Demise of the Big Bang - A Philosophical Conundrum

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Critics of the Big Bang have said every time the Big bang fails an adjustment to the theory is made or a new parameter added to fix it. While a valid criticism it misses the mark in that this is the business of science, constant tinkering until truth is eventually found. Our complaint is in the quotes above. Others have said that there is no truth in science because a theory can never be proven true only falsified. However, there is another wrinkle in that respect; when a 'best' theory is finally found and later falsified what remains is Absolute Truth [3]. Absolute truth in science refers to a finite regime described by a theory that has been falsified. This somewhat rarefied condition is best said about Newton's theories. They remain absolute truth in reference to the finite classical regimes they describe [4]. The aim of this volume is to provide sufficient insight that Big Bang cosmology may finally be falsified.

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> *The crucial discoveries needed to break away from current dogma will only be communicated in alternative journals, conferences and books such as the present one, where investigators can speak frankly about fundamental issues.* – Halton C. Arp [2].

1. Philosophical Overview

The Ptolemaic system with the Earth as center of the universe (geocentric model) lasted for 2,000 years after the Greek Ionian school first postulated a model with the sun as the center of the universe (heliocentric) in 300 BC because of the forceful persona of Hipparchus, considered the greatest mathematician and astronomer of antiquity, in 150 BC and the fervor with which he defended it. It is interesting that Hipparchus first tried to prove the sun as the center, but the contemporary Platonic idea that the circle or sphere were the only perfect shapes and therefore divine and thus the only orbit a planet could have became a significant fact in changing world history. Even though the planetary orbits are nearly circular his calculations were so precise that he totally abandoned the heliocentric system. If he had abandoned circularity instead, another construct based on incorrect religious dogma, the correct heliocentric system would have been accepted 2,000 years earlier. The Ptolemaic system was called the greatest intellectual achievement of ancient astronomy and lasted until the time of Copernicus. These early ideas of perfection and the belief of an eternal universe led to the Newtonian static cosmological model. Einstein assumed that the universe was uniform which came to be called the cosmological principle and later generalized to the perfect cosmological principle for steady-state cosmologies.

Sometimes 'truth' takes awhile to uncover because the avenue leading to it might be unpopular or seem in apparent violation of 'Occam's razor' (All other things being equal, the simplest solution is the

best.). Before the 20th Century scientific cosmology was little more than philosophy; and it appears that Einstein's motivation for a static universe model may have been theological. The Big bang hallowed for over eighty years was motivated by the antithesis of that condition.

Aristotle insisted that 'logic was superior to experiment'; but at the time of Galileo pure logic failed giving rise to empiricism as the dominant pragmatic test. Cosmological data is the most difficult to acquire with precision. It is fascinating to realize that we are on the cusp of another Galilean class revolution in that empiricism has failed epistemologically, not in and of itself, but in the Aristotelian sense that unscientific bias for a preferred theory has demanded errors in interpretation. Indeed, not only have Mather and Smoot won the Nobel prize for the Big bang, but Smoot quoted in saying: "It is impossible that the Big Bang is wrong" [5].

The 2006 Nobel Prize in Physics was awarded to J.C. Mather and G.F. Smoot "for their discovery of the blackbody form and anisotropy of the cosmic microwave background radiation" from measurements made by the COBE satellite launched by NASA in 1989. All that is fine; but Hubble discovered a redshift distance law not expansion of the universe, so we have trouble with this statement by the Swedish Academy: 'The COBE results provided increased support for the Big Bang scenario for the origin of the Universe, as this is the only scenario that predicts the kind of cosmic microwave background radiation measured by COBE'.

It is said that COBE measurements also marked the inception of cosmology as a precise empirical science. According to Big Bang theory, the cosmic microwave background radiation is a relic of the earliest hot phase of the Universe immediately after the big bang which has gradually cooled as the Universe has expanded which today corresponds to a blackbody temperature of 2.75 degrees above absolute zero (equivalent to -273.15 C or -459 F). The COBE measurements revealed a perfect blackbody spectrum for the microwave background radiation. But this is the same scenario as what one would expect from a cosmological QED blackbody cavity without a initial Big Bang singularity for a static universe model for example. And this temperature is precisely what Eddington was able to calculate from fundamental parameters [6].

> *The microwave 'background' makes more sense as the limiting temperature of space heated by starlight than as the remnant of a fireball.* - Sir Arthur Eddington [6]

History has repeated itself. Not in hundreds of years have such conditions existed in science. Copernicus and Galileo were nearly executed for their views. Today the 'murder' has taken a different approach: Young scientists are not given funding or tenure if they try to pursue research avenues not considered politically correct [7].

The cosmological principle which the Big Bang is based on states that the universe is homogeneous, isotropic and time dependent wherein 4D spacetime is described by the Friedmann-Robertson-Walker metric [8,9]

$$ds^2 = -dt^2 + a^2(t)\left[\frac{dr^2}{1-kr^2} + r^2\left(d\theta^2 + \sin^2\theta d\varphi^2\right)\right] \qquad (1)$$

which is an exact solution to Einstein's field equations

$$G_{\mu\nu} + \Lambda g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}\,. \qquad (2)$$

Only one of the Friedmann solutions to Einstein's field equations is stationery which Einstein chose for his static cosmological model by introducing a cosmological constant, Λ equal to $\Lambda_E = 4\pi G\rho/c^2$ with G Newton's constant and ρ the cosmic matter energy density. Einstein added the cosmological constant to General Relativity in order to counteract the effects of gravity which in a universe full of

matter would cause the universe to collapse. By putting $\dot{a} = \ddot{a} = 0$ in the Friedmann equation the Einstein radius of curvature, R_E for a static universe is

$$R_E = \Lambda_E^{-1/2} \frac{c}{\sqrt{4\pi G\rho}}. \qquad (3)$$

A number of other values of cosmological constants have been proposed by various authors and the value zero was particularly popular before 1998. The zero value of cosmological constant predicts a decelerating expansion of the universe. After 1998, when observations established beyond any reasonable doubt that the expansion of the universe seems to be accelerating, the value zero had to be given up and a quest for establishing a real value started and is still going on.

Big Bangers consider the static solution unphysical because of their interpretation of the Hubble redshift as a Doppler shift indicative of an expanding universe. Einstein's field equations do allow the possibility of singularities allowing for the putative occurrence of Big Bang singularities and black holes. The Big Bang's main strengths have been interpreting a Hubble redshift distance relation that appears to coincide with the age of the universe derived from it. Although of course each time the model ran into trouble new parameters like inflation and quintessence were added to fix the problem. The other main pillar is the Cosmic Microwave Background Radiation (CMBR) which is theorized to have cooled to be sufficiently isotropic with a black body temperature spectrum to support the model. There are of course other unpopular interpretations for these two parameters that will be addressed in this volume. A number of problems remain that are sufficiently threatening to warrant the exploration of alternative considerations.

> Perhaps never in the history of science has so much quality evidence accumulated against a model so widely accepted within a field. Even the most basic elements of the theory, the expansion of the universe and the fireball remnant radiation, remain interpretations with credible alternative explanations. One must wonder why, in this circumstance, four good alternative models are not even being comparatively discussed by most astronomers [1].

THE HORIZON PROBLEM

According to the Big Bang the CMBR received in the current epoch originated after the primordial explosion at the time, T_d when matter and radiation 'decoupled' for a cosmological temperature considered to be $T_d \approx 3{,}000^\circ K$. The decoupling time, t_d is calculated by the formula

$$\frac{T_0}{T_d} = \frac{2.73^\circ K}{3{,}000^\circ K} = \frac{a(t_d)}{a(t_0)} = \left(\frac{t_d}{t_0}\right)^{2/3} \qquad (4)$$

yielding a $t_d \approx 200{,}000 \;\; h^{-1}$ years which in this scenario corresponds to a distance the CMBR photons traveled since emission of

$$a(t_0)\int_{t_d}^{t_0} \frac{dt'}{a(t')} 3t_0 \left[1 - \left(\frac{t_d}{t_0}\right)^{2/3}\right] \approx 3t_0 \approx 6{,}000 \;\; h^{-1}Mpc \qquad (5)$$

coinciding with the present particle horizon size [10].

The problem is that this decupling horizon allows the sky to split into $\approx$ 14,000 causally separated patches sending light to us. The difficulty arising is how can the black body radiation temperature from all these patches be so well tuned [10]?

THE FLATNESS PROBLEM

The current energy density of the universe is observed to corresponding to an asymptotically flat for a matter dominated universe. The unsolved question is why the initial energy density of the universe was so finely tuned to be equal to its critical value $k = 0$ in Eq. (1).

DENSITY FLUCTUATION

In order to have structure formation in a Big Bang cosmos there must be a primordial density perturbation, $\delta\rho/\rho$ at all scales and an explanation of the causality violation coinciding with the horizon problem above. Additional difficulties are that in a matter dominated inflationary universe expansion separates particles slowing structure formation and in a radiation dominated universe there is no structure formation [10]. The Big Bang offers no explanation for how these primordial density fluctuations originate.

EX NIHILO CREATION PROBLEM

How could the universe arise form nothing? What triggered the creation process [11]? Something arising from nothing is a logical contradiction. The Greek and Hebrew terms for creation suggest built from or organized from existing material, but what is the cause of the original instability? *Creatio ex Dios?*

Steinhardt and Turok have proposed a cosmology where space and time always existed [12]. By using string theory, they claim the Big Bang was a bridge to a pre-existing universe. Using this idea, they speculate that individual creations could undergo eternal successions, with trillions of years of evolution between each Big Crunch and Big Bang.

LARGE SCALE STRUCTURE & AGE OF UNIVERSE PROBLEM

Recent observations have shown that the size of large galactic structures in the 'Great Wall' are far too large to have formed in 10 to 20 billion years. The new data shows a universe full of super-structures and companion super-voids with a scale of about 10^9 light years that could require over 100 billion years to form by gravitational attraction. This problem, by itself, should be strong enough to discard the Big Bang model and replace it for a new one.

COSMOLOGICAL CONSTANT – DARK ENERGY PROBLEM

Until recently cosmologists assumed the cosmological constant to have a value of zero because it predicted a decelerating expansion of the universe. But the discovery of acceleration caused a revival of the cosmological constant as a mechanism for explaining dark energy. Dark energy in Big Bang cosmology has recently been recast as a scalar field called Quintessence [13] to explain the cause of the observed acceleration of the universe. Quintessence is sold as a way of replacing the cosmological constant with a negative energy pressure of magnitude equal to the positive energy density

$$p = -\rho c^2 \tag{6}$$

This Quintessence replacement energy is derived by

$$\rho \to \rho + \frac{\Lambda c^2}{8\pi G}; \quad p \to p - \frac{\Lambda c^4}{8\pi G}. \tag{7}$$

where to create an accelerating expansion term the scalar Quintessence field must be

$$p < -\rho c^2 / 3 \text{ [13].} \tag{8}$$

QUASAR REDSHIFT-LUMINOSITY PROBLEM

The redshift and luminosity of some Quasars is far greater than would be expected by their distance or compared to the galaxy they are located within [14]. Some are purported to be at the limit of observation suggesting they are both too old to have formed in the time since the Big Bang and also farther away then the calculated Hubble radius. We have proposed a solution in terms of QSO luminosity as gravitational shock-waves within a duality of Newton-Einstein gravity [29,30].

More troubling problems occurred in the spectrum of blueshifted objects like ESO 323-G077 that contain three times more iron than possible for their age [15].

OTHER PROBLEMS

- Galactic rotation speeds suggest 45 to 60 rotations since the big bang which is not sufficient time to achieve a spiral shape. Many spiral galaxies are observed at large distances for times closer to the big bang indicating time for even fewer rotations. Recent Hubble images show spiral galaxies within 5% of the big bang time leaving time for only 2 or 3 rotations at the Milkyway galaxy's rotation rate [16].

- Can galaxies collide if they are flying away from each other?

- Galactic redshift surveys reveal a regular spacing a quarter of the way to the time of the putative Big Bang origin, but Big Bang theory says they should be closer together the closer they are to the time of the Big Bang [16,17].

- Old galaxies are observed near the time of Big Bang origin with insufficient time to evolve.

- High energy cosmic rays are observed at energies beyond a theoretical cutoff for a hot Big Bang conflicting with the postulated CMBR temperature in the early universe. Cosmic ray protons or atomic nuclei traveling through space at speeds approaching the speed of light would have been attenuated by a high temperature radiation field [16,17].

- There remains something disquieting about this model. It contains a huge array of variables that can be changed pretty much at will. So flexible is it that some claim the model can be stretched to fit any observation [18].

- Nowadays, it sometimes appears that the Big Bang model for the origin of the Universe is accepted as established fact, rather than simply another theory – albeit one with a multitude of ardent supporters and which seems to explain so much so satisfactorily. However, problems do remain and

many have been addressed in the past by allowing additions to the basic theory – a privilege not afforded to rival theories [19].

- The temperature of intergalactic space was predicted by Guillaume, Eddington, Regener, Nernst, Herzberg, Finlay-Freundlich and Max Born based on a universe in dynamical equilibrium without expansion. They predicted the 2.7-degree K background temperature prior to and better than models based on the Big Bang [20].

2. A New Cosmological Horizon

After Hubble's discovery of the redshift distance relation, Fritz Zwicky did not agree that the redshift should be interpreted as a Doppler expansion of the universe and he suggested that a static universe would still be viable if an alternative explanation of redshift by a mechanism causing photons to lose energy as it traveled through space could be developed [21]. This is called the 'tired-light concept which we develop elsewhere.

A static universe also has to describe a process for creation of Hydrogen since in an ancient or eternal universe there would no longer be star formation when the universe ran out of Hydrogen [22]. Matter creation has been addressed in the quasi-steady state model [23-28] but not by a formalism considered sufficient by most cosmologists.

The two main pillars of the Big Bang are the Doppler redshift and the Cosmic Microwave Background Radiation (CMBR) which are formally addressed. Here it is sufficient to make the challenge that Hubble discovered a cosmological redshift not a Doppler expansion of a Big Bang singularity. The CMBR has been found to be a perfect blackbody radiation by the COBE and WMAP satellites. There is no reason why they should be so stringently be considered to arise solely as relics of a Big Bang.

Experimental science began in earnest when Galileo demonstrated that heavier objects do not fall faster than lighter objects in opposition to the logical reason at the time. It seems that now we have come full circle to a time when not only are there questions that science cannot answer, but that science draws seriously wrong conclusions from the data acquired. This book describes one such error in terms of the formulation of the Big Bang theory and represents one of the first applications of noetic science to correct the error.

All theory formation is metaphysical, and this is part of the reason why some people call science a religion - whether a theory is formed before data is acquired to design an experiment or after in an attempt to model the world around us, intuition and experience play a significant role in the determining the conclusions drawn.

> *A truth that represents a permanent and final grasp of some limited aspect of nature. Most people would say this is incompatible with the expectation that our theories will be falsified. I adhere to the expectation that our theories will be falsified, and look for the immutable truth only in those theories that have already been falsified. Newtonian mechanics...is an example of the most certain and permanent truth man has ever achieved. Its only failing is its scope; it does not cover everything* [115]. Feynman nat phys law

The inherent tendency of an object to move toward its natural place depends on its composition. Heavy bodies, composed mainly of earth and water, are endowed with the property of gravity, a centripetal tendency to move toward the center of the universe. Light bodies, composed mainly of air and fire, are endowed with the property of levity, Aristotle the belief that the speed of a falling body is proportional to its weight. Aristotle's physics was qualitative rather than quantitative. Indeed, he believed that quantitative physics was impossible. More than 2,000 years ago, Aristotle concluded that heavier objects fall faster than lighter objects. He also surmised that the rate at which an object falls toward Earth when dropped is directly proportional to its mass, i.e., an object with twice the mass of

another falls twice as fast. Reality, it was held, could be understood by pure reason-hence easily-disprovable absurdities like Aristotle's claim that a heavy object falls faster than a light one persisted for millennia.

One can only speculate why a majority of scientists hold a preference for a more Darwinian-Naturalistic cosmogony rather than a deistic one. One reason might be that although it has been over four hundred years since Galileo was forced to recant heliocentrism and spend the last years of his life under house arrest by order of the Roman Inquisition, some residual resentment for the narrow mindedness with which the theocracy hindered the advance of science before the Renaissance. A second, which might be related is that while about ninety-five percent of the general population believe in some form of God only twenty-five to thirty percent of scientists do so because it appears scientists feel capable of finding an explanation without resorting to putative deities.

Science etymologically from the Latin *scio*-'to know', is by definition supposed to be an unbiased search for truth; but this has never been the case. It is human nature to interject the popular or ones personal myopia. In early times the theological bias that everything in 'God's universe must be perfect – perfect spheres for example kept discovery of the heliocentric universe at bay for thousands of years.

Such bias is human nature. We must confess a similar bias; but we do not profess a theistic cosmology solely for alignment with out belief system. As we hope to demonstrate in these chapters; it is the explanatory power of the anthropic cosmology that prospers the underlying predilections. We also believe that the human condition can be overcome or superceded by a second Galilean revolution – one that completes the tools of human epistemology [MIT].

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