

The Big Bang Quote Book

The Big Bang Quote Book

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Even though acclaimed as an undeniable fact^{1, 2} the Big Bang Theory is based on many unobserved, unprovable ideas. Out of these nine problems listed in this article, several have not been dealt with in previous creationist publications. Scientists admit that these are major problems but have not been able to provide any suitable answers. A theory that has so many proven facts against it should be discarded and replaced with a suitable creationist model. Four major new problems are discussed and documented.

Introduction

Out of the 13 problems discussed, seven major new ones are not dealt with previously on CMI books or website.

First.

The amount of cosmic Lithium does not agree with Big Bang Nucleo synthesis [BBN] models.

Second.

The number of visible dwarf galaxies does not line up with Big Bang predictions.

Third.

Cuspy halos should be visible around many galaxies but they are not. This refutes cold dark matter models.

Fourth.

Friction Time Scale Problem.

Fifth

The Missing Cold Dark Matter.

Sixth

The Missing Inflation.

Seventh

Recent studies show that half the Hydrogen in the Universe is missing.

Eighth

The Missing Dark Energy.

Ninth

The Missing Galactic Bulges.

Tenth

Massive Star Formation

Eleven

Binary Star Formation

Twelve

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Numerous Unsolved Problems

Thirteen

There are several other newly discovered phenomena that do not line up with Big Bang models.

- A. The formation of Blue Galaxy.
- B. Compact galaxy groups with discordant red shifts.
- C. The origin of dwarf galaxies
- D. The faint sun problem.
- E. Neutron Star Retention In Globular Clusters

1. The Missing Cosmic Lithium

According to astronomer Bruce Dorminey

“A relative lack of lithium in ancient stars means scientists don't completely understand how stars evolve or how the Big Bang forged the first elements.”³ There is too much Lithium in the Universe to be a product of BBN. The answer that Bruce gives in his article is that we need “new physics” to create the excess Lithium that now exists. The idea of super symmetry and space has 10 dimensions maybe the answer. Unfortunately for Bruce, no such dimensions or the invisible particles that this idea entails have ever been found.

Grant J. Mathews from University of Notre Dame says:

“The ${}^6\text{Li}$ abundance observed in metal-poor halo stars exhibits a plateau as a function of metallicity similar to that for ${}^7\text{Li}$, suggesting a big bang origin. However, the inferred primordial abundance of ${}^6\text{Li}$ is ~1000 times larger than that predicted by standard big bang nucleosynthesis for the WMAP baryon-to-photon ratio. In addition, the inferred ${}^7\text{Li}$ primordial abundance is 3 times smaller than the big bang prediction.”⁴

Richard H Cyburt from Michigan State University states how bad the problem is:

“The lithium problem arises from the significant discrepancy between the primordial ${}^7\text{Li}$ abundance as predicted by big bang nucleosynthesis (BBN) theory and the Wilkinson Microwave Anisotropy Probe (WMAP) baryon density, and the pre-Galactic lithium abundance inferred from observations of metal-poor (Population II) stars. This problem has loomed for the past decade, with a persistent discrepancy of a factor of 2–3 in ${}^7\text{Li}/\text{H}$.”⁵

“In using the WMAP value for η at the period of BBN, we are implicitly assuming that there has been no entropy change between BBN and the decoupling of the CMB. Note that entropy production between BBN and decoupling would require a *larger* value for η at the time of BBN and make the Li problem even worse.”⁶

“Thus, the more conventional solutions to the problem have become increasingly constrained by new data. The possibility that lithium points to new physics at work in the early universe thus remains not only viable, but if anything more compelling. This possibility could receive strong support from the discovery of new physics at the Large Hadronic Collider (LHC) at CERN, slated to start running in early 2009.”⁷

Julien Larena and Jean-Michel Alimi from Paris University agree that the amount of Helium 4 and Deuterium is right but the amount of Lithium is all wrong:

“In the framework of the standard big bang nucleosynthesis (BBN), such a baryon density leads to predictions for the primordial abundances of ${}^4\text{He}$ and D in good agreement with observations. However, it also leads to a significant discrepancy between the predicted and observed primordial abundance of ${}^7\text{Li}$. Such a discrepancy is often termed the lithium problem.”⁸

Sean Bailly⁹ and Karsten Jedamzik¹⁰ offer the same solution as Bruce Dorminey. Using string theory and super symmetry will create the right amount of Lithium. Of course there is no such evidence for super symmetry. A recent article in Scientific American magazine admits it is an unproven theory.¹¹

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Keith A. Olive And Evan D. Skillman from the Astronomy Department, University of Minnesota admit that the Big Bang model explains some things correctly but not the levels of Lithium in the universe:

“This easily allows for concordance between measurements of the baryon-to-photon ratio (x) from WMAP, deuterium abundances, and helium abundance (although the discrepancy with Lithium remains).”¹²

Martin Asplund from Mount Stromlo Observatory admits this is a major problem to the Big Bang theory:

“Lithium’s two stable isotopes, ${}^6\text{Li}$ and ${}^7\text{Li}$, continue to pose intriguing questions for astrophysicists concerned with understanding the origins of this light element.”¹³

The observations do not agree with the theory:

“The observed ${}^6\text{Li}$ abundance is several orders of magnitude larger than that predicted from the standard big bang.”¹⁴

Another scientist adding fuel to the fire is Professor Piau from the Joint Institute for Nuclear Astrophysics, Chicago:

“In order to have provided such a deuterium fraction, standard BBN would have to have produced much more lithium than is currently observed in halo stars on the Spite plateau. More recently, the validity of this discrepancy related to lithium found further strong support through the constraints provided by the cosmic radiation background anisotropies measured by the Wilkinson Microwave Anisotropy Probe (WMAP).”¹⁵

Conclusion

The creationist view has no problem here because it does not need the Big Bang theory. God simply created the present amount of Lithium a few thousand years ago.

2. The Missing Dwarf Galaxies

The cold dark matter (CDM) model predicts many visible dwarf galaxies associated with large galaxies. Observations show that they do not exist. Astronomers Joshua D. Simon And Marla Geha comment:

“The cold dark matter (CDM) cosmological model predicts that massive galaxies such as the Milky Way should be surrounded by large numbers of dark matter dominated satellite halos. The relatively modest populations of observed dwarf galaxies orbiting the Milky Way and Andromeda, however, seem to conflict with this prediction (Kauffman et al. 1993; Klypin et al. 1999; Moore et al. 1999). This apparent disagreement between the expected and observed numbers of dwarf galaxies has become widely known as the ‘substructure’ or ‘missing dwarf’ problem.”¹⁶

James. S. Bullock¹⁷ says that the answer is that the galaxies are too dark to see with modern telescopes. Andrey Kravtsov says that perhaps new views of CDM or galaxy formation will solve the problem.¹⁸ He states in a recent article that the differences between observation and theories are major:

“Comparisons with observations revealed that there is a glaring discrepancy between abundance of sub halos and luminous satellites of the Milky Way and Andromeda as a function of their circular velocity or bound mass within a fixed aperture. This large discrepancy, which became known as the “substructure” or the “missing satellites” problem, begs for an explanation.”¹⁹

Mario Mateo pointed this out thirteen years ago but the problem is still not resolved:

“The current fashion is to assume that the kinematic observations described above constitute part of a dark matter problem. However, it may be wise to remember that this already implies a solution to what remains a long-standing crisis in understanding the internal kinematics of galaxies.”²⁰

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Moore and Ghigna say that if the observations are wrong then the theory itself is wrong:

“Either the hierarchical model is fundamentally wrong, or the substructure lumps are present in the galactic halo and contain too few baryons to be observed. The deficiency of satellites in galactic halos is similar to a deficiency of dwarf galaxies in the field (e.g. Kauffmann *et al.* 1993).”²¹

Peebles And Nusser discussed this in Nature magazine less than a year ago:

“The disparity in the predicted number of Local Void galaxies should not be confused with the prediction of there being many more dwarf dark matter haloes than there are dwarf galaxies.”²²

“We conclude that there is a good case for inconsistency between the theory and our observations of galaxies in the Local Void.”²²

“The variety of problems we have considered in the interpretation of the present baseline motivates serious consideration of adjustments of the fundamental theory.”²³

“Two clear conclusions of this Review are that galaxy formation is not well understood and that the nearby galaxies offer rich and still far from completely explored clues to a better picture of how the galaxies formed.”²³

Conclusion

The cold dark matter theory predicts many more visible dwarf galaxies than what really exist. The theory runs contrary to the evidence.

3. The Missing Cuspy Halo Problem

“The cuspy halo problem arises from cosmological simulations that seem to indicate cold dark matter (CDM) would form cuspy distributions — that is, increasing sharply to a high value at a central point — in the most dense areas of the universe. This would imply that the center of our galaxy, for example, should exhibit a higher dark-matter density than other areas. However, it seems rather that the centers of these galaxies likely have no cusp in the dark-matter distribution at all. This remains an intractable problem. Speculation that the distribution of baryonic matter may somehow displace cold dark matter in the dense cores of spiral galaxies has not been substantiated by any plausible explanation or computer simulation.”²⁴

“This persistent difference is known as the ‘core/cusp controversy’, sometimes also described as ‘the small-scale crisis in cosmology’.”²⁵

“Similarly, the difficulties in reconciling a possible underlying triaxial potential with the circularizing effects of the baryons also needs to be investigated. In short, studies which, constrained and informed by the high quality observations now available, self-consistently describe and model the interactions between the dark matter and the baryons in a cosmological context are likely the way forward in resolving the core/cusp problem.”²⁶

Professor Sanchez-Salcedo from Mexico City University admits there are many theories to try and explain the problem. His article offers no solution however.

“Many astrophysical mechanisms have been suggested to explain these discrepancies.”²⁷

“The problems discussed above are also faced by other models whose mechanisms to produce a core are based on interactions, either elastic or inelastic, between dark matter particles.”²⁷

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Lam Hui from the Department of Physics, Columbia University in New York points out the problem of theory versus facts but again his article like the others offers no answer:

“Conventional Cold Dark Matter cosmological models predict small scale structures, such as cuspy halos, which are in apparent conflict with observations. Several alternative scenarios based on modifying fundamental properties of the dark matter have been proposed.”²⁸

Stacy S. McGaugh from the University of Maryland says the problem is so bad many radical theories have been invoked:

“More radical suggestions about the nature of dark matter have also been made to address the cusp-core problem.”²⁹

This problem was well known over twelve years ago.

“Astronomers have gone to the well and come back perplexed. Galaxy clusters should contain large quantities of dark matter, trapped in their potential well, and we expect that matter to be sharply concentrated near the centre. But using a new method for interpreting the effects of gravitational lensing, Tyson *et al.* have inferred a much smoother and less centrally concentrated distribution of dark matter in one cluster.”³⁰

In 2010 Nature magazine documented that cold dark matter and galaxy formation is far from solved:

“The smallest things often cause the most trouble. The smallest galaxies are no exception: they have long caused difficulties for modern cosmology. Neither the number nor the appearance of small ‘dwarf’ galaxies conforms to the predictions of the otherwise highly successful cold dark matter (CDM) theory of galaxy formation.”³¹

A recent paper lists a whole host of unresolved problems:

“A complete explanation of spiral galaxies in Λ CDM requires a comprehensive theory of galaxy formation. This remains lacking. Indeed, there are a number of lingering problems on small (galaxy) scales. These include the cusp-core problem (e.g., de Blok *et al.* 2001a), the missing satellite problem (e.g., Moore *et al.* 1999a), the dynamical friction time scale problem (Goerdt *et al.* 2006; Sanchez-Salcedo, Reyes-Iturbide, & Hernandez 2006), and a whole suite of other incongruities and apparent contradictions that arise on the scale of individual galaxies (McGaugh & de Blok 1998; Sellwood & Kosowsky 2001).”³²

Nature magazine reports that this problem is fatal to the theory of cold dark matter:

“For almost two decades the properties of ‘dwarf’ galaxies have challenged the cold dark matter (CDM) model of galaxy formation.”³³

“This failure is potentially catastrophic for the CDM model, possibly requiring a different dark-matter particle candidate.”³³

“Interpreting the data in terms of dark matter leads to troublesome fine-tuning problems. Different observations require contradictory amounts of dark matter. Structure formation theories are as yet far from able to explain the observations.”³⁴

Conclusion

The cold dark matter theory does not line up with the observations. The Big Bang theory predicts galactic haloes but they do not exist.

4. Friction Time Scale Problem

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Another problem is the dynamic friction problem. Gravity causes globular clusters to spiral out of orbit into the centre of their parent galaxy. Since globular clusters are supposed to be 10 to 13 billion years old this should have happened billions of years ago. Tobias Goerdts comments on the problem:

“These star clusters move within a dense background of dark matter and should therefore be affected by dynamical friction, causing them to lose energy and spiral to the centre of the galaxy. We will show later that, if Fornax has a cosmologically consistent density distribution of dark matter, the orbital decay time-scale of these objects from their current positions is < 5 Gyr. This is much shorter than the age of the host galaxy, presenting us with the puzzle of why these five globulars have not merged together at the centre forming a single nucleus (Tremaine, Ostriker & Spitzer 1975; Tremaine 1976).”³⁵

Sanchez-Salcedo discusses the problem and then offers the answer as cold dark matter:

“Tremaine (1976) first noticed that using the preliminary values for the radius and mass of the second most luminous of the 10 dSph satellites of the Milky Way, Fornax, this time is 1–2 Gyr, very short as compared to absolute ages estimated for these clusters (14.6 ± 1.0 Gyr for clusters 1–3 and 5, 11.6 Gyr for cluster 4; see Buonanno et al. 1998; Mackey & Gilmore 2003).”³⁶

“This solution has no astrophysical interest because then a dark component has to be added as well to explain the missing mass problem in spiral galaxies. This component will become the main explanation for the missing mass at galactic scales and not only at cosmological scales (Pointecouteau & Silk 2005).”³⁷

Since there is no proof of cold dark matter this is no answer at all. Oh and Lin have calculated that this free fall into the centre of the galaxy would only take one billion years:

“While the nucleus of NGC 1705 might result from a single globular cluster, for most nucleated dwarf galaxies the merger of many globular clusters at the center would be required. The results in model 1 show that cluster coalescence may also lead to off center displacement of the nucleus, which subsequently diminishes on a typical timescale of less than 1 Gyr.”³⁸

Oh, Lin and Richer propose a huge black hole in the centre of the galaxy or tidal disruption to explain away the problem:

“In the Fornax dwarf spheroidal galaxy, globular clusters preserve their diffuse spatial distribution despite the fact that the clusters orbital decay timescale is much shorter than the estimated age of the host galaxy. We propose that this paradox may be resolved if (1) Fornax contains black holes with a sizeable fraction of the mass of these clusters or if (2) it is currently undergoing tidal disruption.”³⁹

At the end of the article he admits that the black hole’s existence is purely hypothetical and the friction would overpower any tidal disruption.⁴⁰

Conclusion

The cold dark model does not answer this time scale problem.

5. The Missing Cold Dark Matter

Claims have been made that Amelia Fraser-McKelvie and two other scientists from Monash University in Victoria have found cold dark matter [CDM]. A closer look reveals what they have found is just standard matter and energy listed in popular physics textbooks.

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“What is needed now is an accurate determination of filaments’ electron densities and plasma temperatures from spectral fitting to provide a solid comparison with the models, which will then provide more realistic predictions for the missing baryon problem.”⁴¹

REBUTTAL:

Baryonic material is just the periodic table [<http://en.wikipedia.org/wiki/Baryon>]. It is not exotic bizarre matter.

"The low densities (10^{-6} – 10^{-4} cm^{-3}) and high temperatures (100,000–10,000,000 Kelvin) expected from such structures in X-rays are presenting an observational challenge." ⁴¹

REBUTTAL:

The matter is not cold.

"The gas is likely to be inhomogeneous, with a range of temperatures and densities, different metallicities and ionization timescales (see Bertone et al. 2008 for a review)." ⁴¹

REBUTTAL:

It contains Periodic Table elements and is not exotic bizarre matter.

"In summary, we have detected a soft X-ray emission from the combined sample of 41 filaments with known positions using the Pimblet et al. (2004) filament catalogue." ⁴¹

REBUTTAL:

The energy it gives off is standard stuff found in Physics textbooks:

Another claim for finding CDM is discussed ⁴² by Professor Stawarz from Stanford University in California. High energy cosmic ray electrons have been claimed to be the by product of cold dark matter annihilation. Professor Stawarz concludes his examination of these claims saying that these energies are just normal energy from Super Nova Remnants:

“In this paper, we show that the observed excesses in the energy distribution of the Galactic CR electrons around energies $E = 0.1$ – 1 TeV may be easily reproduced without invoking any unusual source of ultra relativistic electrons (or $e \pm$ pairs), such as dark matter annihilation/decay or some nearby astrophysical object (e.g., a pulsar), other than the general diffuse Galactic components of CR electrons and protons injected by SNRs.” ⁴³

As of March 2011 cold dark matter is still just a ghost without a trace:

“Although its real nature is unknown, dark matter seems to outweigh the ordinary matter visible in stars and galaxies by roughly 5.5 to 1. Down here on Earth, however, physicists struggling to answer the ‘what is it?’ question often feel like they’re chasing a ghost. Certainly, their detectors have been giving them a lot of strange and contradictory results.” ⁴⁵

This article claims ⁴⁵ that cold dark matter physics is based on string theory and super symmetry. Of course there is no such evidence for super symmetry. A recent article in Scientific American magazine admits it is an unproven theory. ¹¹

Another author admits recently that cold dark matter’s nature is entirely unknown:

“The theorist’s goal is to understand these observations in a cosmological context. In the standard picture, most of the Universe is composed of dark matter, whose nature is unknown.” ⁴⁶

J. A. Sellwood and A. Kosowsky have listed ⁴⁷ twelve objections to the existence of cold dark matter:

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1.

Many galaxies do not have the right rotation curve that CDM would create.

2.

The structure of SB galaxies is all wrong.

3.

CDM does not give the right mass accelerations.

4.

CDM does not relate the halo parameters correctly to the luminous mass distribution.

5.

The predicted angular momentum of the disk is at least an order of magnitude less than that observed.

6.

The spectacular variation of f_{max} between galaxies found by Sellwood (2000) and Dalcanton & Hogan (2000) indicates that DM cannot be a simple collisionless particle.

7.

No observational evidence *requires* halos to have the predicted cusps.

8.

Navarro & Steinmetz (2000a) describe their failure to predict the zero point of the TFR as a "fatal problem for the Λ CDM paradigm."

9.

The sub clumps are more numerous than the numbers of observed satellite galaxies, and may threaten the survival of a thin disk in the host galaxy.

10.

The TFR discrepancy is even worse in the CDM model.

11.

Galaxies like NGC 2403 have the wrong halo shape.

12.

Measurements of the microwave background power spectrum at sub-degree scales show CDM does not have to the correct answer.⁴⁷

Conclusion

The existence of CDM is so far unverified. There are many valid scientific objections to its existence. String theory and super symmetry physics are supposed to be its basis. Of course there is no such evidence for super symmetry. A recent article in Scientific American magazine admits it is an unproven theory.¹¹

6. The Missing Inflation

A recent article in Scientific American highlights some of the new problems with inflation theory:

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“But some of the theory’s creators, including the author, are having second thoughts. As the original theory has developed, cracks have appeared in its logical foundations. Highly improbable conditions are required to start inflation. Worse, inflation goes on eternally, producing infinitely many outcomes, so the theory makes no firm observational predictions.”⁴⁸

What started the ignition of inflation? Evolutionists do not have any evidence as to what would start this super fast expansion process. What caused the deceleration of inflation? Since the universe is not expanding today at this super fast speed, what turned inflation off? Again there is no answer.

According to Adrienne L. Erickcek and Sean M. Carroll from California Institute of Technology the universe is not isotropic and homogeneous but lop sided:

“Measurements of CMB temperature fluctuations by the Wilkinson Microwave Anisotropy Probe (WMAP) indicate that the fluctuation amplitude in one half of the sky differs from the amplitude in the other half.”⁴⁹

“However, there is an anomaly in the CMB: measurements from the Wilkinson Microwave Anisotropy Probe (WMAP) [A] indicate that the temperature-fluctuation amplitude is larger, by roughly 10%, in one hemisphere than in the other [B]. Fewer than 1% of simulated isotropic fluctuation maps exhibit such an asymmetry, and the asymmetry cannot be attributed to any known astrophysical foreground or experimental artefact.”⁴⁹

“The hemispherical power asymmetry in the CMB challenges the assumption that the Universe is isotropic and homogeneous.”⁵⁰

Bartosz Lew also agrees:

“The analysis of the modulation amplitude within few multipole bins yielded a large, best-fit modulation amplitudes, that seem to significantly reject the isotropic Universe model (with $A = 0$). However as much as few in one hundred GRF simulations, processed as data, also yielded a similar or larger modulation values, and also excluded the $A = 0$ hypothesis at yet even higher confidence levels, than in the case of the V5 data. This effectively reduces the overall significance at which the isotropic model of the Universe can be rejected, down to only about 94% or = 95% using the V5 data in the range $\ell = [7, 19]$, and $\ell = [7, 79]$ respectively.”⁵¹

Professor H. K. Eriksen from Oslo University in Norway lists some three more unsolved problems:

“Perhaps the three most important ones were:

- 1) Alignments and symmetry features among low ℓ multipoles (de Oliveira-Costa et al. 2004; Eriksen et al. 2004),
- 2) An apparent asymmetry in the distribution of fluctuation power in two opposing hemispheres (Eriksen et al. 2004; Hansen et al. 2004), and
- 3) A peculiar cold spot in the southern hemisphere (Vielva et al. 2004; Cruz et al. 2005). All of these features were subsequently studied extensively by independent groups, and all remain unresolved to the present day.”⁵²

Three more unsolved problems in detail:

One.

“We have investigated anomalies reported in the Cosmic Microwave Background maps from the WMAP satellite on very large angular scales. There are three independent anomalies involving the quadrupole and octopole:

1. The cosmic quadrupole on its own is anomalous at the 1-in-20 level by being low (the cut-sky quadrupole measured by the WMAP team is more strikingly low, apparently due to a coincidence in the orientation of our Galaxy of no cosmological significance).

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2. The cosmic octopole on its own is anomalous at the 1-in-20 level by being very planar.
3. The alignment between the quadrupole and octopole is anomalous at the 1-in-60 level.”⁵³

“More importantly, the observed asymmetry is remarkably stable with respect to frequency and sky coverage. The most intriguing possibility remains therefore that the recent findings require some fundamentally new physics on large scales in the universe.”⁵⁴

Two.

“An extremely cold and big spot is detected. This spot (*The Spot*) is seen in the SMHW coefficients at scales around 4° (implying a size of around 100 on the sky) and at Galactic coordinates ($b = -57^\circ$, $l = 209^\circ$). The probability of having such spot for a Gaussian model is of only $R=0.2$ per cent, which implies that, if intrinsic, The Spot has not been caused by primary anisotropies in the standard scenario of structure formation because standard inflation predicts Gaussian fluctuations in the matter energy density and therefore in the CMB temperature fluctuations.”⁵⁵

“We have presented the detection of non-Gaussianity in the WMAP first-year data, in the kurtosis of the SMHW coefficients at scales around 4° , which implies a size on the sky of around 10° .”⁵⁶

Three.

“Having eliminated systematic errors as the source of the signal, the intriguing possibility is raised that the cosmological principle of isotropy is violated and/or that fundamentally new physics on large scales in the Universe is required. Further clarification of this scenario awaits further observations from *WMAP*, and ultimately the forthcoming *Planck* satellite mission.”⁵⁷

According to another article posted on Fox News website the inflation theory cannot explain the uneven distribution of cosmic background microwave radiation:

“But the normal model of inflation can't account for the asymmetry now noted.”⁵⁸

To try and get around that Carroll postulates two inflation force fields instead of one.

“To try to explain that, Carroll, astrophysicist Marc Kamionkowski and graduate student Adrienne Erickcek (all at Caltech) tested a new version of inflation theory, in which two fields are responsible for the universe's early bloom of expansion.”⁵⁸

That only makes the problem worse for the Big Bang theory. What turned both the force fields on and then later turned them off? Since the universe is not expanding today at this super fast speed, what turned double inflation off?

Conclusion

The Big Bang theory has a series of unanswered problems. This series includes:

- 1) The singularity;
- 2) Energy is converted to matter, but not antimatter;
- 3) The ignition of the Big Bang;
- 4) The ignition of inflation;
- 5) The deceleration of inflation;
- 6) Compaction of expanding gas into stars;
- 7) Ordering of stars into galaxies, many with rotation;
- 8) Ordering of galaxies into super clusters; and
- 9) Ordering of matter into planets, with unique orbits, rotation axes and rotation directions.⁵⁹

7. The Missing Hydrogen

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Another newly discovered problem is missing Hydrogen. This is not to be confused with cold dark matter. The amount of Hydrogen in the Universe does not agree with the Big Bang model. Galaxies should contain twice as much as they are observed to have:

“Forget dark matter, dark energy or any other hypothetical substance postulated to plug gaping holes in the fabric of the universe. Here is a tangible scandal of cosmic bookkeeping right on our doorstep. When we tot up all the everyday atoms in our galaxy - the sort that make up its stars, planets and people- about half of what we expect to see is missing.”⁶⁰

This article in New Scientist magazine admits that there is no easy solution to the problem:

“This solution is not without its problems, however. Dark matter is thought to be found within a spherical "halo" surrounding a visible galaxy, but that distribution struggles to produce the right rotation curve. Pockets of dark molecular hydrogen gas, about the size of the solar system, scattered around the outer reaches of a galaxy would do a far better job, says Pfenniger. "If we were to triple the gas content of the Milky Way, we could flatten the rotation curves," he says. That might sound nice and simple, but there's a catch: it brings us into conflict with our models of the big bang, which predict twice, not three times, the number of atoms we see. For this reason, Pfenniger thinks his model is unlikely to do away with dark matter entirely, and proposes a compromise: unseen atoms contribute around half of the rotation curve solution, with the rest still coming from dark matter.”⁶¹

A very recent article this year in Scientific American highlights the growing problem:

“Cen, Ostriker and Dave dubbed this material the warm-hot intergalactic medium, or WHIM. If we could empirically con-firm its presence and extent, we might be able to pin down the location and condition of the missing baryons.”⁶²

The theory is plagued with many problems:

One

“The trouble with this model is that the flow of gas into galaxies cannot go on unabated. If it did, galaxies would grow into monsters and we know they do not: galaxies today come in only a limited range of masses. Early models seemed to reproduce the observed range of galactic masses pretty well, but in retrospect they worked only because astronomers were using a value for the overall baryon density that was about half the present value.”⁶²

Two

“As new measurements of the baryon fraction revised the value upward, theorists fed this information into simulations and realized that their model universes were plagued by a serious overabundance of massive galaxies that are not seen in nature.”⁶³

Three

“Another problem is that models predict a profusion of smallish dark matter clumps that agglomerate into progressively larger bodies. Real galaxies do not follow this pattern. Observers do not see nearly as many small galaxies as the models predict, and the most massive galaxies appear to have formed quickly and efficiently, rather than through the gradual assembly of smaller pieces.”⁶³

Joel N. Bregman discusses this problem and how it has been recently discovered.

“It is largely in the past decade that we have come to an appreciation of the missing baryon problem and the likely existence of a cosmologically important Warm-Hot Intergalactic Medium (WHIM) at low red shift.”⁶⁴

Later in the article he admits that these missing particles will not be discovered for a long while:

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“Uncovering the missing baryons is a feasible goal, requiring only sensitivity improvements that can be attained with existing technologies. We hope that these sensitivity improvements will be realized in the coming decade through the construction of the next generation of instruments. The result would be a watershed of new discoveries.”⁶⁵

“Here we (re)define the WHIM as gas with over densities lower than that in haloes (ρ/ρ_{-100} today) and temperatures $T > 10^5$ K, to more closely align it with the ‘missing baryons’ that are not easily detectable in emission or Ly α absorption.”⁶⁷

“Hence, our revised definition more closely reflects the idea that the WHIM is the repository of the ‘missing’ cosmic baryons.”⁶⁸

“A particularly promising application of this is tracing the missing baryons with wide Ly α lines because, unlike relying on high-ionization metal lines such as OVI (e.g. Tripp, Savage & Jenkins 2000) or OVII (e.g. Nicastro et al. 2005), HI line widths are independent of metallicity.”⁶⁹

“Astronomers have long inferred that most of the material in the universe is invisible, existing as mysterious dark matter. But a recent study suggests that most ordinary matter is hidden as well.”⁷⁰

“Some scientists had proposed that the missing stuff might be hidden in extended halos of gas surrounding galaxies, but University of Michigan astronomer Joel Bregman has dealt a blow to that idea. Studying light from distant stars that had filtered through the Milky Way’s halo, Bregman determined that “the matter really isn’t there,” he says. He suggests that perhaps much of the hot gas in the early universe was never captured by galaxies at all and instead remained scattered invisibly through intergalactic space.”⁷⁰

Conclusion

Not only is the cold dark invisible matter missing so is the visible Hydrogen!

8. The Missing Dark Energy

Another interesting thing is dark energy. If dark matter is in doubt so should dark energy. The nature of this strange energy is still unknown.

“The main question to consider now has to be whether to accept the evidence for detection of dark energy.”⁷¹

“The physical nature of dark energy is not yet understood. Several explanations have been put forward including the presence of smoothly-distributed energy such as a cosmological constant or a quintessence scalar field, a large-scale modification to Einstein’s theory of General Relativity, or the effects of spatially-varying curvature in an inhomogeneous Universe.”⁷²

“The main concern of this approach is that these fitting formulae may only be valid for the subset of cosmologies and galaxy formation models in which they were derived (an important point given the unknown nature of dark energy).”⁷²

As far as dark matter haloes goes, section three of this essay discusses haloes around galaxies and that they do not line up with dark matter predictions.

“In addition, the form of F and the value of Σv depend strongly on details such as galaxy type, dark matter halo mass and satellite fraction.”⁷³

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Conclusion

Dark energy like dark matter has never been observed.

9. The Missing Galactic Bulges

“Jonathan Feng, a particle physicist and cosmologist at the University of California, Irvine, thinks we may have to accept that there is no "one size fits all" explanation for how galaxies come to be.”⁷⁴

"Galaxies are complicated and we don't really know how they form. It's really an embarrassment.”⁷⁴

“All that means we are left rather in the dark. ‘We need some measurements, some tests, of the nature of dark matter,’ says Peebles - until we do, we won't have any idea of its true influence on galaxy formation.”⁷⁵

“That means there should be fewer smaller galaxies than the standard cosmology permits.”⁷⁵

John Kormendy in The Astrophysical Journal⁷⁶ also talks about the issue of spiral galaxies not having bulges.

Conclusion

The origin of galaxies is still unknown.

10. Massive Star Formation

“The formation of massive stars is one of the major unsolved problems in stellar astrophysics. However, only few if any of these are found as single stars, on average massive stars have more than one companion.”⁷⁷

“The third problem is that the formation of massive binaries seems to require an extreme fine tuning, especially in terms of the impact parameter.”⁷⁷

“The birth of massive stars remains one of the outstanding problems in star formation.”⁷⁸

"There are currently two competing ideas as to how massive stars form.”⁷⁹

“Despite this importance, massive star formation is a poorly understood process. Observational studies are hampered by the distance to massive star-forming regions, and the high degree of obscuration in such regions. From a theoretical point of view, the very existence of massive stars presents a challenge.”⁸⁰

“The problem of massive star formation (O & B stars with masses $>8 M_{\odot}$) still represents a challenge from both a theoretical and observational point of view.”⁸¹

“Our current understanding of massive star-forming regions remains poor, despite their importance in the structure and evolution of galactic systems, due to their strong feedback.”⁸²

“The lack of a detailed, observationally based evolutionary sequence for massive young stellar objects (MYSOs) limits our understanding of the early stages of high mass ($M > 8 M_{\odot}$) star formation.”⁸³

“Although high-mass ($> 8 M_{\odot}$) stars are clue pieces in the Universe and galaxy evolution, many questions remain

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open concerning their formation process. The root of the problem is that the Kelvin-Helmholtz timescale for a high-mass star is much shorter than the free-fall timescale of the natal core, and thus the star reaches the main-sequence while still accreting matter.”⁸⁴

“The onset of massive star formation is not well understood because of observational and theoretical difficulties.”⁸⁵

“The second drastic problem in the context of massive star formation is how to avoid fragmenting the massive cores in many objects.”⁸⁶

“Though they are important, in the shaping and evolution of their host galaxies, the physics of the formation and evolution of massive stars is unclear.”⁸⁷

“We identify a “supernova rate problem”: the measured cosmic core-collapse supernova rate is a factor of 2 smaller (with significance 2) than that predicted from the measured cosmic massive-star formation rate.”⁸⁸

“The exact steps that lead to the formation of a high-mass star are not completely understood.”⁸⁹

“The formation of massive stars is currently an unsolved problems in astrophysics.”⁹⁰

“I review models for the evolution of these objects from the observed massive core phase through collapse and into massive star formation, with particular attention to the least well understood aspects of the problem: fragmentation during collapse, interactions of newborn stars with the gas outside their parent core, and the effects of radiation pressure feedback.”⁹¹

“This has implications for a number of outstanding problems in star formation, including the mechanism of massive star formation, the origin of the stellar initial mass function and its relationship to the core mass function, the demographics of massive binaries, and the equation of state in star-forming gas.”⁹²

“The physical mechanism that allows massive stars to form is a major unsolved problem in astrophysics. Stars with masses $> 20 M_{\odot}$ reach the main sequence while still embedded in their natal clouds, and the immense radiation output they generate once fusion begins can exert a force stronger than gravity on the dust and gas around them. They also produce huge Lyman continuum luminosities, which can ionize and potentially unbind their parent clouds. This makes massive star formation a more daunting problem than the formation of low mass stars.”⁹³

“There remains, however, the problem of getting mass from the core onto a star. This is potentially difficult because massive protostars have short Kelvin-Helmholtz times that enable them to reach the main sequence while they are still forming from their parent clouds.”⁹²

11. Binary Star Formation

Evolutionists believe that binary stars are the product of the Big Bang explosion and random evolution. They currently admit that there is no consensus as to how they formed:

“The formation of binary stars remains a subject of active research and debate.”⁹⁴

“We have no idea how short period binaries with periods much shorter than 3–5 days form. In fact, such binaries, particularly those with periods shorter than 1 day, should not exist: indeed, even if some unknown process formed contact binaries at the T Tauri stage, the relatively large sizes of the component stars would imply that the resulting orbital periods be longer than about 3–5 days.”⁹⁵

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“Formation of binary and multiple stars is a subject of active research and debate, still remaining one of the major unsolved issues.”⁹⁶

“There are two primary reasons for this lack of predictive power. First, the results of fragmentation calculations depend sensitively on the initial conditions, which are poorly constrained. The second problem is that of accretion.”⁹⁷

“The relative frequency of stable hierarchies in our simulations is generally comparable to those observed in MSC, but with some notable exceptions.”⁹⁸

“Even if every disc undergoes an interaction, as might happen during dynamically triggered star formation, then the capture rate is extremely low unless the stars initially have a very low velocity dispersion.”⁹⁹

“The magnitude of the energy transfer calculated in our simulations is greater than that of the binding energy of material exterior to periastron by a factor of two in the prograde case, and up to a factor of five in the case of the retrograde encounter. The destructive nature of the encounters indicates that a non linear treatment is essential in all but the most distant encounters.”¹⁰⁰

“There are a comparable number of double neutron star systems compared to isolated recycled pulsars. We find that standard evolutionary models cannot explain this fact, predicting several times the number of isolated recycled pulsars than those in double neutron star systems.”¹⁰¹

“With the currently available limited sample we are having problems constraining the evolutionary parameters.”¹⁰²

“The main problem arises from the fact that the pulsar’s magnetic field needs to be quenched without a significant spin-up. Possibly our understanding of the accretion physics is incomplete and future studies could solve the problem with spinning up those mildly recycled pulsars.”¹⁰³

“How the spiral-in of the neutron star in the common envelope goes in detail is not known, and more extensive calculations are needed to pin this down.”¹⁰³

“We do not know whether the neutron star in spiral-in tidally disrupts the core, or whether it merges with the core, before or after turning into a black hole, etc. However, it is clear that essentially no neutron stars survive the spiral-in.”¹⁰³

“Our arguments may suggest that in the standard evolutionary model for, e.g., PSR 0655 + 64 the neutron star would not survive a common envelope with the companion star, as the latter evolved.”¹⁰³

“Our calculations and estimates suggest that the standard scenario for forming binary pulsars, in which the neutron star from the first explosion spirals in through the hydrogen envelope of the secondary, does not, in general, work.”¹⁰³

According to two different articles the gas cloud accretion theory is flawed.^{104, 105}

“Unfortunately, the current state of theoretical models falls short of the present and upcoming data. At the root of the theoretical difficulties is the range of extreme physical conditions encountered in many of the observed systems: high magnetic fields, angular momentum, degenerate matter, neutrino effects, etc.”¹⁰⁶

“That the merging rates derived from evolutionary calculations are higher, by two orders of magnitude, than those based on binary pulsar statistics only.”¹⁰⁷

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“We wish to answer the question of why estimations of merging rates obtained from pulsar statistics are systematically less, by two orders of magnitude, than those obtained from evolutionary calculations.”¹⁰⁷

“We repeat, however, that the Maxwellian kick velocity distribution would be in strong disagreement with binary pulsar fractions even at low kick velocities.”¹⁰⁷

“The formation of massive stars is one of the major unsolved problems in stellar astrophysics. However, only few if any of these are found as single stars, on average massive stars have more than one companion.”¹⁰⁸

“Therefore, disk fragmentation cannot yield nearly equal mass spectroscopic binaries which are so prevalent among the observed massive binaries. Also, disk fragmentation produces only wide binaries, of order 10 - 100 AU, comparable to the radial disk extent.”¹⁰⁸

“The second problem with this model is the difficulty to first promote and then to avoid stellar mergers.”¹⁰⁸

“The third problem is that the formation of massive binaries seems to require an extreme fine tuning, especially in terms of the impact parameter.”¹⁰⁸

“The interplay between stellar dynamics and stellar evolution, as external and internal factors modifying the binary properties, is highly complex, and many details of these processes are not well understood”¹⁰⁹

“A comprehensive theory of binary star formation is still lacking, including explanations for the observed statistical properties of binary and multiple systems – such as multiplicity fractions, periods, eccentricities and mass ratios.”¹¹⁰

“The formation of close (1 AU), or even spectroscopic binaries (< 1 AU), which contribute a significant fraction to the observed binary populations, is less clear.”¹¹⁰

“The birth of massive stars remains one of the outstanding problems in star formation.”¹¹¹

“The origin of the initial mass function (IMF) has been extensively debated in the literature.”¹¹¹

“However, a quantitative prediction of the star formation rate and the initial distribution of stellar masses remains elusive.”¹¹²

“The process of star formation, particularly the origin of the stellar initial mass function (IMF), is a fundamental problem in astrophysics.”¹¹³

“The binary-star problem is thus potentially worse in less dense clusters, because binary systems survive for longer.”¹¹⁴

“There are currently two competing ideas as to how massive stars form.”¹¹⁶

“The formation of close binary stellar systems is an as yet unsolved problem in the field of star formation.”¹¹⁷

“The formation of high-mass stars is a large unknown in modern astronomy.”¹¹⁸

“Forming close binary stars systems, is difficult even amongst lower-mass stars.”¹¹⁸

“The comparison with observational data also illustrates two problems with the simulation results.”¹¹⁹

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“We can hope that various uncertainties in the model may be clarified by a careful comparison of the models with such observed quantities as rotation periods.”¹²⁰

“Not only do we have to guess more initial quantities, including spin periods and eccentricity as well, but we also have considerable uncertainty in the coefficients governing the tidal friction and dynamo models.”¹²⁰

“Most stars – especially young stars – are observed to be in multiple systems. Dynamical evolution is unable to pair stars efficiently, which leads to the conclusion that star-forming cores must usually fragment into ≥ 2 stars.”¹²¹

“It has been shown that it is not possible to reproduce the observed f_{mult} through the dynamical evolution of star clusters that are born with a single-star population. Dynamical interactions are able to disrupt many wide binaries, but are not able to pair stars efficiently or significantly change the properties of close binaries. This leads us to the conclusion that the majority of stars must form in multiple systems.”¹²¹

“The generally high f_{mult} for pre-main sequence late-type stars uncovers an elementary discrepancy between observation and star-formation theory if cloud cores produce $N > 3$ stars.”¹²¹

“These conclusions place strong constraints on theories of star formation. For any theory of star formation to match observations the majority of cores *must* fragment into multiple objects. However, they can usually only fragment into 2 or 3 stars. The currently available theoretical results appear to be inconsistent with this, as the cloud-core fragmentation calculations typically form $N = 5-10$ fragments per core.”¹²¹

“The observational result that poses the greatest challenge to theory is that both the inferred delay time between cloud formation and star formation and the ages of the young stars present can be considerably smaller than the lateral crossing time or dynamical time of the star formation region, suggesting that some kind of external ‘triggering’ must be involved.”¹²²

“The available cloud-collapse calculations have not been able to reproduce the wide range of observed periods and, in particular, do not lead to short-period ($P < 10^3$ days) systems.”¹²³

“Despite this importance, massive star formation is a poorly understood process. Observational studies are hampered by the distance to massive star-forming regions, and the high degree of obscuration in such regions. From a theoretical point of view, the very existence of massive stars presents a challenge.”¹²⁴

“Another important constraint casting doubt on the possibility of planet formation by GI even at 100 AU comes from comparing observed masses of extrasolar giant planets.”¹²⁵

“We have shown that disks capable of producing giant planets by GI at 1 AU cannot exist on dynamical grounds—to cool efficiently, they must be too hot to be bound to the central star. This rules out the possibility of an in situ formation of close-in extrasolar giant planets by GI.”¹²⁵

“The question of binary star formation is now regarded as the central unsolved issue in star formation, given the observational evidence that the majority of stars are in binary systems both during the main sequence (e. g. Duquennoy and Mayor 1991, Fischer and Marcy 1992, Abt 1983) and pre main sequence stages”¹²⁶

“Unfortunately, numerical simulations of the growth of the bar mode into the non linear regime have repeatedly shown that fission does not occur for compressible fluids such as stars.”¹²⁷

“In terms of forming close binaries, star-disk capture is unlikely to play a large role as the capture cross section is the disk size and thus would generally result in binaries of 100 AU.”¹²⁷

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“The remaining capture mechanism, tidal capture, also requires high stellar density which is unlikely to be a general occurrence.”¹²⁷

“However, the fragmentation hypothesis, and in particular the numerical calculations which support it, also have a number of problems.”¹²⁸

12. Numerous Unsolved Problems

The Iron Discrepancy In Elliptical Galaxies¹²⁹

A macroscopic discrepancy emerges between the expected iron abundances in the hot interstellar medium (ISM) and what is indicated by the X-ray observations, especially when allowance is made for the current iron enrichment by Type Ia supernovae. This strong discrepancy, that in some extreme instances may be as large as a factor of D20, calls into question our current understanding of supernova enrichment and chemical evolution of galaxies. Page 128

There is clearly a macroscopic discrepancy between the expected abundance, even with the lowest SN Ia enrichment, and what is consistently indicated by the X-ray observations of elliptical galaxies with four different X-ray telescopes: BBXRT and those on board Ginga, ROSAT, and ASCA. Instrumental problems, such as calibrations and the like, can therefore be firmly excluded as the origin of this iron discrepancy. Note also that the discrepancy is exacerbated by another factor of D2 if a short distance scale is adopted (h50\2). We believe that the solution of the discrepancy, whatever it is, will have profound implications for our understanding of galaxy formation and evolution. Page 129

The iron abundance of ISM should then be at least twice solar, and the discrepancy factor appears to range from 4 to 20. It may actually be even larger, considering that stellar abundances in Figure 2 are luminosity- rather than mass-weighted. Page 133

A comparison of the iron abundances as inferred from optical observations of the starlight and from X-ray observations of the hot ISM has then revealed a major discrepancy: even neglecting any ISM enrichment from SN Ia', the stellar iron abundances exceed those derived for the hot ISM by factors that range between 2 and 10. Page 134

We believe that the optical and the X-ray abundances cannot be easily reconciled, and therefore the existence of this macroscopic discrepancy opens three main options. Page 134

Here we mention yet another, admittedly exotic solution to the iron discrepancy. Page 138

Yet the iron abundance in the latter galaxies is as low as, or even lower than, that of cluster members. We conclude that dilution does not offer a viable solution either. Page 138

This strong discrepancy appears to shake our understanding of supernova enrichment and chemical evolution of galaxies. Page 141

Discrepancy In Globular Cluster Systems¹³⁰

One of the conundrums in extragalactic astronomy is the discrepancy in observed metallicity distribution functions (MDFs) between the two prime stellar components of early-type galaxies—globular clusters (GCs) and halo field stars. Page 150

The cause of the discrepancy between these two prime stellar components of galaxies has been the topic of much interest both on theoretical (e.g., Beasley et al. 2002, 2003; Pipino et al. 2007) and observational grounds (e.g.,

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Forbes & Forte 2001; Forte et al. 2005, 2007; Liu et al. 2011) because the disagreement signifies highly decoupled evolutionary paths between GC systems and their parent galaxies. Page 150

However, ever since *direct* photometry of spatially resolved constituent stars in a dozen nearby galaxies became possible thanks to the *HST* and large ground-based telescopes, the discrepancy between the MDFs of GCs and field stars has remained a conundrum. Page 167

However, whether the inferred GC MDFs represent the intrinsic, true ones are still unproven, and so it may be partly a coincidence. Page 167

Metallicity-Dependent Star Formation¹³¹

In contrast, the observed metallicity distributions of dwarf galaxies or stars within them are not bi-modal. We argue that this discrepancy points to substantial early stochastic pre-enrichment by Population III stars. Page 68

We interpret this apparent discrepancy between theoretical expectation and observations as indication that gas within regions where first Population II stars were formed was pre-enriched by Population III stars to metallicities as high as $\sim 10^{-2}$. Page 69

This discrepancy can have different explanations and we discuss some of them below. Page 72

The interpretation of this discrepancy is less certain, given that the sample of dwarf galaxies shown in the figure is not volume limited. Page 72

Blue Luminous Stars In Nearby Galaxies¹³²

A comparison with the predictions of current stellar evolutionary models indicates that there are significant discrepancies, in particular with regard to the degree of chemical processing, with the models predicting a much lower degree of O depletion than observed. At the same time, the mass-loss rate derived in our analysis is an order of magnitude lower than the values considered in the evolutionary calculations. Page 39

This discrepancy between theoretical predictions and $H\alpha$ and radio continuum derived mass-loss rates for mid-B types has been previously reported for Small Magellanic Cloud (Trundle & Lennon 2005) and Galactic (Crowther et al. 2006; Markova & Puls 2008; Benaglia et al. 2008) super giants. We refer the reader to Markova & Puls (2008), where this dilemma has been discussed at some length. In fact, in the case of UIT 005, the high theoretical mass-loss rate is also not consistent with the observed SED (see below). Page 48

This picture is supported by the predictions of recent evolutionary models, although we must point out that some discrepancies are still present, such as the degree of chemical processing predicted by the models. Page 49

The Sagittarius Dwarf Galaxy¹³³

The discrepancy between the abundance derived from the oxygen ORL and that derived from the collisionally excited line is >1 dex. Page 39

We found that the discrepancy between O^{2+} ORL and CEL abundances is >1 dex. The O^{2+} discrepancy has been found in many PNe including BoBn1 (see Section 4 of Otsuka et al. 2010). Page 45

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In this paper, we will not examine the O discrepancy problem further. To resolve the O abundance discrepancy, it is necessary to obtain high-dispersion spectra to increase the chance of OII detections and properly de-blend these OII lines with the others. Page 46

The large discrepancy between the observed [O ii] λ 3726/29 line fluxes and the model might be due to the flux calibration uncertainty around 3700 Å and the adopted monotonically decreasing R^2 density profile. Page 49

The large discrepancy between the 2MASS K_s and the models might be due to the contribution from the H_2 line. Page 49

Galaxies Of The Local Group¹³⁴

This is smaller, by about a factor of 2, than the well-known discrepancy between theory and observation at low metallicity commonly derived for Galactic globular clusters (GCs). This result is confirmed by a comparison between the adopted theoretical framework and empirical estimates of the ΔV_{bump} parameter for both a large database of Galactic GCs and for four other dwarf spheroidal galaxies for which this estimate is available in the literature. Page 707

In order to understand the causes of the discrepancy existing for Galactic GCs, a detailed analysis of the possible observational biases (uncertainties) is mandatory, but this is beyond the scope of the present work. Page 714

The comparison between the observations and the theoretical predictions reveals that the well-known discrepancy between the observed and predicted brightness of the RGB bump seen in Galactic GCs is smaller, by more than a factor of 2 in our dSph sample. This evidence is supported by the inclusion of four additional dSph galaxies, for which the ΔV_{bump} values are available in the literature. Page 715

Evidence For Mass-Dependent Evolution¹³⁵

The discrepancy at the high-mass end is susceptible to uncertainties in the models and the data, but the discrepancy at the low-mass end may be more difficult to explain. Page 1765

While the discrepancies at the low-mass end are still present, the discrepancies at the high-mass end are significantly reduced. Page 1784

Convolving the model-predicted SMFs does not instead help at all to solve the discrepancies below the characteristic stellar mass. Page 1785

As already pointed out in Somerville et al. (2008), potentially serious discrepancies, common to all of the CDM-based semi analytic models, are connected with low-mass galaxies. This is indeed what we find, although the presence of a significant population of very massive galaxies out to red shift $z \sim 3-4$ and the little observed evolution in its number densities from $z = 4.0$ to $z = 1.3$ highlight other potential problems within the theoretical models. Page 1785

The discrepancy at the high-mass end is susceptible to uncertainties in the models and the data, but the discrepancy at the low mass end may be more difficult to explain. Page 1787

included in the error budget (bottom panels of Figure 18). However, the discrepancy at the low-mass end is still present and significant. Page 1791

This “discrepancy” thus indicates that they appear to be C-enhanced beyond what is expected from canonical stellar evolution (i.e., the level of the mixed stars). This would mean that the stars must have been born from material that

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was overabundant in carbon. Page 571

Extremely Metal-Poor Stars¹³⁶

This agreement contrasts with the results of earlier studies of more metal-rich stars ($-2.5 < [\text{Fe}/\text{H}] < -1.0$) in more luminous dwarf spheroidal galaxies, which found significant abundance discrepancies with respect to the MW halo data. Page 560

Vhb Parameter In Globular Clusters¹³⁷

Evolutionary models that account either for α - and CNO-enhancement or for helium enhancement do not alleviate the discrepancy between theory and observations. The outcome is the same if we use the new solar heavy-element mixture. Page 527

This discrepancy does not depend on the adopted metallicity scale and becomes strongest in metal-poor ($[\text{M}/\text{H}] < -1.5$) GCs. Page 530

Such a discrepancy can hardly be explained as a spread in cluster age. Page 530

Given the limited changes between the current and previous predictions, the discrepancy between theory and observations in the metal-poor tail is confirmed and reinforced by the inclusion of new GCs in this metallicity regime. Page 531

The current discrepancy between theory and observations is little affected by the new solar heavy-element mixture provided by Asplund et al. (2005, hereinafter A05). Page 534

Evolutionary models that include either α - and CNO-enhancement or helium enhancement do not alleviate the discrepancy between theory and observations. Page 535

The above discrepancy between theory and observations is not affected by the new solar heavy-element mixture. Page 535

Heavy-Element Abundances¹³⁸

We discuss the apparent discrepancy between abundance ratios N/O measured in BCGs and those in high-red shift damped Ly α galaxies, which are up to 1 order of magnitude smaller. We argue that this large discrepancy may arise from the unknown physical conditions of the gas responsible for the metallic absorption lines in high-red shift damped Ly α systems. Page 539

The discrepancy between theory and observation is much more important for N. The N yield inferred from observations is 1 to more than 2 orders of magnitude larger than the theoretical yields of models with subsolar metallicities (Table 7). Page 652

Si, Ti, And O Isotopic Ratios¹³⁹

These discrepancies probably reflect errors in the supernova models used to calculate the GCE paths. Page 222

Apart from underestimating the fraction of dredged-up He-shell material, mixing of the normalized GCE models and He-shell material cannot explain several other features of the grain data. The steeper slope and non solar intercept of the mainstream Si isotope trend is the most obvious discrepancy. Page 228

Galactic Globular Cluster Stars¹⁴⁰

In light of this serious discrepancy, which casts doubt on the adequacy of low-mass He-burning stellar models, we have re derived the initial He abundance for stars in two large samples of GGCs by employing theoretical models computed using new and more accurate determinations of the equation of state for the stellar matter. Page 862

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This large discrepancy between the CMB and R parameter results casts doubt on the ability of stellar models to accurately predict the evolutionary times of these crucial phases of stellar evolution. Page 863

Color-Magnitude Diagram Age Discrepancy¹⁴¹

Using a new age indicator, Ha 130 which is particularly effective at breaking the degeneracy between age and metallicity, we confirm the discrepancy between the spectroscopic age and the CMD age of 47 Tuc, in that the spectroscopic age is much older. Page 274

This discrepancy shows clearly that current stellar population synthesis models used for interpreting the integrated light of stellar systems may have severe zero-point problems. Page 274

13. Many More Unsolved Mysteries

The formation of Blue Galaxies.

“These galaxies represent a highly evolving class that may play an important role in the decline of star formation since $z = 1$, but their exact nature and evolutionary pathways remain a mystery.”¹⁴²

“The explanation for the existence of an excess population of faint blue galaxies (FBGs) has been a mystery for nearly two decades and remains one of the grand astronomical issues to date. Existing models cannot explain all of the observational data, such as galaxy number counts in the optical and infrared pass bands and the red shift distributions of galaxies.”¹⁴³

Compact galaxy groups with discordant red shifts.

“We consider the twin paradoxes posed by compact groups that involve: (1) gravitational instability of physically dense accordant groups and (2) a plethora of discordant red shift components.”¹⁴⁴

The origin of dwarf galaxies

“Early-type dwarfs are the most common galaxy in the local universe, yet their origin and evolution remain a mystery.”¹⁴⁵

The faint sun problem.

“A moderately massive young Sun has been proposed to resolve the so-called faint young Sun paradox.”¹⁴⁶

Neutron Star Retention In Globular Clusters

“This retention problem is a long-standing mystery.”¹⁴⁷

What Existed Before The Big Bang?

This article has eight sections which are all admitted to be “unknown.”¹⁴⁷

What Existed Before The Big Bang?

“Although such theories, if they were to be proved true, may provide an explanation for what existed before the Big Bang, they do not solve an even more fundamental mystery: why is there something here at all, instead of nothingness?”

Why didn't the Universe Disappear as Soon as it Formed?

“The big bang theory suggests that when time began, matter and antimatter were generated in equal amounts. If that is true, the universe would have been transformed into pure energy—it should have perished in a profusion of radiation when matter and antimatter collided, but it exists.”

How Did Galaxy Formation Start?

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“What is unclear is why the gas that filled the universe gathered into galaxies.”

What Makes up The Universe?

“Dark energy is more complicated, because there are no reliable theories about its composition.”

How many dimensions are there?

“Experiments at the Large Hadron Collider have yet to yield results, so chances are we won't get an answer soon.”

Are the laws of nature accidental?

“Trying to explain the laws of nature is an almost impossible task, but there have been at least three attempts.”

What lies beyond the known universe?

“Further observations of this phenomenon, called dark flow, may yield new findings.”

Did Life Originate In Other Places?

“If life is a natural consequence of the laws of nature, it is strange that we have not found signs of it in other places. If there are intelligent creatures in the universe, why haven't we heard from them?”

An Emerald-Cut Diamond in the Rough

“An Australian-led international team of astronomers has discovered a rare, rectangular galaxy that challenges current theories of galaxy evolution. Known by its catalogue designation as LEDA 074886, but now nicknamed the "Emerald-cut Galaxy" for its odd, rectangular shape, "it's one of those things that just makes you smile because it shouldn't exist, or rather, you don't expect it to exist," says Alister Graham (Swinburne University of Technology), lead author of the study.”¹⁴⁸

Bang Goes The Theory

“PROBLEM: Once inflation starts it cannot stop Bits of the inflating universe themselves begin inflating off into independent existences. This creates an infinite "multiverse" of universes, making cosmological predictions impossible.”¹⁴⁹

Conclusion

I am sure there are lots more problems the Big Bang cannot explain. The creationist who accepts the Genesis creation account has no problem with the Universe being created just the way it is.

14. Galaxy Formation Problems

References

Introduction

1. <http://www.talkorigins.org/faqs/astromy/bigbang.htm>
2. http://www.astro.ucla.edu/~wright/cosmology_faq.html

The Big Bang Quote Book

1. The Missing Cosmic Lithium

3. Where Has All The Lithium Gone?, By Bruce Dorminey, Astronomy Magazine, February 2011, Pages 44-49.
4. Big Bang Nucleo Synthesis Problems, The Astrophysical Journal, June 20, 2008, Volume 680, Page 846.
5. Big bang Nucleo Synthesis Prediction for Lithium, Journal of Cosmology and Astro Particle Physics, Volume 11, 2008, Page 1.
6. Reference 5, Page 5.
7. Reference 5, Page 11.
8. The Key Problem Of The Primordial Lithium Abundance, The Astrophysical Journal, March 20, 2007, Volume 658, Page 1.
9. The Lithium Primordial Abundance, Journal of Cosmology and Astro Particle Physics, Issue 3, March 2011, Pages 1-25. <http://iopscience.iop.org/1475-7516/2011/03/022/>
10. Solving the Cosmic Lithium Problems, Journal of Cosmology and Astro Particle Physics, Issue 7, July 2006, Pages 1-16. <http://iopscience.iop.org/1475-7516/2006/07/007/>
11. Gordon L. Kane, The Dawn of Physics Beyond the Standard Model, Scientific American, June 2003, Page 60.
12. Primordial Helium Abundance, The Astrophysical Journal, Volume 617, 2004, Page 29.
13. Lithium Isotopic Abundances, The Astrophysical Journal, Volume 644, 2006, pages 229.
14. Reference 13, Page 254.
15. Predictions From Big Bang Nucleo Synthesis, The Astrophysical Journal, Volume 653, 2006, Page 301.

2. The Missing Dwarf Galaxies

16. Solving The Missing Satellite Problem, The Astrophysical Journal, Volume 670, pages 313, 2007, Joshua D. Simon And Marla Geha
17. Notes on the Missing Satellites Problem, By James. S. Bullock (UC Irvine), Page 1. http://arxiv.org/PS_cache/arxiv/pdf/1009/1009.4505v1.pdf
18. Dark Matter Substructure, By Andrey Kravtsov, Advances in Astronomy, Volume 2010, Article ID 281913, 21 pages 10, 11.
19. Reference 18, Page 1.
20. Dwarf Galaxies Of The Local Group, By Mario Mateo, Annual Review Astronomy Astrophysics. Volume 36, pages 35, 1998. http://arxiv.org/PS_cache/astro-ph/pdf/9810/9810070v1.pdf

The Big Bang Quote Book

21. Dark Matter Within Galactic Halos, By B. Moore, Astrophysical Journal Letters, 29 July 1999, Page 3.
22. Nearby Galaxies, By P. J. E. Peebles & Adi Nusser, Nature, Volume 465, 3 June 2010, Page 566.
23. Reference 22, Page 568.

3. The Missing Cuspy Halo Problem

24. http://en.wikipedia.org/wiki/Cuspy_halo_problem
25. The Core-Cusp Problem, By W. J. G. De Blok, 19 October 2009, Advances in Astrophysics, Page 2. http://arxiv.org/PS_cache/arxiv/pdf/0910/0910.3538v1.pdf
26. Reference 24, Page 9.
27. The Cuspy Halo Problem In Dwarf Galaxies, By F. J. Sanchez-Salcedo, The Astrophysical Journal, Volume 591, Pages L107, 2003 July 10.
28. Unitarity Bounds and the Cuspy Halo Problem, By Lam Hui, Physical Review Letters, Volume 86 (2001) pages 3467. http://arxiv.org/PS_cache/astro-ph/pdf/0102/0102349v3.pdf
29. Rotation Curves of Galaxies, By Stacy S. McGaugh, Astrophysical Journal, Volume 584 (2003) Pages 566-576. http://arxiv.org/PS_cache/astro-ph/pdf/0210/0210641v1.pdf
30. Well of Darkness, By August E. Evrard, Nature, Volume 394, 9 July 1998, Pages 122.
31. Galaxy Formation: Gone With The Wind? By Marla Geha, Nature, Volume 463, 14 January 2010, Page 167.
32. Intermediate Radii in Disk Galaxies, Astrophysical Journal, Volume 659, Pages 149-161, 2007. http://arxiv.org/PS_cache/astro-ph/pdf/0612/0612410v1.pdf
33. Bulgeless Dwarf Galaxies, Nature, By F. Governato, Volume 463, 14 January, 2010, Page 203-206.
34. McGaugh, S.S., & de Blok, W.J.G. 1998, Astrophysical Journal, Volume 499, Page 41. <http://iopscience.iop.org/0004-637X/499/1/41/pdf/36926.pdf>

4. The Friction Time Scale Problem

35. Goerdt, T., Moore, B., Read, J. I., Stadel, J., & Zemp, M. 2006, Monthly Notices of the Royal Astronomical Society, Volume 368, Page 1073. <http://adsabs.harvard.edu/abs/2006MNRAS.368.1073G>
36. Sanchez-Salcedo, F.J., Reyes-Iturbide, J., & Hernandez, X. 2006 Monthly Notices of the Royal Astronomical Society, Volume 370, Page 1829. <http://adsabs.harvard.edu/abs/2006MNRAS.370.1829S>
37. **Reference 36, Page 1839.**
38. Oh K. S., Lin D. N. C., 2000, Nucleation Of Dwarf Galaxies, Astrophysical Journal, Volume 543, Page 620. http://iopscience.iop.org/0004-637X/543/2/620/pdf/0004-637X_543_2_620.pdf

The Big Bang Quote Book

39. Oh K. S., Lin D. N. C., Richer H. B., 2000, Globular Clusters In The Fornax Galaxy, Astrophysical Journal, Volume 531, Page 727
http://iopscience.iop.org/0004-637X/531/2/727/pdf/0004-637X_531_2_727.pdf

40. Reference 39, page 736.

5. The Missing Cold Dark Matter

41. Electron Density in Filaments of Galaxies, Monthly Notices Royal Astronomy Society, 8 April 2011, Page 4, By Amelia Fraser-McKelvie. http://arxiv.org/PS_cache/arxiv/pdf/1104/1104.0711v2.pdf

42. On The Energy Spectra Of Cosmic Ray Leptons, By Lukasz Stawarz, The Astrophysical Journal, Volume 710, Pages 236, 2010 February 10.

43. Reference 42, Page 246.

44. The Baryon Content Of Cosmic Structures, By Stacy S. Mc Gaugh, The Astrophysical Journal, Volume 708, Pages L14–L17, 2010 January 1,

45. The Hunting Of The Dark, By Adam Mann, Nature, 24 March 2011, Volume 471, Page 433.

46. The Role Of Black Holes, By A. Cattaneo, Nature, Volume 460, 9 July 2009, Page 213-219.

47. Sellwood, J. A., & Kosowsky, A. 2001, ASP Conf. Ser. 240: Gas and Galaxy Evolution, Volume 240, Pages 312-314. <http://adsabs.harvard.edu/abs/2001ASPC..240..311S>

6. The Missing Inflation

48. The Inflation Debate, By Paul J. Steinhardt, Scientific American, April 2011, Page 20.

49. Power Asymmetry from Inflation, By Adrienne L. Erickcek, Physical Review D, Volume 78, 123520, 2008, Page 1.

50. Reference 49, Page 4.

51. Hemispherical Power Asymmetry, By Bartosz Lew, Journal of Cosmology and Astroparticle Physics, Issue 9, page 22, (2008)

52. Hemispherical Power Asymmetry, By H. K. Eriksen, Astrophysical Journal, Volume 660, Pages L81-L84, 2007

53. Largest Scale CMB Fluctuations, de Oliveira-Costa, A., Tegmark, M., Zaldarriaga, M., & Hamilton, A. 2004, Physical Review D, Volume 69, 063516, Page 9.

54. Microwave Background Anisotropy Field, By H. K. Eriksen, 2004, Astrophysical Journal, Volume 605, Page 14.
http://iopscience.iop.org/0004-637X/605/1/14/pdf/0004-637X_605_1_14.pdf

The Big Bang Quote Book

55. Detection of a non-Gaussian Spot, By M. Cruz, 2005, Monthly Notices of the Royal Astronomical Society, Volume 356, Page 29.
56. Detection Of Non-Gaussianity, By P. Vielva, 2004, Astrophysical Journal, Volume 609, Page 39.
http://iopscience.iop.org/0004-637X/609/1/22/pdf/0004-637X_609_1_22.pdf
57. Testing The Cosmological Principle, By F. K. Hansen, 2004, Monthly Notices of the Royal Astronomical Society, Volume 354, Page 663.
58. <http://www.foxnews.com/story/0,2933,479911,00.html>
59. <http://www.icr.org/article/inflation-hypothesis-doesnt-measure-up-new-data/>

7. The Missing Hydrogen

60. Half The Universe Is Missing, New Scientist, April 26, 2011, Pages 32.
61. Reference 60, Page 35.
62. The Lost Galaxies, By James E. Geach, Scientific American, May 2011, Pages 34.
63. Reference 62, Page 35.
64. The Search for the Missing Baryons at Low Redshift. Joel N. Bregman, Annual Review of Astronomy and Astrophysics. Volume 45, Number 1, pages 2: September 2007.
Preprint available at www.arxiv.org/abs/0706.1787
65. Reference 64, Page 29.
66. The Chandra Deep Proto Cluster Survey, James E. Geach, Astrophysical Journal, Volume 700, Number 1, pages 1-9; July 2009. www.arxiv.org/abs/0904.0452
67. The Intergalactic Medium over the Last 10 Billion Years, Romeel Dave, Monthly Notices of the Royal Astronomical Society, Volume 408, Number 4, page 2051, November 2010.
68. Reference 67, Page 2057, 2058.
69. Reference 67, Page 2067.
70. Matter Gone Missing, by Andrew Grant, Discover Magazine, June 2010.
<http://discovermagazine.com/2010/jun/22-first-matter-dark-now-visible-invisible-too>

8. The Missing Dark Energy

71. The Cosmological Constant and Dark Energy, By P. J. E. Peebles, 2002, Reviews Of Modern Physics, Volume 75, Page 2, 2003.

The Big Bang Quote Book

72. The Wiggle Z Dark Energy Survey, By Chris Blake, Monthly Notices Royal Astronomical Society, 15 April 2011, Page 2. http://arxiv.org/PS_cache/arxiv/pdf/1104/1104.2948v1.pdf

73. Reference 72, Page 8.

9. The Missing Galactic Bulges

74. Battle Of The Bulges, Vanessa Thomas and Richard Webb, New Scientist, 11 June, 2011, Page 34.

75. Reference 74, Page 35.

76. Bulgeless Giant Galaxies, John Kormendy, The Astrophysical Journal, 2010, Volume 723, Page 54.

10. Massive Star Formation

77. <http://adsabs.harvard.edu/abs/2003IAUS..212...80Z>

78. The Astronomical Journal, 2005, Volume 129, Pages 2281–2293

79. MNRAS, 2004, Volume 349, Pages 735

80. MNRAS, 2004, Volume 349, Issue 2, pages 678–686

81. <http://arxiv.org/pdf/1211.0847.pdf>

82. <http://arxiv.org/abs/1210.5537.pdf>

83. <http://arxiv.org/pdf/1210.3366.pdf>

84. <http://arxiv.org/pdf/1210.2285.pdf>

85. <http://arxiv.org/pdf/1210.2063.pdf>

86. <http://arxiv.org/pdf/1209.1786.pdf>

87. <http://arxiv.org/pdf/1208.0599.pdf>

88. <http://arxiv.org/pdf/1102.1977.pdf>

89. <http://arxiv.org/pdf/1102.1147.pdf>

90. <http://arxiv.org/pdf/0712.0828.pdf>

91. <http://arxiv.org/pdf/astro-ph/0607429.pdf>

92. <http://arxiv.org/abs/astro-ph/0603026.pdf>

93. <http://arxiv.org/pdf/astro-ph/0511766.pdf>

The Big Bang Quote Book

11. Binary Star Formation Problems

- 94 Astronomy & Astrophysics, 2006, Volume 450, Pages 681–693
- 95 The Astronomical Journal, 2006, Volume 131, Pages 2986–3007
- 96 MNRAS, 2008, Volume 389, Pages 925-938
- 97 MNRAS, 2000, Volume 314, Pages 33-53
- 98 MNRAS, 2006, Volume 000, Pages 1–13
- 99 MNRAS, 1998, Volume 300, Pages 1214–1224
- 100 MNRAS, October 11, 1995
- 101 MNRAS, 2010, Volume 407, Pages 1245-1254
- 102 MNRAS, 2011, Volume 413, Pages 461–479
- 103 Astrophysical Journal, 1995, Volume 440, Pages 270-279
- 104 Astrophysical Journal, 1993, Volume 411, Page L33
- 105 Astrophysical Journal, 1994, Volume 422, Page 729
- 106 <http://arxiv.org/pdf/astro-ph/9509144.pdf>
- 107 MNRAS, 1997, Volume 288, Pages 245-259
- 108 <http://adsabs.harvard.edu/abs/2003IAUS..212...80Z>
- 109 The Astrophysical Journal, 2003, Volume 591, Pages L131–L134
- 110 Astronomy And Astrophysics, 2003, Volume 411, Pages 91–97
- 111 The Astronomical Journal, 2005, Volume 129, Pages 2281–2293
- 112 Review Of Modern Physics, 2004, Volume 76, Pages 125
- 113 Astrophysical Journal, 2002, Volume 576, Pages 870
- 114 MNRAS, 2001, Volume 322, Pages 244
- 115 Science, 2002, Volume 295, Pages 82
- 116 MNRAS, 2004, Volume 349, Pages 735
- 117 The Astrophysical Journal, 1998, Volume 508, Pages L95–L98
- 118 MNRAS, Volume 362, 2005, Pages 915-920
- 119 MNRAS, 2004, Volume 351, Issue 2, pages 617–629

The Big Bang Quote Book

- 120 Astrophysics and Space Science, 2005, Volume 296, Pages 327–336
- 121 Astronomy And Astrophysics, 2005, Volume 439, Pages 565, 567, 569
- 122 The Astrophysical Journal, 2001, Volume 562, Pages 854
- 123 The Astrophysical Journal, 2001, Volume 555, Pages 945
- 124 MNRAS, 2004, Volume 349, Issue 2, pages 678–686
- 125 The Astrophysical Journal, 2005, Volume 621, Pages L71
- 126 Astrophysics And Space Science, 1995, Volume 233, Pages 73-90
- 127 IAU Symposium, 2001, Volume 200
- 128 IAU Symposium, 2001, Volume 200

12. Numerous Unsolved Problems

- 129 The Astrophysical Journal, 1997, Volume 477, Pages 128-143
- 130 The Astrophysical Journal, 2011, Volume 743, Pages 150
- 131 The Astrophysical Journal, 2012, Volume 745, Pages 68
- 132 The Astrophysical Journal, 2011, Volume 735, Pages 39
- 133 The Astrophysical Journal, 2011, Volume 729, Pages 39
- 134 The Astrophysical Journal, 2010, Volume 718, Pages 707–716
- 135 The Astrophysical Journal, 2009, Volume 701, Pages 1765–1796
- 136 The Astrophysical Journal, 2010, Volume 708, Pages 560–583
- 137 The Astrophysical Journal, 2010, Volume 712, Pages 527–535
- 138 The Astrophysical Journal, 1999, Volume 511, Pages 639-659
- 139 The Astrophysical Journal, 1999, Volume 519, Pages 222-235
- 140 The Astrophysical Journal, 2003, Volume 588, Pages 862–870
- 141 The Astrophysical Journal, 2001, Volume 549, Pages 274-280

13. Many More Unsolved Mysteries

- 142 The Astrophysical Journal, 2010, Volume 708, Page 1076

The Big Bang Quote Book

- 143 The Astrophysical Journal, 1999, Volume 511, Pages 574
- 144 The Astrophysical Journal, 1997, Volume 482, Page 640
- 145 The Astrophysical Journal, Volume 559, Pages 791-811, October 2001.
- 146 The Astrophysical Journal, Volume 660, Pages 1700-1706, May 2007
- 147 The Astrophysical Journal, Volume 573, Pages 283, July 2002.
http://arxiv.org/PS_cache/astro-ph/pdf/0106/0106141v1.pdf
- 148 Science Illustrated, August 2012, Pages 7-13, What Existed Before The Big Bang?
- 149 An Emerald-Cut Diamond in the Rough, Australian Sky And Telescope, July, 2012, Page 13
- 150 Bang Goes The Theory, New Scientist, 30 June 2012, Pages 32-37
- 151 <http://arxiv.org/pdf/1211.1815.pdf>
- 152 <http://arxiv.org/pdf/1111.4492.pdf>
- 153 <http://arxiv.org/pdf/1104.2836.pdf>
- 154 <http://arxiv.org/pdf/1012.5658.pdf>
- 155 <http://arxiv.org/pdf/0912.3017.pdf>
- 156 <http://arxiv.org/pdf/0906.0458.pdf>
- 157 <http://arxiv.org/ftp/arxiv/papers/0902/0902.2576.pdf>
- 158 <http://arxiv.org/pdf/0811.2402.pdf>
- 159 <http://arxiv.org/pdf/0807.1114.pdf>
- 160 <http://arxiv.org/pdf/0801.2965.pdf>
- 161 <http://arxiv.org/pdf/0712.0828.pdf>
- 162 <http://arxiv.org/pdf/0709.2285.pdf>
- 163 <http://arxiv.org/pdf/0708.3890.pdf>
- 164 <http://arxiv.org/pdf/0708.0417.pdf>
- 165 <http://arxiv.org/pdf/0707.1209.pdf>
- 166 <http://arxiv.org/pdf/astro-ph/0409737.pdf>

The Big Bang Quote Book

14. The Origin Of Galaxies

- 167 <http://arxiv.org/pdf/1211.1997.pdf>
- 168 <http://arxiv.org/pdf/1207.0068.pdf>
- 169 <http://arxiv.org/pdf/1203.2616.pdf>
- 170 <http://arxiv.org/pdf/1111.1776.pdf>
- 171 <http://arxiv.org/pdf/1110.4638.pdf>
- 172 <http://arxiv.org/pdf/0806.4189.pdf>
- 173 <http://arxiv.org/pdf/astro-ph/0605212.pdf>
- 174 <http://arxiv.org/pdf/astro-ph/0511680.pdf>
- 175 <http://arxiv.org/pdf/astro-ph/0512384.pdf>
- 176 <http://arxiv.org/pdf/astro-ph/0509177.pdf>
- 177 <http://arxiv.org/pdf/astro-ph/0508666.pdf>
- 178 <http://arxiv.org/ftp/astro-ph/papers/0401/0401366.pdf>

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