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New Cosmic Center Universe Model Matches Eight of Big Bang's Major Predictions Without The F-L Paradigm

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Abstract

Accompanying disproof of the F-L expansion paradigm eliminates the basis for expansion redshifts, which in turn eliminates the basis for the Cosmological Principle. The universe is not the same everywhere. Instead the spherical symmetry of the cosmos demanded by the Hubble redshift relation proves the universe is isotropic about a nearby universal Center. This is the foundation of the relatively new Cosmic Center Universe model, which accounts for, explains, or predicts: (i) The Hubble redshift relation, (ii) a CBR redshift relation that fits all current CBR measurements, (iii) the recently discovered velocity dipole distribution of radiogalaxies, (iv) the well-known time dilation of SNe Ia light curves, (v) the Sunyaev-Zeldovich thermal effect, (vi) Olber's paradox, (vii) a modified Tolman relation, (viii) SN dimming for $z < 1$, and for $z > 1$ an enhanced brightness that fits SN 1997ff measurements, (ix) the existence of extreme redshift ($z > 10$) objects which, when observed, will further distinguish it from the big bang. The CCU model also plausibly explains the $z = 3.91$ BAL quasar's high Fe/O ratio which so directly contradicts big bang's F-L paradigm. This leads to CCU's prediction that similar high-ratio, high-z quasars which falsify big bang's nucleosynthesis time line will also be discovered.

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I. INTRODUCTION — DISCOVERY OF NEARBY UNIVERSAL CENTER PROVIDES THE OBSERVATIONAL FOUNDATION FOR A NEW COSMIC MODEL TO REPLACE THE BIG BANG

A separate paper [1] has shown the exact calculation of the present F-L expansion-induced rate of photon wavelength change leads to a prediction of CBR temperature that seriously contradicts the measured 2.73 K. We conclude the universe is not governed by the F-L expansion paradigm, as generally believed. Disproof of the F-L expansion paradigm also eliminates its expansion redshifts, which in turn eliminates the basis for the Cosmological Principle. The universe is not homogeneous and isotropic. Instead the spherical symmetry of the cosmos demanded by the Hubble redshift relation proves the universe is only isotropic about a nearby universal Center. Thus the Hubble relation forms one part of the powerful observational evidence supporting the discovery of the existence of the nearby cosmic Center.

The equally powerful second and third parts come from: (i) Fishman and Meegan's 1995 review of Gamma-Ray Bursters (GRBs), wherein they noted [2], *"The isotropy and inhomogeneity of the [gamma-ray] bursts show only that we are at the center of the apparent burst distribution,"* and (ii) Woosley's 1995 review, wherein he noted [3], *"The observational data show conclusively that the Earth is situated at or very near the center of the gamma-ray burst universe."* These evaluations occurred before GRBs were discovered to be at cosmological distances. Now that the cosmological distances to GRBs have been confirmed [4], it is obvious that GRBs unambiguously prove a nearby universal Center does exist.

In one sense this discovery is not at all surprising considering that notable cosmologists have occasionally expressed rather strong doubts about the Cosmological Principle over the past few decades. In 1978 Weinberg described it as the [5], *"...one great uncertainty that hangs like a dark cloud over the standard model."* A decade later Hawking made an equally frank admission, saying [6], *"... it might seem that if we observe all other galaxies to be moving away from us, then we must be at the center of the universe. There is, however, an alternate explanation: the universe might look the same in every direction as seen from any other galaxy, too. This, as we have seen, was Friedmann's second assumption. We have no scientific evidence for, or against this 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 ..."*.

Peebles has added to this, saying [7], *"Might we be at the center of an inhomogeneous but spherically symmetric universe?"*, only to conclude shortly thereafter that, *"... the best argument against a spherically symmetric inhomogeneous universe is that the Milky Way does not appear to be a special galaxy, nor does it seem to be in a special place."*

That eminent cosmologists could openly describe the Cosmological Principle in such weak terms, and this without awakening serious discussion of this topic in astronomical and astrophysical journals, shows how deeply this hypothesis, and its parent, the F-L paradigm, have been entrenched in modern cosmology.

An alternative to a F-L paradigm universe is one formatted according to Einstein's original static spacetime solution of the field equations. A new cosmic model, the New Redshift Interpretation, based on this relativistic format was published in 1997 [8], and provisionally updated in 1998 [9]. In its initial form the NRI was demonstrated to provide an alternate explanation of the 2.73 K CBR and the Hubble relation. This model, now renamed the Cosmic Center Universe model, has now been considerably expanded to show it is capable of explaining at least eight of big bang's major predictions.

II. THE COSMIC CENTER UNIVERSE MODEL — AN OVERVIEW OF ITS PREDICTIONS AND OTHER REASONS FOR DENYING THE COSMOLOGICAL PRINCIPLE AND THE F-L EXPANSION PARADIGM

Bahcall [10] has enthused *"The Big Bang is bang on"* because Cosmic Blackbody Radiation (CBR) measurements [11] at $z = 2.34$ match its prediction of 9.1 K. This article proposes the relatively new Cosmic Center Universe (CCU) model [8] equally qualifies because it accounts for, explains, or predicts: (i) a $T(z) = 2.73(1+z)$ K relation that fits all current CBR measurements [11, 12], (ii) the recently discovered velocity dipole distribution of radiogalaxies [13], (iii) the $(1+z)^{-1}$ dilation of SNe Ia light curves [14], (iv) the Sunyaev-Zeldovich thermal effect [15], (v) Olber's paradox, (vi) a $\sim (1+z)^{-3.56}$ modified Tolman relation, (vii) SN dimming for $z < 1$, and for $z > 1$ an enhanced brightness that fits SN 1997ff measurements [16], and (viii) the existence of extreme redshift ($z > 10$) objects which distinguishes it from the big bang.

My earlier discovery, that ours is a universe governed by Einstein's static solution of the field equations [17], forms the relativistic basis for the CCU. It therefore denies F-L expansion's galaxy-and-associated-heavy-element, z-dependent, creation timeline, and postulates instead that all galaxies interior to a very distant outer galactic shell, have a common time origin and heavy element abundances independent of z. Thus, the recently discovered $z = 3.914$ quasar [18] with a Fe/O ratio three times that of the sun directly contradicts big bang's heavy element nucleosynthesis scenario, and shows that its underlying F-L expansion postulate is flawed. In contrast this observation fits easily within the CCU's basic framework, and provides a strong foundation for its extraordinary postulate of a nearby cosmic Center (C) and corresponding denial of the Cosmological Principle (CP). One very great advantage of this new model is that it restores conservation of energy to physics, in stark contrast to the big bang, which involved gargantuan nonconservation of CBR energy losses amounting to more than thirty million times the baryonic mass of the visible universe [17].

III. THE COSMIC CENTER UNIVERSE MODEL — ITS USE OF VACUUM ENERGY REPULSION TO ACCOUNT FOR THE HUBBLE REDSHIFT RELATION IN TERMS OF EINSTEIN GRAVITATIONAL AND RELATIVISTIC DOPPLER SHIFTS

In late 1997, before the SNe Ia evidence for cosmic repulsion was published in early 1998 [19, 20], I developed the Einstein-static-solution-based NRI (now CCU) model [8] which predicted that ours is a universe dominated by vacuum energy density, $\rho_v \simeq 8.9 \times 10^{-30}$ g-cm^{-3} and density parameter $(\Omega_\Lambda)_{\rm CCU} = 8\pi\rho_v G/3H_o^2 \simeq 1$. This compares to $\Omega_\Lambda \sim 0.7$ from SNe Ia observations [16]. The CCU accounts for the Hubble redshift relation in terms of Einstein gravitational and relativistic Doppler redshifts caused by vacuum gravity repulsion. Since the latter produces a true Hubble recession of the galaxies away from C, the CCU represents a physically expanding universe, but without big bang's singularity and F-L expansion. Moreover, its nearby Center provides a unique understanding for the heretofore unexplained quantized redshifts and quasar redshift peaks [21], in particular that quasars in different spherical shells are grouped in different $z_i \pm \Delta z_i$ intervals at cosmological distances. Additionally, a nearby Center implies that Earth's motion through the CBR must result in a dipole velocity distribution of distant galaxies. This has recently been observed [13].

IV. THE COSMIC CENTER UNIVERSE MODEL — ITS USE OF VACUUM ENERGY AND AN OUTER GALACTIC SHELL TO EXPLAIN THE COSMIC BLACKBODY RADIATION AS GRAVITATIONALLY REDSHIFTED CAVITY RADIATION

A nearby C enables the CCU's model to associate the 2.7 K CBR with cavity radiation instead of expansion-shifted big bang relic radiation. Cavity radiation exists in the CCU model because in it galaxies of the visible universe are enclosed by a thin, very distant outer shell of closely-spaced galaxies at a distance R from C. Years ago Misner *et al* [22] theorized, *"The cosmic microwave radiation has just the form one would expect if the earth were enclosed in a box ('black-body cavity') with temperature 2.7 K."* While the MTW box resembles the CCU's outer shell, the CCU's vacuum energy and gravitational redshifts – and its use of the radial variation of gravitational potential within the spherical cavity [8] to explain the CBR's temperature-redshift dependence – clearly distinguish it from the MTW scenario. Thus the blackbody cavity radiation temperature, $T(z)$, at any interior point, P, depends on the Einstein gravitational redshift between P and the outer shell, or between P and the nearby Center. If the vacuum pressure, p_v, is negative, then the vacuum density, ρ_v, will be positive, and the summed vacuum pressure/energy contributions to vacuum gravity will be $-2\rho_v$. So, excluding the outer galactic shell at R, the net density throughout the cosmos from C to R would be $\rho - 2\rho_v$, where ρ is the average mass/energy density of ordinary matter. Beyond R both densities are assumed to either cancel or diminish to negligible values, which achieves for the CCU model what Birkhoff's theorem did for standard cosmology. By including ρ_v and p_v into the gravitational structure of the cosmos, together with appropriate boundary conditions, one obtains $T(z) = 2.73(1 + z)$ K for the CBR temperature-redshift equation [8], which duplicates big bang's prediction for all z, but without its F-L expansion. Thus, radiation emitted from the outer shell is gravitationally redshifted to become the 2.73 K blackbody cavity radiation here at the Galaxy [8], and 9.1 K at $z = 2.34$ and 10.97 K at $z = 3.025$, in accord with recent measurements of 6.0 K $< T <$ 14 K [11] and $T = 12.1^{+1.7}_{-3.2}$ K [12].

True blackbody cavity radiation results from assuming the outer shell consists of regularly spaced galactic clusters with stars composed of pure H at uniform temperature 5400 K [8]. On this basis the gravitational redshift from the outer shell to C is 5400 K/2.726 K $\simeq$ 2000, and the distance from C to the outer shell is $R = 14.24 \times 10^9$ ly [8]. Within broad limits this temperature is an arbitrary parameter, a change in which produces only minimal change in this radius. Thus in the CCU the ripples in the CBR [23, 24] are preliminarily attributed to either regularly spaced voids between its galactic clusters and/or small temperature variations within the clusters. The latter might also account for the thus far unexplained hot spots in the 2.7 K CBR [25]. Moreover since all galaxies in the visible universe are backlighted by the outer shell, they will cast a shadow in local 2.7 K CBR measurements. This is a new interpretation of the Sunyaev-Zeldovich (S-Z) thermal effect [15]. The kinematic S-Z effect is treated separately [26].

V. THE COSMIC CENTER UNIVERSE MODEL — ITS MODIFIED TOLMAN RELATION CLOSELY APPROXIMATES BIG BANG'S TOLMAN RELATION FOR $z < 1$, AND THE COSMIC BLACKBODY RADIATION IS PREDICTED TO BE PLANCKIAN

To compare the CCU model with the Tolman relation we follow the treatment of Ellis [27] and let L be a galaxy's intrinsic luminosity, and r_g, the *galaxy observer distance* measured by an observer in the *galaxy's* rest-frame. The proper flux measured locally would be $F_g = L/4\pi r_g^2$. However, CCU's redshift expression [8] contains r, the *observer area distance*, which is the galaxy's quasi-Euclidean distance as measured by a *stationary* local observer [27]. Aberration gives rise to a reciprocity relation between distance measures [27] such that $r_g = r(1 + z_d)$, where $1 + z_d$ is the CCU's special relativistic Doppler redshift factor, and v is the galactic recessional velocity relative to a fixed local observer [8]. Thus photons arrive locally by a factor of $(1 + z)^{-1}$ slower than emitted in the receding rest frame due to the combined relativistic Doppler and gravitational redshifts. This relative clock rate slowing accounts for the $(1 + z)^{-1}$ broadening of SNe Ia light curves [14]. Additionally, each photon arriving locally will likewise have its energy diminished by this same redshift factor. Thus the flux, F, measured by a local observer would be

$$F = \frac{L}{4\pi r_g^2(1+z)^2} = \frac{L}{4\pi r^2[(1+z)(1+z_d)]^2}, \tag{1}$$

after utilizing the $r_g = r(1 + z_d)$ substitution. If only Doppler effects are operational then, as Misner *et al* [22] show, the flux is $F_{\rm dopp} = L(1 + z_d)^{-4}/4\pi r^2$ and the bolometric intensity is $I_{\rm dopp} = F/\Delta\Omega = I_{\rm o}(1+z_d)^{-4}$, where $\Delta\Omega$ is the solid angle subtended by the source at r [27]. By analogy, for the CCU,

$$I_{\rm CCU} = F/\Delta\Omega = I_{\rm o}[(1+z)(1+z_d)]^{-2}. \tag{2}$$

Utilizing the CCU's total redshift factor [8], $1+z = (1+Hr/c)/\sqrt{1-2(Hr/c)^2}$, along with its Doppler factor, $1+z_d = (1+Hr/c)/\sqrt{1-(Hr/c)^2}$, allows fitting I solely in terms of z over the interval, $0 < z < 1$, namely

$$I_{\rm CCU} = I_{\rm o}/(1+z)^{3.56}, \tag{3}$$

which differs from the Tolman relation, $I_{bb} = I_{\rm o}/(1+z)^4$. Interestingly, Lubin and Sandage [28], in reporting observations on 34 galaxies from three clusters with $z = 0.76$, $z = 0.90$, and $z = 0.92$, conclude the exponent on $(1+z)$ varies from 2.28 to 2.81 in the R band, and 3.06 to 3.55 in the I band, depending on $q_{\rm o}$'s value. Further study is needed to assess the significance of the I band's near agreement with the CCU result. Of course Lubin and Sandage were unaware of this possible agreement.

Instead they propose evolutionary effects could bring their results in agreement with the Tolman exponent, $n = 4$, which they assume is correct using the usual argument that no deviation in the CBR has been found to one part in 10^4 [29]. In fact, however, this argument is flawed. The problem begins with Lubin and Sandage's assumption that the CBR is big bang's relic radiation, on which basis they conclude that an initial blackbody spectrum would remain Planckian only if the normalization is decreased with redshift by $(1+z)^{-4}$. They then reason that, since the Planck equation defines a surface brightness, a test of the Tolman surface brightness is obtainable from measuring the deviation of the photon number per unit surface area of the sky and by comparing observations with the normalization given by the Planck equation. They then say, correctly, that no deviation in the CBR has been found to one part in 10^4. The problem begins with their assuming the CBR is big bang relic radiation; they conclude it must have experienced perfect normalization due to cosmic wavelength expansion, which in turn implies validity of the Tolman surface brightness factor.

This article challenges this reasoning because: (i) Reference [1] presents factual disproof of the expansion hypothesis, (ii) the CCU provides an alternative explanation of the CBR without cosmic expansion, and (iii) there is a failure to distinguish between necessary and sufficient conditions. That is, while the CBR is Planckian to a high degree of precision, this is only a necessary condition for it to be identified with big bang's relic radiation, not a sufficient condition. Indeed, the assumption that the CCU model's outer shell's galactic clusters are composed of pure H stars – which are assumed to have originated in a different epoch than those in the visible universe – also guarantees that the CBR must be Planckian to an equally high degree of precision in the CCU model.

VI. THE COSMIC CENTER UNIVERSE MODEL — ITS (m, z) RELATION CLOSELY APPROXIMATES BIG BANG'S (m, z) RELATION FOR $z < 1$

Turning now to the CCU's (m, z) relation, using Equation (1) we utilize the usual luminosity distance definition, $d_L = \sqrt{L/4\pi F} = r_g(1+z) = r(1+z)(1+z_d)$, which becomes $d_L = r(1+z)^2$ for $z < 1$. Here the CCU's $(1+z)$ redshift factor is approximated by $Hr/c \approx z/(1+z)$, which leads to $d_L = cz(1+z)/H$. Substituting into the distance modulus, $m - M = 5(\log d_L - 1)$, we find

$$\begin{aligned}(m-M)_{\mathrm{CCU}} &= 5[\log cz - \log H + \log(1+z)] - 5 \\ &\approx 5[\log cz - \log H] + 1.623z - 5,\end{aligned} \tag{4}$$

as a reasonable fit over $0 < z < 1$, which compares closely with standard cosmology's redshift prediction,

$$\begin{aligned}(m-M)_{bb} &= 5[\log cz - \log H] + 1.086(1-q_{\mathrm{o}})z - 5 \\ &\approx 5[\log cz - \log H] + 1.75z - 5,\end{aligned} \tag{5}$$

for the recent estimate of $q_{\mathrm{o}} \approx -0.75$ [16]. If we write $\mathcal{M} = M - 5[\log H - \log(1+z)] - 5$, then Equation (4) reduces to $m = \mathcal{M} + 5\log cz$, the Hubble relation for $z \ll 1$.

To investigate the expected brightness for $z > 1$ we adapt other parts of the analysis of Ellis [27] to obtain the *specific intensity*, $i_v = F_v/\Delta\Omega$, the *specific flux* per unit solid angle, for the CCU model. Let the source spectrum be represented by a function $\phi(\nu_g)$, where $L\phi(\nu_g)$ is the rate at which radiation is emitted from the galaxy at frequencies between ν_g and $\nu_g + d\nu_g$, with $\phi(\nu_g)$ normalized so that $\int_0^\infty \phi(\nu_g)d\nu_g = 1$. The frequency, ν, measured by some stationary observer at r is related to the emission frequency, ν_g, in the galaxy's rest frame by $\nu = \nu_g/(1+z)$, which implies $d\nu = d\nu_g/(1+z)$. Following the treatment of Ellis

[27] the flux expression becomes

$$F = \frac{L}{4\pi} \frac{\int_0^\infty \phi(\nu_g) d\nu_g}{r_g^2 (1+z)^2} = \frac{L}{4\pi} \frac{\int_0^\infty \phi(\nu) d\nu}{r^2 (1+z)(1+z_d)^2}. \tag{6}$$

Defining the *specific flux* over the interval $d\nu$ as Reference [27], $F_v d\nu = L\phi(\nu) d\nu / 4\pi r^2 (1+z)(1+z_d)^2$, we obtain, after substitutions, the *specific flux*, $F_v = F_g \phi(\nu)/r^2(1+z)(1+z_d)^2$, from which it follows that

$$i_v = \frac{F_v}{\Delta\Omega} = \frac{F_g \phi(\nu)/A}{(1+z)(1+z_d)^2} = \frac{I_g \phi(\nu)}{(1+z)(1+z_d)^2}, \tag{7}$$

where A is the surface area of the source and $I_g \phi(\nu) = i_\mathrm{o}$ is the surface brightness of the source at frequency ν (see Ellis [27], p 163). In the CCU $(1+z) \approx (1+z_d)$ for $z < 1$, in which case $(i_v/i_\mathrm{o})_\mathrm{CCU} \approx (1+z)^{-3}$ for this redshift interval, the same as big bang's prediction of $(i_v/i_\mathrm{o})_{bb} = (1+z)^{-3}$. But for higher redshifts $1+z \not\approx 1+z_d$, in which case we must use the full expression

$$(i_v/i_\mathrm{o})_\mathrm{CCU} = (1+z)^{-1}(1+z_d)^{-2} :: (\text{for } z > 1). \tag{8}$$

VII. THE COSMIC CENTER UNIVERSE MODEL — ITS $\Delta(m-M)_\mathrm{CCU}$ PREDICTION LIES WITHIN THE 68% DISTANCE MODULUS CONTOUR FOR SN 1997FF OVER THE REDSHIFT INTERVAL $0 < z < 2$

Before showing how Equation (8) accounts for the apparent luminosity of some high-z galaxies, we turn attention to the CCU model's prediction of SN Ia brightness enhancement. Figure 11 of Riess *et al* [16] compares predictions of several cosmological models with data obtained from the High-z Supernova Search team (Riess *et al* [19]), the Supernova Cosmology Project (Perlmutter *et al* [30]), and their own observations of SN 1997ff. Figure 1 in this article reproduces (with permission) Figure 11's redshift data, including its point at $z = 1.7$ for SN 1997ff, along with the favored LCDM distance modulus curve, as well as Riess *et al*'s 68% and 95% confidence contours for the SN 1997ff modulus. Additionally, Figure 1 also includes an equivalent plot of $\Delta(m-M)_\mathrm{CCU}$.

The protocol used for obtaining $\Delta(m-M)_\mathrm{CCU}$ was the same as for that used in Figure 11, which means that the value of $\Delta(m-M)_\mathrm{CCU}$ was computed by comparison against the

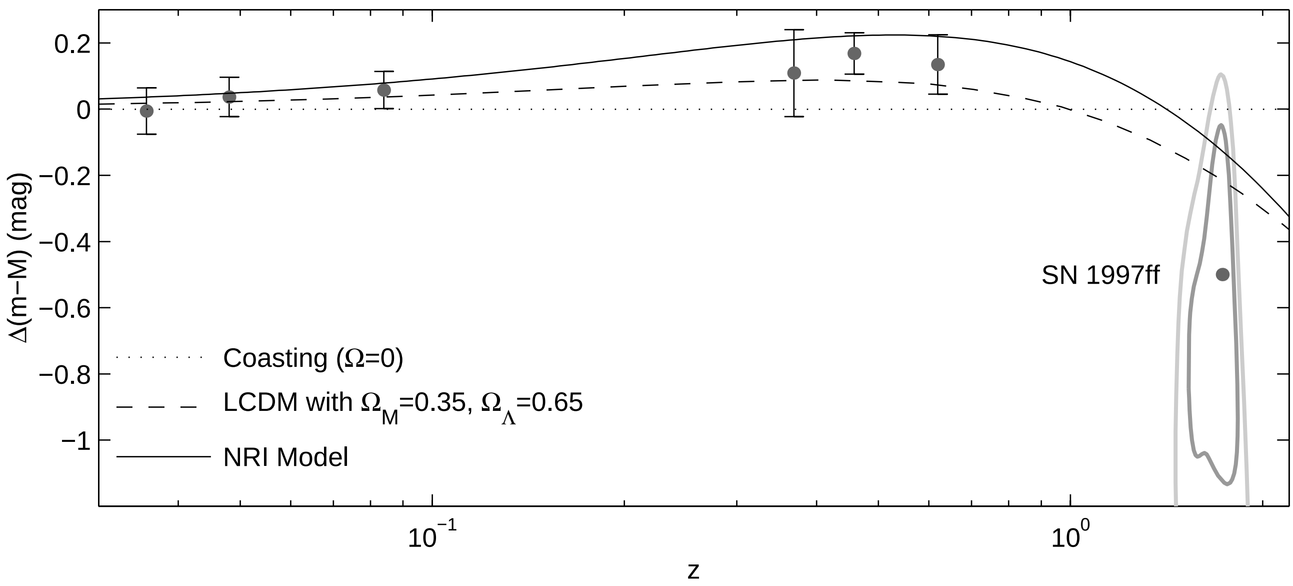

FIG. 1: Hubble diagram of SNe Ia minus an "empty" ($\Omega = 0$) Universe compared to the LCDM model and the equivalent CCU model. This graph partially reproduces Figure 11 of Riess *etal* [19] The points are the redshift-binned data from the HZT (Riess *etal* [19]) and the SCP (Perlmutter *etal* [30]). Confidence intervals of 68% and 95% for SN 1997ff are indicated.

Coasting ($\Omega = 0$) model. Thus, $\Delta(m - M)_{\rm CCU} = 5 \log d_L/D_L$, where d_L is defined above, and D_L is defined by Riess *et al* [19]). At $z = 1.7$ the CCU produces an enhanced brightness relative to the Coasting model of 0.1 magnitudes compared to the LCDM enhancement of 0.2 magnitudes. This puts the CCU's prediction within the 68% contour for the SN 1997ff distance modulus. Additionally, the proper CCU distance modulus traces the LCDM modulus quite well (within error bars) over the redshift interval $0 < z < 2$.

VIII. THE COSMIC CENTER UNIVERSE MODEL — DIFFERS FROM THE BIG BANG IN PREDICTING APPARENT ULTRALUMINOSITY OF VERY HIGH-z GALAXIES

Returning now to the apparent ultraluminosity of high-z galaxies, Disney [31] recognizes it is extraordinary that galaxies at $z = 2$ are observed at all given that their apparent brightness is reduced by the Tolman factor, in this instance $(1 + z)^{-4} \sim 10^{-2}$. For the high redshift $z = 5.74$ galaxy [32], the Tolman factor is $\sim 5 \times 10^{-4}$. Use of heterochromatic dimming factors still results in large differences at high redshifts between the big bang's prediction, $(1+z)^{-3}$, and the CCU's, which is Equation (8). The reason is that the $(1+z_d)$ term in the latter increases more slowly than does $(1+z)$ as r increases. For $z = 5.74$ big bang's prediction is $(1+z)^{-3} \approx 0.003$, whereas the CCU's – namely, $(1+z)^{-1}(1+z_d)^{-2} \approx [(6.74)(1.9)(1.9)]^{-1} \approx 0.04$ – predicts a significantly brighter image.

The more recent observation of Hu *et al* [33] of a galaxy at $z = 6.56$ yields ≈ 0.01 for the big bang and ≈ 0.15 for the CCU, assuming a 4.5 magnification [33]. The quasars at $z = 5.82$, 5.99 and 6.28 [34], yield greater differences without magnification, and clearly favor CCU's dimming factor. Moreover, in the big bang celestial objects do not even exist at $z > 20$, so until now there was no reason to search for such objects. But the CCU model has no such constraints. As its $1+z = (1+Hr/c)/\sqrt{1-2(Hr/c)^2}$ relation reveals, z increases without limit as $r \rightarrow c/\sqrt{2}H$. And, even though Equation (8) yields an enhanced apparent brightness, it still accounts for Olber's paradox because the CCU model represents a bounded universe, and hence a diminishing number density of high-z galaxies.

IX. THE COSMIC CENTER UNIVERSE MODEL — ASTRONOMICAL OBSERVATIONS OF HIGH-z OBJECTS THAT EVEN NOW AGREE WITH THE CCU

Observations that may distinguish between the big bang and the CCU are: (1) The exotic AGN sources detected by Chandra [35], some possibly with $z > 6$. (2) The unusual infrared object in HDF-N [36]. (3) The photometric redshift determinations of Yahata *et al* [37] of 335 faint objects in the HDF-S, who *tentatively* identify eight galaxies with $z > 10$, two with $z \sim 14$ and one with $z \sim 15$. Such redshifts are far beyond big bang's predictions and, moreover, require standard dimming factors stretching from $(1+z)^{-3} \approx 1/1300$ to $1/4000$, whereas the CCU model yields $(1+z)^{-1}(1+z_d)^{-2} \approx 1/60$ and $1/90$ for $z = 10$ and 15 respectively. (4) The observations by Totani *et al* [38] of Hyper Extremely Red Objects, which they admit may be galaxies with z greater than about 10 instead of dust-reddened galaxies at $z \sim 3$. (5) The CCU has no constraints on primordial black holes, so certain GRBs may originate from these sources [39]. Those with $z > 20$ should exhibit long duration pulses and be optically dark [40].

X. THE COSMIC CENTER UNIVERSE MODEL — POSSIBILITIES FOR CONFIRMING THE CCU'S HIGH-z PREDICTIONS WITH HUBBLE ACS, SIRTF IRAC, AND VIEWING THE $z = 3.91$ QUASAR'S FE/O RATIO AS AN AFFIRMATION OF ITS BASIC POSTULATES

Finally, Hubble's Advanced Camera for Surveys' recent observation [41] of the massive clusters in Abell 1689 points to the exciting prospect of testing the CCU's prediction of the existence and detection of galaxies and other celestial objects with $z > 10$. The zoom lens effect of Abell 1689, together with ACS's IMAX movie-quality sharpness, may have already revealed galaxies that are twice as faint as those in Hubble Deep Field, and this with only a 13-hour exposure. We propose that much longer ACS exposures of Abell 1689, or some other massive clusters, be carried out as soon as feasible, for we contend that these observations, combined with those from IRAC on SIRTF [42], may well show evidence of the high-z objects that will confirm the CCU's unique predictions. The recent discovery [18] of the very high-z BAL quasar with $z = 3.91$ emphasizes the urgent need for this search. Even with its presumed ~ 50 magnification, it is still one the most luminous objects in the universe, which fits the CCU model's prediction. Even more definitive evidence supporting the CCU model is that this quasar's Fe/O ratio is 2–5 times that of the Sun, which directly contradicts big bang's fundamental theory of heavy element production because it is just the reverse of what the big bang predicts. In contrast, in the CCU model there is no constraint on the Fe/O ratio of high-z objects. This paper takes the position that continued searches will, in time, reveal other high-z quasars with perhaps even higher Fe/O ratios, and that these discoveries will unambiguously confirm the predictions of the CCU model.

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[1] Gentry R V, *Discovery of a Major Contradiction In Big Bang Cosmology Points To The New Cosmic Center Universe Model*, 2003 *Preprint* Submitted to *CERN*

[2] Fishman G J and Meegan C A, *Gamma-Ray Bursts*, 1995 *Ann. Rev. Astron. Astrophys.* **33** 415

[3] Woosley S E, *Gamma-Ray Bursts – What Are They?*, 1995 in *Seventeenth Texas Symposium on Relativistic Astrophysics and Cosmology* ed Böhringer H *et al* (New York: New York Academy of Sciences) p 446

[4] Mészáros P, *Gamma-Ray Bursts: Accumulating Afterglow Implications, Progenitor Clues, and Prospects*, 2001 *Science* **291** 79 [astro-ph/0102255]

[5] Weinberg S 1997 *The First Three Minutes* (New York: Bantam Books) p 111

[6] Hawking S 1990 *A Brief History of Time* (New York: Bantam Books) p 42

[7] Peebles P J E 1993 *Principles of Physical Cosmology* (Princeton: University Press) p 665

[8] Gentry R V, *A New Redshift Interpretation*, 1997 *Mod. Phys. Lett. A* **12** 2919 [astro-ph/9806280]

[9] Gentry R V, *The New Redshift Interpretation Affirmed*, 1998 *Preprint* physics/9810051

[10] Bahcall J, *The Big Bang is bang on*, 2000 *Nature* **408** 916

[11] Srianand R, Petitjean P, and Ledoux C, *The cosmic microwave background radiation temperature at a redshift of 2.34*, 2000 *Nature* **408** 931

[12] Levshakov S A *et al*, *H_2, D/H and the CMBR temperature at* $z = 3.025$ *toward QSO 0347-3819*, 2002 in *New Trends in Theoretical and Observational Cosmology: Proc. of the 5th RESCEU Int. Symposium* ed Sato K and Shiromizu T (Tokyo: Universal Academy Press) [astro-ph/0201043]

[13] Blake C and Wall J, *A velocity dipole in the distribution of radio galaxies*, 2002 *Nature* **416** 150

[14] Goldhaber G *et al*, *Observation of cosmological time dilation using type Ia supernovae as clocks*, 1997 in *Thermonuclear Supernovae: Proc. NATO Adv. Study Inst.* ed Ruiz-Lapuente P *et al* (Dordrecht: Kluwer) p 777 [astro-ph/9602124]

[15] Grego L *et al*, *The Sunyaev-Zeldovich effect in Abell 370*, 2000 *Astrophys. J.* **539** 39 [astro-ph/0003085]

[16] Riess A G 2001 *et al*, *The farthest known supernova: support for an accelerating universe and a glimpse of the epoch of deceleration*, 2001 *Astrophys. J.* **560** 49 [astro-ph/0104455]

[17] Gentry R V and Gentry D W, *The Genuine Cosmic Rosetta*, 1998 *Preprint* gr-qc/9806061

[18] Hasinger G, Schartel N, and Komassa S, *Discovery of an ionized Fe-K edge in the* $z = 3.91$ *Broad Absorption Line Quasar APM 08279+5255 with XMM-Newton*, 2002 *Astrophys. J.* **573** L77 [astro-ph/0207005]

[19] Riess A G *et al*, *Observational evidence from supernovae for an accelerating universe and a cosmological constant*, 1998 *Astron. J.* **116** 1009

[20] Perlmutter S *et al*, *Discovery of a supernova explosion at half the age of the universe*, 1998

Nature **391** 51

[21] Burbidge G and Napier W M, *The distribution of redshifts in new samples of quasi-stellar objects*, 2001 *Astron. J.* **121** 21 [astro-ph/0008026]

[22] Misner C W, Thorne K S, and Wheeler J A 1973 *Gravitation* (New York: W.H. Freeman & Co.) pp 712, 783, 794

[23] de Bernardis P *et al*, *Multiple peaks in the angular power spectrum of the cosmic microwave background: significance and consequences for cosmology*, 2002 *Astrophys. J.* **564** 559

[24] Lee A T *et al*, *A high spatial resolution analysis of the MAXIMA-1 cosmic microwave background anisotropy data*, 2001 *Astrophys. J.* **561** L1 [astro-ph/0104459]

[25] Kowitt M S *et al*, *A detection of bright features in the microwave background*, 1997 *Astrophys. J.* **482** 17 [astro-ph/9604155]

[26] Gentry R V 2003 in preparation

[27] Ellis G F R 1971 in *General Relativity and Cosmology* ed Sachs R K (Academic Press) p 144

[28] Lubin L M and Sandage A, *The Tolman surface brightness test for the reality of the expansion. IV. A measurement of the Tolman signal and the luminosity evolution of early-type galaxies*, 2001 *Astron. J.* **122** 1084 [astro-ph/0106566]

[29] Fixsen D J *et al*, *The cosmic microwave background spectrum from the full COBE FIRAS data set*, 1996 *Astrophys. J.* **473** 576

[30] Perlmutter S *et al*, *Measurements of* Ω *and* Λ *from 42 high-redshift supernovae*, 1999 *Astrophys. J.* **517** 565 [astro-ph/9812133]

[31] Disney M, *The case against cosmology*, 2000 *Gen. Rev. Grav.* **32** 1125 [astro-ph/0009020]

[32] Hu E M and McMahon R G, *An extremely luminous galaxy at* $z = 5.74$, 1999 *Astrophys. J.* **522** L9 [astro-ph/9907079]

[33] Hu E M *et al*, *A redshift* $z = 6.56$ *galaxy behind the cluster Abell 370*, 2002 *Astrophys. J.* **568** L75 [astro-ph/0203091]

[34] Becker R H *et al*, *Evidence for reionization at* $z \sim 6$*: Detection of a Gunn-Peterson trough in a* $z = 6.28$ *quasar*, 2001 *Astron. J.* **122** 2850 [astro-ph/0108097]

[35] Alexander D M *et al*, *Exotic sources detected in the 1 Ms Chandra Deep Field North Survey*, 2002 *Preprint* astro-ph/0202044

[36] Dickinson M *et al*, *The Unusual Infrared Object HDF-N J123656.3+621322*, 2000 *Astrophys. J.* **531** 624

[37] Yahata N *et al*, *Photometry and photometric redshifts of faint galaxies in the Hubble Deep Field South NICMOS field*, 2000 *Astrophys. J.* **538** 493 [astro-ph/0003310]

[38] Totani T *et al*, *Hyper extremely red objects in the Subaru deep field: Evidence for primordial elliptical galaxies in the dusty starburst phase*, 2001 *Astrophys. J.* **558** L87 [astro-ph/0108145]

[39] Cline D B, Matthey C, and Otwinowski S, *Evidence for a galactic origin of very short gamma ray bursts and primordial black hole sources*, 2003 *Astropart. Phys.* **18** 531 [astro-ph/0110276]

[40] Piro L *et al*, *The bright Gamma-Ray Burst of February 10, 2000: a case study of an optically dark GRB*, 2002 *Astrophys. J.* **577** 680 [astro-ph/0201282]

[41] See `http://hubblesite.org/newscenter/archive/2003/01/`

[42] See Space Telescope Infrared Facility website: `http://sirtf.caltech.edu/SSC/irac/`