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Research Article

A Biophysical Model of Growing Black Hole Universe Endowed with Light Speed Expansion and Power Law Super Gravity of Galactic Baryonic Matter Greater than 200 Million Solar Masses

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ABSTRACT

This brief note points to some inadequacies in standard Lambda cosmology and suggests the need for developing a biophysical model of quantum cosmology having certain characteristic features of growing black holes that follow quantum mechanics as well as general theory of relativity. Considering light speed expansion' of a Planck scale black hole and scaling the famous Hawking's black hole temperature formula-issues like big bang, temperature, redshift, flatness, acceleration and dark energy can be reviewed at fundamental level. We propose that, observations attributed to dark matter can be understood as a representation of power law 'super gravity' associated with increasing galactic baryonic mass greater than 4 × 1038 kg. With further study-Flatness, acceleration and dark energy issues can be relinquished with light speed expansion; and Dark matter issue can be relinquished with super gravity of large baryonic mass content. Thus, a unified model of 'Quantum Cosmology' can be developed with light speed expanding universe formed with massive baryonic galaxies having super gravitational behaviour.

Keywords: Quantum cosmology; Quantum mechanics; Lambda cosmology

Abbreviations: QC: Quantum Cosmology; GTR: General Theory of Relativity; QM: Quantum Mechanics; LC: Lambda Cosmology; BAO: Baryon Acoustic Oscillations; GR: General Relativity

INTRODUCTION

Current model of standard cosmology is completely based on General theory of relativity and observations associated with galactic red shifts, distances, flat rotation speeds, gravitational lensing effects and cosmic back ground radiation temperature [1]. Final unification point of view, it seems essential to work on developing a model of Quantum Cosmology (QC) that combines General Theory of Relativity (GTR) and Quantum Mechanics (QM). In this context, by considering 'light speed expansion' and 'Planck scale' as the unified features of GTR and QM, in our recent publications, we have developed a very simple model of QC associated with growing cosmic black hole [2-4].

We would like to emphasize the point that, based on Hawking's black hole temperature formula, geometric mean of Planck mass and the so called Hubble mass, $\left(\frac{c^3}{2GH_t}\right)$ seems to play a crucial role in estimating the observed cosmic microwave back ground temperature [5]. It can be expressed as, $T_0 \cong \frac{\hbar c^3}{8\pi k_B G\sqrt{M_0 M_{pl}}}$ where $M_0 \cong \frac{c^3}{2GH_0}$ and $M_{pl} \cong \sqrt{\frac{\hbar c}{G}}$. If one is willing to proceed further, there is a scope for understanding the observed universe in a biophysical picture of 'growing black hole' compared to currently believed model of 'Lambda Cosmology' (LC). To proceed further, in the following sections (2), (3), (4) and (5) we have highlighted the basic issues of LC and suggested the best possible alternative physical concepts [5].

MATERIALS AND METHODS

Inadequacy of lambda cosmology

Most intriguing concept of LC is 'cosmic evolution'. Clearly speaking is, universe is having a beginning and its size and time are increasing. Earlier mater was in the form of radiation and observed matter is being created in the form of growing

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stars and galaxies with increasing number of elementary atoms and their next level atoms. Another interesting feature is that, universe is expanding with increasing speed (accelerating). These observations were developed on the concept of galactic red shift associated with the observed and laboratory wavelengths of photon, being defined as $z \cong \frac{\lambda_{Observed} - \lambda_{Lab}}{\lambda_{Lab}} \cong \frac{\lambda_{Observed}}{\lambda_{Lab}} - 1$.

Most complicated feature of LC is current cosmic acceleration [6]. By studying the galactic red shifts and galactic distances, cosmologists are trying to establish the notion of 'accelerating universe'. But in reality, it is practically impossible to investigate and measure the real expansion speeds of galaxies. Another bitter truth is that, as the observed universe is very large, it is absolutely beyond the scope of human beings to measure the expansion speed of cosmic boundary. Even though, cosmologists are strongly believing in cosmic acceleration and seriously working on chasing its mystery with 'dark energy' and 'Lambda term' like strange physical entities.

Most controversial feature of LC is galactic dark matter. To understand the observed excess rotation speeds of galactic orbiting stars and to understand the observed galactic gravitational lensing effects, scientists are seriously believing in the existence of 'dark matter' as an exotic form of matter not found in the standard particle model [7].

Unfortunately, dark energy and dark matter, both seem to be 'unphysical' in nature and raising doubts on the 'scope', 'applicability' and 'correctness' of the basic assumptions of LC and GTR. Unless dark matter and dark energy are identified, LC cannot be considered [4,8-13] as a complete model of cosmology.

Most misleading part of lambda cosmology

It may be noted that, by the time of defining the definition of galactic red shift, maximum red shift value was around 0.003. We would like to emphasize the point that, definition of galactic red shift is ambiguous [14,15]. It can also be defined as, $z_{new} \cong \frac{\lambda_{Observed} - \lambda_{Lab}}{\lambda_{Observed}} \cong 1 - \frac{\lambda_{Lab}}{\lambda_{Observed}}$. See our references [2,15]. With reference to current definition, z value lies between 0 and infinity. By following our new definition, z value lies between 0 and 1. It may be noted that, with our given definition, it is very easy to implement 'light speed expansion' in cosmic evolution scheme. By considering light speed expansion concept, dark energy and lambda term concepts can be relinquished.

Thought of in this way, as there is no evidence for dark energy, the current definition of galactic red shift can be considered as the most misleading part of LC. Figure 1 compares galactic light travel distances according to our new definition, $(z_{new})\left(\frac{c}{H_0}\right)$ (Red curve) and the conventional formula connected with dark energy density and other density fractions (Green curve).

Super gravity of baryonic matter

Considering the case of supposition of dark matter through gravitational interaction, inferring the negative results of dark matter experiments and following the on-going debate concerning the existence of exotic form of dark matter, we are proposing the existence of a power law based super gravitational behaviour of baryonic matter as a possible explanation for the observed galactic rotation curve anomalies. We would like to emphasize the point that, in reality there exists no dark matter and equivalent mass of galactic dark matter can be defined as [16], $(M_{dark})_G \cong (M_{baryon})_G^{3/2} \Big/ \left(4\times10^{38}\right)^{1/2}$ kg where 4×10^{38} kg (200 million solar masses) can be considered as the 'current reference mass unit'. Based on this idea, galactic masses less than kg will have decreasing trend of super gravity and galactic masses greater than 4×10^{38} kg will have an increasing trend of super gravity and it is proportional to $(M_{baryon})_G^{3/2}$. Total mass of galaxy can be expressed as, $M_G \cong (M_{baryon})_G + (M_{dark})_G$. Following this relation, galactic flat rotation speeds can be understood with a relation of the form, $v_G \cong \frac{1}{4}\left[\frac{M_G}{M_0}\right]^{1/4} \cong \frac{1}{4}\left[\frac{\left[(M_{baryon})_G + (M_{dark})_G\right]}{M_U}\right]^{1/4}$ where $M_0 \cong \frac{c^3}{2GH_0} \cong$ Current Hubble mass. Flat rotation speeds from 10 km/sec to 500 km/sec can be understood in this way. Our proposal is in line with newly discovered dark matter deficient galaxies [17] and large massive galaxies having high flat rotation speeds [18]. Another interesting feature is that, Sun's estimated equivalent dark mass is around 1.5×10^{26} kg and its effect seems to be negligible. It needs observational and experimental confirmation. To some extent, considering the estimated virial mass of sun and based on the theory of light bending, our proposal can be confirmed. Nucleons estimated equivalent dark mass is around 10^{-60} kg and it needs experimental verification.

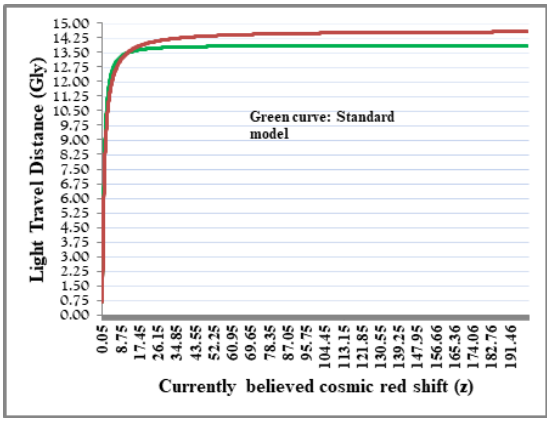

Figure 1: Comparison of standard and estimated light travel distances.

Standard ruler associated with baryon acoustic oscillations

As per the cosmic Baryon Acoustic Oscillations (BAO), current acoustic bubble radius is around 150 Gpc [19,20]. This characteristic length can be fitted with a simple relation of the form, $\sqrt{\frac{T_0}{T_{\text{Recomb}}}}\left(\frac{c}{H_0}\right) \cong \frac{c}{H_{\text{Recomb}}^{1/4} H_0^{3/4}} \cong \left(\frac{2GM_{\text{Recomb}}^{1/4} M_0^{3/4}}{c^2}\right) \cong 150$ Mpc where , and represent recombination epoch temperature, Hubble parameter and mass respectively. Hawking's black hole temperature formula pertaining to recombination epoch can be expressed as, $T_{\text{Recomb}} \cong \frac{\hbar c^3}{8\pi k_B G\sqrt{M_{\text{Recomb}} M_{pl}}} \cong \frac{\hbar\sqrt{H_{\text{Recomb}} H_{pl}}}{4\pi k_B G}$. Clearly speaking, 'light speed' being a characteristic feature of cosmic expansion and being a characteristic feature of cosmic recombination, baryon acoustic bubble radius seems to be inversely proportional to $H_0^{3/4}$. It needs further study.

On cosmic rotation and cosmic centre

Considering the evolving universe as a growing black hole or simply a white hole [2], it seems natural to expect cosmic rotation [21]. We would like to emphasize the point that,

Spin is a basic property of QM and one who is interested in developing quantum models of cosmology, must think about cosmic rotation. It may be noted that, without a radial in-flow of matter in all directions towards one specific point, one cannot expect a big crunch and without a big crunch, one cannot expect a big bang. Really if there was a "big bang" in the past, with reference to formation of big bang as predicted by GTR and with reference to the cosmic rate of expansion that might have taken place simultaneously in all directions at a "naturally selected rate" about the point of big bang: "Point" of big bang can be considered as the characteristic reference point of cosmic expansion in all directions. Thinking in this way, to some extent, point of big bang can be considered as a possible centre of cosmic evolution. If so, thinking about the universe without a center of rotation is illogical. Based on this logic, we appeal the science community to see the possibility of thinking about angular velocity, cosmic rotation and rotational axis [22,23].

As per the recent 2020 publication, according to Vladimir, et al. [24] "In observational cosmology, the main difficulty for detecting a global rotation is its smallness-less than 10^{-13} rad/year according to the generally accepted assessment. It is impossible in the Universe to distinguish the direction corresponding to the axis of rotation, with respect to which one could notice deviations (in the standard tests) from the Friedman standard cosmology. In theoretical cosmology, the main difficulties are related, on the one hand, to the lack of simple models of an expanding and rotating universe in General Relativity (GR) similar to Friedman-Robertson-Walker models. On the other hand, there are no convincing predictive effects of cosmic rotation that are consistent with the capabilities of the equipment of modern astronomical observatories".

Biophysical behaviour of the black hole universe

Over the past 6 years, gravitational wave observatories have been detecting black hole mergers and very complicated observation is that, many of the black holes are very large in size. To understand this issue, it has been proposed that, black holes grow along with the expansion of the universe. This idea is very interesting and most fascinating and can be considered as one of the 'stunning ideas' of modern cosmological and astrophysical observations [25]. Proceeding further, science community tries to infer this idea as, 'realistic black holes don't exist in a static universe'. This idea is almost in line with our idea pertaining black holes and black hole universe published in 2010 [26]. We are very much thankful to the reviewer and editorial board of 'Progress in Physics' for encouraging us.

In our daily life, generally it is observed that any animal or fruit or human beings (from birth to death) grows with closed boundaries (irregular shapes also can have a closed boundary). An apple grows like an apple. An elephant grows like an elephant. A plant grows like a plant. A human grows like a human. Throughout their life time they won't change their respective identities. These are observed facts. From these observed facts it can be suggested that "growth" or "expansion" can be possible with a closed boundary. By any reason if the closed boundary is opened-it leads to "destruction" rather than "growth or expansion". Thinking that nature loves symmetry, in a heuristic approach in our earlier published paper [26] we proposed that "throughout its life time universe is a black hole". Even though it is growing, at any time it is having an event horizon with a closed boundary and thus it retains her identity as a black hole forever. Note that universe is an independent body. It may have its own set of laws. At any stage, if universe maintains a closed boundary, to have its size minimum for that time, it must follow "Schwarzschild radius" at that time. If universe is having no black hole structure, no massive body (which is bound to the universe) can have a black hole structure. Clearly speaking, 'black hole' structure may be a subset of cosmic structure.

RESULTS AND DISCUSSION

We would like to emphasize the fact that, the basic principles of cosmology were developed when the subject of cosmology was in its budding stage. Friedmann made two simple assumptions about the universe [27]. They can be stated in the following ways.

- When viewed at large enough scales, universe appears the same in every direction.
- When viewed at large enough scales, universe appears the same from every location.

In this context, Hawking, et al. [28] expressed that: "There is no scientific evidence for the Friedmann's second assumption. We believe it only on the grounds of modesty: It would be the most remarkable if the universe looked the same in every direction around us, but not around other points in the universe". Proceeding further, current galactic observations and advanced technology raise many doubts on the validity of Friedmann's first assumption [22,23]. It may be noted that,

- There is no clear cut mechanism for understanding big bang.
- Whether big bang followed known physical laws or not-is unclear and unknown.
- Mass and size of universe pertaining to pre and post big bang are unclear.
- Applying Planck scale physics to big bang notion seems to be ambiguous.
- As there exist no clear reasons for understanding the occurrence of exponential expansion, cosmologists are having different opinions on cosmic inflation.
- So far, it has not yet been possible to establish solid connection between Planck scale and current physical parameters of the observable universe.

As of now, theoretically and observationally, with respect to inflation, isotropy, expansion rate, dark matter, dark energy, flatness and rotation, whole subject of cosmology is being driven into many controversies and dividing cosmologists into various groups with difference of opinions. On the other hand, very unfortunate thing is that, quantum cosmology point of view, "as a whole", progress is very poor [29,30]. Instead of discussing the controversies, we would like to propose a new model which can pave a new way for understanding and correlating all astrophysical and cosmological observations in terms of quantum mechanics, general theory of relativity and biophysical objects having growth within closed boundaries. It needs further study with the above proposed new concepts.

CONCLUSION

We would like emphasize that:

1) It is a must to review and revise the current model of Lambda cosmology in view of QC.

2) Hawking's black hole temperature formula associated with the geometric mean mass of current Hubble mass and Planck mass seems to play a key role in developing a perfect QC model.

3) To estimate the current value of Hubble parameter, there is no need to depend on galactic distances and galactic red shifts.

4) As the ending state of universe is unclear, light speed expanding universe can be considered as a representation of 'flat universe'.

5) If universe is a growing black hole, there exists no scope for causal disconnection of galaxies.

6) Even though universe is very large, if it is expanding at speed of light, with future engineering techniques, decreasing trend of cosmic temperature can be understood.

7) Our approach associated with non-existence of dark matter is very simple to understand and more closer to Machian models of cosmology compared to other non-dark matter models and till the confirmation of dark matter, 'super gravity' feature of baryonic matter can be given a chance in understanding galactic flat rotation speeds.

8) To develop a quantum model of cosmology it seems essential to consider cosmic rotation.

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REFERENCES

1. Lopez-Corredoira M. Tests and problems of the standard model in cosmology. Found Phys. 2017;47(6):711-768.
2. Seshavatharam UVS, Tatum ET, Lakshminarayana S. The large scale universe as a quasi-quantum white hole. Int Astron Astrophys Res J. 2021;3(1):22-42.
3. Tatum ET, Seshavatharam UVS, Lakshminarayana S. The basics of flat space cosmology. Int J Astron Astrophys. 2015;5(2):116-124.
4. Tatum ET, Seshavatharam UVS. Flat space cosmology: A new model of the universe incorporating astronomical observations of black holes, dark energy and dark matter. Universal Publishers, USA. 2021.
5. Perlmutter S et al. Measurements of Ω and Λ from 42 high-redshift supernovae. Astrophys J. 1999;517(2):565.
6. Collaboration P, Ade PA, Aghanim N, Armitage-Caplan C, Arnaud M. Planck 2015 results. XIII. Cosmological parameters. 2015.
7. Clowe D, et al. A direct empirical proof of the existence of dark matter. Astrophys J Lett. 2006;648(2):L109-L113.
8. Nielsen JT, Guffanti A, Sarkar S. Marginal evidence for cosmic acceleration from type Ia supernovae. Sci Rep. 2016;6(1):1-8.
9. Dam LH, Heinesen A, Wiltshire DL. Apparent cosmic acceleration from type Ia supernovae. Mon Notices Royal Astron Soc. 2017;472(1):835-851.
10. Wang D, Meng XH. No evidence for dynamical dark energy in two models. Phys Rev D. 2017;96(10):103516.
11. Milgrom MA. Modification of the Newtonian dynamics as a possible alternative to the hidden mass hypothesis. Astrophys J. 1983;270:365-370.
12. Brownstein JR, Moffat JW. Galaxy rotation curves without non-baryonic dark matter. Astrophys J. 2006;636(2):721-741.
13. Chae KH, Lelli F, Desmond H, McGaugh SS, Li P, Schombert JM. Testing the strong equivalence principle: Detection of the external field effect in rotationally supported galaxies. Astrophys J. 2020;904(1):20.
14. Hubble EP. A relation between distance and radial velocity among extra-galactic nebulae. Proc Natl Acad Sci U S A. 1929;15(3):168-173.
15. Seshavatharam UVS, Lakshminarayana S. Light speed expanding white hole universe having a red shift of [z/(1+z)]. World Sci News. 2021;162:87-101.
16. Seshavatharam UVS, Lakshminarayana S. On the role of cosmic mass in understanding the relationships among galactic dark matter, visible matter and flat rotation speeds. NRIAG J Astron Geophys. 2021;10(1):1-15.
17. Shen Z et al. A tip of the red giant branch distance of 22.1 ± 1.2 Mpc to the dark matter deficient galaxy NGC 1052-DF2 from 40 orbits of hubble space telescope imaging. Astrophys J Lett. 2021;914(1):L12.
18. Ogle PM, Farr J, Lemos P, Font-Ribera A. A break in spiral galaxy scaling relations at the upper limit of galaxy mass. Astrophys J Lett. 2019;884(1):L11.
19. Andrei Cuceu et al. Baryon acoustic oscillations and the hubble constant: Past, present and future. J Cosmol Astropart Phys. 2019;2019(10):044.
20. Bernal JL, Smith TL, Boddy KK, Kamionkowski M. Robustness of baryon acoustic oscillation constraints for early-universe modifications to ΛCDM. Phys Rev D. 2020;102:123515.
21. Chechin LM. Does the cosmological principle exist in the rotating universe?. Gravit Cosmol. 2017;23(4):305-310.
22. Lior Shamir. Large-scale asymmetry of galaxy spin directions- A comparison of 12 datasets. Bull AAS. 2021;53(6):230-238.
23. Lior Shamir. New evidence and analysis of cosmological-scale asymmetry in galaxy spin directions. J Astrophys Astr. 2022;arXiv:2201.03757v1.
24. Korotky VA, Masár E, Obukhov YN. In the quest for cosmic rotation. Universe. 2020;6(1):14.
25. Croker KS, Zevin M, Farrah D, Nishimura KA, Tarlé G. Cosmologically coupled compact objects: A Single-parameter model for LIGO–virgo mass and redshift distributions. Astrophys J Lett. 2021;921(2):L22.
26. Seshavatharam UVS. Physics of rotating and expanding black hole universe. Prog Phys. 2010;2:7-14.
27. Friedmann A. On the curvature of space. General Relativity and Gravitation. 1999;31:1991-2000.
28. Hawking SW. A brief history of time. Bantam Dell Publishing Group. New York. 1988.
29. Ashtekar A, Gupt B, Jeong D, Sreenath V. Alleviating the tension in the cosmic microwave background using Planck-scale physics. Phys Rev Lett. 2020;125(5):051302.
30. Bojowald M. Foundations of quantum cosmology. AAS-IOP Publishing. 2020.