Observations that Seem to Contradict the Big Bang Model While at the Same Time Support an Alternative Cosmology

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Abstract

This research paper summarizes many very distant observations made by many groups of astronomers over a number of years, primarily utilizing the Hubble Space Telescope (HST) and ground radio astronomy observations, observations which are thought to contradict or question the standard Big Bang (BB) and Lambda Cold Dark Matter (LCDM) models, along with a listing and discussion of generally known and lesser-know problems with Big Bang cosmology. Also presented is an alternative cosmology and arguments contending support for this alternative model where the standard BB model seems to be deficient.

Keywords: Big Bang Problems, Contradicting astronomical observations, Alternative Cosmology

Introduction

The purpose of this paper is to illustrate that there have been many observations that appear to contradict the standard Lambda Cold Dark Matter (LCDM) model but, for the same reasons, seem to support alternative cosmologies. This paper is timed to increase awareness of alternatives to the BB and LCDM models so that its predictions and expectations can be compared to observations produced by the new long-baseline radio telescope Atacama Array in Chile and the James Webb Space Telescope (JWST) when it is successfully operating. For this reason the authors herein offer a particular cosmology that they believe will fit past and future observations much better than any other cosmology currently available. The observations in question are, for the most part, distant observations made by the Hubble Space Telescope (HST), the Spitzer Space Telescope (SST), and long-baseline radio telescope arrays. Some of these observatories, like the HST, have operated for decades and have made the same high-quality observations that can be made with them today.

The alternative cosmology being presented herein is called the "Pan Theory" and is preferred by the authors to explain the observations being presented for two reasons: it requires no ad hoc hypotheses like the standard BB model (Inflation, dark matter, and dark energy), and it is believed to be better supported by observational evidence presented here and elsewhere.

1. Discussion

The discussions of this paper will center on a list of perceived "problems" with BB cosmology**,** and for some of these problems we have presented listed observations that exemplify these problems. The list is given below to quickly introduce the reader to the scope of this paper's arguments. Following the list, each problem is discussed in turn, describing why it is a continuing problem with the BB model and why certain alternative cosmologies would not share these same problems.

The list of Big Bang problems to be considered are as follows:

(1.1) The Horizon Problem
(1.2) The Flatness Problem
(1.3) The Density Problem
(1.4) Galaxy Emergence and Universe structure Formation Problem
(1.5) The Anachronistic Galaxy Problem
(1.6) The Anachronistic Black Hole Problem

(1.7) The Metallicity Problem
(1.8) The Gravity Problem
(1.9) The Distance/ Brightness Problem

1.1 The Horizon Problem

Although this problem is believed by theorists to be somewhat "mitigated" by the Inflation hypothesis, theoretical problems still remain as will be explained. From cosmic microwave background data, background radiation temperatures vary no more than .01% in all directions from us; any patterns in this variance describe differences of a very low order of magnitude. This homogeneity is mirrored in the appearance of galaxies in all directions. Roughly, this was/ is the basis of the horizon problem**.** (colon deleted)

Arguments: In a BB scenario, these regions of the cosmos could never have been in direct contact with one another after the beginning of the universe, so how could these uniformities of temperatures and galaxy appearances exist at opposite ends (i.e. horizons) of observation? Ad hoc explanations to fit the BB theory to the facts ended up collectively making up the Inflation hypotheses proposing superluminal universal expansion immediately following the BB. This superluminal expansion allowed the size of the actual universe to well exceed the size of the observable universe, which would act to homogenize conditions both by dilution (spreading a set amount of matter over a very large volume) and isolation (where any outlier mass concentrations would become likely to be far away from observable volumes).

This homogenization accordingly led to the universe we observe today. As matter did not exist during the Inflation period, this expansion must have carried with it some form of energy that later condensed into the basic units of matter. The fundamental energies that we know of today—those unrelated to the energy of relative motion — are forms of electromagnetic radiation that involve wavelengths, Zero Point energy, or hypothetical dark energy. Wavelengths involved in the superluminal expansion of space would seemingly "stretch out" beyond recognition or dissipate during a rapid expansion of space, and the energy carried by electromagnetic radiation is a function of its wavelength. Hyperinflation could therefore logically lead to comparative energy deficits.

Other horizon problems concern the matter of what actually was expanding during inflation. If it was only space, then initial conditions could never have mixed (since they would be spatially getting farther away from each other; one can't mix things by separating them) and caramelized into homogeneity outside of the diffusion of observation, which would mean that our vantage point is not necessarily mundane (the assumption of banality) and therefore our observations cannot be considered average. This would effectively eliminate cosmology as a meaningful study into the nature of things beyond the observable universe altogether, as the assumption that our observations are not particularly special are fundamental to being able to draw general conclusions from them. If anything else expanded and multiplied during the inflationary period, then there would be new creation from nothing, which is explicitly not permitted by the assumptions of the BB theory.

Another general criticism of Inflation is that the theoretical physics used to explain it are functionally "invented" and have no counterpart in observed reality. These physics can therefore never be tested, and newer physics can always be invented and proposed if the other models fail to explain a particular phenomenon. Valid hypotheses must be testable. The Inflation hypotheses are untestable speculation that can only claim observational support by its own implications.

Why the Alternative Model Better Explains these Observations

The Pan Theory might be described as a type of quasi-steady-state model (but not infinite) and as such lacks a horizon problem. (From this point forward, we will not use the quasi-steady-state term to describe this model so as not to confuse it with the prior quasi-state model of Hoyle, Narlikar, Belinger, et. al. by that name.) No steady-state model would have a horizon problem since there would be a constant density in the universe, with no Inflation. The Pan Theory model is not an eternal universe model, but the universe would be much older than conventional cosmology asserts and therefore there would be much more time for the universe to homogenize and evolve into the vast and complicated structures we observe today. If energy travels at the speed of light but the universe functionally expands much more slowly, then there can be sufficient energy transfer over time to ensure homogeneity and support the assumption that our observations are indeed representative of the way things are in the observable universe as a whole.

Additionally, by not requiring new physics, the Pan Theory can be rather easily tested: if we continue building better telescopes and seeing further away and keep seeing the same sorts of galaxies that we have been seeing so far, galaxies that interact in ways we would predict modern galaxies to, then that lends support to a steady-state theory. If, on the other hand, with better telescopes like the JWST and the Atacama Array, we start seeing phase shifts, seeing only small, young-appearing blue galaxies at the farthest observable distances or, perhaps, nothing at all, then these observations would contradict all steady-state theories with no chance of them being salvaged on an *ad hoc* basis.

1.2 The Flatness Problem

According to observations and the predictions of General Relativity, the amount of matter in the observable universe is greater than one tenth but less than ten times the critical density needed to stop the predicted expansion of the universe. This two-orders-of-magnitude range of matter density, and an equivalent ranging energy density, leads the topology of the universe to be "very nearly flat." With the changing density of an expanding universe, why should the density today—which, again, should not be a special point in time if we are to reliably make predictions off of our observations—be so close to the critical density? Also substantial variation from this critical density would, according to General Relativity, deform space in such a way that it should be observable. There seems to be no curvature of the observable universe which would indicate we are close to the critical density; this is the continuing flatness problem.

As with the horizon problem, the inflation hypothesis was also invented to help explain the flatness problem. According to this hypothesis the critical density of the universe just after the BB was theoretically close to the critical density, then stayed about the same during Inflation, and has decreased little since then. This seems illogical because as space expands, and the gravitational influence of a given mass diminishes over a greater volume, one would expect the critical density near collapse would change while the actual density of the universe would decrease. The differing ratios between density and critical density would result in the topology being different from time to time, even if the rates of change between the ratios were small. That would make the current observation of "very nearly flat" a special case, which means we are extraordinarily lucky to see it at this point. If we are extraordinarily lucky to see it, general conclusions we draw from it must naturally come under question because the assumption of banality is violated. If something is being created from nothing to maintain the observed density this is also a theoretical problem as explained concerning the Horizon problem, and the physics of the Inflation hypotheses.

Why the alternative model better explains these observations: Steady-state models lack a flatness problem also as they all propose that the density of the universe has always been effectively constant. The Pan Theory proposes a very slow decrease in the size of existing matter combined with the 'creation' of 'new' matter from the decrement, which leads to a constant matter density. While explained in more detail below, it can be readily described using the analogy, that after countless eons an object of static volume and mass could be split in half repeatedly: the numbers of objects increase, and the volume and mass of each object decreases, but the total mass, density, and volume of the system remains constant. From the viewpoint of slowly shrinking yardsticks, the total system appears to be getting bigger. As such, although space would appear to be expanding, instead matter and scales of measurement would very slowly be getting smaller. This would explain the observed redshifts of galaxies and other cosmic entities from our perspective.

1.3 The Density Problem

The density problem is similar to the flatness problem, but has proven resistant to being explained by Inflation. Based on the standard model of an expanding universe and the volume of a sphere, when the universe was half its present age (and diameter), it would have been eight times denser with matter, primarily observable as galaxies. At a quarter its age (and diameter), it would have been 64 times more dense compared to now, based upon a relatively constant rate of expansion since that time. An even larger difference would be observable if expansion were accelerating. These are not small differences. Since the HST has detected galaxies from calculated distances of ~13.2 billion years ago in a ~13.8 billion year old universe, such great differences in densities should be observable if the standard model were valid. Inflation hypotheses can not change this since expansion has accordingly continued at observed rates after Inflation ended. But deep-field studies have not observed greater densities.

Indeed, we appear to see the opposite: observed galactic density decreases the farther away (and back in time) one looks. The presently accepted explanation for why this is so is summarized in this excerpt from an astronomy website (Springbob, 2003).

Why does the density of galaxies seem to steadily fall off with distance on large scale galactic maps?

The short answer is that it's harder to see things that are farther away. So while we can see almost all the galaxies nearby, we can only see the very brightest ones far away. This effect overwhelms everything else, and is responsible for the density of galaxies in those maps dropping off at large distances. So if you look at one of those maps, you can imagine that there are actually many more galaxies on the outskirts, but we just can't see them.

The above is true, but smaller, less luminous galaxies cannot explain the comparative paucity of galaxies in the universe around seven billion years ago when, as stated above, matter and galaxies should be about eight times denser, as well as more galaxy mergers should be observable. Adjusting for estimates of the opacity of the intergalactic medium, there still should have been many times as many bright-enough galaxies, as they do not take billions of years to form based upon present observations of the most distant galaxies. These observations instead appear to indicate that the density of galaxies falls off with distance; that the universe was *less* dense in the past than it is now.

Another common answer is that astronomers cannot easily measure density with only a telescope. Angular separations inside telescopes cannot be used to measure the mass inside any significant volume. This explanation is also valid, but also dodges the question since there's no reason to assume that bright stars in the past were of appreciably different mass than they are now, nor alter the appearance of a photograph like the Hubble Ultra Deep field, a collective of hundreds of the most distant galaxies that appears the same as a local photograph of such a collective. Still another explanation invokes Inflation mechanics and suggests that the further back one looks the more that dark energy— the force proposed for causing Inflation in some models— would push galaxies farther apart. Both proposals ignore that regardless of expansion rates at any given point in time, if the universe has been expanding steadily for more than 13 billion years, from a denser past, then this greater density should be detectable from large-scale galaxy surveys. Even if the average galaxy in the past may have been smaller and relatively farther apart from each other, there should have been more of them—corrected for intergalactic medium opacity—than now. This is not what is being observed.

Another answer suggests that by the standard model most galaxies would not have formed yet. This is logical on its face, though the Earth's four-billion year history up to now being almost a third of the entire universe's age—and with Sol not even being a first-generation star—seems to suggest that galaxies would need to have formed comparatively quickly to be consistent with a universe of only 13.8 billion years. Additionally, by the standard model, the most distant galaxies should be young, blue immature galaxies that have not yet differentiated. Instead, astronomical observations find, at twelve billion light years' distance, some galaxies they identify as large spiral and elliptical galaxies functionally identical to the Milky Way, without the greater star production which might be expected if interstellar hydrogen densities were indeed greater.

Why the alternative model explains these observations: steady-state models, true to their name, predict a roughly constant galactic density that leads to a decreasing observed galactic density following the inverse square law of illumination and any effects of the opacity of the intergalactic medium. This appears to be exactly what is being observed, which is contrary to what would normally be expected with the BB model as described above. Most previous steady-state models, however, lack an origin and invoke infinity; the Pan Theory instead posits an age of the universe so great that the observable universe is effectively uniform and steady-state whilst avoiding the quandary of simply 'having always been.'

Although decreasing galactic densities looking backward in time contradict the BB model, it supports the Pan Theory in that galaxies in the past would have been of equal density, but space in the past would appear to us as being larger than it really was because of the diminution of matter resulting in our changing scales of measurement.

1.4 The Galaxy Formation Problem

The non-uniformities that would be produced by an expanding universe—either by inflation or expansion alone—do not seem to be sufficient to allow enough time for galaxies, clusters, webs of galaxies, and all of the intergalactic structures that have been observed, to have formed within the limited time allowed by the BB model.

Due to the nature of expansion, all of these structures would effectively have to form *in situ* with limited opportunity for mutual influence and self-ordering. Based upon the rate of assumed universal expansion, gravitational attraction would be too slow to form galaxies if expansion resulted in a reasonable level of turbulence.

As such, "the question of how the large-scale structure of the universe could have come into being has been a major unsolved problem in cosmology" (Trefil, p. 63, Daily Galaxy, 2010)(Problems in Cosmology, 2012)
To explain this problem, theorists have been compelled to look at a theoretical period before one millisecond after the BB to form hypotheses explaining the observable existence of galactic and intergalactic-scale structures by one means or another. To be blunt, this is pure theory with no counterpart in immediately observable reality or any means to test the theory except by computer modeling, and the weakness of validation-by-model is that if the model is incorrect, it can be tweaked until it is "correct." Even then, there is always the risk that new structures—such as the Large Quasar Group four billion light-years across discovered using the HST in 2013 (Klotz, 2013)—was observed which required fine-tuned model addendums, in a continuing process of fine-tuning and changes in fine tuning, but with continuous surprises rather than predictive power.

Why the alternative model better explains these observations: The Pan Theory proposes a much older universe which provides ample billions (or even trillions) of years to form the large scale structures of the universe that we can now observe, but does not involve the philosophical problems of a temporally infinite universe as do most other steady-state models.

1.5 The Anachronistic Galaxy Problem

This may be the most obvious problem with the Big Bang model at this time since there have been a great many observations by many different groups of astronomers that have come to the conclusion that some of the most distant galaxies appear to be very old and mature, rather than young appearing as the Big Bang model would require. This is exemplified by the sampling of such observations shown below.

In a universe 13.8 billion years old, it stands to reason that the most distant and therefore first-to-form galaxies should be young galaxies: small, with young blue mostly first-generation stars within them. This is not what has been observed, and as such constitutes the greatest weakness of the BB model. There have been many large, old-appearing galaxies at the farthest distances that we have been able to see, observed many times by several different groups of astronomers. Some appear to be filled with old, red stars; others appear to be large spirals and ellipticals, like the Milky Way and our surrounding galaxies.

Observations in Support of Statements

1.5.1 Old Galaxies Observed Ten Billion Light Years Away by the Ultra-Deep Survey

The purpose of the Ultra-Deep Survey (UDS), "an image containing over 100,000 galaxies over an area four times the size of the full moon," (Massey, 2008) was to "allow astronomers to look back in time over 10 billion years, producing images of galaxies in the Universe's infancy." Doctor Foucaud of the UDS project said first that "our ultra-deep image allows us to look back and observe galaxies evolving at different stages in cosmic history, all the way back to just 1 billion years after the Big Bang," and then "we see galaxies 10 times the mass of the Milky Way already in place at very early epochs."

Further analysis of the UDS had surprising results, paraphrased below**:**

The distant galaxies identified are considered elderly because they are rich in old, red stars, not ~~But~~ because the light from these systems has taken up to 10 billion years to reach Earth. They are seen as they appeared in the very early Universe, just four billion years after the Big Bang. The presence of such fully-evolved red-appearing galaxies so early in the life of the cosmos is hard to explain and has been a major puzzle to astronomers studying how galaxies form and evolve. (University of Nottingham, 2008).

For fairness, dark matter was invoked to explain how these ancient galaxies could have evolved into supermassive modern ones, but this leaves unanswered the question of how they became supermassive so quickly at the beginning stages of the universe and at the same time appear so "elderly" in the first place.

1.5.2 Massive Distant Galaxies Observed in the HST's Ultra Deep Field

Similar to the UDS, the Ultra Deep Field was an effort to use the HST to detect distant galaxies and then follow up observations with the Spitzer Space Telescope and the European Southern Observatory Very Large Telescope (USO VLT). One galaxy, HUDF-JD2, was seen "as the universe was only about 800 million years old" (Britt, 2005). Nahram Mobasher of the European Space Agency had this to say about it: "It made about eight times more mass in terms of stars than are found in our own Milky Way today, and then, just as suddenly, it stopped forming new stars. It appears to have grown old prematurely."

The article reporting this goes on to say**:** The leading theory of galaxy formation holds that small galaxies merged to gradually form larger ones. But the newfound galaxy is so massive at such an early epoch that astronomers now think that at least some galaxies formed more quickly in a monolithic manner.

What would be a large galaxy today would be phenomenally huge in the early days of an expanding universe, having to form rapidly *in situ* rather than coalescing from smaller galaxies. Whether it would have had time to do either is questionable under the BB model.

1.5.3 Very Distant Red Galaxies Challenge Theory

The Spitzer Space Telescope discovered four extremely red galaxies. Jiasheng Huang of the Harvard-Smithsonian Center for Astrophysics, lead author on the discovery, said "We've had to go to extremes to get the models to match our observations" (Aguilar, 2011); the authors here note that this is a dangerous statement to make since it is suggestive of having to force models to fit data. An article reporting on this discovery explains:

Galaxies can be very red for several reasons. They might be very dusty. They might contain many old, red stars. Or they might be very distant, in which case the expansion of the universe stretches their light to longer wavelengths and hence redder colors (a process known as redshifting). All three reasons seem to apply to the newfound galaxies. All four galaxies are grouped near each other and appear to be physically associated, rather than being a chance line-up. Due to their great distance, we see them as they were only a billion years after the Big Bang - an era when the first galaxies formed (Aguilar, 2011).

In terms of probability, it seems unlikely that these ultra-red galaxies should exist at all at these great distances and therefore unsurprising that current computer models had to be forced to the data in an attempt to provide explanations. If more of these galaxies are observed (as expected and predicted by the Pan Theory), then they must accordingly be more common, and 'extremes' of a model are insufficient to explain them, since such 'extremes' should be either non-existent or very rare.

1.5.4 Distant Anachronistic Galaxy Cluster Contradicts Theory

A group of scientists used the USO VLT, the XMM-Newton telescope, and the Chandra X-Ray observatory to analyze the CL J1449-0856 galaxy cluster and stated that its "properties imply that this structure could be the most distant, mature cluster known to date and that X-ray luminous, elliptical-dominated clusters are already forming at substantially earlier epochs than previously known" (Gobat, 2010). In their conclusions, they state:

Our results show that virialised clusters with detectable X-ray emission and a fully established early-type galaxy content were already in place at $z > 2$, when the Universe was only ~3 Gyr old. While it took us several years of observations to confirm this structure, upcoming facilities like JWST and future X-ray observatories should be able of routinely find and study similar clusters, unveiling their thermodynamic and kinematic structure in detail. The census of $z > 2$ structures similar to CL J1449+0856 will subject the assumed Gaussianity of the primordial density field to a critical check.

As continuously more of these mature galactic clusters are detected in a theoretically young universe—and, most importantly, if they are detected farther away—then this would even more strongly contradict the BB model.

1.5.5 Most Distant Galaxy Cluster Contradicts Theory

A research team lead by Andrew Newman confirmed "that JKCS 041 is a rich cluster and derive a redshift $z=1.80$ via the spectroscopic identification of 19 member galaxies, of which 15 are quiescent" (Newman, 2014). This indicates a large, ancient galactic cluster past the peak of its star-forming period.

There were other notable observations:

- "We construct[ed] high-quality composite spectra of the quiescent cluster members that reveal prominent Balmer and metallic absorption lines." Young, early-generation stars (as should be expected in young, early-generation galaxies) should not have notable metallicity.
- "We find no statistically significant difference in the mass/radius relation or in the radial mass profiles of the quiescent cluster members compared to their field counterparts." Galaxies in clusters are expected to be larger than isolated galaxies, due to their increased opportunity to coalesce. This does not seem to be the case here; both cluster and field galaxies grew at the same rate.

It must be noted that as-yet unobserved Population III stars have been hypothesized to explain metallicity, but there is currently no explanation for galaxy clustering not leading to larger galaxies. Again, the large number of mature, quiescent galaxies at approximately 9.9 billion light years away emphasizes the limited amount of time available for this to occur, and therefore such observations remain anomalous.

Why the alternative model explains these observations without contradiction: For the Pan Theory and other steady state models, old-appearing galaxies at increasingly greater distances are not only predicted but are expected and required by these models since the portion of old appearing galaxies would accordingly have been about the same portion throughout the observable universe. Such theories can immediately explain observations such as the above since they match predictions. On the other hand, if we observe a 'hard limit' that we cannot see beyond, and at these distances observe no old appearing galaxies, but only small, blue, young appearing galaxies as in BB predictions, then seemingly all these alternative models would be discredited and disproven, as would the Pan Theory.

1.6 The Anachronistic Supermassive Black Hole Problem

According to the BB model, black holes form from matter within a galaxy and grow alongside it: the bigger the galaxy gets, the bigger the central black hole. Very large black holes in extremely distant galaxies is akin to the problem of Milky Way-sized (and larger) galaxies being observed near the theoretical beginning of the universe. The Milky Way itself is theorized to be approximately twelve billion years old, for comparison's sake.

1.6.1 Particularly, Submillimeter Array observations of 4C60.07 "now suggest that such colossal black holes were common even 12 billion years ago, when the universe was only 1.7 billion years old and galaxies were just beginning to form" (Aguilar, 2008). One of the galaxies seems quiescent, the other active; both "are about the size of the Milky Way." As can be seen, such observations extend the anachronistic galaxy problem.

Why the alternative model explains these observations: For all cosmologies proposing a much older universe than the standard BB model, large black holes should be found equally in large distant galaxies as well as local ones, which is what is being observed.

1.7 The Metallicity Problem

Metals—are characterized in astronomy as being anything heavier than hydrogen and helium. Anything other than hydrogen can be produced by nuclear fusion inside of stars. Late-generation stars are made up of the ejecta of earlier generation stars that underwent nova and supernovae processes that expelled these heavier elements into interstellar space. Logically, this means that early-generation stars should be metal poor, and the hypothesized Population III stars (first generation stars) are theoretically metal-free, as suits the first stars in the universe. Stars should become more metallic—in other words, their metallicity should increase—the later they form. Therefore, distant galaxies, being part of a younger universe and an earlier generation, should have stars of lower metallicity than today.

1.7.1 The quasar SDSS J1148+5251 is "hyperluminous" and resides within "a high metallicity galaxy in the early universe" (Galliano). A redshift of 6.42 would make this quasar, by the Hubble equation, about 13.4 billion years old. This means that the quasar and galaxy can be, at most, 400 million years old, which is the average lifetime of a large metal-producing star. However, "various metal tracers, like the [FeIII], [MgII], and [CII] lines, as well as the large amount of CO and dust emission, indicate a nearly solar metallicity." The Sun is a Population I star about 4.5 billion years old; its metallicity should not resemble that of a quasar at almost the beginning of the universe.

The quasar's dust content and metallicity can therefore only be explained conventionally by a huge population of supermassive, short-lived stars and almost "instantaneous" recycling. The researchers also estimated that "previous studies overestimated the star formation rate [of this galaxy] by a factor of 3-4."

Why the alternative model explains these observations: For steady-state models such as the Pan Theory, the metallicity of distant galaxies, on an average, should be the same as those found in local ones. According to these models no matter how near or far one would look s back in time there should be galaxies of all ages, points in their evolution, and metallicities – which is what is being confirmed by observations such as this one. The difficulty of such observations of metallicity at these great distances will remain a problem in their observation, regardless of the model being considered.

1.8 The Gravity Problem

For a long time now it has been known that the Milky Way and its surrounding dwarf galaxies present anomalies that cannot be accurately explained by computer modeling. In a resent study it was confirmed that the dwarf galaxies surrounding the Milky Way appear "preferentially distributed and orbit within a common plane" (now being called the Magellanic Plane)

1.8.1 (Pawlowski, 2014) around a "vast polar structure (VPOS)… globular clusters and stellar and gaseous streams appear to preferentially align with the VPOS too." M31 appears to have a similar satellite system, "and aligned systems of satellites and stellar streams are also being discovered around more distant galaxies." This is "a challenge for the standard Λ-cold dark matter cosmological model" because it is "incompatible with the planar VPOS." In short, most objects around the Milky Way orbit in the same direction and in a roughly-aligned plane, but because the dark matter halos that galaxies should form from are first-order isotropic, there should be no preferred orientation within them. Likewise, the distribution of sub-halos is also isentropic so if there are follower galaxies, they should be widely distributed and moving in random directions.

Pawlowski *et al* essentially performed a Monte Carlo simulation using the standard cosmological ~~models~~ model(s) to try to replicate the ordered structures seen around the Milky Way and M31: the structures could be flukes. However, the models predicted far more random systems and reduced the likelihood of 'vast structures' to a very low order of probability. Pawlowski then went on to suggest that these satellite galaxies are tidal dwarf galaxies caused by galactic collision debris, which would have to have a signature on the Local Group scale, and says that he "discovered that the non-satellite galaxies in the Local Group are confined to two thin and symmetric planes" (Pawlowski, date unknown). Professor Pavel Kroupa, a co-author of the paper, went further: "There's a very serious conflict, and the repercussion is **we do not seem to have the correct theory of gravity**" (bold added) (Luntz, 2014).

Why the alternative model better explains these observations: The Pan Gravity model predicts galaxy formation and similar rotation curves for spiral galaxies by way of simple vortex mechanics in such cases where the majority of mass is not centrally located. To do this, it proposes a kind of "curved momentum" (not unlike the alleged lines of warped space but using Euclidean geometry) for stars in spiral galaxies so that an extra gravitational force inward would not be needed to maintain the higher stellar velocities that have been observed. It also hypothesizes admittedly *ad hoc* electromagnetic influences that could produce spiral galactic bars, and mechanisms that could explain a wall of tidal galaxies perpendicular to a large spiral like the Milky Way. Alternative galaxy-formation models and gravity theory involving outside-the-box explanations, such as the Pan gravity theory, might also be considered (if experimenters are aware of such a theory and of its details) and investigated as a possibility if known models of galaxy formation have failed, as indicated by the above related observations and attempted computer modeling using presently accepted theory.

About the Pan Gravity model: The Pan Gravity model is a mechanical 'pushing gravity' model with similarities to Newton's Pushing Gravity model, in his second edition of *Optics* (1717). Unlike his first explanation, he proposed a mechanical pushing aether explanation of gravity whereby the aether would get progressively thinner (less dense) when approaching celestial bodies (wikipedia, Mechanical explanations of gravity, Newton, Static Pressure). A similar explanation is proposed by the Pan Gravity model.

1.9 The Distance/ Brightness Problem

The conventionally accepted method of calculating cosmological distances involves redshifts and is based upon the Hubble formula. The results tend to result in Type 1a supernovae—generally considered to be equivalent to standard candles concerning their relatively constant brightnesses—being brighter or dimmer than expected and thus resulting in a parabolic curve of brightnesses vs. redshifts. This unexpected result was thought to necessitate the proposal dark energy.

It should also be noted that if one is using the wrong equations to calculated distances and brightnesses, one would come to the wrong conclusion concerning the appearances of cosmic entities in the past. The conclusion that cosmic entities in general were different in the past could be totally wrong for this reason. This was one of the two conclusions that put the Big Bang model into prominence. The other conclusion was that the cosmic microwave background radiation and its uniformity could be best explained by the Big Bang epoch of Recombination, rather than steady-state explanations of the time.

The problem comes from the belief that the Hubble distance formula, also called the Hubble Law, calculates distances correctly based upon redshifts. Based upon Hubble calculations type 1a supernova as standard candles do not act as one would expect from them—their luminosity does not diminish as expected with distance—increasingly complex models that can only be justified mathematically, and even then the mathematics can be, and have been adjusted to account for newer observations. This is not necessarily a bad thing; despite Occam's Razor. There is nothing that says that the cosmos must operate in the simplest possible way. However, these models are evangelized with the ring of truth, which ignores that they are models: as Korzybski said, "the map is not the territory." Models, as assumption-based analytical predictors of future observations, should be as pragmatically simple as necessary to make predictions. Continuous adjustment to them is generally indicative of some flaw that some different model with a different context would explain more simply**:** the complex helical planetary movements from a geocentric model simplify to ellipses in a heliocentric model, for example. Truth value aside, the *ad hoc* adjustment (and some would say foundation) of current models leave room for other models with better predictive power, if they exist and are available.

Why the alternative model ~~better~~ explains these observations: As related to the present authors' previous paper: *The Pan Theory proposes new formulas for calculating cosmic distances and brightnesses based upon slowly shrinking matter rather than an expanding universe*.

The Pan Theory proposed a complete replacement of the Hubble formula and has added an additional brightness formula based upon the theory, the results being very well-supported by observations of type 1a supernova. The Hubble formula is based upon the tenets of an expanding universe. These alternative equations were derived instead from the diminution of matter concept and in the authors' previous paper, as indicated below, which matched observations of supernova very well without the need for hypothetical dark energy.

1.9.1 The alternative distance equation was/is proposed to replace the existing Hubble formula directly below (Noble, Cooper 2014):

$$r_H = \frac{v}{H_0} = \frac{\beta c}{H_0} = \left[\frac{(z+1)^2 - 1}{(z+1)^2 + 1}\right]\frac{c}{H_0}$$

The new proposed formula is linear and was derived based upon the Pan Theory premise, the diminution of matter:

$$r_1 = 21.2946 \log_{10} [.5((z+1)^{.5} - 1) + 1] (z+1)^{.5} P_0$$

Where r_1 is distance, z is the observed redshift, *and* P_0 is a constant = 1,958.

Based upon the rate of the diminution of matter, and an additional formula is needed to calculate brightnesses, since matter would appear to have been larger and brighter in the past. This increased brightness would be wholly diminished by increased distances. The brightness formula is:

$$\Delta L = 2.512 \log_{10} [[((z+1).5t - 1)).5t + 1](z+1)]$$

Where ΔL is the calculated brightness, z is the observed redshift, and t is the calculated quantitative timeframe based upon the rate of the diminution of matter in "doubling periods," which is a function of the observed redshifted wavelengths:

$$t = 9.966 \log_{10} [(z+1)^{.5}]$$

The alternative cosmology is based upon the changing scale of matter (matter diminution) so the formulas are linear and the results at great distances, very different. This proposal succeeded in forming the distance/brightness trend line to an approximate constant resulting in a straight-line graph, as would be expected from a standard candle without dark energy (Noble, Cooper 2014).

This does not require invoking any phenomena that cannot be either directly observed or immediately disproved: as the diminution rate is constant and all mathematical operations in the model have explicit mechanical explanations, it cannot be 'tweaked' to force flatness. The mathematics of the alternative model are, for the most part, simpler and its assumptions involve the diminution of matter rather than the expansion of space. From a relative perspective they might be considered the same thing, but the ramifications of each result in different mathematical formulations and implications.

2. Summaries of the Above Problems

The Horizon, Galaxy Formation, Anachronistic Black Hole, Metallicity, and Gravity Problems all relate to the limited age of the universe (13.8G years) required by the Hubble formula concerning the BB model. Any cosmology of a much older universe would not have these same problems.

The Flatness and Density Problems are common to all cosmological models that do not propose a steady-state condition of the universe. Steady-state or quasi-steady-state models would not have these problems.

The Gravity Problem relates to any cosmology like the BB model that proposes the standard model of gravity, with or without dark matter. Cosmologies that can explain galaxy formation as presently observed, along with galaxy rotation curves, whether right or wrong, would not have this problem.

The Distance/Brightness Problem occurs in ~~an~~ expanding universe models like the BB and Hoyle's steady-state models, or any other model that uses the Hubble formula to calculate distances and brightnesses. The problem shows up as unexpected brightnesses and sizes of distant cosmic entities. The researchers and authors of this paper believe that so far only the Pan Theory has, from its basic tenets, derived the correct distance and brightness formulations and therefore is the only model able to correctly calculate distances, brightnesses, and angular sizes of galaxies and other cosmological objects accurately, especially at the greatest distances.

3. Explaining of the Pan Theory

The Pan Theory is a type of **steady-state theory** which proposes that, as far as we could ever observe, a constant cosmological density, and that **the universe as a whole is much older** than is currently thought. Unlike most previous steady-state models, the Pan Theory does not propose that the universe is of infinite age or size; there was a beginning point in time prior to which the question of 'what happened before' would not be a valid question (much like the initial version of the BB model). The universe would be a much simpler place.

It is a scale-changing theory that proposes that rather than space expanding, matter very slowly gets smaller over time. Matter would decrease in size about 1/1000 part every 8 million years. This is a similar perspective to expanding space since space would appear to be expanding from our perspective. This slow decrease in the size of matter is accordingly enough to explain the observed redshift of galaxies and other cosmic entities.

It is also a single-force theory evidenced by the particle spin of fermions. Particle spin would be real, in this model, not just angular momentums as in present theory. **It is an aether model** involving a universal medium (a physical background field) believed to be evidenced by the Zero Point Field. EM radiation would be density waves of aether particles. Electro-magnetism would be explained by aether flow similar to Maxwell's aether model, and a pushing theory of gravity also based upon aether flow, with its own equations explaining stellar velocities in the discs of spiral galaxies, there being no need for the existence of non-baryonic dark matter, excepting as non-matter aether particulates.

The authors submit the Pan Theory for consideration based upon the evidence submitted above and observations in general, with the understanding that reality always trumps theory. If its predictions are not borne out or, more importantly, specified counter-evidence comes to light, then it would be fundamentally in jeopardy of being disproved as would any model continuously contradicted by evidence, such as the BB model, and not worthy of consideration or continued support.

Certain aspects of the Pan Theory are presently considered controversial, such as **pushing gravity** rather than the warped space of General Relativity and dark matter. **It proposes the diminution of matter** resulting in ~~a~~ the changing scale of measurement, rather than the expansion of space, and **proposes real waves in an aetherial background field** rather than pure energy waves or probability waves of Quantum Theory. Two of these controversial tenets will now be discussed.

3.1 Proposing a new Aether

As mentioned above, the Pan Theory is an aether model. There have been a number of proposals on an ongoing basis, explaining and/or proposing a "new aether" (Mingst, 1997)(Wikipedia, 2014, Superfluid Vac.)((Scientific American, June 2014; Spacetime Superfluid).

The Pan Theory proposes the following**:**

A background aether-like field of particles forms into coiled strings (3 dimensional) of like particles. There is only one fundamental particle that makes up everything, including matter and aether field particles, all of reality. Space is the volume the matter and the aether occupy without any other meaning to it. These particles are called Pan (as in "everything"), which are hypothesized to be much smaller than either proposed dark matter particles or Higgs particles. Pressure differentials within Pan fields explain both gravity and magnetism. Electromagnetic radiation and De Broglie waves are explained as physical, mechanical waves in the Pan field aether (encompassing the local hidden variables of quantum theory in what De Broglie called pilot waves), carrying discrete collections of Pan (which Planck called quanta) and we call photons. This explains the coexistence of particles and waves in the quantum realm, and would simplify this aspect of quantum theory to simple pilot-wave theory. The pilot waves for photons would be EM radiation, and the Pilot waves for electrons would be De Broglie waves. If this interpretation of quantum theory were valid and accepted, the applied physics of quantum mechanics, with its proven predictive power, would not necessarily need to change, and quantum mechanics could be considered mechanical rather than "mystical."

This aether would encompass the entire universe and would be comprised of aether particulates within it. It would have relative motions and flows to it. We partly observe it as the Zero Point Field. It would be a preferred reference frame. Other present-day theoretical/ hypothetical background fields are the microwave background, the Higgs field, dark matter, dark energy, gravitons, quantum foam, etc.. Any background reference frame could theoretically negate special relativity. If so the effects of special relativity would be replaced by Lorentz transforms, whose formulations are the same as special relativity but would be based on aether physics as Lorentz proposed. Like quantum mechanics, many of the concepts and predictions of special relativity and its mechanics would not necessarily need to change.

Within the realm where the proposed pushing gravity works similarly enough to pulling gravity that currently forms the foundation of physics, Pan Gravity theory would have no application difference. Because Pan Gravity is pushing and mechanical, and involves field pressure differences and flows, it is not irrotational and leads to vortices being produced, at both ~~at~~ galactic and atomic scales. These vortices accordingly produce tangential accelerations as well as radial ones, but the tangential components are most recognizable at interstellar scales. These tangential accelerations, along with gravity mechanics, accordingly would explain the increased orbital velocities of spiral galaxy disk stars, and increased velocities observed concerning orbiting galaxies in a cluster, mostly in the same galactic plane.

3.1.1 Additional possible empirical support for this new aether comes from physical experimentation by Harris and Bush. Their experiments with mechanical, macroscopic oil droplets bouncing on water produced evidence of pilot waves, confirming previous work by Couder, and stable quantized orbits (Harris, 2014). As Bush explained, "this is a classical system that exhibits behavior that people previously thought was exclusive to the quantum realm, and we can say why" (Wolchover, 2014). Couder's previous experiments demonstrated that a combination of a bouncing droplet, the primary waves that it rides, and the pilot waves it generates can replicate the famous double-slit experiment (Couder, 2006). All of this shows that what used to be considered purely quantum mechanical phenomena can be produced and explained by macro-mechanics. This is not evidence of physical aether waves, admittedly, but it does lend credence to the Pan Theory (and De Broglie theory), or any concept or theory ~~of~~ explaining quantum phenomena in terms of macroscopic mechanics. It was the asserted impossibility of physical waves to exist in the absence of a background field that lead the De Broglie theory to be discarded completely in preference for the Copenhagen interpretation.

3.2 Proposing a Single Force Theory

The Pan Theory is a single-force theory that is inherently mechanical**:** this single force is an unwinding force innate to matter, observable as the particle spin of fermions. This is the sole force which would be the singular cause of both time and motion in the entire universe.

This 'unwinding and concurrent rewinding' is the cause of individual Pan forming into spring-like stands which eventually lead them to *mechanically link* to themselves (in a looped form). As these loops self engage they begin to spin because of their innate unwinding requirement, but not all of the loops that form are stable. Some have a tendency to spin apart, while others, because of their configuration, lengths, and type of attachments, stabilize. This process explains stable, unstable, and virtual particles. Such spinning spring-shaped looped particles when forced together during the great force involved in stellar fusion processes**,** can describe nuclear bonds within matter (the Strong, Weak, and Strong nuclear force), and when spins are opposite explain matter/antimatter annihilation, which in this model only involves particle-form destruction rather than substance destruction. In the case of nuclear bonds, the bonds are actual physical, mechanical connections of the nucleons with each other.

These springs engage each other mechanically upon stellar fusion of nuclei, and produce a spring-stretching resistance force when attempts are made to separate nucleons. When these connections are broken, the springs physically break violently much like strong macroscopic springs do when they rupture.

Therefore, the single force aspect of Pan Theory would explain the Strong, the Weak, and the Strong nuclear forces as simply mechanical connections of nucleons resisting separation. Gravity and Electromagnetism are explained by differences in field aether pressures produced by matter and ferro-magnetic materials, resulting in aether flow that we have perceived as forces. The warped space of General Relativity would be explained instead as pressure differentials in a background aether field. The equations of Newtonian gravity and General Relativity or their applications, are changed to explain rotation curves of spiral galaxies, galaxies in a cluster, and the additional bending observed concerning gravitational lensing, as an additional bending diffraction, without the need for dark matter to explain anything. All effects presently explained by dark matter would instead be explained by a flowing aether caused by aether density variations, and where no unobservable dark matter would be needed.

3.3 Predictions, With Similarities and Differences to Other Models

The Pan Theory is based on the long-documented and widely accepted correlation between the distance to cosmological entities and the observed red-shift of their spectra. But unlike the standard model, space is not expanding (though, if matter shrinks, space would certainly appear to be expanding). Red-shifts rather then being stretched by expanding space, were created by larger atoms in past timeframes where time ticked more slowly. Both aspects would produce redshifted, longer wavelengths of light from our perspective, from a far distant time frame. From this viewpoint, different equations were derived which match observations very much better than the Hubble formula, without the need for any ad hoc hypothesis like dark energy (Noble, Cooper 2014).

In terms of observations, what the Pan Theory predicts is that galaxies in the distant past should appear unexpectedly bright, condensed, and that the average observed size of objects should appear to decrease the farther back in time one looks, using the Hubble formula to calculate distances. Since distances are accordingly underestimated using the Hubble formula**,** the angular size of galaxies will appear to be unexpectedly small at the farthest distances, by many factors, but would appear to be unexpectedly brighter because they would be calculated to be much closer than they really are based upon Hubble formula calculations. Using the alternative formulations above in 1.9, instead galaxies in all timeframes should appear to be the same variations of size and brightnesses that we see close by.

The Pan Theory proposes that Black Holes are not vacuous singularities but are instead a more dense form of matter comprised of highly compressed aether particles, more dense than neutron stars. They, along with the background aether field, are accordingly the creators of all the matter in the universe, with minor possible exceptions. In terms of operation, the Pan Theory proposes that 'new' matter is being created surrounding Black Holes similar to the 'C field' (creation field, Hoyle) creation processes maybe similar to those proposed by the quasi-steady state theory, or otherwise created by the forces at the base, surrounding, and within galactic and stellar black-hole jets.

Like Halton Arp's original proposal, the Pan Theory hypothesizes that black holes can spin off pieces of themselves which eventually will produce a new galaxy, although it is not a theory requirement. The atomic particles of electrons, positrons, and protons are accordingly created by the above processes, with no Big Bang or original creation process. Anti-protons are theorized to be short-lived particles like free neutrons, unless their spin is somehow continuously reinforced.

The lack of antimatter in the observable universe is explained by antimatter being mechanically unlikely to remain stable in the first place (particularly anti-protons) —going against the unwinding force inherent to Pan—and having a much shorter half-life.

As collections of individual Pan become smaller in size, they become longer in length, and eventually spin off pieces of themselves, or are pared off by particle interactions, the pieces again becoming part of the background aether. This would partly explain the zero point field, with more original matter-creating processes being involved. Phenomena such as virtual particles and hypothetical quantum foam would be explained as temporary combinations of Pan that mechanically engage and disengage. In effect, quantum phenomenon that are currently described as 'simply happening' without cause, would have almost classical mechanical explanations as to how they occur; for the most part, stochastic quantum mechanical equations would remain as an accurate description as to the frequency these phenomena will occur, as well as many other successful phenomenological equations of Quantum Mechanics.

One of the alleged philosophical weaknesses of most steady-state cosmologies was that they lacked initial conditions, invoking infinity forwards and backwards in time. Prior to the BB this was more-or-less accepted almost as a matter of faith, but the BB model did have the advantages of more reasonably explaining the observations of the time and proposing a beginning to an finite universe. Likewise, the Pan Theory similarly proposes an initial condition**:** at some point in the distant past, there was but one single Pan particle contained all of the matter and volume of the entire universe. The difference between this and the conventional universal monoblock of the BB model, in essence, is that if one had a set of 'magical scales' to measure the matter of the initial state in BB cosmology the monoblock would have been extremely massive, while the Initial Pan, to coin a term, would have been smaller than an electron: any measurement system has to be relative to the units that make it up, and even electrons would accordingly be made of huge numbers of Pan. This perspective of the Pan Theory involves an additional "simple" theory of relativity, involving the relativity of the size of matter to time.

This, and the diminution and progressive increase in the numbers of this first Initial Pan, establish the foundation for the rest of the Pan Theory's cosmology, although there are different possibilities concerning exact details of Pan mechanics. The rate of this diminution and number of "doubling cycles" dictates the age of the universe, and the diminution itself affects the observed size of matter, masses, and times concerning distant observations. One of the principal authors of this paper has calculated that the maximum rate of the proportional loss of size in atomic matter is approximately $1/1000^{th}$ part every eight million years. This small amount accordingly explains the redshifting of cosmic entities. Hence, every eight billion years (note that diminution is continuous and therefore must use an exponential function rather than a linear one) an atom has half the volume and substance it once possessed and, overall, there are twice as many Pan in the cosmos than there was about 8 billion year ago (which is a reduction in diameter of about .794 (1 over the cube root of 3) about every 8 billion years. From this, it is clear that the Pan Theory predicts a far greater age for the universe than conventional BB models. Indeed, the age could be 'functionally' infinite since there is no effective way to estimate the bounds of the cosmos beyond the observable universe. Unlike previous steady-state theories an initial state and beginning is proposed; no infinities would exist in the Pan Theory. It would be a model whereby we are "lost" in both time and space.

One important difference between the expansive and diminutive interpretations of observations is that in the Pan Theory, galaxies do appear to be moving away from each other but new galaxies will eventually form in the spaces so opened up, resulting in a relatively steady-state appearance and densities. While galaxies are moving away from each other, they are only doing so at a relatively minor pace. Mutual gravitational attraction causing the formation of cosmological structures such as galactic superclusters and filaments, the same as in the standard model, but there would have been a much greater amount of time for such galactic structures to form. Large voids may be created in this model by a number of hypothetical occurrences such as burned out or exploding galaxies, and again there is much more time available for their formation. As matter would slowly radiate outward from a starting point such an exploding galactic core, or a dissipating burned out galaxy, new galaxies would form from this outward moving matter leaving large expanding voids as the origin of an ancient galactic parent.

4. Conclusions

It is the opinion of the authors that the merit of any theory can be judged on the summation of reasonable criteria: We propose four in our short summation.

1. A theoretical model should be able to explain all observations and predict the outcome of experiments over time, with a minimum of ad hoc additions or adjustments.
2. Within its scope, a theoretical model should be able to make predictions agreed upon by a consensus of its practitioners, rather than many different practitioners proposing different predictions and outcomes.
3. New observations and analysis should tend to confirm the model, rather than requiring the model to be regularly adjusted.
4. One or more methods to disprove the model should be agreed upon and proposed by a consensus of its practitioners.

Considering both the conventional BB model and the proposed Pan Theory model under these considerations, it appears to the authors that the Pan Theory could have some distinct advantages over the BB model in places where the BB model is demonstrably weak. It can be argued that the BB model has *ad hoc* alterations and additions due to regular observational contradictions of the model. But on the other hand the same observations that seem to contradict the BB model support the Pan Theory. In observation and natural experiment, then, radio astronomy often sees the farthest. Future observations of the most distant galaxies by radio telescopes, especially by extremely capable and newer ones such as the James Webb Space Telescope or the ATACOMA array, have the potential to confirm or deny the Pan Theory, other cosmologies proposing an older or infinite age universe, or the BB model.

Three observations, in particular, could make the distinction of validity:

1. **Galactic density:** an expanding universe should have evidence other than red-shifting. The galactic density of past epochs should be able to determine whether the universe is expanding or whether matter is getting smaller and 'filling in the gaps.' In an expanding universe, past epochs should have had galaxies more densely packed than they are now. In the Pan Theory, density should remain roughly constant no matter what epoch is observed, although density would appear to have been less since distances would appear to have been relatively greater in the past.
2. **The Dark Ages epoch:** according to the BB model, there should be a horizon beyond which we can observe no galaxies because there are no galaxies for us to observe, since they had not formed yet. This should also be a relatively hard limit; before it in time there should be the beginning luminous galaxies and after it nothing, rather than a weakening in luminosity until there is eventually nothing, as that would suggest some other possible factors, such as the imperfect transparency of the intergalactic medium, being responsible. The Pan Theory instead expects a gradual weakening in luminosity until the opacity of intergalactic hydrogen and dust establish a 'foggy' horizon.
3. **Galactic evolution:** the composition and structure of early-epoch galaxies will be a deciding factor between the BB and steady state models. The very first galaxies should not be large, well-ordered elliptical or spiral galaxies with a wide range of Population I stars with high metallicities. They should be small, blue galaxies of Population III stars. The Pan Theory, alternatively, expects some galaxies to be mature-looking and complex no matter how far back in time one looks until they are finally obscured by the dust horizon.

One of the biggest problems for those proposing the Pan Theory is that BB practitioners are using different formulas for calculating distances and brightnesses and therefore would be expected, according to the Pan Theory, to misinterpret distant galaxies as being smaller, denser, and brighter than what they really were.

Observations along these lines are already causing uncertainty amongst practitioners, as can be seen from the reference observations listed below. The authors expect that these challenging observations to the BB model, will continue in greater numbers as new telescopes of all types identify even more distant cosmological entities, a portion of which will continue to appear old. They further predict that the BB model may be seriously questioned—in terms of an active search for an alternate model—within three years following the proper placement and functioning of the James Webb Space Telescope, if the trend in observations holds true. Before an attempt is made to add an additional hypothesis to the Big Bang model to greatly increase the age of the BB universe based upon contradicting observations, it is hoped that the Pan Theory may be better known by that time and considered an alternative possibility. In the meantime, it is hoped that the theory may become known for its many different predictions, and in particular that of continuous anomalous observations of large, old appearing galaxies at ever increasing distances and that its distance and brightness equations will be tested and confirmed by many others, as it was by the authors concerning hundreds of type 1a supernova in their prior research.

Further Explanations

For any cosmology when one is first exposed to the theory, despite all explanations given, there will always be many possible remaining unanswered questions that cannot all be thought of, addressed, or answered in a single paper. All readers are encouraged to ask the authors questions concerning any and all remaining questions they may have regarding this paper or related theory.

Responses

Please contact the author Forrest Noble at pantheory.org@gmail.com. He will be very happy to answer any questions, consider corrections, and comments. If you are interested in testing the equations on page 9, have new or different insights, or need additional explanations concerning this paper or the alternative cosmological model, the authors are willing to discuss this.

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