\pi\varepsilon_0 G m_p^2}\right)\left(\frac{e^2 H_0}{4\pi\varepsilon_0 c}\right) \quad (34)$$

$$\left(E_{\text{tot}}\right)_t \cong -\left(\frac{T_0}{T_t}\right)\left(\frac{e^2}{4\pi\varepsilon_0 G m_p^2}\right)\left(\frac{e^2 H_0}{4\pi\varepsilon_0 c}\right) \quad (35)$$

This can be considered as the base for the 'cosmological thermodynamic light emission mechanism'. At any time in the past, at any galaxy, emitted photon energy can be expressed as follows.

$$\left(E_{photon}\right)_t \cong \left(\frac{T_0}{T_t}\right)\left(\frac{e^2}{4\pi\varepsilon_0 G m_p^2}\right)\left(\frac{e^2 H_0}{4\pi\varepsilon_0 c}\right)\left[\frac{1}{n_1^2}-\frac{1}{n_2^2}\right] \quad (36)$$

This issue is for further study. Considering laboratory experiments on hydrogen atom or observations on distant galactic hydrogen atom, by studying the rate of increase in 'future redshift', the absolute rate of cosmic expansion can be verified. It can be understood as follows. From now onwards, as cosmic time passes, within a selected or predefined time span and within the scope of observational accuracy of galactic hydrogen atom's redshift or within the scope of experimental accuracy of laboratory hydrogen atom's redshift, if magnitude of 'rate of increase in future redshift' is gradually increasing, it is an indication of cosmic acceleration. If magnitude of 'rate of increase in future redshift' is practically constant, it is an indication of uniform rate of cosmic expansion. If magnitude of 'rate of increase in future redshift' is gradually decreasing, it is an indication of cosmic deceleration. If magnitude of 'rate of increase in future redshift' is zero, it is an indication of cosmic halt.

In a unified picture, electron's current quantum of angular momentum can be expressed as follows.

$$\hbar \cong \sqrt{\frac{M_0}{m_e}}\left(\frac{G m_p m_e}{c}\right) \cong \frac{G m_p\sqrt{m_e M_0}}{c} \cong \hbar_0$$
$$\cong \sqrt{\frac{c^3}{2GH_0 m_e}}\left(\frac{G m_p m_e}{c}\right) \cong \sqrt{\left(\frac{c}{H_0} \div \frac{2Gm_e}{c^2}\right)}\left(\frac{G m_p m_e}{c}\right) \quad (37)$$

If atomic nuclear mass increases in integral multiples of the proton mass, then the observed discreteness of the reduced Planck's constant can be expressed as follows.

$$n\hbar \cong \frac{G\left(n.m_p\right)\sqrt{m_e M_0}}{c} \cong n\hbar_0 \quad (38)$$

Where $n = 1, 2, 3, ..$ This issue is also for further study. At any time in the past, hypothetically, in terms of the current and past 'primordial' cosmic temperatures, it is possible to express the cosmological 'variable quantum of angular momentum' of electron in the following way. Whether it is virtual or real or speculative - to be confirmed from further study.

$$\hbar_t \cong \sqrt{\frac{T_t}{T_0}}.\hbar_0 \cong \sqrt{\frac{\lambda_t}{\lambda_0}}.\hbar_0 \quad (39)$$

It may be noted that, throughout the cosmic evolution, Planck's constant and the Uncertainty constant both can be conside-red as 'constants'. Now the fundamental questions to be answered are –

1. Is reduced Planck's constant – an output of the atomic system?
2. Is the reduced Planck's constant – a cosmological variable?
3. Is the Planck's constant – a cosmological constant?
4. How to understand and how to consider the constancy of the Planck's constant along with the variable reduced Planck's constant?
5. Is the condition, $\hbar \to (h/2\pi)$ an indication of saturation or halt of cosmological expansion?

III. Connecting Cosmic Thermal and Physical Parameters

a) *Cosmic Thermal Energy Density and Matter Energy Density*

It may be noted that connecting CMBR energy density with Hubble's constant is really a very big task and mostly preferred in cosmology. At any given cosmic time, thermal energy density can be expressed with the following semi empirical relation.

$$aT_t^4 \cong \left[1+\ln\left(\frac{M_t}{M_S}\right)\right]^{-2}\left(\frac{3H_t^2c^2}{8\pi G}\right)$$
$$\cong \left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^{-2}\left(\frac{3H_t^2c^2}{8\pi G}\right) \quad (40)$$

$$T_t \cong \left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^{-\frac{1}{2}}\left(\frac{3H_t^2c^2}{8\pi G a}\right)^{\frac{1}{4}} \quad (41)$$

With a suitable derivation if above expression is obtained, then certainly the subject of black hole cosmology is put into main stream physics. Thus at present, if H_0 is close to 71 km/sec/Mpc, obtained CMBR temperature is 2.723 K [53-57]. For the time being this can be considered as a remarkable discovery and an accurate fit.

$$aT_0^4 \cong \left[1+\ln\left(\frac{H_S}{H_0}\right)\right]^{-2}\left(\frac{3H_0^2c^2}{8\pi G}\right)$$
$$\cong \left[1+\ln\left(\frac{M_0}{M_S}\right)\right]^{-2}\left(\frac{3H_0^2c^2}{8\pi G}\right) \quad (42)$$

$$T_0 \cong \left[1+\ln\left(\frac{H_S}{H_0}\right)\right]^{-\frac{1}{2}}\left(\frac{3H_0^2c^2}{8\pi Ga}\right)^{\frac{1}{4}} \quad (43)$$

With reference to the current cosmic temperature, at any time in the past,

$$\frac{T_t}{T_0} \cong \left\{\frac{\left[1+\ln\left(\frac{H_S}{H_0}\right)\right] H_t}{\left[1+\ln\left(\frac{H_S}{H_t}\right)\right] H_0}\right\}^{\frac{1}{2}} \quad (44)$$

Using this relation, cosmic redshift data can be fitted. When the assumed CMBR temperature is 2999 K, esti-mated redshift is 1099 and is in very good agreement with the standard model of cosmology.

Mostly at the ending stage of expansion, rate of change in H_t will be practically zero and can be considered as practically constant. Thus at its ending stage of expansion, for the whole cosmic black hole as H_t practically remains constant, its corresponding thermal energy density will be 'the same' throughout its volume. This 'sameness' may be the reason for the observed 'isotropic' nature of the current CMB radiation. With this coincidence it can be suggested that, at the beginning of cosmic evolution,

$$aT_S^4 \cong \left(\frac{3H_S^2c^2}{8\pi G}\right) \quad (45)$$

Matter-energy density can be considered as the geometric mean density of volume energy density and the thermal energy density and it can be expressed with the following semi empirical relation.

$$(\rho_m)_t c^2 \cong \sqrt{\left(\frac{3H_t^2c^2}{8\pi G}\right)\left(aT_t^4\right)} \cong \left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^{-1}\left(\frac{3H_t^2c^2}{8\pi G}\right)$$
$$\cong \left[1+\ln\left(\frac{M_t}{M_S}\right)\right]^{-1}\left(\frac{3H_0^2c^2}{8\pi G}\right) \quad (46)$$

Here one important observation to be noted is that, at any time

$$\frac{8\pi G(\rho_m)_t}{3H_t^2} \cong \left[1+\ln\left(\frac{M_t}{M_S}\right)\right]^{-1} \cong \left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^{-1} \cong (\Omega_m)_t \quad (47)$$

Thus at present,

$$(\rho_m)_0 \cong \frac{1}{c^2}\sqrt{\left(\frac{3H_0^2c^2}{8\pi G}\right)\left(aT_0^4\right)} \cong \left[1+\ln\left(\frac{H_S}{H_0}\right)\right]^{-1}\left(\frac{3H_0^2}{8\pi G}\right)$$
$$\cong \left[1+\ln\left(\frac{M_0}{M_S}\right)\right]^{-1}\left(\frac{3H_0^2}{8\pi G}\right) \cong 6.6\times10^{-32}\ \text{gram/cm}^3 \quad (48)$$

Based on the average mass-to-light ratio for any galaxy present matter density can be expressed with the following relation [61].

$$(\rho_m)_0 \cong 1.5\times10^{-32}\,\eta h_0\ \ \text{gram/cm}^3 \quad (49)$$

Here

$$\eta \cong \left\langle\frac{M}{L}\right\rangle_{\text{galaxy}} \Big/ \left\langle\frac{M}{L}\right\rangle_{\text{sun}},\ h_0 \cong H_0/100\ \text{Km/sec/Mpc} \cong 0.71$$

Note that elliptical galaxies probably comprise about 60% of the galaxies in the universe and spiral galaxies thought to make up about 20% percent of the galaxies in the universe. Almost 80% of the galaxies are in the form of elliptical and spiral galaxies. For spiral galaxies, $\eta h_0^{-1} \cong 9 \pm 1$ and for elliptical galaxies, $\eta h_0^{-1} \cong 10 \pm 2$ For our galaxy inner part, $\eta h_0^{-1} \cong 6 \pm 2$. Thus the average ηh_0^{-1} is very close to 8 to 9 and its corresponding matter density is close to (6.0 to 6.7) × 10^{-32} gram/cm^3 and can be compared with the above proposed magnitude of 6.6 × 10^{-32} gram/cm^3.

b) Age of the Growing Cosmic black hole

Age of the growing cosmic black hole can be assumed as the time taken to grow from the assumed Stoney scale to the current scale. At present,

$$g_0 \cong \left(\frac{8\pi GaT_0^4}{3H_0^2c^2}\right)c \cong \left[1+\ln\left(\frac{M_0}{M_S}\right)\right]^{-2} c$$
$$\cong \left[1+\ln\left(\frac{H_S}{H_0}\right)\right]^{-2} c \approx 14.66\ \text{km/sec} \quad (50)$$

Clearly speaking, at present, Hubble volume is growing at 14.66 km/sec in a decelerating trend. Starting from the Stoney scale, if the assumed growth rate is gradually decreasing, at any time average growth rate can be expressed as follows.

$$\frac{g_S+g_t}{2} \cong \frac{1}{2}\left\{1+\left[1+\ln\left(\frac{M_t}{M_S}\right)\right]^{-2}\right\}c$$
$$\cong \frac{1}{2}\left\{1+\left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^{-2}\right\}c \quad (51)$$

For the current scale, average growth rate can be expressed as follows.

$$\frac{g_S+g_0}{2} \cong \frac{1}{2}\left\{1+\left[1+\ln\left(\frac{M_0}{M_S}\right)\right]^{-2}\right\}c$$
$$\cong \frac{1}{2}\left\{1+\left[1+\ln\left(\frac{H_S}{H_0}\right)\right]^{-2}\right\}c \quad (52)$$

Time taken to reach from the Stoney scale to any assumed scale can be expressed as follows.

$$\left(\frac{g_S+g_t}{2}\right)t \cong \left(R_t - R_S\right) \cong R_t \quad (53)$$

where, $R_t \gg R_S$ and $R_S \approx 0$. Hence for the current scale,

$$\left(\frac{g_S+g_0}{2}\right)t_0 \cong \left(R_0 - R_S\right) \cong R_0 \cong \frac{c}{H_0} \quad (54)$$

$$t_0 \cong \left(\frac{g_S+g_0}{2}\right)^{-1}\frac{c}{H_0} \cong \left\{1+\left[1+\ln\left(\frac{H_S}{H_0}\right)\right]^{-2}\right\}^{-1}\frac{2}{H_0} \quad (55)$$

$\cong$ 27.496 Gyr.

where $\left\{1+\left[1+\ln\left(\frac{H_S}{H_0}\right)\right]^{-2}\right\}^{-1} \cong 0.99995.$

This proposal is for further study. Based on this proposal, after one second from the Stoney scale, cosmic angular velocity is 2 rad/sec, growth rate is 29 km/sec and cosmic temperature is 3×10^9 K. With reference to the current and past cosmic temperatures, at any time in the past, at any galaxy, for any hydrogen atom,

$$\frac{E_0}{E_t} \cong \frac{\lambda_t}{\lambda_0} \cong \frac{T_t}{T_0} \cong \left\{\frac{\left[1+\ln\left(\frac{H_S}{H_0}\right)\right]H_t}{\left[1+\ln\left(\frac{H_S}{H_t}\right)\right]H_0}\right\}^{\frac{1}{2}}$$
$$\cong \left\{\frac{\left[1+\ln\left(\frac{R_0}{R_S}\right)\right]R_0}{\left[1+\ln\left(\frac{R_t}{R_S}\right)\right]R_t}\right\}^{\frac{1}{2}} \cong \left\{\frac{(\Omega_m)_t H_t}{(\Omega_m)_0 H_0}\right\}^{\frac{1}{2}} \quad (56)$$

By guessing H_t, (z_0+1) can be estimated. It seems to be a full and absolute definition for the cosmic redshift. Thus at any time in the past,

$$\left(\frac{E_0}{E_t}-1\right) \cong \left(\frac{\lambda_t}{\lambda_0}-1\right) \cong \left(\frac{T_t}{T_0}-1\right)$$
$$\cong \left\{\frac{\left[1+\ln\left(\frac{H_S}{H_0}\right)\right]H_t}{\left[1+\ln\left(\frac{H_S}{H_t}\right)\right]H_0}\right\}^{\frac{1}{2}} -1 \cong \left\{\frac{(\Omega_m)_t H_t}{(\Omega_m)_0 H_0}\right\}^{\frac{1}{2}} -1 \cong z_0 \quad (57)$$

Please see the following table-1 for the cosmic physical and thermal parameters. This table prepared with C++ program with reference to the observed 2.725 K. In this table:

Column-1 = Assumed cosmic angular velocity.
Column-2 = Estimated cosmic radius, from relation (7).
Column-3 = Estimated cosmic mass, from relation (7).
Column-4 = Estimated cosmic growth index, from relation(11).
Column-5 = Estimated cosmic growth rate, from relation (13).
Column-6 = Estimated cosmic time, from relation (53).
Column-7 = Estimated cosmic temperature, from relation (41)
Column-8 = Estimated cosmic redshift, from relation (57)

Table 1 : Assumed Cosmic angular velocity and estimated other cosmic physical and thermal parameters

Assumed Cosmic Angular velocity	Estimated Cosmic radius	Estimated Cosmic mass	Cosmic Growth index $\cong \left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^2$	Estimated Cosmic Growth rate	Estimated Cosmic time	Estimated Cosmic temperature	Estimated Cosmic Redshift z_0
(rad/sec)	(meter)	(kg)	(number)	(km/sec)	(sec)	(K)	(number)
1.086E+44	**2.761E-36**	**1.859E-09**	**1**	**299792**	**0.000E+00**	**2.237E+32**	**8.207E+31**
2.305E+43	1.301E-35	8.759E-09	6.50173	46109.6	5.924E-44	6.455E+31	2.368E+31
2.305E+42	1.301E-34	8.759E-08	23.5461	12732.1	8.148E-43	1.480E+31	5.428E+30
2.305E+41	1.301E-33	8.759E-07	51.1943	5855.97	8.493E-42	3.853E+30	1.414E+30
2.305E+40	1.301E-32	8.759E-06	89.4463	3351.65	8.580E-41	1.060E+30	3.888E+29
2.305E+39	1.301E-31	8.759E-05	138.302	2167.66	8.615E-40	3.006E+29	1.103E+29
2.305E+38	1.301E-30	8.759E-04	197.762	1515.93	8.634E-39	8.692E+28	3.189E+28
2.305E+37	1.301E-29	8.759E-03	267.825	1119.36	8.645E-38	2.548E+28	9.347E+27
2.305E+36	1.301E-28	8.759E-02	348.492	860.256	8.653E-37	7.544E+27	2.768E+27
2.305E+35	1.301E-27	8.759E-01	439.763	681.714	8.658E-36	2.251E+27	8.258E+26
2.305E+34	1.301E-26	8.759E+00	541.638	553.492	8.662E-35	6.756E+26	2.479E+26
2.305E+33	1.301E-25	8.759E+01	654.116	458.317	8.665E-34	2.038E+26	7.477E+25
2.305E+32	1.301E-24	8.759E+02	777.199	385.735	8.667E-33	6.173E+25	2.265E+25
2.305E+31	1.301E-23	8.759E+03	910.885	329.122	8.668E-32	1.876E+25	6.883E+24

2.305E+30	1.301E-22	8.759E+04	1055.17	284.116	8.670E-31	5.719E+24	2.098E+24
2.305E+29	1.301E-21	8.759E+05	1210.07	247.748	8.671E-30	1.748E+24	6.411E+23
2.305E+28	1.301E-20	8.759E+06	1375.57	217.941	8.671E-29	5.352E+23	1.964E+23
2.305E+27	1.301E-19	8.759E+07	1551.67	193.207	8.672E-28	1.642E+23	6.025E+22
2.305E+26	1.301E-18	8.759E+08	1738.37	172.456	8.673E-27	5.048E+22	1.852E+22
2.305E+25	1.301E-17	8.759E+09	1935.68	154.877	8.673E-26	1.554E+22	5.701E+21
2.305E+24	1.301E-16	8.759E+10	2143.59	139.855	8.674E-25	4.790E+21	1.757E+21
2.305E+23	1.301E-15	8.759E+11	2362.11	126.917	8.674E-24	1.478E+21	5.424E+20
2.305E+22	1.301E-14	8.759E+12	2591.23	115.695	8.674E-23	4.568E+20	1.676E+20
2.305E+21	1.301E-13	8.759E+13	2830.96	105.898	8.675E-22	1.413E+20	5.184E+19
2.305E+20	1.301E-12	8.759E+14	3081.28	97.2947	8.675E-21	4.375E+19	1.605E+19
2.305E+19	1.301E-11	8.759E+15	3342.21	89.6987	8.675E-20	1.356E+19	4.973E+18
2.305E+18	1.301E-10	8.759E+16	3613.75	82.9588	8.675E-19	4.204E+18	1.542E+18
2.305E+17	1.301E-09	8.759E+17	3895.89	76.951	8.676E-18	1.305E+18	4.786E+17
2.305E+16	1.301E-08	8.759E+18	4188.63	71.5729	8.676E-17	4.052E+17	1.486E+17
2.305E+15	1.301E-07	8.759E+19	4491.98	66.7395	8.676E-16	1.259E+17	4.619E+16
2.305E+14	1.301E-06	8.759E+20	4805.93	62.3797	8.676E-15	3.915E+16	1.436E+16
2.305E+13	1.301E-05	8.759E+21	5130.48	58.4336	8.676E-14	1.218E+16	4.468E+15
2.305E+12	1.301E-04	8.759E+22	5465.64	54.8504	8.676E-13	3.791E+15	1.391E+15
2.305E+11	1.301E-03	8.759E+23	5811.41	51.5869	8.676E-12	1.180E+15	4.331E+14
2.305E+10	1.301E-02	8.759E+24	6167.77	48.6063	8.676E-11	3.678E+14	1.349E+14
2.305E+09	1.301E-01	8.759E+25	6534.74	45.8767	8.676E-10	1.146E+14	4.206E+13
2.305E+08	1.301E+00	8.759E+26	6912.31	43.3708	8.677E-09	3.575E+13	1.311E+13
2.305E+07	1.301E+01	8.759E+27	7300.49	41.0647	8.677E-08	1.115E+13	4.091E+12
2.305E+06	1.301E+02	8.759E+28	7699.27	38.9378	8.677E-07	3.480E+12	1.277E+12
2.305E+05	1.301E+03	8.759E+29	8108.66	36.9719	8.677E-06	1.086E+12	3.985E+11
2.305E+04	1.301E+04	8.759E+30	8528.65	35.1512	8.677E-05	3.392E+11	1.244E+11
2.305E+03	1.301E+05	8.759E+31	8959.24	33.4618	8.677E-04	1.059E+11	3.887E+10
2.305E+02	1.301E+06	8.759E+32	9400.43	31.8913	8.677E-03	3.310E+10	1.214E+10
2.305E+01	1.301E+07	8.759E+33	9852.23	30.4289	8.677E-02	1.035E+10	3.796E+09
2.305E+00	**1.301E+08**	**8.759E+34**	**10314.6**	**29.0648**	**8.677E-01**	**3.234E+09**	**1.187E+09**
2.305E-01	1.301E+09	8.759E+35	10787.6	27.7904	8.677E+00	1.011E+09	3.710E+08
2.305E-02	1.301E+10	8.759E+36	11271.3	26.598	8.677E+01	3.163E+08	1.161E+08
2.305E-03	1.301E+11	8.759E+37	11765.5	25.4807	8.677E+02	9.897E+07	3.631E+07
2.305E-04	1.301E+12	8.759E+38	12270.3	24.4324	8.677E+03	3.097E+07	1.136E+07
2.305E-05	1.301E+13	8.759E+39	12785.7	23.4475	8.677E+04	9.693E+06	3.556E+06
2.305E-06	1.301E+14	8.759E+40	13311.7	22.5209	8.677E+05	3.034E+06	1.113E+06
2.305E-07	1.301E+15	8.759E+41	13848.4	21.6482	8.677E+06	9.501E+05	3.486E+05
2.305E-08	1.301E+16	8.759E+42	14395.6	20.8253	8.677E+07	2.976E+05	1.092E+05
2.305E-09	1.301E+17	8.759E+43	14953.4	20.0484	8.677E+08	9.321E+04	3.419E+04
2.305E-10	1.301E+18	8.759E+44	15521.9	19.3142	8.677E+09	2.920E+04	1.071E+04
2.305E-11	1.301E+19	8.759E+45	16100.9	18.6196	8.677E+10	9.150E+03	3.356E+03
2.52E-12	**1.19E+20**	**8.01E+46**	**16667.6**	**17.9865**	**7.94E+11**	**2998.85**	**1099.21**
2.305E-12	**1.301E+20**	**8.759E+46**	**16690.6**	**17.9618**	**8.677E+11**	**2.868E+03**	**1.051E+03**
2.305E-13	1.301E+21	8.759E+47	17290.8	17.3382	8.677E+12	8.988E+02	3.288E+02
2.305E-14	1.301E+22	8.759E+48	17901.7	16.7466	8.677E+13	2.818E+02	1.024E+02
2.305E-15	1.301E+23	8.759E+49	18523.2	16.1847	8.677E+14	8.835E+01	3.141E+01
2.305E-16	1.301E+24	8.759E+50	19155.2	15.6507	8.677E+15	2.771E+01	9.164E+00
2.305E-17	1.301E+25	8.759E+51	19797.9	15.1427	8.677E+16	8.689E+00	2.188E+00
2.305E-18	**1.301E+26**	**8.759E+52**	**20451.2**	**14.6589**	**8.677E+17**	**2.726E+00**	**0.000E+00**

See the below figure-1 for the cosmic growth index for ~ 61 values starting from 1 to 20451.2 of Column-4 in table-1.

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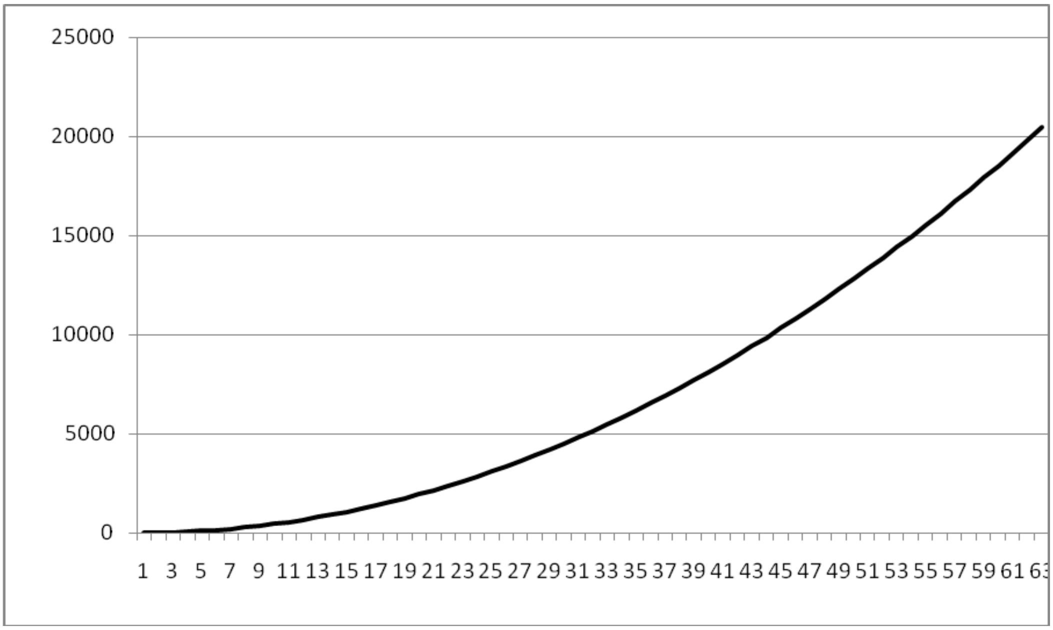
Figure 1 : Cosmic Growth Index



c) *Direct fitting of the two current CMBR wavelengths*

Note that the spectrum from Planck's law of black body radiation takes a different shape in the frequency domain from that of the wavelength domain, the frequency location of the peak emission does not correspond to the peak wavelength using the simple relationship between frequency, wavelength, and the speed of light. In other words, the peak wavelength and the peak frequency do not correspond. The frequency form of Wien's displacement law is derived using similar methods, but starting with Planck's law in terms of frequency instead of wavelength. The effective result is to substitute 3 for 5 in the equation for the peak wavelength. Thus it is possible to say that [62],

$$\sqrt{\frac{c}{\lambda_m f_m}} \cong \sqrt{1.75978} \cong 1.326567 \cong \frac{4}{3} \qquad (58)$$

Where λ_m and f_m are the peak wavelength in wavelength domain and peak frequency in frequency domain respectively.

Let λ_f is the wavelength corresponding to $\frac{dE_\nu}{d\nu}$ and E_ν is the total energy at all frequencies up to and including **ν**, at any given cosmic time. λ_m is the wavelength corresponding to $\frac{dE_\lambda}{d\lambda}$ and E_λ is the total energy at all wavelengths up to and including λ. Considering the observed CMBR wavelengths, it is possible to express both the wavelengths in the following way.

$$\left[(\lambda_m)_t \text{ and } (\lambda_f)_t\right] \propto \sqrt{1+\ln\left(\frac{M_t}{M_S}\right)} \qquad (59)$$

$$\left[(\lambda_m)_t \text{ and } (\lambda_f)_t\right] \propto \sqrt{\left(\frac{4\pi G M_t}{c^2}\right)\cdot\left(\frac{4\pi G M_S}{c^2}\right)} \qquad (60)$$

Guessing in this way it is noticed that,

$$(\lambda_f)_t \cong \left(\frac{4}{3}\right)\cdot\sqrt{1+\ln\left(\frac{M_t}{M_S}\right)}\cdot\frac{4\pi G\sqrt{M_t M_S}}{c^2} \cong \left(\frac{4}{3}\right)\cdot\sqrt{\frac{3H_t^2}{8\pi G(\rho_m)_t}}\cdot\frac{4\pi G\sqrt{M_t M_S}}{c^2} \qquad (61)$$

$$(\lambda_m)_t \cong \left(\frac{3}{4}\right)\cdot\sqrt{1+\ln\left(\frac{M_t}{M_S}\right)}\cdot\frac{4\pi G\sqrt{M_t M_S}}{c^2} \cong \left(\frac{3}{4}\right)\cdot\sqrt{\frac{3H_t^2}{8\pi G(\rho_m)_t}}\cdot\frac{4\pi G\sqrt{M_t M_S}}{c^2} \qquad (62)$$

Thus it is possible to express both the wavelength relations in the following way.

$$(\lambda_f,\lambda_m)_t \cong \left(\frac{4}{3}\right)^{\pm 1}\cdot\sqrt{1+\ln\left(\frac{M_t}{M_S}\right)}\cdot\frac{4\pi G\sqrt{M_t M_S}}{c^2} \cong \left(\frac{4}{3}\right)^{\pm 1}\cdot\sqrt{1+\ln\left(\frac{H_S}{H_t}\right)}\cdot\frac{2\pi c}{\sqrt{H_S H_t}} \cong \left(\frac{4}{3}\right)^{\pm 1}\cdot\sqrt{\frac{3H_t^2}{8\pi G(\rho_m)_t}}\cdot\frac{2\pi c}{\sqrt{H_S H_t}} \qquad (63)$$

Alternatively geometric mean of $\left(\lambda_f, \lambda_m\right)_t$ can be expressed as follows.

$$\sqrt{\left(\lambda_m\right)_t\left(\lambda_f\right)_t} \cong \sqrt{1+\ln\left(\frac{M_t}{M_S}\right)} \cdot \frac{4\pi G\sqrt{M_t M_S}}{c^2} \cong \sqrt{1+\ln\left(\frac{H_S}{H_t}\right)} \cdot \frac{2\pi c}{\sqrt{H_S H_t}} \cong \sqrt{\frac{3H_t^2}{8\pi G\left(\rho_m\right)_t}} \cdot \frac{2\pi c}{\sqrt{H_S H_t}} \tag{64}$$

At present, if H_0 is close to 71 km/sec/Mpc,

$$\left(\lambda_f, \lambda_m\right)_0 \cong \left(\frac{4}{3}\right)^{\pm 1} \cdot \sqrt{1+\ln\left(\frac{M_0}{M_S}\right)} \cdot \frac{4\pi G\sqrt{M_0 M_S}}{c^2} \cong \left(\frac{4}{3}\right)^{\pm 1} \cdot \sqrt{1+\ln\left(\frac{H_S}{H_0}\right)} \cdot \frac{2\pi c}{\sqrt{H_S H_0}} \cong \left(1.90 \text{ mm}, 1.069 \text{ mm}\right) \tag{65}$$

With reference to $\left(\lambda_m\right)_t$ and Wien's displacement constant, from above relations $k_B T_t$ can be expressed as follows.

$$T_t \cong \frac{2.898\times 10^{-3}}{\left(\lambda_m\right)_t} \cong \left(\frac{hc}{4.965114 k_B}\right)\left(\frac{1}{\left(\lambda_m\right)_t}\right) \text{ and}$$

$$k_B T_t \cong \left(\frac{4}{3x}\right)\sqrt{\left(1+\ln\left(\frac{M_t}{M_S}\right)\right)^{-1}\left(\frac{M_t}{M_S}\right)} \cdot \left(\frac{hc^3}{4\pi G M_t}\right) \tag{66}$$

where $x \cong 4.965114$.

$$k_B T_t \propto \left(\frac{hc^3}{4\pi G M_t}\right) \cong \frac{hH_t}{2\pi} \cong h\left(\frac{H_t}{2\pi}\right) \tag{67}$$

This relation may not be identical but similar to the famous Hawking's black hole temperature formula [63].

$$k_B T_t \propto \sqrt{\left(1+\ln\left(\frac{M_t}{M_S}\right)\right)^{-1}\left(\frac{M_t}{M_S}\right)} \tag{68}$$

In this way in a very simple approach observed CMBR and the proposed Black hole universe concepts can be put into single frame of reference. Here the very interesting and strange observation is that, at present

$$\left(1+\ln\left(\frac{M_0}{M_S}\right)\right)^{-1}\left(\frac{M_0}{M_S}\right) \cong \exp\left(\frac{1}{\alpha}\right) \tag{69}$$

where $\left(\frac{1}{\alpha}\right)$ is the inverse of the fine structure ratio. Forany mathematician this seems be a fun. For a cosmologist it may be an accidental coincidence. For any physicist it is an astounding and exciting coincidence. Even though it depends upon one's own choice of scie-ntific interest, from unification point of view, assuming it to be a cosmological variable it is possible to express $\left(\frac{1}{\alpha}\right)$ in the following way.

$$\left(\frac{1}{\alpha}\right)_0 \cong \ln\left[\left(1+\ln\left(\frac{M_0}{M_S}\right)\right)^{-1}\left(\frac{M_0}{M_S}\right)\right] \cong 137.047 \tag{70}$$

Here $\left(\frac{1}{\alpha}\right)_0$ may be considered as the current magnitude of 'inverse of the fine structure ratio. In atomic and nuclear physics, the fine-structure ratio (α) is a fundamental physical constant namely the coupling constant characterizing the strength [64-66] of the electromagnetic interact-ion. Being a dimensionless quantity, it has a constant numerical value in all systems of units. Note that, fromunification point of view, till today role of dark energy or dark matter is unclear and undecided.Their laboratoryor physical existence is also not yet confirmed. In this critical situation this application or coincidence can be considered as a key tool in particle cosmology. Based on the above heuristic observation and for the assumed initial conditions of the universe , if $M_t \to M_S$, $\left(\frac{1}{\alpha}\right)_S \to 0$. Based on the relation (70), if one is willing to consider the cosmological variable nature of $\left(\frac{1}{\alpha}\right)$, relation (66) can be expressed as follows.

$$T_t \cong \sqrt{\left(e^{\frac{1}{\alpha}}\right)_t} \cdot \left(\frac{bc^2}{3\pi G M_t}\right) \tag{71}$$

At the beginning of cosmic evolution for the Stoney scale,

$$T_S \cong \left(\frac{bc^2}{3\pi G M_S}\right) \tag{72}$$

From now onwards, CMBR temperature can be called as 'Comic Black Hole's Thermal Radiation' temperature and can be expressed as 'CBHTR' temperature. From ground based laboratory experiments, it is possible to measure the rate of change in $\frac{d}{dt}\left(\frac{1}{\alpha_t}\right)$. Hence the absolute cosmic rate of expansion can be measured. Thus at any time based on $\left[\frac{d}{dt}\left[\left(\lambda_m\right)_t \text{ and } \left(\lambda_f\right)_t\right], \frac{d}{dt}\left(T_t\right) \text{ and } \frac{d}{dt}\left(H_t\right)\right]$, the absolute cosmic rate of expansion can be confirmed.

At present with reference to $\left[\frac{d}{dt}\left[(\lambda_m)_0 \text{ and } (\lambda_f)_0\right], \frac{d}{dt}(T_0) \text{ and } \frac{d}{dt}(H_0)\right]$ current 'true' cosmic rate of expansion can be understood. Drop in current 'cosmic temperature' can be considered as a measure of the current cosmic expansion and 'rate of decrease in current cosmic temperature' can be considered as a measure of the current cosmic 'rate of expansion'. But if rate of decrease in temperature is very small and is beyond the scope of current experimental verification, then the two possible states are: a) cosmic temperature is decreasing at a very slow rate and universe is expanding at a very slow rate and b) there is no 'observable' thermal expansion and there is no 'observable' cosmic expansion. If observed CMBR temperature is 2.725 K and is very low in magnitude and is very close to absolute zero, then thinking about and confirming the 'cosmic acceleration' may not be reasonable. Similarly 'rate of decrease in current 'Hubble's constant' can be considered as a measure of current cosmic 'rate of expansion'. If rate of decrease in current 'Hubble's constant is very small and is beyond the scope of current experimental verification, then the two possible states are: a) current 'Hubble's constant is decreasing at a very slow rate and current universe is expanding at a very slow rate and b) at present there is no 'observable' cosmic expansion. Fortunately as per the Cobe/Planck satellite data current CMBR temperature is very smooth and isotropic. and there is no data that refers to the rate of change in the current Hubble's constant. Hence it can be suggested that at present there is no significant cosmic expansion. Even though this suggestion is completely against to the current notion of cosmic acceleration [32,33], based on the proposed arguments, relations and observed data authors request the science community to review the standard cosmology. If observed CMB radiation temperature is 2.725 K and is very low in magnitude and is very close to absolute zero, then thinking about and confirming the 'cosmic acceleration' may not be reasonable.

IV. To Understand the Physical Significance of Large Numbers in Cosmology

Great cosmologists proposed many interesting large numbers in cosmology [67-74]. Ultimately the essence of any cosmological number or ratio is to connect the microscopic and macroscopic physical constants with a possible physical meaning with in the 'evolving universe'. Clearly speaking large dimensionless constants and compound physical constants must reflect an 'observable' intrinsic property of any natural physical phenomenon. Then only the real meaning of any cosmological number can be explored. In this regard authors proposed many interesting relations in the previous sections of this paper. Authors noticed that uncertainty relation or Planck's constant or reduced Planck's constant or inverse of the Fine structure ratio or characteristic nuclear potential radius or rms radius of proton or classical radius of electron - play a crucial role in the understanding the halt of cosmic expansion. The basic questions to be answered are: 1) The general idea of large number coincidence is interesting, yet is there any observational proves? and 2) How Einstein's general theory of relativity is fitted in the theory of the large cosmological numbers ? In this regard the characteristic and key relation can be expressed in the following way.

$$\frac{c^3}{2GM_0} \cong H_0 \text{ Or } \frac{c^3}{2GH_0} \cong M_0 \tag{73}$$

Here (M_0, H_0) can be considered as the current mass and current angular velocity of the black hole universe respectively. By this time if the expanding black hole universe is coming to a halt, then above relation can be re-expressed as follows.

$$\frac{c^3}{2GM_{sat}} \cong H_{sat} \text{ Or } \frac{c^3}{2GH_{sat}} \cong M_{sat} \tag{74}$$

Here (M_{sat}, H_{sat}) can be considered as the saturated mass and saturated angular velocity of the black hole universe at its ending stage of expansion. Fortunately it is noticed that, $M_{sat} \cong M_0$ and $H_{sat} \cong H_0$. Authors strongly believe that the following relations certainly help in understanding the mystery of the halting of the present cosmic expansion.

a) Role of the Uncertainty relation

It is noticed that,

$$\frac{Gm_p m_e}{R_p H_0} \cong \frac{h}{4\pi} \tag{75}$$

Here $R_p \cong (0.84184 \text{ to } 0.87680)$ fm is the rms radius of proton [57,75]. After re-arranging, it can be expressed in the following way.

$$\left(\frac{2Gm_p}{c^2 R_p}\right)\frac{m_e c^2}{H_0} \cong \left(\frac{2Gm_p}{c^2 R_p}\right)\left[m_e c\left(\frac{2\pi c}{H_0}\right)\right] \cong h \tag{76}$$

By this time if the expanding black hole universe is coming to a halt, then above relation can be re-expressed as follows.

$$H_{sat} \Rightarrow \frac{4\pi G m_p m_e}{hR_p} \cong \frac{Gm_p m_e}{(h/4\pi)R_p} \tag{77}$$

$$\Rightarrow H_{sat} \cong (67.87 \text{ to } 70.69) \text{ km/sec/Mpc}$$

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This is a remarkable fit and needs further study.

b) Role of the Classical Radius of Electron

It is noticed that,

$$\sqrt{\left(\frac{2G\sqrt{m_p m_e}}{c^2}\right)\left(\frac{c}{H_0}\right)} \cong \sqrt{\left(\frac{2G\sqrt{m_p m_e}}{c^2}\right)\left(\frac{2GM_0}{c^2}\right)} \cong \left(\frac{e^2}{4\pi\varepsilon_0 m_e c^2}\right) \quad (78)$$

$\left(\frac{e^2}{4\pi\varepsilon_0 m_e c^2}\right)$ is nothing but the presently believed classical radius of electron. In a broad picture or considering the interaction in between proton and electron it is a very general idea to consider the geometric mean mass of proton and electron. By this time if the expanding black hole universe is coming to a halt, then above relation can be re-expressed as follows.

$$\left(\frac{c}{H_{sat}}\right) \Rightarrow \left(\frac{e^2}{4\pi\varepsilon_0 m_e c^2}\right)^2 \left(\frac{c^2}{2G\sqrt{m_p m_e}}\right) \quad (79)$$

$$H_{sat} \Rightarrow \frac{2G\sqrt{m_p m_e}}{c}\left(\frac{4\pi\varepsilon_0 m_e c^2}{e^2}\right)^2 \quad (80)$$

$$\cong 67.533 \text{ km/sec/Mpc}$$

This is also a remarkable fit and needs further study.

c) Role of the Characteristic Nuclear Potential Radius

It is noticed that,

$$\frac{G\sqrt{M_0\sqrt{m_p m_e}}}{c^2} \cong \sqrt{\left(\frac{GM_0}{c^2}\right)\left(\frac{G\sqrt{m_p m_e}}{c^2}\right)} \quad (81)$$

$$\cong 1.4\times10^{-15} \text{ m} \cong R_n$$

R_n is nothing but the presently believed characteristic nuclear potential radius [76] or the nuclear strong interaction range as proposed by Yukawa [77]. By this time if the expanding black hole universe is coming to a halt, then above relation can be re-expressed as follows [78-80].

$$\frac{G\sqrt{M_{sat}\sqrt{m_p m_e}}}{c^2} \Rightarrow R_n \quad (82)$$

$$H_{sat} \Rightarrow \frac{G\sqrt{m_p m_e}}{2cR_n^2} \quad (83)$$

This is also a remarkable coincidence and accuracy mainly depends upon the magnitude of the characteristic nuclear potential radius. Further study may reveal the mystery.

d) Role of the 'inverse' of the Fine Structure Ratio

In a cosmological approach fine structure ratio can be fitted in the following way [64-66]. Total thermal energy in the present Hubble volume can be expressed as follows.

$$(E_T)_0 \cong aT_0^4 \cdot \frac{4\pi}{3}\left(\frac{c}{H_0}\right)^3 \quad (84)$$

Thermal energy present in half of the current Hubble volume can be expressed as follows.

$$\frac{(E_T)_0}{2} \cong \frac{1}{2}\left[aT_0^4 \cdot \frac{4\pi}{3}\left(\frac{c}{H_0}\right)^3\right] \quad (85)$$

If (c/H_0) is the present electromagnetic interaction range, then present characteristic Hubble potential can be expressed as

$$(E_e)_0 \cong \frac{e^2}{4\pi\varepsilon_0 (c/H_0)} \cong \frac{e^2 H_0}{4\pi\varepsilon_0 c} \quad (86)$$

If H_0 is close to 71 km/sec/Mpc and $T_0 \cong 2.725$ K, it is noticed that,

$$\ln\sqrt{\frac{[(E_T)_0/2]}{(E_e)_0}} \cong 137.05 \quad (87)$$

By this time if the expanding black hole universe is coming to a halt, then above relation can be re-expressed as follows.

$$\ln\sqrt{\frac{[(E_T)_0/2]}{(E_e)_0}} \cong \ln\sqrt{\frac{[(E_T)_{sat}/2]}{(E_e)_{sat}}} \Rightarrow \left(\frac{1}{\alpha}\right) \quad (88)$$

$(E_T)_{sat}$ can be considered as the total thermal energy in the Hubble volume at the end of cosmic expansion.

$(E_e)_{sat}$ can be considered as the Hubble potential at the end of cosmic expansion.

V. To Fit the Nuclear Charge Radius and the Planck's Constant

The subject of final unification is having a long history. After the nucleus was discovered [76] in 1908, it was clear that a new force was needed to overcome the electrostatic repulsion of the positively charged protons. Otherwise the nucleus could not exist. Moreover, the force had to be strong enough to squeeze the protons

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into a volume of size 10^{-15} meter. In general the word 'strong' is used since the strong interaction is the "strongest" of the four fundamental forces. Its observed strength is around 10^2 times that of the electromagnetic force, some 10^5 times as great as that of the weak force, and about 10^{39} times that of gravitation.

The aim of unification is to understand the relation that connects 'gravity', 'mass', 'charge' and the 'microscopic space-time curvature'. Many scientists addressed this problem in different ways [78-80]. The authors also made many attempts in their previously published papers [81-84]. Experimentally observed nuclear charge radius R_{ch} can be fitted with the following strange and simple unified relation.

$$R_{ch} \cong \sqrt{\ln\left(\frac{e^2}{4\pi\varepsilon_0 G m_p m_e}\right)\cdot\left(\frac{e^2}{4\pi\varepsilon_0 G m_p m_e}\right)}\cdot\left(\frac{2GM_S}{c^2}\right) \quad (89)$$

$\cong 1.252$ fermi

Considering the rest energy of proton and 1.25 fermi, semi empirical mass formula energy coefficients can be fitted very easily.

$$\frac{R_{ch}c^2}{2GM_S} \cong \sqrt{\ln\left(\frac{e^2}{4\pi\varepsilon_0 G m_p m_e}\right)\cdot\left(\frac{e^2}{4\pi\varepsilon_0 G m_p m_e}\right)} \quad (90)$$

Whether the expression $\ln\left(\frac{e^2}{4\pi\varepsilon_0 G m_p m_e}\right) \cong 90.62$ playing a 'key unified role' or 'only a fitting role' to be confirmed. With a great accuracy the famous Planck's constant can be fitted with the following relation.

$$\begin{aligned} h &\cong \frac{1}{2}\ln\left(\frac{e^2}{4\pi\varepsilon_0 G m_p m_e}\right)\cdot\left(\sqrt{m_p m_e}\cdot c\cdot R_{ch}\right) \\ &\cong \ln\sqrt{\frac{e^2}{4\pi\varepsilon_0 G m_p m_e}}\cdot\left(\sqrt{m_p m_e}\cdot c\cdot R_{ch}\right) \\ &\cong 6.63862\times 10^{-34} \text{ J.sec} \end{aligned} \quad (91)$$

Recommended value of h is $6.6260695729\times10^{-34}$ J.sec and the error is 0.189%. Now above relation can be simplified into the following form [75].

$$h \cong \left[\ln\left(\frac{e^2}{4\pi\varepsilon_0 G m_p m_e}\right)\right]^{3/2}\left(\frac{e^2}{4\pi\varepsilon_0 c}\right) \quad (92)$$

Connecting quantum constants and gravity is really a very big task. At this juncture this relation can be given a chance. It casts a doubt on the independent existence of quantum mechanics. With this relation, obtained magnitude of the gravitational constant is, $G \cong 7.48183566\times10^{-11}$ m^3.kg^{-1}sec^{-2}. Independent of 'length', 'force' and other physical considerations, with this relation order of magnitude of G can be confirmed from atomic physical constants. To proceed further - at first the hierarchy of physical constants must be established and it needs further study and analysis.

VI. Conclusions

a) Need of the mass unit $M_S \cong \sqrt{e^2/4\pi\varepsilon_0 G}$ in unification

The basic idea of unification is – 1) To minimize the number of physical constants and to merge a group of different fundamental constants into one compound physical constant with appropriate unified interpretation and 2) To merge and minimize various branches of physics. In this regard instead of Planck mass, $M_S \cong \sqrt{e^2/4\pi\varepsilon_0 G}$ can be considered as the nature's given true unified mass unit. Using this mass unit, proton-electron mass ratio and proton rest mass can be fitted in the following way.

$$\ln\sqrt{\frac{m_p}{m_e}\cdot\left(\frac{m_p^2}{m_e}\right)} \cong \left(M_S m_e^2\right)^{\frac{1}{3}} \quad (93)$$

$$\ln\sqrt{\frac{m_p}{m_e}\cdot\left(\frac{m_p}{m_e}\right)} \cong \frac{\left(M_S m_e^2\right)^{\frac{1}{3}}}{m_p} \quad (94)$$

Here, lhs=6908.3745 and rhs=6899.7363. Accuracy can be improved with the following relation.

$$\frac{\left(M_S m_e^2\right)^{\frac{1}{3}}}{m_p} \cong \left[\left(\frac{m_p}{m_e}\right)\ln\sqrt{\frac{m_p}{m_e}}\right] + \ln\left[\left(\frac{m_p}{m_e}\right)\ln\sqrt{\frac{m_p}{m_e}}\right] \quad (95)$$

Interesting observation is that $\ln\left[\frac{\left(M_C m_e^2\right)^{\frac{1}{3}}}{m_p}\right] \cong \ln(6900) \cong 8.84$ and is close to the presently believed inverse of the strong coupling constant α_s [53]. From the above relation, magnitude of the gravitational constant [57,85,86] can be fitted in the following way.

$$\left.\begin{aligned} &\text{If } X \cong \left(\frac{m_p}{m_e}\right)\ln\sqrt{\frac{m_p}{m_e}} \text{ and } M_S \cong \left[X+\ln(X)\right]^3\left(\frac{m_p^3}{m_e^2}\right) \\ &G \cong \frac{e^2}{4\pi\varepsilon_0 M_S^2} \cong 6.672681991\times10^{-11} \text{ m}^3\text{.kg}^{-1}\text{sec}^{-2} \end{aligned}\right\} \quad (96)$$

where, $m_p \cong 1.672621777(74)\times10^{-27}$ kg,

$m_e \cong 9.109\ 382\ 91(40)\times10^{-31}$ kg,

$e \cong 1.602\ 176\ 565(35)\times10^{-19}$ C.

Now the strong coupling constant can be fitted with the following relation.

$$\exp\left(\frac{1}{\ln(X)}\right) - 1 \cong \alpha_s \cong 0.11978 \quad (97)$$

b) To Consider the Universe as a Growing and light speed rotating Primordial black hole

If 'black hole geometry' is more intrinsic compared to the black hole 'mass' and 'density' parameters, if universe constitutes so many galaxies and if each galaxy constitutes a central growing and fast spinning black hole then considering universe as a 'growing and light speed rotating primordial black hole' may not be far away from reality. If universe is having no black hole geometry - any massive body (which is bound to the universe) may not show a black hole structure. That is black hole structure or geometry may be a subset of the cosmic geometry. At this juncture considering or rejecting this proposal completely depends on the observed cosmic redshift. Based on the relations proposed in sections 2 and 4 observed cosmic redshift can be considered as a result of cosmological light emission mechanism. Authors are working on the assumed Hubble volume and Hubble mass in different directions with different applications [1-13] that connect micro physics and macro physics. Based on the proposed applications and short comings of the standard model of cosmology - concepts of black hole cosmology may be given at least 99% priority.

c) About the current cosmic black hole's deceleration

In view of the applications proposed in sections (2) to (4) and with reference to the zero rate of change in inverse of the fine structure ratio (from ground based experiments), zero rate of change in the 'current CMBR temperature' (from Cobe/Planck satellite data) and zero rate of change in the 'current Hubble's constant' (from Cobe/Planck satellite data) it can be suggested that, current cosmic expansion is almost all saturated and at present there is no significant cosmic acceleration [47,48]. Clearly speaking, Stoney scale cosmic black hole's growth rate is equal to the speed of light and current cosmic black hole is growing at 14.66 km/sec in a decelerating trend. It can be also be possible to suggest that currently believed 'dark energy' is a pure, 'mathematical concept' and there exists no physical base behind its confirmation. Now the key leftover things are nucleosynthesis and structure formation. Authors are working in this direction. As nuclear binding energy was zero at the beginning of cosmic evolution, by considering the time dependent variable nature of magnitudes of the semi empirical mass formula energy coefficients it is possible to show that, at the beginning of formation of nucleons, nuclear stability is maximum for light atoms only. If so it can be suggested that, from the beginning of formation of nucleons, in any galaxy, maximum scope is being possible only for the survival of light atoms and this may be the reason for the accumulation and abundance of light atoms in large proportion.

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