THENEW COSMOLOGY

By

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The New Cosmology

According to the second law of thermodynamics, we assume that that the frequency and energy (E) of electromagnetic radiation (EM radiation) emitted by stars and galaxies undergoes intrinsic decay at an exponential rate as it traverses the vast reaches of interstellar and intergalactic space according to the first equation of the new cosmology (Equation 1). We further assume that said intrinsic decay of EM radiation is not caused by the inverse square law, or by an expansion of the universe.

Equation 1: 

where **E.is** the electromagnetic energy (EM energy) emitted at its origin by stars, galaxies, etc., **f:** is the EM energy arriving in the proximate sky of Earth as the

cosmic microwave background radiation (the CMB), **CX.** (alpha) is the decay constant of EM radiation (in units of energy: e.g., in electron volts per light year per light year), and tis equal to cosmic time (in light years). This first premise of the new cosmology was the implicit basis for the red-shift (z) sky survey in the 1980's of Professors John Huchra and Margaret Geller of the Harvard Center for Astrophysics, which was a predecessor of the Sloan Digital Sky Survey (the SDSS). Vide infra: on page 10 hereof, a "galaxy map" from the SDSS, attached under a caption thereto.

First postulate: The low energy cosmic microwave background radiation (the CMB) in the proximate sky of Earth originated as high energy EM radiation emitted by stars and galaxies located within the inner and the outer boundaries of an exceedingly distant virtual thick-walled spherical shell of galaxies geometrically centered on the proximate sky of Earth. The inner and the outer boundaries of said virtual thick-walled spherical shell of galaxies are many, many orders of magnitude more distant from the Earth than the most distant visible celestial emitters. If it were not for the finite system of galaxies acting as gravitational lenses intervening between the exceedingly distant high energy origin of the CMB, and the arrival of the low energy CMB in the Earth's proximate sky greatly reduced by intrinsic decay of electromagnetic frequency and energy decay, then said exceedingly distant virtual thick-walled spherical shell of galaxies geometrically centered on the proximate sky of Earth would exhibit the physical properties of a perfectly absorbing (Planck) cavity radiator, and the CMB in the proximate sky of the Earth would be perfectly isotropic!

Moreover, our own exceedingly distant virtual thick-walled spherical shell of galaxies geometrically centered on the proximate sky of Earth can be conceptualized as one of an infinite series of such virtual spherical thick-walled shells of galaxies

centered geometrically on one of an infinite series of points in the universe, whereat the CMB throughout the universe would be perfectly isotropic, if the (infinite) space of the universe were not to be replete with gravitational lenses! Consider also that the anisotropy of the CMB recorded by the WMAP (after its launch in 2001), in view of the subtle anisotropic imperfections of the CMB reported by Woody and Richards in 1976, and by Peterson and Richards in 1983, and recorded in the data from COBE (the Cosmic Microwave Background Explorer) as of 199 3, were caused by our own "contemporary" universe, replete as it is with gravitational lenses. Vide infra.

Further, we assume that the universe is infinite in cosmologic space, and eternal in cosmologic time, and on a large scale a thermodynamic equilibrium. Also, we assume that the second equation of the new cosmology (Equation 2) is the thermodynamic equation of state of the universe!

Equation 2: Jo*0-* 0

t--.

where <r (sigma) is defined hereby as the degree of thermodynamic disorder

(mentropy) and order (negentropy) in the universe, where the thermodynamic degree of disorder and order in the universe has (respectively) a positive value (mentropy), or a negative value (negentropy), and the value of the "integral" of thermodynamic order (negentropy)\_and thermodynamic disorder (mentropy) is "zero", from regions of cosmologic space approaching an infinite dimension (oo ), to regions of cosmologic space equal to the dimension of a point ( o ), as cosmologic time approaches eternity( ).

Second postulate: The universe is infinite in cosmologic space, and eternal in cosmologic time, and on a large-scale a thermodynamic equilibrium, comparable to an infinite and eternal series of wave-functions, consisting of interminable cycles of formation and dissolution of stars and galaxies; which cycles can be conceptualized as sine and cosine wave-functions as cosmic time approaches eternity (00 ) and cosmic space approaches infinity (co ). These physical properties of the universe of stars and galaxies, and interminable cycles or wave-functions, are all encompassed within the second equation of the new cosmology: the thermodynamic equation-of­ state of the universe (sic)!

Also, it has not escaped our attention that the large-scale structure of the universe; viz., a reticular (net-like) structure interspersed with voids (spaces devoid of galaxies) resembling cells: as depicted on a "galaxy map" from the SDSS (on page 10 hereof) attached under a caption thereto. This large-scale structure suggests a biologic proto-structure (a histologic proto-structure).

We further assume that the third equation of the new cosmology (Equation 3), which was derived by the author in 1993, is the equation-of-state of "degenerate" gases (i.e., a mass-dense gas (e.g., a neutron star) that does not obey the classical gas laws of physics: Boyle's law, Charles' law; and Gay-Lussac's law.

Equation 3:

where Pis the pressure generated by the degenerate *K* (kappa) is a physical constant, *;:,* (the lower case Greek letter, rho) is the mass-density of the degenerate gas, and e (the square root of 2) is the base of natural logarithms.

Third postulate: Whereas the Pauli exclusion principle is conceptualized as a total mutual exclusion of elementary particles (fermions) from occupying the same space, to the contrary of said conception of Pauli, the third equation of the new cosmology: the equation of state of degenerate gases (mass-dense gases), derived hereby in the Spring of 1993, suggests that the total mutual exclusion of elementary particles from occupying the same space imagined by Pauli in fact might be a partial mutual exclusion, if and when the elementary particles of a mass-dense object (e, g., a white dwarf star or a neutron star) are placed under extreme mutual gravitational compression by a sufficient gravitational force.

Discussion

Now, the mass-density of ordinary matter (e.g., a piece of wood) is relatively low; and with reference to the third equation of the new cosmology: the equation of state of a degenerate gas, it has not escaped our attention that if matter qua matter were to be conceptualized as a degenerate gas (a mass-dense gas), and if this concept of matter were to be correct, then the third equation of the new cosmology would be an equation of state of matter qua matter.

See Equation 3 he new cosmology, and let us trace the history of Equation 3. Subrahmanyan Chandrasekhar, an astronomer and astrophysicist at the University of Chicago, and the Yerkes Observatory in Lake Geneva, Wisconsin, who was awarded the Nobel Prize in Physics in 1983 for his theoretical description of the physical processes of importance to the structure and evolution of stars, as long ago as 1931 understood that the term for mass (and mass-density) in Albert Einstein's theory of general relativity belonged in the numerator of the equation; and in his

own equation for a degenerate gas (i.e., a mass-dense gas) Chandrasekhar placed

the term for mass and mass-density *r,* (rho) in the numerator (Chandrasekhar, 1931). *r*

Chandrasekhar's equation: P = k/'"

where Pis the pressure of the degenerate gas, k is an empirical constant, ,tJ,, (rho) is the mass-density of the degenerate gas, and the exponent, n, is a property of the mass-density of the degenerate gas.

In the Spring of 1993, the author of this paper solved Chandrasekhar's 1931 equation (which had come to be known as the "canon ical" equation for a degenerate gas) for the value of the exponent, n, whereby he found that the value of the exponent, n, was equal to the base of natural logarithms, e (the square root of 2),

raised to the exponential power of the mass-density,;' (rho), of the degenerate gas, and that M (kappa) of our Equation 3 was not equal to the constant, k, of Chandrasekhar's 1931 equation. In the Spring of 1993, the author of this paper thereby derived the third equation of the new cosmology. If Equation 3 of the new cosmology (the equation of state of a degenerate gas) were to be the equation of state of matter qua matter, the fact thereof would certainly be noteworthy!

Not insignificantly, the third equation the new cosmology explains the physical mechanism whereby mass-dense objects (e. g., white dwarf stars and neutron stares) explode into novae and supernovae, and thereby recycle matter into the universe for stellar neosynthesis, and ultimately for galaxy formation.

With reference to the so-called "standard" theory (i.e., the "standard" cosmology) of the 20 th Century; that is to say, the "big bang, expanding" universe concept, from its beginning in the 1920's a century ago, the "big bang, expanding" universe concept has been fraught with problems, and this has continued into the current third decade of the 21st Century.

In the first place, in the 1920's, the "big bang, expansion" hypothesis assumed the actuality in cosmologic time of a beginning, by drawing upon the biblical book of Genesis, whereby the Belgian Jesuit (and priest-astronomer), the Abbe Georges Lemaitre suggested that the universe began with an explosion of a primeval "super atom", and was taken seriously by the Harvard astronomer and astrophysicist Edwin Hubble, who with Milton Humason at the Mount Wilson Observatory in California), was able to demonstrate a relation between the red-shift of light from distant stars and the estimated distance of the stars from Earth borne observers, a "redshift-distance" relation (a correlation, thereafter known as "Hubble's law"), wherewith given the conception of an explosive "beginning" of the universe (a "big bang"), an "expansion" of the universe was further assumed by Hubble and others, evidenced by a demonstrable preponderance in the universe of "red-shifts" over "blue-shifts", which (red-shifts) were assumed to be Doppler shifts (analogous to the Doppler shifts of a train whistle receding from a listener), and the conception of an "expanding universe" propelled by the force of a "primeval explosion" captured the imaginations of 20th Century astronomers and astrophysicists.

Secondly, in as much as we currently understand the problem, an explosion of a primeval "super atom" would have been nothing more than a fantasy of Abbe Lemaitre's imagination (in violation of the tautologic rule:. "nihil ex hihilo"), and by the decade of the 1940's Lemaitre's hypothetical primeval "atomic" explosion (and "beginning" of the universe) was assumed by an informal "association" of physicists (viz., Ralph Alpher (M. I. T.), Hans Bethe (Cornell), and George Gamow (University of Colorado), to have been a primeval "thermonuclear" explosion. The joint authorship of their paper: "Alpher, Bethe, and Gamow" (meant to paraphrase the Greek: "alpha, beta, & gamma"), was devised for the express purpose of publication (whether or not in 1941 or in 1948, whether or not at the suggestion of Sir Arthur Eddington); and their assumption of a primeval "thermonuclear"\_explosion, inasmuch as this

hypothesis was assumed by one and another to be consistent with the abundance of hydrogen and helium in the universe (whether before or after the hypothetical "big bang") was not subsequently opposed throughout the remainder of the 20 th Century by professional astronomers and astrophysicists, or during the first two (2) decades of the 21 st Century, and even unto the present day.

With further reference to the so-called standard "big bang, expansion" theory and cosmology of 20 th Century astronomy and astrophysics, and now even into the first and second decades of the 21 st Century, the (2) fundamental hypotheses of the "big bang, expansion" cosmology have not been called into question by professional astronomers and astrophysicists, but only by our new cosmology. Moreover, the "big bang, expansion" cosmology in order to stay afloat has required of all of us a number of implausible and improbable assumptions.

For example, an inexpedient "convention of thought" came into play some years after Hubble, Humason, and Lemaitre left their mark, and Alpher, Bethe, and Gamow followed in step, which ("convention of thought") gained a foothold among professional astronomers and astrophysicists in the latter half of the 20 th Century, and even survives unto the present day, which is to say the habit of expressing cosmologic distances in terms of velocities of recession of the galaxies observed; and cosmologic distance was soon assumed by astronomers and astrophysicists to be a velocity of recession of galaxies away from Earth borne observers, and away from all other galaxies. The parameter of distance became a parameter of velocity! This has been a most disingenuous assumption, and it reinforces the idea of expansion at every mention of it. Another "convention of thought" which came into play by mid­ century, and gained a foothold among professional astronomers and astrophysicists, was the gratuitous transformation of an observable "redshift-distance" correlation (Hubble, 1929) into a theoretical "velocity-distance" correlation, which was wholly

"derivative". According to the correlation between "velocity" and "distance", which was wrongfully conceived from its inception (because it made "velocity" a measure of distance) the most distant galaxies were receding from an Earth borne observer at the fastest velocities.

Now, as a result of these widely accepted (but incorrect) "conventions of thought" among professional astronomers and astrophysicists, a "velocity-distance" correlation (a wholly "derivative" concept) was widely accepted by professional astronomers and astrophysicists as an alternative expression of Hubble's law; and it seems further to have gone unnoticed that the velocity of recession of galaxies away from Earth borne observers, and away from all other galaxies, and that the velocity of expansion of the universe itself at some future cosmologic time would reach and exceed the speed of light, at which unforeseeable future cosmologic moment, the most distant galaxies receding at the fastest velocities (in fact having over taken the speed of light) would be the first galaxies to disappear from our "view". This is to say, according to the logic inherent in the fundamental hypotheses of the standard "big hang, expansion" cosmology of 20 th and early 21st Century astronomy and astrophysics, the universe itself of galaxies and stars eventually would disappear

from all points of view!

These considerations of detail and logic and their implications for scientific discourse after one hundred years of the standard "big bang expansion" cosmology can be seen to be grave, and in this light we can see that the so-called "standard" theory and "standard" cosmology of 20 th Century and early 21 st Century astronomy and astrophysics: the "big bang, expansion" cosmology, has been engendered and nurtured, even unto the present day, pursuant to an implausible and improbable set of false premises. Moreover, the recipients of the 2006 Nobel Prize in Physics were standard "big bang, expansion" theorists, and their concerns have continued to focus on the hypothetical and infinitesimally brief physical conditions of a primeval "big bang" universe, and the fractions of seconds immediately before, during, and after the hypothetical "big bang". Professional astronomers and astrophysicists of the early 21st Century, and the Nobel Committee for Physics, have continued to rely on the same implausible and improbable false premises as their predecessors.

To the contrary, the new cosmology observes that their infinitesimally brief intervals of primeval time, and fluctuations of primordial space and matter, have no practical significance, and are wholly imaginary! In fact, the new cosmology hereby states that the "early" universe of the so-called "standard" theory and cosmology, on the one hand, and the "contemporary" universe, on the other hand, exhibit the same physical properties, the same dimensions of cosmologic space and time, and similar large-scale distributions of galaxies and stars!

The aforesaid errors of scientific reasoning which confounded 20th Century astronomy and astrophysics, and continue to confound scientific discourse among professional astronomers and astrophysicists, are traceable to Edwin Hubble's incorrect assumption (his false first premise) that the "red-shifts" recorded by his colleague Milton Humason at the Mount Wilson Observatory in California were Doppler shifts caused by the expansion of the universe, and that the preponderance of red-shifts in the universe (compared to blue-shifts) observed by Vesta Slipher in the second decade of the 20 th Century meant that the universe itself was expanding.

As a matter of fact, the preponderance of red-shifts in the universe is caused by intrinsic decay of the frequency of EM radiation as it traverses the vast distances of interstellar time and space, and the vast reaches of intergalactic time and space. Our alternative hypothesis (the intrinsic decay of EM radiation) certainly would have been discussed in the early decades of the 20 th Century among the "luminaries" of modern physics at Harvard, Princeton, M. I. T., Caltech, etc. The author of this paper himself has seen evidence among the volumes shelved in the Astronomy Library at Princeton University, which evidence persuaded him that an alternative hypothesis (probably the intrinsic decay hypothesis) would have been discussed at Princeton as early as 1929 (and Hubble's false first premise that the red-shifts were Doppler shifts). The intrinsic decay hypothesis is the basis for the first equation and the first postulate of the new cosmology. which intrinsic decay hypothesis would have been, doubtlessly, the alternative hypothesis that was sought by early 20 th

Century skeptics of Edwin Hubble's "Doppler-shift" and "expansion" hypotheses.

Now, the new cosmology avoids the confounding of scientific discourse in the fields of astronomy and astrophysics that has attended the so-called standard "big bang, expansion" hypothesis. (Vide supra.) Also, the new cosmology hypothesizes an alternative explanation for the findings of the Cosmic Background Explorer Satellite (COBE) launched in 1989, and the findings of the Wilkinson Microwave Anisotropy Probe (WMAP) launched in 2001. The investigators who designed and set in motion the COBE and the WMAP flights, and analyzed and interpreted the data from the COBE and the WMAP flights, have been and remain proponents of the so­ called standard "big bang, expanding" universe hypothesis, who (as we approach the third decade of the 21st Century) have also succeeded in ignoring the fact of the new cosmology, and who continue to pay lip service to and promote the standard "big bang, expansion" hypothesis. Also, they have failed to acknowledge the exquisite technological research in astronomy and astrophysics (prior to COBE and WMAP) of Professors Paul Richards, and David Woody (1976), and Jeff Peterson (1983) at the University of California, Berkeley. The exquisite technological research of Richards, Woody, and Peterson anticipated the findings of the COBE and the WMAP, and at less cost to the United States government!

Moreover, in 2006 the Nobel Committee awarded the Nobel Prize in Physics to the COBE and WMAP investigators for their contributions to our understanding of the early "infancy" of the universe, a theoretical primeval interval of cosmologic "time" following the hypothetical "big bang", during which interval "primordial" fluctuations of matter are assumed by them to have coalesced to form galaxies, and that the universe of galaxies has been expanding for thirteen and one-half billion (13.5 billion) years following the "big bang". By contrast, the new cosmology rejects these conclusions of the COBE and WMAP investigators, and the judgment in 2006 of the Nobel Committee. Also, the new cosmology has required fewer, and critically more plausible, assumptions than the standard "big bang, expansion" hypothesis.

Wherefore, let us summarize. According to the first equation and the first postulate of the new cosmology: the anisotropy of the CMB detected both by the COBE and by the WMAP was caused by a finite system of galaxies (gravitational lenses) intervening between (on the one hand) the exceedingly distant origin of the CMB (many, many orders of magnitude more distant from Earth than the extreme edge of the visible universe), and (on the other hand) the arrival of the CMB in the proximate sky of Earth. To the contrary of assumptions among standard theorists, the anisotropy of the CMB in the Earth's proximate sky detected by the COBE and the WMAP was not caused by primordial fluctuations of the residual matter of the universe following a primeval explosion (a "big bang"), as subscribed to by the COBE and the WMAP investigators (and as subscribed to by the Nobel Committee on Physics in 2006). According to the new cosmology there was no such time and place. The universe is infinite in cosmologic space, and eternal in cosmologic time. The early ("infancy") of the universe, as conceptualized by the "big bang, expansion" hypothesis, is a wholly imaginary time and place!

With reference to these matters, be referred to the (published) "rationale and justification" of the Nobel Committee on Physics for awarding the 2006 Nobel Prize in Physics to the COBE and WMAP investigators. The focus of the COBE and WMAP investigators, and the Nobel Committee on Physics in 2006, was a primeval interval of cosmologic time that was itself hypothetical, and on primordial fluctuations of cosmologic matter that were also hypothetical. What did the data from the COBE and the WMAP suggest to the standard "big bang, expansion" theorists about these hypotheticals? The false first premise of Hubble that his colleague Humason's red­ shifts were Doppler shifts, and that the universe was expanding, has itself evolved now into a question about: (a), "fluctuations" of hypothetical primordial "matter", (b), after a hypothetical "big bang", (c) in a hypothetical primeval "time and place".

In the meanwhile: firstly, the exquisite technologic research of Professors Paul Richards, David Woody, and Jeff Peterson over Palestine (Texas), published in 1976 and 1983, which described the distribution of the electromagnetic energy of the cosmic microwave background (the CMB); and secondly, the discovery of the large­ scale structure of the universe by Professors John Huchra and Margaret Geller of the Harvard Center for Astrophysics has not yet been acknowledged by the Nobel Committee.

Further, by way of comparison and contrast to the so-called standard theory and standard cosmology of 20 th Century astronomy and astrophysics, the new cosmology suggests that the so-called "early" ("infancy" of the) universe and the "contemporary" universe necessarily exhibit the same "physical properties": the same spatial and temporal "dimensions", and the same large-scale structure of the distribution of galaxies. The universe is infinite (OO ) in cosmologic space, and eternal (a, ) in cosmologic time; there was no primeval explosion (no primeval "big bang"), and the universe has not been "expanding". These contrary points of view place the new cosmology correctly in fundamental opposition to the "standard" (big bang, expansion) theory, and the "standard" cosmology of the 20 th Century, and the "early" 21st Century.

Also, with reference to the Hubble "diagrams" of morphologic galaxy "types" (Hubble, 1935), Hubble's schemata did not provide for an evolutionary sequence of morphologic types of galaxies, and we question whether elliptical galaxies are not a stage in the evolution of spiral galaxies (and/or vice versa), and we further suggest that spherical galaxies are as likely (as not) to be elliptical galaxies sighted along the long axis of the ellipsoidal. We further suggest that the "life times" of spiral galaxies and elliptical galaxies have been greatly under-estimated by the so-called standard "big bang, expansion" cosmology of 20 th Century astronomy and astrophysics.

We have concluded that on a large-scale the universe is a thermodynamic equilibrium, eternal in cosmologic time, and infinite in cosmologic space (eternal and infinite in all directions from all points of view). Moreover, there are no "black holes" (as such). There are "white dwarf stars" and there are "neutron stars"; there are "novae" and "supernovae"; there are "galactic nuclei" and active "galactic nuclei" (i.e., synchrotron systems), but there are no "black holes" (as such). Furthermore,

there is no "dark matter" (as such), and the universe is not going to collapse upon itself with a "big crunch" from the gravitational force of a "dark matter".

Acknowledgements: I wish to express my gratitude for the research of John Huchra and Margaret Geller of the Harvard Center for Astrophysics (Cambridge, Massachusetts), and for the research of the Sloan Digital Sky Survey (the SDSS) at the Apache Point Observatory (Las Cruces, New Mexico), which latter research of the SDSS drew upon the earlier research of Professors Huchra and Geller. The respective research of these two (2) teams of astronomers and astrophysicists, and the theoretical research on the new cosmology, commenced independently of any

academic affiliation by the author of this paper (myself) during the Summer of 1984 in Marblehead, Massachusetts, can be demonstrated to be perfectly complementary, and to a degree mutually verifying, even though the respective research of the author hereof (myself), and the Harvard Center for Astrophysics, and the Sloan Digital Sky Survey, have not been collaborative. As a result of their independent research, their combined efforts in the hands of the author of this paper have yielded the new cosmology, and a "paradigm shift" in the professions of astronomy and astrophysics, a "scientific revolution" of the type described by Thomas S. Kuhn in his 1962 book The Structure of Scientific Revolutions. This paper recapitulates and summarizes the "paradigm shift" introduced by the new cosmology.

Caption to the photocopy attached hereto from the Sloan Digital Sky Survey (the SDSS). This photocopy of an SDSS "galaxy map" depicts a two (2) dimensional slice (less than 1 degree in width) of a three (3) dimensional "galaxy map" of the sky out to a distance 2 billion light years from Earth (at the center of the circle). This "galaxy map" was reproduced from the SDSS, the methodology of which was based on an earlier red-shift sky survey performed by Professors Huchra and Geller of the Harvard Center for Astrophysics. On the photocopy of this "galaxy map" from the SDSS, the radius of the circle is 2 billion light years, and the Earth is at the center of the circle. Each point of the galaxy map represents a galaxy containing some 100 million stars. The reticular (net-like) large-scale structure of the universe, and the voids or (cell-like) empty spaces seen interspersed among the reticular large-scale structure are discernable. The voids measure between 100 million and 300 million light years in diameter more or less, and some (voids) measure upwards to 500 million light years in diameter. This large-scale structure of the universe: a reticular interstitium that resembles a net-work, with voids (devoid of galaxies), interspersed throughout that resemble cells, which suggests to the author (myself) a prototype of a biologic (histologic) structure, and is not the structure of the universe predicted by the so-called "standard" (big bang, expansion) cosmology. On a "galaxy map" (from the SDSS) that has been color-coded for the age of galaxies, younger galaxies are colored green and older galaxies are colored red, and the dark wedge-shaped spaces to the right and the left of the Earth at the center of the circle are regions of the sky obscured by our Milky Way galaxy from observation by the SDSS.

At this point of our narrative, consult the "galaxy map" from the SDSS on page 10 of this text. The caption (above) coordinates with said "galaxy map".

