Article

Emergence of Cosmos Quantum by Quantum

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Abstract

We explore relations among the observed cosmological redshifted light from the nascency of the cosmos, the variation of Planck's quantum of action, and the associated emergence and evolution of spacetime.

Keywords: Cosmological redshift, spacetime, Planck's Constant, cosmic age, primordial wavelengths.

Introduction

We examine the idea that during the evolution of the cosmos, the magnitude of Planck's constant changed. We also explain the observed cosmological redshift as an aspect of the nascency of the cosmos. Current concepts of temporal and spatial variations of the redshift are considered relative to putative cosmological variations of Planck's constant and spacetime parcels with the age of the cosmos.

Hubble initially interpreted redshifts as a Doppler effect, due to the motion of the galaxies as they receded from our location in the cosmos, as though the galaxies were moving apart through space. Later, upon reconsideration, Hubble departed from his earlier interpretation and said that the observed cosmological redshifts may be due to an undiscovered mechanism, but perhaps not because of currently accepted notions of the dark-energy-driven expansion of cosmic space.

It has been suggested that during cosmic evolution, the magnitude of Planck's constant increased and that the quanta of energy converted to mass gradually increased [1]. At present, the value of Planck's constant appears fixed. Currently, cosmological redshift is explained with reference to an initial expansion of space. We argue that cosmological redshift may be due to the evolution of spacetime voxels and topology.

Premise

Our foundational premise is that the cosmos emerged quiescently, quantum by quantum, bit by bit, from a universal energy field that is contained by and is integral to the mesostratum. The mesostratum comprises the interface between the superstratum and the physiostratum [2]. We postulate that the superstratum is a nonmaterial transcendent reality encompassed by the universe and that the physiostratum is a physical-material reality that comprises the cosmos. The cosmos in this sense is but an observable subset of the universe that contains our terrestrial observation

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platform. We concede that the universe may contain uncountable, separate cosmoses beyond terrestrial observation or exploration.

We argue that, contrary to the big bang hypothesis, the cosmos emerged not from an isolated singularity but from an infinitude of singularities. We contemplate the idea of a mesostratum ZPF (zero-point field) quantum foam that emerged bit by bit, acquired mass, and agglomerated to form the dark matter and ultimately the galaxies and stars of the cosmos. It can be argued that during its nascency, preceding star formation, the cosmos was a cryogenic dark matter commixture, equivalent to a Bose-Einstein condensate. We previously described a cubic lattice nucleon/nucleus theory that explains why nucleosynthesis of hydrogen and elements beyond hydrogen did not require a hot big bang or stellar temperatures and pressures [3].

Obviously, all this transpired in a cosmological volume of space over an extended time. It is appropriate to define and examine the nature of the spacetime milieu that hosted the emergence of the material content of the cosmos. Our premise includes the idea that spacetime consists of voxels - parcels of spacetime - that also emerged from the mesostratum energetic continuum [4]. It is argued that spacetime voxels necessarily preexisted and provided the stage for the appearance of the massive material content of the cosmos.

Mesostratum Spacetime Voxels

We argue that the mesostratum is the transcendent base and source of the material world of our experience. It is perceptible in its effect on physiostratum phenomena that we can sense, observe, and measure. We argue further that physiostratum spacetime is granular and that it consists of an oceanic array of tesselated interacting spacetime parcels - depicted as voxels in Figure 1. The voxels are essentially identical, uniformly dispersed, and form the cosmic physiostratum discontinuum. The mesostratum continuum is conceived as an energetic substrate and source that generates the granular spacetime foundation of the physiostratum. Figure 1 represents the physiostratum as a voxel-accumulation subset within the mesostratum.

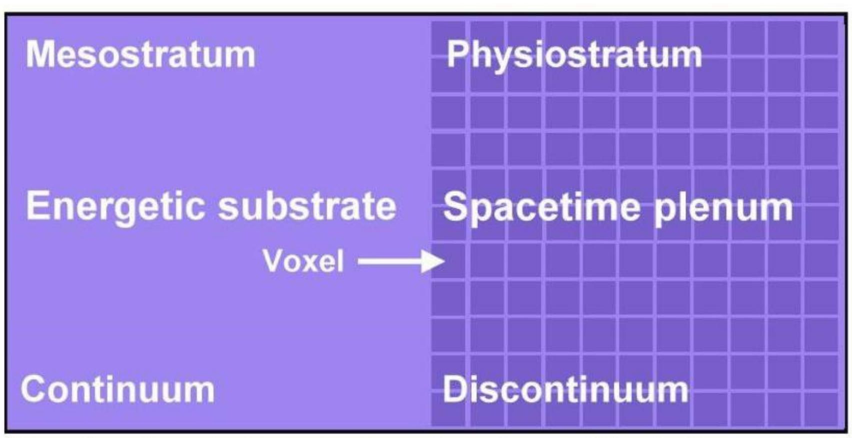

Figure 1 - Conceptual mesostratum and voxel array of the physiostratum.

Quantum gravity models assume that spacetime is discontinuous and particulate - that spacetime is a fractal substance and that the granularity of spacetime is on the scale of Planck length (10^{-33} centimeter) and Planck interval (10^{-43} second). In agreement, we postulate that spacetime consists of energetic 'four-dimensional' parcels - dynamic, mathematically-definable objects consisting of cubical volumes (voxels) of space that oscillate in time - hypothetical oscillating cavities of spacetime. Spacetime is assumed as being analogous to a deformable fluid consisting of tesselated voxels. This corresponds to Einstein's concept of a deformable spacetime, that is, a substantive material-like spacetime.

Einstein's relativistic formulations assume that the ratio of Planck length to Planck time, [L] / [T], which equals c, the velocity of light, is a cosmological constant. It will be seen that there is a deeper meaning to the quantity c as it relates to the physiostratum discontinuum to the mesostratum continuum. The ratio [L] / [T] characterizes the dimensionality of spacetime voxels. The ratio and associated cosmic voxel populations ostensibly change with the age of the cosmos - concomitantly with the emergence of gravitational matter in the evolving cosmos [5]. It is suggested that cumulative variations of voxel characteristics and cosmological topography explain gravitational lensing and wavelength redshifts associated with cosmological age.

Planck's Constant and Light Velocity

Planck's constant, h, the quantum of action, has the dimensions of [energy]·[time]. The Planck–Einstein relation connects 'particulate' photon energy ε with its associated wave frequency *f*, so that $\varepsilon = h f$. Since the frequency *f*, wavelength λ, and speed of light c are related by $f = c / \lambda$, the relation can also be expressed as $\varepsilon = (h c) / \lambda$. This leads to another relationship involving the Planck constant. With p denoting the linear momentum of a quantum particle, photon, or other elementary particle, the de Broglie wavelength λ of the particle is given by $\lambda = (h / p)$ or $\lambda = (h / \varepsilon) c$.

We initially assume that Planck's quantum of action, h, is a cosmological constant and that the quantum particle energy or momentum of a photon is a function of the photon emitter (or particle emitter). The quantum theory developed by Bohr and Sommerfeld suggested that particle trajectories exist but are hidden and constrained by quantum laws that define their action. Modern quantum theory suggests that photon and elemental particle trajectories and motion do not even exist. Instead, the photon is defined by a wavefunction which is spread out in space and in time. This presents an inconsistency that is resolvable if the concept of *velocity of light*, the quantity c, is reexamined in terms of the adjacent realities concept, given that photons are utterly unlike macroscopic particles traveling through space.

Adjacent Realities Concept

The wave function and associated spin, charge, and momentum specify the state of subatomic entities within the mesostratum continuum while their position, mass and particulate nature specify their identity within physiostratum massive agglomerations (for example their appearance on and excitation of detector screen constituents). This may be construed as wave-particle duality or a pairing of two separate *sequential* realities. Conversely, we propose adjacent realities - *concurrent* transcendent and material realities - wherein the wave function is a mesostratum continuum aspect while the quantum particle is a physiostratum discontinuum material aspect of a singular entity, for example, an electron or photon. These adjacent realities combine to form our empirical awareness and measurement of particulate objective reality (the physiostratum), which is coupled with an adjacent wave function/signal transmission continuum (the mesostratum).

The momentum and location of a quantum particle are complementary variables in the adjacent realities of the mesostratum and the physiostratum, respectively. There is a limit to the precision with which certain pairs of properties of quantum particles, such as momentum p and position x, can be known concurrently. In quantum mechanics, this known as the Heisenberg uncertainty principle. It follows from the fact that position x of a quantum particle must be referred to as a gravitational agglomeration - a massive collection of quantum particles at rest in the physiostratum, e.g., a detector screen. The momentum p, the product of mass and velocity, a vector quantity, is a purely mathematical entity essentially defined in the mesostratum continuum. This illustrates that the reality of a quantum particle, or subatomic particle, depends on its appearance/interaction/detection in the physiostratum, otherwise the particle and its trajectory are but conceptual entities in the mesostratum. Consequently, the instantiation of such particles depends on their interaction with or activation of physiostratum spacetime voxels or massive gravitational agglomerations.

We may depict the motion of a quantum particle such as a photon during its transit through the physiostratum as jumping from one spacetime parcel to the next adjacent host parcel, while simultaneously retaining its mesostratum momentum and wavelike property. We thus may perceive spacetime as the electron or photon sees it: as a bumpy granular environment in which they need to quantum jump from one spacetime parcel to another. We accordingly deduce that spacetime voxel oscillations set the speed of light, c, throughout the physiostratum, while the speed of light is undefined or instantaneous in the mesostratum continuum. Accordingly, we need to reexamine the concept of light velocity and whether the quantity c varied with the texture of spacetime topography as it evolved during the nascency and evolution of the cosmos.

Reexamination of Light Velocity Dimensions

As noted previously, the cosmological wavelength λ of an elementary particle is given by $\lambda = (h / p)$ or $\lambda = (h / \varepsilon)\, c$. Rewriting the equation as a generalization of primordial cosmic photons, which are observed after having been emitted during the nascency of the cosmos yields the following: $c\, (h / \varepsilon \lambda) = 1$, where the ratio $(h / \varepsilon \lambda)$ has the dimensions of [energy · time] / [energy · length]. Photon velocity can thus be redefined as, c = [energy expended over a distance] / [energy expended over a time interval]. Since identical quanta of energy ε are represented in the numerator and denominator, c ultimately has the physiostratum dimensions characteristic of velocity: [L/T].

Variation of Spacetime Topology with Cosmic Age

The velocity of light c has the physiostratum dimensions of [length] / [time] or the ratio [L] / [T] that is taken as the characteristic dimensionality of spacetime voxels. For spacetime voxels in the current epoch, L ≈ Planck length (10^{-33} centimeter) and T ≈ Planck time (10^{-43} second) and c ≈ $3 \cdot 10^{10}$ cm/s.

We propose that each individual photon is guided by the spacetime topology or the 'configuration space' through which it travels [5]. We further conjecture that primordial red-shifted photon wavelengths λ conform to the spacetime topological configuration associated with the emitters of that epoch. Assuming that h is a cosmological constant, since c = (ε λ / h), the primordial voxel ratio [L] / [T] needed to be greater at the earlier epoch, during which the redshifted λ was greater.

Assuming that primordial photon velocity varies with the characteristic dimension L of physiostratum voxels with which a photon interacts, it may be argued that nascent cosmos spacetime physiostratum voxels were larger and light had a higher velocity. This is consistent with the idea depicted in Figure 2 that the cosmological voxel ratio [L] / [T] exhibited a Machian reduction as the mass and material content of the cosmos increased [5]. If the Planck quantum of action varies while c is constant, then h = (ε λ) / c diminishes as λ diminishes inversely with increasing cosmic age, as depicted in Figure 2. The characteristic voxel ratio may still decrease inversely with increasing cosmic age, as argued previously.

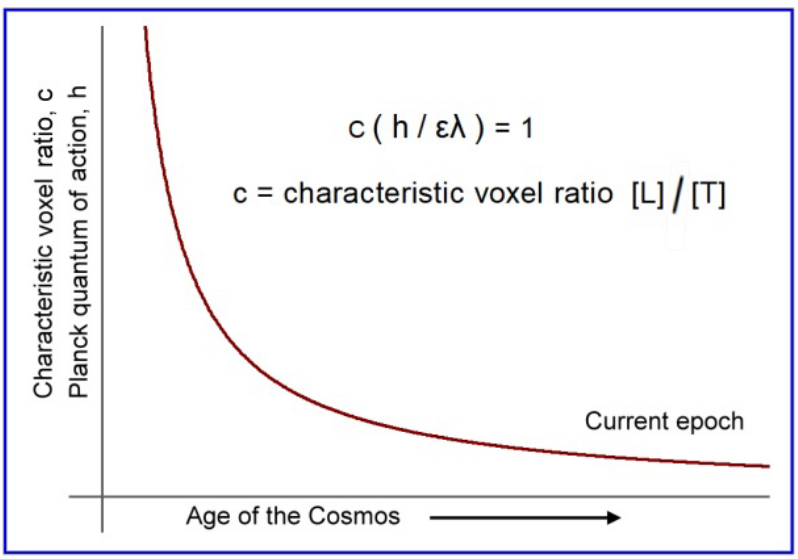

Figure 2 - Conjectured cosmological variation of Planck action quantum and light velocity with increasing age the of the cosmos.

Discussion

Our foundational premise is based on the presumption that during the initial stages of its formation, the cosmos was filled with large-wavelength de Broglie photons primarily due to Compton scattering. Accordingly, Figure 2 represents the premise that this cosmological wavelength diminished as the cosmos aged and that both the characteristic voxel ratio [L] / [T] and the Planck quantum of action h diminished.

Hubble's law of the correlation between redshifts and distances assumed that the wavelength of photons propagating through the expanding space is stretched, creating the cosmological redshift. This is contrary to the idea that cosmological redshifts are a consequence of the relative velocities of distant to nearby observation platforms. Current abstract reasoning holds that ancient photons exhibit redshifted wavelengths because space itself expanded exponentially during the formative stages of the cosmos. This is supplemented by the idea that ‘expanding space’ is continuing as a post-nascency increase in the cosmic voxel population, with continually diminishing characteristic voxel ratios extending into the current epoch.

Figure 2 also implies that light velocity was incredibly greater near zero cosmic age compared to light velocity at the current epoch. This may be interpreted as an initiating primordial emergence of enormous spacetime voxels from the mesostratum continuum in which the speed of light is undefined or instantaneous. The companion implication of Figure 2 is that, near zero cosmic age, Planck’s quantum of action was initially implausibly greater than it is in the current epoch, and that subsequently Planck’s quantum of action diminished quickly with cosmic age to acquire the minuscule value we assign today. We must acknowledge that the extraordinary magnitudes of c and h during the nascency of the cosmos, as depicted in Figure 2, are relative and reckoned from measurement standards of the current epoch.

The initially infinite Planck quantum of action, depicted in Figure 2, suggests the generation of a singular big bang that was possibly followed by innumerable mini big-bang-like events accompanying individual energy eruptions from the mesostratum zero-point field, leading to the current epoch. Figure 2 is based on the inference that the wavelength λ varies inversely with the age of the cosmos T: that $\lambda \propto 1/T$. This conjecture leads to the dilemma of the implied infinity at cosmic age zero which we resolve as follows.

In Figure 3, we suggest two stages in the formation and evolution of the cosmos. We do not believe that an infinite amount of energy emerged instantaneously from the ZPF in a Big Bang, but that energy became available. The Zero Time zone is a mesostratum realm utterly devoid of spacetime. We suggest that oscillating spacetime voxels, indeed veritable ticking clocks, emerged in the physiostratum spacetime epoch. These provided bases for Planck energy parcels generating Bose-Einstein condensate dark matter (BECDM), baryonic gravitational agglomerations, and the nucleation of galaxies and thermonuclear ignition of stars.

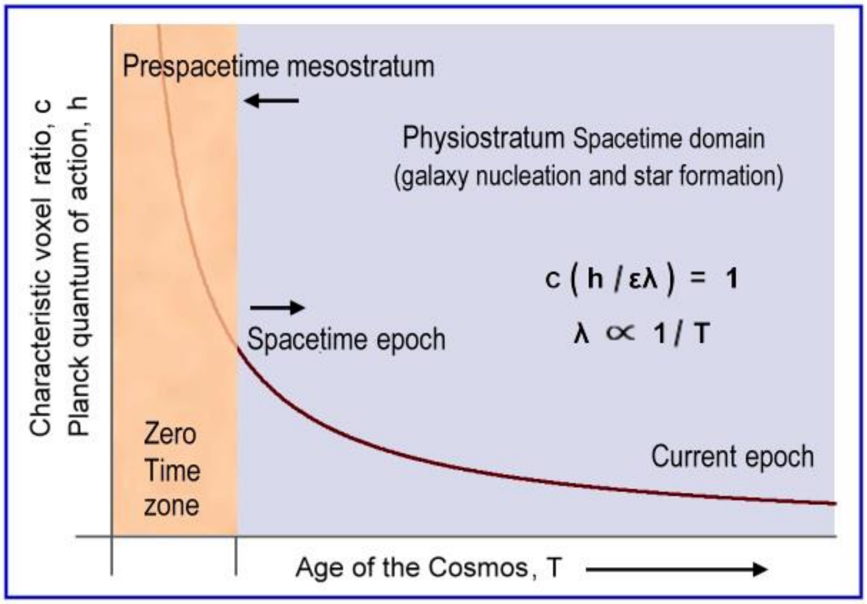

Figure 3 - Conjectured cosmological origin/evolution scenario.

We posit that the nascency of the cosmos consisted of uncountable minute energy eruptions that produced the spacetime foundation for a Bose-Einstein condensate [3]. The Bose-Einstein condensate consisted of pervasive dark matter in the nascent cosmos. The dark matter agglomerated with the dynamical evolution of the baryons, and the growth of perturbations, which provided the initial conditions for the formation of galactic nuclei, most likely of black holes. In the nascent Bose-Einstein condensate dark matter, perturbations presumptively grow more rapidly than is assumed by current cosmology models, leading to a much faster growth rate of baryonic perturbations, accelerating the galaxy formation process.

Studies of Bose-Einstein condensates demonstrated the implosion and explosion of certain condensates. When the number of particles becomes sufficiently large, so that N > Nc, where Nc is a critical number, attractive interparticle energy causes the condensate to implode. At a certain critical value, a fraction of the particles is expelled. On an order of a few milliseconds, the imploded condensate stabilizes. The growing literature on the Bose-Einstein condensate dark matter (BECDM) model has been successful at describing large scale structure of the cosmos [6]. The BECDM genesis of black holes from primordial cryogenic dark matter is consistent with the cryogenic nature and virtually zero Kelvin temperature of black holes.

Cosmological redshifted radiation appears to be evidence of primordial physical parameters in the nascency of the cosmos. Parameters c and h apparently decrease with the age of the cosmos. The cosmic microwave background radiation further attests to the cryogenic nature of the primordial cosmos that even in the current epoch is isotropically cryogenic, with the exception of sparsely distributed relative pin points of stars in the vastness of cosmic space. The implication is that, throughout the immediate epoch of the cosmos, conditions continually prevail for emergence of Bose-Einstein condensate dark matter and the agglomeration of matter and perturbations that lead to new gravitational formations.

In Figure 2 we represent the conjecture that the Planck quantum of action, h, and the characteristic voxel ratio, c, simultaneously decrease as the age of the cosmos increases. We further conjecture that both c and h may change alternately and periodically with the cosmological age of the particular cosmic region involved and result in the observed redshift periodicity [7]. Observations of redshift periodicity and redshift discretization have led to the hypothesis that the redshifts of cosmologically distant objects, particularly of galaxies and quasars, tend to cluster around multiples of some particular value [8]. This conforms with the notion that different regions of galaxy clusters and superclusters evolve and age differently and represent different stages of cosmological aging [9]. Moreover, given redshift periodicity, we are inclined to adopt the concept of a cosmological wavefunction that prevails throughout the cosmos, as represented in Figure 4.

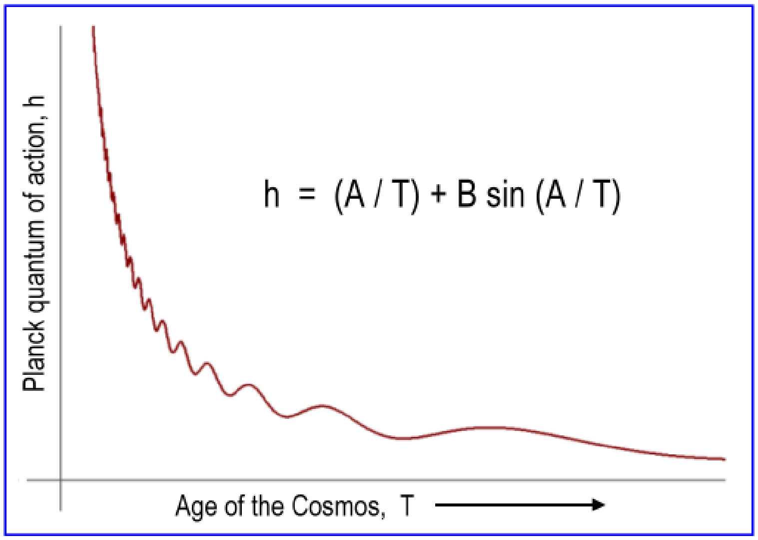

Figure 4 - Assumed cosmological wave function.

Conclusion

Figure 3 suggests that the prespacetime mesostratum continuum accommodates the entire dimensional spectrum from zero to infinity. The physiostratum discontinuum has a sequential history and as the curve for c or h approaches zero, the cosmos is apparently reduced to a state of increasingly diminished energy parcels and ultimately reaches thermodynamic equilibrium or maximum entropy. But the plausibility of this ultimate fate for the cosmos is a subject of interpretation of the past, present, and future of the cosmos as implied by Figure 3 and the conjectured cosmological wavefunction of Figure 4.

References

1. Is Planck's Constant - A Cosmological Variable?, U. V. S. Seshavatharam, S. Lakshminarayana, *International Journal of Astronomy*, Vol. 2, No. 1, 2013, pp. 11-15.
2. Exploration of Mesostratum Physics, A. Vary, *Prespacetime Journal*, Vol. 7, No. 11, 2016, pp. 1473-1483.
3. Cubic Lattice Nucleus Model and Cryogenic Cosmology, A. Vary, *Prespacetime Journal*, Vol. 7, No. 2, 2016, pp. 422-441.
4. Fibonacci Sunflowers, Mathematical Objects, and Cubic Electrons, A. Vary, *Prespacetime Journal*, Vol. 7, No. 11, 2016, pp. 1463-1472.
5. Hidden Variables, Diffraction and Spacetime Topology, A. Vary, *Prespacetime Journal*, Vol. 8, No. 2, 2017, pp. 268-276.
6. Evolution of Cosmological Perturbations in Bose-Einstein Condensate Dark Matter, T. Harko, *Monthly Notices Royal Astronomical Society,*413 (4): 3095-3104 (2011).
7. Redshift Periodicities, The Galaxy-Quasar Connection, W. G. Tifft, *Astrophysics and Space Science*, 285 (2):429 (2006).
8. Possible Discretization of Quasar Redshifts, K. G. Karlsson, *Astronomy and Astrophysics*, 13: 333 (1970).
9. A Possible Relationship between Quasars and Clusters of Galaxies, H. Arp and D. Russel, *Astrophysical Journal*, 549 (2):802 (2001).

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