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The Universe Explained by Violation of Third Law of Motion

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Abstract: ***This research paper makes an attempt to explain the various theories related to the world of astrophysics like the repulsive nature of gravitational force, inflation, Big Bang theory to name a few which are to be explained.***

Keywords: gravitational force, repulsive, inflation, gravitational waves

1. Introduction

This paper shall discuss the various theories which are related to the Universe like the Big Bang, inflation theory, repulsive gravity to name a few. Also, it shall be discussed in detail how the Newton's third law is being violated by gravitational force.

2. Violation of Newton's Third Law of Motion

Earlier, in the previous paper [1], we had provided a mathematical proof for the fact that Newton's Third Law of Motion is being violated by the conservative forces, among which gravitational force is one of them. Now, we shall be discussing in detail how gravitational force is violating the third law of motion, why we have taken into consideration the gravitational waves to prove that gravitational force is repulsive in nature and how the repulsive nature of gravitational force can explain theories like the Big Bang and the Inflation Theory.

3. Mathematical Proof of Gravitational Force disobeying Third Law of Motion [1]

Gravitational force is another non-contact force, also an important one, for which we will prove that it violates Newton's Third Law of Motion.

The mathematical proof of the gravitational force disobeying Newton's Third Law of Motion is given as follows:

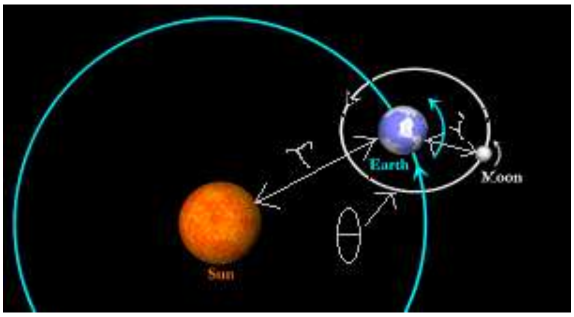

Figure 5: Orbit diagram of the sun-earth-moon system

As per the given diagram, we will take into consideration of the net attractive force and repulsive force of the earth with respect to other planetary objects to make the derivation much simpler. Here, we are taking into consideration the sun-earth-moon system for our derivation. Here, the earth is exerting an attractive force on the moon and a repulsive force on the sun. So, let us proceed with the derivation.

$$\text{Let } F_r \text{ be the net repulsive force of the earth}$$
$$\text{Let } F_a \text{ be the net atrractive force of the earth}$$
$$\text{Let } r \text{ be the distance between the sun and the earth}$$
$$\text{Let } r' \text{ be the distance between the earth and the moon}$$
$$\text{Let } \theta \text{ be the angle made by } r' \text{ with respect to } r$$
$$\text{Let } M_e \text{ be the mass of the earth}$$
$$\text{Let } M_m \text{ be the mass of the moon}$$
$$\text{Let } M_s \text{ be the mass of the Sun}$$
$$F = G\frac{m_1 m_2}{r^2}$$
$$F_r = G\frac{M_e M_s}{r^2}$$
$$F_a = G\frac{M_e M_m}{(r')^2}$$

Now if we try to resolve r and r' with respect to the angle formed between them i.e. θ, we will obtain the following expression

$$F = G\frac{M_e M_m}{\left(\frac{r}{\cos\theta}\right)^2} = G\frac{M_e M_m \cos^2\theta}{r^2}$$

Now, as per Newton's Third Law of Motion, the net attractive force of the earth should have been equal to the net repulsive force of the earth i.e.

$$F_r = F_a,$$

but as per our calculation and observation,

$$F_r \neq F_a.$$

This shows that the gravitational force also violates Newton's Third Law of Motion.

4. Application of Heisenberg's Uncertainty Principle in Gravitational Physics

This heading itself may sound weird to the readers as we usually believe that Heisenberg's Uncertainty Principle is one of the principles of Quantum Mechanics and also, we know that quantum mechanics and relativity try to contradict each other. Well, if we look at the revolution of the Earth around the Sun, or in that case, any planet revolving around a star or a binary star system or other such systems, we will observe that there is quite a small amount of uncertainty in the time span of the revolution of a planetary object with respect to the other and so is the same with the time taken for completing one rotation about its own axis. We also observe that there is uncertainty in the velocity of the Earth while revolving around the Sun during the perigee and apogee period. Thus, it does make some sense that although Heisenberg's Uncertainty Principle is a fundamental quantum mechanics principle, but its application is far beyond the quantum world. Thus, we proceed with one derivation which has been discussed in a previous paper [2] by the author which proceeds as follows:

We are well aware of the general form of the Heisenberg's Uncertainty Principle, which is given as:

$$\Delta x . \Delta p \geq \frac{\hbar}{2}$$

where $\hbar$ is the reduced Planck's constant which is given by $h/2\pi$.

If we do the following process,

$$\Delta x . \Delta p \geq \frac{\hbar}{2}$$

$$\lim_{\substack{\Delta x \to 0 \\ \Delta p \to 0}} \Delta x . \Delta p \geq \frac{\hbar}{2}$$

$$dp \geq \frac{\hbar}{2dx}$$

$$dm . dv \geq \frac{\hbar}{2dx}$$

$$dm . \frac{dx}{dt} \geq \frac{\hbar}{2dx}$$

$$\frac{dm}{dt} \geq \frac{\hbar}{2(dx)^2}$$

$$dm \geq \frac{\hbar . dt}{2(dx)^2}$$

$$dm . (dx)^2 \geq \frac{\hbar . dt}{2}$$

Integrating both the sides, we get:

$$\int dm . \int_0^{\Delta x} (dx)^2 . dx \geq \frac{\hbar}{2} \int_0^{\Delta t} dt . dt$$

$$\Delta m . \frac{(\Delta x)^3}{3} \geq \frac{\hbar}{2} . \frac{(\Delta t)^2}{2}$$

$$\Delta m . \frac{(\Delta x)^2 . \Delta x}{3(\Delta t)^2} \geq \frac{\hbar}{4}$$

$$But \ \frac{\Delta x}{(\Delta t)^2} \ can \ be \ given \ by \ \Delta a$$

$$\Delta m . \Delta a . \frac{(\Delta x)^2}{3} \geq \frac{\hbar}{4}$$

$$\Delta m . \Delta a \geq 3 . \frac{\hbar}{4(\Delta x)^2}$$

we will obtain the following expression,

$$\Delta F \geq 3 . \frac{\hbar}{4(\Delta x)^2}$$

In the above derivation, we come across that there is uncertainty in factors like mass/distribution of mass, time, velocity, momentum and position. Interestingly, in the Theory of General Relativity given by Albert Einstein, we observe that it, indirectly, does state about uncertainty in time which is in accordance with our derivation. Hence, from the above derivation, we have another mathematical proof which supports the idea that gravitational force does not follow Newton's Third Law of Motion as in the final step, we realize that there is uncertainty in the amount of gravitational force between two planetary objects/systems. Since there is uncertainty in the position of the celestial objects, we can observe that they do not trace a perfect circular path but a horizontal elliptical path and also the Sun is not located at the exact center of the ellipse where the minor and major axis intersect each other in a perpendicular manner.

5. Repulsive Nature of Gravitational Force and its Applications

From the first derivation in the paper, we can also conclude that gravitational force is not only attractive in nature but also repulsive in nature. In Sub-Heading 1, we shall discuss the reasons why the author has come up with this dramatic conclusion and in Sub-Heading 2, the author will try to explain some of the theories like the Big Bang, the Inflation theory. Firstly, let's get ourselves refreshed with the concept of why we should treat gravitational force as a multidirectional force [1]:

The most intriguing question in this theory is whether gravitational force can be considered as a multidirectional force or a unidirectional force. Before we get into this debate, I will like to explain the example of a spring which is a unique structure as it can exhibit both unidirectional forces as well as multidirectional forces.

Case I: When the one of the ends of the spring is fixed.
When one of the ends of the spring is fixed to a rigid support and try to compress or stretch the spring within its limit of elasticity, we will observe that it will exert an equal and opposite restoring force which tells us that in this case, the spring is exerting a unidirectional force.

Case II: When both ends of the spring is free to vibrate
When neither end of the spring is attached to the rigid support i.e. both ends are free to vibrate and the spring is compressed or stretched within its limit of elasticity, our naked eyes will deceive us in believing the fact that an equal and opposite force is acting on the spring, but actually there are two forces which are acting on the spring on either ends when the spring is trying to regain its original dimensions. This observation helps us in interpreting that a spring is not only capable of exhibiting unidirectional force but also multidirectional force which makes the spring a unique structure in terms of this theory.

Now, since we have completed the case study of the spring, we can get into the discussion of whether gravitational force is a unidirectional force or multidirectional force.

As per observations and this theory, gravitational force must be considered as a multidirectional force. The reason why the gravitational force should be considered a multidirectional force is as follows:

Structure of the Gravitational wave

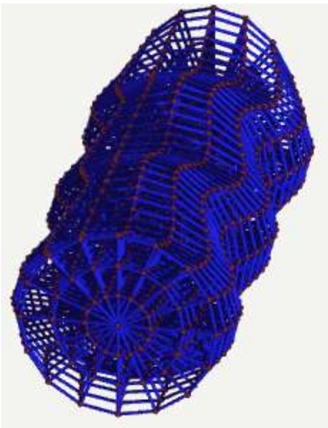

Figure 2: Graphical Representation of the Structure of Gravitational Wave
(Courtesy: Max Planck Institute of Gravitational Physics)

As per the given graphical representation, we see that the gravitational waves resemble the structure of a spring as well as it behaves like a spring. The gravitational waves get compressed and stretched simultaneously at the same instant of time. The structure of the gravitational waves resembles more of the structure of a spring whose neither ends are attached to a rigid support. Hence, if we compare the structure of the gravitational waves to the structure of a free spring, we can easily interpret that the gravitational force is a type of multidirectional force as these waves exhibit multidirectional forces on two bodies.

Planetary orbits and planets

We observe that all planetary objects are following a constant imaginary elliptical path called as the orbits and none of the planetary objects leaves this imaginary path. Now, if the gravitational force would have been only attractive in nature, it would have caused all the planetary objects to get closer to each other causing a violent collision. Thus, we must understand that the planetary objects exhibit a force which is attractive as well as repulsive in nature which is none other than the gravitational force.

Magnetic field of planetary objects

Quite similar to the discussion as in the second point, we know that every planetary object has its own magnetic field. Since it has its own magnetic field, we know that the planetary object will exhibit multidirectional force and the gravitational force is the multidirectional force specified here.

Now, as we are done with the recapitulation of the concept, let us proceed with the analysis.

5.1 Why Gravitational Force is Repulsive?

The reason why the author has come to such a dramatic conclusion is lying behind the major discovery of gravitational waves.

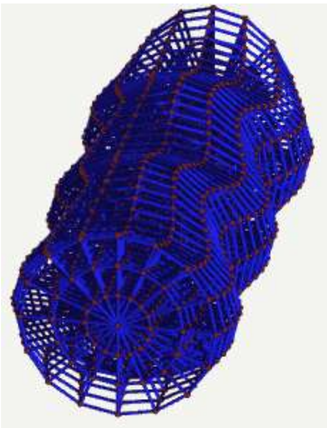

Figure 3: Graphical Representation of the Structure of Gravitational Wave
(Courtesy: Max Planck Institute of Gravitational Physics)

If we had look into the structure of gravitational waves in 3D graphics, it does resemble a spring as we have discussed above. Now, the mystery lies that as per Einstein's Theory of General Relativity, the Earth is kept into the orbit by the gravitational pull of the sun which works under the mechanism of waves. Now, if we look in the representation below, we can arrive to the conclusion that unless the smaller body i.e. the Moon is set to roll into the space-time warp with an accurate and proper velocity, the Moon either flies off in a parabolic or a hyperbolic trajectory, else it has to collapse in the space-time warp, which is not the current scenario in the space we know today.

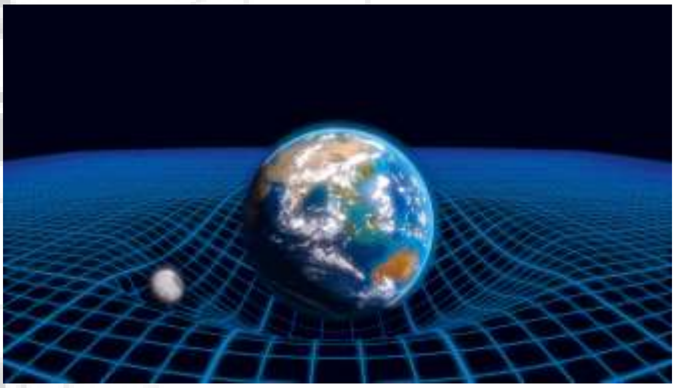

Figure 4: Graphical Representation of the Space-Time Warp with the Moon revolving around the Earth
(Courtesy: Tumblr)

So, what keeps the moon in its stable orbit from either collapsing into the space-time warp of the Earth or from flying off in a parabolic or hyperbolic trajectory- it has to be the repulsive nature of gravitational force 'aka' repulsive gravity.

Also, if we try to plot the structure of gravitational waves in our 2D Cartesian Space, we will get a typical structure of a wave which is periodic in nature and comprises of several crests and troughs. Now, if the crests were to resemble the attractive nature of gravitational force, then what were the troughs to represent- nothing other than a geometric proof of the existence of repulsive gravity.

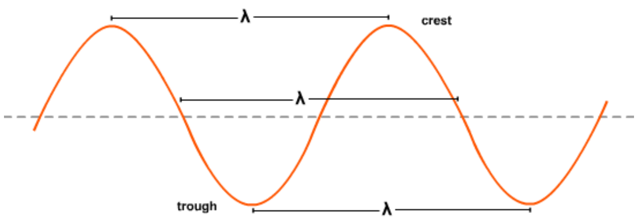

Figure 4: Graphical Representation of a Periodic Wave with label of a Crest and a Trough and the Wavelength (Courtesy: BBC)

Even if we were to use the analogy of a stone thrown onto a pond, thus leading to formation of 'ripples' on the surface, if we were to keep an object like a paper boat near the source of the waves, it will eventually be pushed back from the origin which eventually gives us an observational proof to the existence of repulsive gravity.

5.2 Repulsive Gravity and Violation of Third Law of Motion used to explain Big Bang and Inflation

Since we have proven that gravitational force does not follow Newton's Third Law of Motion and we have also established proofs for the existence of repulsive gravity i.e. gravitational force is not only attractive but also repulsive in nature, now let us see whether we can explain the Big Bang theory as well as the Inflation Theory.

5.2.1 Inflation and The Big Bang- A Sudden Event or A Periodic Event?

This may seem to be blasphemous to your ears to think that some amount of matter did exist before the Big Bang happened but with the above mathematical proofs, it is pretty much convincing that the Big Bang was no out-of-the-blue event but rather it is pretty much a periodic event i.e. matter did exist before the Big Bang. There are three reasons which the author would like to cite. Firstly, if we go back to our first derivation which we dealt in the paper, we observe that gravitational force is a cosine function which is a periodic wave function with time tends to infinity. Secondly, if we believe in the assumption that nothing existed before the Big Bang happened, it means we are disobeying the very basic laws like Law of Conservation of Mass and Charge and Energy. Thirdly, if there were no matter before Big Bang, how is it possible that suddenly, matter got created and everything got pushed (accelerated inflation) if gravitational force was to be only attractive in nature. Thus, we must arrive to the conclusion that matter did exist before Big Bang and Big Bang is a periodic event.

So, how did the creation of the modern Universe take place? In the previous universe, there comes a time that the attractive gravitational force's value becomes greater than the repulsive gravity due to which matter starts getting compressed slowly. Eventually, it will form a Bose-Einstein condensate. But due to the large amount of energy within the mass and internal radiation, matter gets emitted out i.e. the Big Bang occurs with an immense force i.e. repulsive gravity attains a value far greater than attractive gravitational force leading to accelerated inflation. Due to matter getting cooled down, the medium becomes denser and the intensity of repulsive gravity reduces slowly and this cycle goes on occurring infinitely. Since the medium becomes denser, the speed of light also keeps on decreasing. The current value of speed of light is 299,792,458 m/s in air. In the past few billion light years ago, the speed of light was far greater than the current value and in the future, the value of the speed of light will keep on decreasing although the decrease in the value, if ever to be detected, will be negligible in a span of a century or a millennium.

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Author Profile

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