



Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/11685

DOI URL: <http://dx.doi.org/10.21474/IJAR01/11685>



RESEARCH ARTICLE

A NEW INSIGHT INTO THE COSMOLOGY

Mahesh Yadav¹ and Sajan Acharya²

1. Department of Physics, St. Xavier's College, Maitighar, Kathmandu, Nepal.
2. Department of Physics, British Model College, Thapathali, Kathmandu, Nepal.

Manuscript Info

Manuscript History

Received: 10 July 2020

Final Accepted: 14 August 2020

Published: September 2020.

Key words:-

Cosmology, Gravitation, Space, Hubble-Lemaitre's law

Abstract

In 17th century satellites such as Europa, IO, Titan were discovered. 18th century Uranus was discovered, 19th century Neptune and many more. Without concrete research, it was concluded that these celestial bodies were at the same celestial coordinates from the beginning of the universe. To put that into perspective, imagine being late to dining table and assuming that everyone was sitting at the same chair from the beginning where you are seeing them at right now. That can't be really true right? Combining the Hubble-Lemaitre's law and the Newtonian gravitational force, we concluded that some of the celestial bodies might not have originated in the same celestial coordinated where we see them at right now but have arrived there by being flown away linearly into the interstellar space. Furthermore, in this research, we attempted to prove that some of our accepted cosmological ideas are wrong. We showed how the correct one can unlock some of the mysteries of the interstellar space as well as help us know about the density, gravity, atmosphere, and many more things about the far-away interstellar space.

Copy Right, IJAR, 2020,. All rights reserved.

Introduction:-

Big Bang Theory suggests that the universe began by expanding from an infinitesimal volume with extremely high density and temperature. The universe was initially significantly smaller than even a pore on your skin. With the big bang, the fabric of space itself began expanding like the surface of an inflating balloon – matter simply rode along the stretching space like dust on the balloon's surface. The big bang is not like an explosion of matter in otherwise empty space; rather, space itself began with the big bang and carried matter with it as it expanded. Scientists believe that the Universe was initially so hot and dense, that even elementary particles like protons and neutrons could not exist. But as the Universe began to cool during the first few minutes, protons and neutrons began to form. Then slowly over time these protons, neutrons and electrons came together to form Hydrogen and small amounts of Helium. After billions of years, they combined and formed planets, stars and galaxies which are now collectively known as celestial bodies [1,2]. They traveled distances suiting the energy and assumed their places in the universe. Due to the classic gravitational force, the smaller masses started rotating around a heavier mass [3]. According to Hubble-Lemaitre's law, the space between any two celestial bodies increases with the rate of expansion being directly proportional to the distance between them [4,5]. It is believed that all celestial bodies we know today originated in the same celestial coordinates where they are right now [6]. There is not enough research done about the space where a particular celestial body originated. From the dawn of history to the beginning of the 17th century the known universe consisted of only 8 celestial bodies and some "fixed" stars. Now we have innumerable celestial

Corresponding Author:- Mr. Sajan Acharya

Address:- Department of Physics, British Model College, Thapathali, Kathmandu, Nepal.

bodies, all of which were discovered after 16th century [7,8]. This brings out the ultimate question; Were they revolving other star or system and came here after being shot into the space?

Methodology:-

From Hubble-Lemaitre's law, we have,

$$V = H_0 R,$$

From Newton's law of gravitation,

$$F = \frac{GMm}{R^2}$$

With Hubble-Lemaitre's law, the space between any two celestial bodies increases with the rate of expansion being directly proportional to the distance between them. Newton's gravitational law suggest that the gravitational force between any two body is the function of the distance between them. As the distance between any two celestial bodies is increasing, the Newtonian force must be decreasing with the time. Let's call the minimum force required to keep the rotating body into the orbit be critical force and the maximum distance at which the body can be in the orbit be critical distance. The critical force can never be zero as all the celestial body are huge in size. With the increase in the distance, the orbital velocity decreases. As the critical force cannot be zero, the orbital velocity will never be zero.

When the R becomes the critical radius between two body, F becomes the critical force which can be calculated by;

$$F_{\text{critical}} = \frac{GMm}{R_{\text{critical}}^2} \text{ Where } R_{\text{critical}} \text{ is critical radius.}$$

When the gravitational force 'F' decreases than F_{critical} , the celestial body is shot out from the gravitational system. Using the theory of relative velocity, we can calculate, velocity of approach, Time of approach, and Velocity of recession by;

Velocity of approach:

Let's suppose a celestial body is escaped out from the gravitational system with velocity 'V' headed towards the earth. The body will approach earth if $V > H_0 R$ and recede earth if $V < H_0 R$, where 'R' is the distance from the earth. The velocity of approach depends upon the velocity of expansion and the velocity of a shot body, which can be expressed as;

$$V_{\text{approach}} = V - H_0 R \text{ where } H_0 \text{ represents Hubble constant with the value of } 67.7 \text{ km/s/mpc}$$

Time of Approach:

The time period in which the shot celestial body reaches the earth's celestial coordinate from the time of shot.

$$T_{\text{approach}} = \frac{R}{V - H_0 R} = \frac{1}{\frac{V}{R} - H_0} \text{ Where 'V' is shot velocity and 'R' is the distance between earth and initial position of the shot body.}$$

Velocity of Recession:

If it recedes away, then the recession velocity can be expressed by

$$V_{\text{recession}} = V + H_0 R \text{ if 'V' is in opposite direction of earth}$$

$$V_{\text{recession}} = H_0 R - V \text{ if 'V' is in the direction of earth and } V < H_0 R$$

Result and Discussion:-

As the distance increases than the critical distance, the force will decrease than the critical force. The force weaker than the critical force will result into the disruption of the orbit of a celestial body. After the disruption, the celestial mass will be shot into the space with velocity $v = rw$.

The body will follow linear path with some perturbation until it comes into the influence of the other mass with the gravitational force strong enough to set the body into the orbit. The gravitation dominant body of a gravitational system has a different potential at different point. The body settled at the edge of a gravitational field might take very short time to get shot linearly into the space. After the big bang, many bodies might have settled and shot into the space. If a body at 2.4×10^{13} km away from the earth is shot towards earth with the velocity 50.052 km/s, it will

reach earth in 15.2×10^3 years. The age of the universe in second is 13.7×10^9 years[9]. As the time of approach is smaller than the age of universe itself, the planet might come in our solar system from a different gravitational system. So, without exploring the history of each body, we cannot say where the body had settled after the big bang.

Many celestial objects are believed that they formed in the same celestial coordinates. But it is also possible that they might have come from the other gravitational system by being shot in our direction and later discovered in the present coordinates. There is a chance that the new object may come into our solar system and we discover it.

If we could research further and are able to find the masses, created in other interstellar space, within our reach; it could be a game changer. Recently we detected an interstellar object called Oumuamua also known as the first visitor from extrasolar planetary system [10,11]. So, if we could study its density, water content, magnetic field, and many other things, we can highlight all those characteristics of the space where it originated. This field of research can also help us in the search of habitable exoplanets to some extent. Let's say earth was originated in other gravitational system. It is high possibility that there might be more planets like earth in that system. We could research further on that gravitational system which might help us find new earth.

Conclusion:-

- 1) The celestial bodies might not have originated in the same celestial coordinate as they are seen now.
- 2) After the celestial body at distance 'R' from earth is shot from its orbit towards us or away from us then,

$$V_{\text{approach}} = V - H_0 R,$$

$$V_{\text{recession}} = V + H_0 R \quad \text{if 'V' is in opposite direction to earth}$$

$$V_{\text{recession}} = H_0 R - V \quad \text{if 'V' is in the direction of earth and } V < H_0 R.$$
- 3) If we begin our search for the origin of each celestial body in the universe, then it can open a new field of astronomy. This could provide insights into the actual composition and the history of the place of origin which in turn can help us understand the actual history of the universe.

Future Observation:-

The velocity of approach holds high significance for us. With an eye on the gravitational system, we can calculate the shot velocity. Using the formula $V_{\text{approach}} = V - H_0 R$, we can calculate the exact time of collision of the planets and other celestial bodies millions of years before the actual collision.

Implications:

This insight into the cosmology can provide the actual coordinates of origin of the objects which could be researched in future.

Acknowledgement:-

We would like to thank our mentors Mr. Sajit Chandra Sakya and Mr. Balram Khadka of Department of physics, British Model College and Mr. Ram Sundar Matang and Mr. Ajay Karn of Department of physics, St. Xavier's college. We would also like to thank all the faculty members for their constant help and support.

Reference:-

1. Dr. Shiv Shakti Singh, Origin of Universe [Online] Available: <http://ijear.org/vol4.1/shiv.pdf>
2. <https://www.space.com/25126-big-bang-theory.html>
3. https://en.wikipedia.org/wiki/Newton%27s_law_of_universal_gravitation
4. <https://history.aip.org/history/exhibits/cosmology/ideas/expanding.htm>
5. Neta A. Bahcall, Hubble's Law and the expanding universe [Online] Available: <https://www.pnas.org/content/112/11/3173.short>
6. Alfvén, H. & Wilcox, J. M, On the Origin of the Satellites and the Planets (Astrophysical Journal, vol. 136, p.1016); [Online] Available: <http://adsabs.harvard.edu/full/1962ApJ...136.1016A>
7. <https://nineplanets.org/chronology-of-solar-system-discovery/>
8. Tinetti Giovanna, 2014 Galactic planetary science Phil. Trans. R. Soc. A. 37220130077 [Online] Available: <http://doi.org/10.1098/rsta.2013.0077>
9. https://en.wikipedia.org/wiki/Age_of_the_universe
10. <https://en.wikipedia.org/wiki/%CA%BBOumuamua>

11. Sean N Raymond, Philip J Armitage, Dimitri Veras, Elisa V Quintana, Thomas Barclay, Implications of the interstellar object 1I/Oumuamua for planetary dynamics and planetesimal formation, **Monthly Notices of the Royal Astronomical Society**, Volume 476, Issue 3, May 2018, Pages 3031–3038, <https://doi.org/10.1093/mnras/sty468>.