

World Academics Journal of _____ Engineering Sciences Vol.7, Issue.3, pp.46-51, September (2020)

E-ISSN: 2348-635X

Equilibrium State of Existence of Sun in Its Solar System

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Available online at: www.isroset.org

Received: 18/Jul/2020, Accepted: 22/Aug/2020, Online: 30/Sept/2020

Abstract- The solar system is a gravitationally bound system of sun that is situated at a fixed point and the other revolutionary bodies are as surrounding it. The sun as a central big body must remain in a static position. There is no any effective gravitational force responsible for motion is acting on it. Thus, the solar system is perfectly an ideal road map which can be applied in case of defining the mechanism of existence of other star systems independently in the universe. The planets occupy a very little space in comparison to the open space available around the sun. But, the planets of the solar system play a primary role in keeping the sun very far away from the gravitational active zones. Hence, the solar system is mostly an empty space. This causes the sun to exist in its equilibrium state of rest in such a way that suppose a solar system is free from the outer universe. In principle, the mass of the sun is comparatively high enough to get to move. Because, this mass provides the gravitational force to the respective planets for revolutionary motion to occur around the sun. The creation of high class gravitational pressure within the sun for undergoing interactions responsible for emerging radiant pressure of high luminousity can be understood only on the basis of having a big mass of the sun. Of course, the sun can be treated as the shining model for all of the stars of the universe because, for a star also everything depends usually upon its mass. Hence, the solar system becomes an unit for understanding the mechanism of role of stars in building the universe.

Keywords: Solar system, Star system, Exoplanets, Equilibrium state of motion, Gravitational pressure, Radiant pressure, Interaction, Density, Luminousity, Milky way galaxy, Galactic centre. Orion arm, Ecliptic, Spectroscopic eye.

I. INTRODUCTION

The existence of the so called stars in the universe can be understood on the basis of the same type of argument comparable with the atomic model of the matter by such a mechanism. As in case of atom, due to electrostatic force acting on electrons by the nucleus, the revolution of electrons around the greater mass of the fixed nucleus is responsible for making the atomic structure independently to exist freely from the other surrounding atoms. The atoms remain in the equilibrium state of existence by remaining mutually at distances of interatomic space within the matter. Similarly, the solar system is the basic unit for the designing of the universe. Thus, the universe is surrounded by such star systems in bulk as atoms in the matter are found uncountable. According to it, the central body of every star system would be like as a sun star, shining in the universe. Most of the stars can be seen in the universe as traditionally fixed stars. Therefore for being such a fixed star, it can be assumed in the same manner as the sun of our solar system. It is also treated to exist in the equilibrium state of motion for getting a static position in the absence of any effective external force acting upon it. A star with a family of planets can only exist independently in the universe as solar system has made its place in this universe.

The solar system consists of sun as a star. Eight terrestrial planets known as mercury, venus, earth, mars, jupiter, saturn, uranus, and neptune all revolve around the sun almost in well defined elliptical orbits, except the innermost planet mercury is considered to have circular type of orbit. Saturn has a symbolic structure of a body surrounded by rings also. All the planets very extra ordinarily revolve around in the same plane called the ecliptic and it is defined by the plane of earth's orbit. The difference is only of the distance of the orbit of the planet from the sun. Besides this, three small sized planets Ceres, Pluto and Eris are categorized as dwarfs. Asteroids belt between the orbits of mars and Jupiter and the satellites of the planets are also associated with the solar system. The most effective gravitational field of sun of the solar system so far investigated in the recent years is active up to a distance about 50 AU, where 1 AU is called the astronomical unit of distance for showing the distance of earth from the sun and is equal to 1.5×10^{11} m. The active size is estimated by knowing the distance of neptune = 30.1 AU and the distance of Kuiper cliff 50 AU = 7.5 \times 10^{12} m = .0008 LY, where 1 LY = 9.6 × 10¹⁵ m. It seems that the gravitational field of sun of the solar system is not limited only up to this distance. Its gravitational field must decrease gradually towards the front. Because, recent studies on finding the exoplanets of proxima centaury, a nearest star reported by NASA also show that it is a star system containing the exoplanets and is located at about 4.25 LY distant apart. The existence of the nearest star at so very high surprising distance is a clear cut evidence of the fact that two stars in space can exist in equilibrium states of motion if occupy positions at very far from each other so that the gravitational force in between the relative

masses might not influence the state of existence considered in the rest state of inertia.

II. THEORY

According to Newtonian classical mechanics, the mass of a body is the measurement of its inertial property. In the absence of any effective external force, no body can change its state of motion. If it is at rest, it will remain ever at rest [1]. In an usual investigation, it is studied that if the mass of the body is too great and then a little force acting on the heavy mass is also found unable to change its state of motion. Because, the observations of change in movement is the only one method of measurement of determining the effect of the force acting on the body. Such forces which can not change the state of motion may be considered as negligible. The same criteria is applicable in case of whether it is an atomic system, or a solar system. In both the systems, two bodies are involved in between which the mutual attraction takes place. However in case of atom, the force of attraction between the nucleus and the electron is electrostatic in nature and the magnitude is defined by Coulomb's law. While in case of solar system, the gravitational force acts in between the sun and the revolving planet around it. The effect of force is related with the mass of the body. A force changes the state of motion depending upon the mass of the body. The nucleus is greater in mass than the mass of the electron revolving around it. Similarly, the sun is greater in mass than any of the body that revolves around it. Although, the electrostatic force acting between the nucleus and the electron on each other is same in magnitude but the force acted by the nucleus on electron can only give the revolutionary motion to the electron. This force shows its effect on electron of a lighter mass. The force acted by the electron on nucleus can't move the nucleus fixed as a central body. Because this force is unable to change the rest state of motion due to high inertial property of mass of the nucleus. In the same manner, the gravitational force acting between the sun and any of the planet on each other is of same magnitude but the influence of force acted by the sun on the planet can be found by observing the revolutionary motion of the planet under the kind control of gravitational force of the sun. The force exerted by the planet on the sun is ineffective to move the sun. Because this force is unable to change the rest state of sun due to very high inertial property of mass. It is also a rule that the gravitational force between two bodies does not only depend upon the product of masses but, it also depends upon the distance between the concerned bodies by Newton's gravitational formula depicted by -

 $F = G (m1 \times m2) / R^2$

Where $G = 6.7 \times 10^{-11}$ N m² / kg ² and R is the distance between the massive bodies. The gravitational force acting between two bodies situated at very large distance R will be negligible. Such a negligible force can't be expected to give any motion to any one due to high property of inertial mass.

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It is quite obvious that if two massive bodies are supposed to act a gravitational force on each other of such a magnitude that the force acting on each other is unable to change the respective states of motion of each body. It becomes only possible due to the cause of big inertial mass of each body as well as due to the cause of distance, if the massive bodies are kept too far from each other. The gravitational force acting on each other may be negligible to take part in any kind of motion. Thus, two big masses can be found independently free from each other to exist in the equilibrium state of motion. The universe is made of such star systems and the solar system is one of them.

Because, the inertial property of mass of sun is very high. The sun applies a very high class gravitational force to fix the state of motion of revolutionary bodies around it. The gravitational force applied by the sun on its nearby planetary bodies is acted two dimensionally to change the direction of velocity as well as to decide the orbital velocity during the revolution [2]. In case of circular motion, the orbital velocity remains the same through out the whole motion. Only the direction is changed during the motion for keeping in the orbit of circle. Thus the distance of revolving body remains invariable. This happens due to the equal amount of the gravitational force applied on the revolutionary body. The sun must be statically fixed at the centre of the circle from which it provides such a motion to the nearby body as exhibited by the nearest planet mercury. For other planets revolving around the sun, the orbit takes a shape of ellipse and the gravitational force of sun changes during the whole motion. The sun is still in its original position, only the shape of orbit for the planets is elliptical. The sun is now called not at the centre of circle but at the focus of the ellipse. The revolving bodies around the sun remain ever under gravitational control of great mass of sun.

The value of gravitational field due to sun at the height of earth from it can be evaluated with the help of mass of the sun and the astronomical distance between the sun and earth by putting the values in the expression-

 $\begin{aligned} & g = G M / R^2 \\ &= (6.67 \times 10^{-11} \times 2 \times 10^{30}) / (1.5 \times 10^{11})^2 \\ &= 5.92 \times 10^{-3} \text{ Newton / kg} = 5.92 \times 10^{-3} \text{ m / sec}^2 \end{aligned}$

The gravitational force acting on earth by sun is shown as -

 $F = M' g = 6 \times 10^{24} \times 5.92 \times 10^{-3} = 3.6 \times 10^{22}$ Newton Similarly, the value of gravitational field of earth at the height of location of sun can be determined with the help of mass of the earth and the astronomical distance between the sun and the earth by putting the values in the expression-

$$g' = G M' / R^{2}$$

= (6.67 × 10⁻¹¹ × 6 × 10²⁴) / (1.5 × 10¹)

= 1.78×10^{-8} Newton / kg = 1.78×10^{-8} m / sec²

The total gravitational force acting on the sun by one of the planet earth will be -

$F' = M g' = 2 \times 10^{30} \times 1.78 \times 10^{-8} = 3.6 \times 10^{22}$ Newton

However, the gravitational force exerted by sun and the earth on each other is of same magnitude but there is no any comparison between these two forces in view of respective effectiveness. The gravitational force of sun acts on less magnitude of inertial mass of the earth. The force is used to keep the earth in revolutionary orbit around the sun. While, the gravitational force applied by the earth on very big inertial mass of the sun can not give any type of motion to sun, hence is useless. Such gravitational forces acting on sun by its other neighbors can not also change the inertial rest state of sun from its solar system. It can be drawn a clue from such investigation that the gravitational force acting among the planets can not influence the planetary motion of the respected planets from the elliptical orbit provided by the strongest gravitational force of the sun. The orbital velocity decided by the gravitational force of sun can not be changed at any way by the vicinity members. Thus the solar system is gravitationally a bound system. It does not allow trivial forces for any kind of change from its state of existence. As a result of such finding, it can be said that the place of planets in respective elliptical orbits remain the same for ever. The distance of the planet from the sun remain the same. The climatic seasons affiliated with the planet during revolution will not be affected by the mutual presence of the planets surrounding the sun in the solar system.

The same pattern is applicable in case of the force applied by the sun on the other stars as well as on the sun by the other stars. For dealing with such types of two kinds of forces and for simplifying the interpretation, the universe is needed to divide into two parts. One part within of the solar system from where the universe is viewed and the another outer part from the solar system where the stars are only viewed. The first part is a small inner universe. While, the another is a widely spread up to infinite as an outer universe.

In the inner universe and within the solar system, the force applied on the sun by any of its surrounding planet can be taken as ineffective. Only a one sided gravitational force acting on each planet towards the sun is dominant within the solar system. These forces are responsible for the revolutionary motions of the planets around the sun in mutually distributed individual orbits. The mechanism of revolutionary motion is governed by Kepler's laws of planetary motion [3]. For a fixed universe, the gravitational force acted by the sun on other bodies of the outer universe can be considered as also not effective. On the other hand, the force acting between stars seems not feasible for any kind of motion due to high property of inertial mass of each. A star can not revolve around another because of the mass factor. The mass of sun is 2×10^{30} kg. Increasing masses towards the infinite mass will be needed for revolution of stars one around the another in the universe spread up to infinite. Therefore, such a force is impossible to occur for the attachment of universal stars. Thus, the universe is so designed that a star system can not enter

inside the boundary of another star system. Every star system has been alloted its place to remain in its state of existence ruled by the inertial property of mass. The equilibrium state of motion is well exhibited by the sun in its solar system.

In this way, we can estimate that in the absence of any movable force, the sun is situated at the centre of the solar system in its equilibrium state of motion and therefore the whole solar system is in its independent state of existence. It can be said that our sun is free from the outer universe. Neither it is attracted by any body from the outer universe nor it is attracting any body of the outer universe for any kind of motion. The position of sun is absolutely static. It has no any relation about motion with the outer universe. But the theory for the designing of universe can be drawn with the help of our sun and its family so called the solar system. Thus, the whole universe is full of stars. Every such star must be also a container of planets and its satellites for the static existence in the outer universe as the solar system exists in the inner universe independently [4]. Our solar system is the shining model for each of the star system. A star can not exist with out its family members. The reflected light of a star from every inter stellar planets and satellites should also appear to enlighten the universe. Because, the planets of our sun also appear by reflecting sun light in the sky of night. Our planets in the inner universe however are closely associated with the earth in distance. Hence, these reflect intense light. The moon being a satellite of earth, is seen in big in size. In the moon night, the earth surface is highly illuminated by full moon light. The stars living in the outer universe seen from the inner universe are called the actual stars. In the contest of universe, our sun of solar system is also called a star. Because, it is one of the star of main sequence of stars. It is seen in big size than other stars. It is because of the fact that we are present as an observer in the planet 'earth' very close to sun in the solar system. Although, the stars are also very big and separated by large distances, yet the stars are seen very little and very close to each other. This happen due to stars are being very far from the observer of earth. Because, the angle of vision of two distinct objects goes on decreasing when the observer is displaced far from the objects. The star systems are designed in open space all around the solar system at various distances. But, stars have been placed mutually at very large distances from each other. Therefore, the stars can be found to be located at various distances. The masses of various stars may differ. The size may differ. The radiant pressure generated in various stars may also differ. The composition and the density of matter responsible for generating radiant pressure can differ in magnitude. These may be the cause of the fact that stars of different intensities are viewed.

One thing is very interesting to realize that what ever be the system whether a solar system or a star system, the existence of the system mainly depends upon the mass around which a system is composed. The whole mass of sun or of a other star in the universe is responsible for creating a gravitational field required for the revolution of

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planetary like bodies associated by orbiting around the shining body. The mass of the shining body should remain unchanged for an unchanged type of revolutionary motion of bodies orbiting around. There remains a relation between the acceleration due to gravity and the velocity of the body in a fixed orbit for revolution. In view of this investigation, the mass of sun or of a star must remain unchanged. A fixed mass can only provide a revolutionary type of motion to the family of planets in fixed orbits with an ever remaining velocity. An appropriate velocity is required for revolution at a fixed height from the fixed mass. The mass is also related with that least mass whose gravitational force on the surface is able to create the gravitational pressure under which the matter is interacted to go for collision with an emission of radiant energy. In recent years a low or medium category mass of a star is supposed by its mass comparative to the .4 to 3.4 times the mass of sun.

III. EXPERIMENTAL

For shining as a star, the mass of the central body which has to become a star must be high enough, so that the gravitational pressure on itself can generate fire within the shining body. This theory of firing is based upon the obtained experimental evidence similar during investigation done on natural geruwa mineral solution of constituents of different densities. Pressure column of alumina dissolved water solution containing comparatively high density of emerging precipitates of Fe2O3 molecules is applied on already settled over after sand part above the bottom of copper made boiler bottle. The boiler is generally available in physics labs. for specific heat experiments. The sample was pressurized by Boyles law technique. In this apparatus the matter is compelled to spark for radiating light. The exhaust of fire resulted by the observation of a ray of light. The ray came out by making a hole through melting of boiler's wall. The light was very surprising. Because, this light was obtained by pressure exerted on molecules of iron compound. When the fire came outside from the wall of copper made boiler, a visible hole expanding in size was detected. But, the hole was immediately disappeared due to shrinkage of metal on cooling. It is decided that a very high class interaction is involved for the creation of radiation. The light ray so produced in such a way provides a clue to derive the similar mechanism applicable for the source of solar energy.

The source of solar energy seems due to its big mass and high class gravity of the body. The high gravitational force is not only applied by the sun on its bodies of planetary family for revolution but also upon its own particles. Within the sun the gravitational force acting on its surface is maximum. The surface material undergo collision by interaction. The collision is the main cause of transformation of gravitational energy into radiative energy. An exhibition of density related gravitational pressure of a body due to which the matter within it remains in a state of interaction can be demonstrated in figure 1 by similar finding in earth surface also. The intra molecular type of interactions remain involved. This type of interaction comes to play as a result of gravitational pressure acting on the constituents of material body. The constituent molecules are energized for the movement. The movement of constituents molecules takes place towards opposite directions due to difference of density of constituents under gravitational force of home place. The high density particles go down ward while the low density particles come upward. This causes spectroscopic isolation of constituents by the involvement of intra molecular attractive interactions.



Figure 1. Interaction model showing isolation of constituents of different densities in geruwa stone under the gravity of earth.

The interaction can cause the collusion between the constituents also. Two different type of molecules which go towards opposite directions can collide with each other. Because, when there remains no any option except to interact by collision. The collision takes place during isolation in the bifurcating layer of two different kinds of molecules. As a matter of fact, the molecular state of matter goes to a state of change in its composition as a result of collision. For finding the place in an equilibrium state, the designing of reconstruction of other type of molecular structure takes place. The elementary particles of matter are rearraneged for reconstruction of new composition. As a result of interaction by collision, two groups of different composition of molecules give origination to a new group of molecules. An indication of space occupied by the resulting material is left as a spectroscopic marking of evidence for the dominance of interaction involved during restructuring of matter from its fundamental particles. This is shown in figure 2.

IV. RESULTS AND DISCUSSION

The sun is very big in its size and mass. Planets like bodies of relatively very less masses can only revolve around the great mass of this sun [5]. Thus, it becomes a rule that the mass of the body found at the centre of revolving body must be very high. So that, one sided gravitational force may be effective as necessary for the requisite revolutionary motion of lighter mass. The mass of the earth is 6×10^{24} kg. While, the mass of sun is 2×10^{30} kg. The mass of sun is 3.3×10^5 times the mass of the earth. The planet Jupiter is the biggest planet of the solar system. It is 318 times big in mass than earth. Of course, it is also revolving around the sun. The sun is 1000 times greater in mass than Jupiter. Only, the bodies lighter in mass can revolve around a body of heavier mass. Similar is the case for the revolution of moon around the earth. The mass of moon is 7.4×10^{22} kg. The earth is 81 times big in mass than moon. In case of revolutionary motion around the sun, the mass of the sun is so high that It's high gravitational pressure causes radiant pressure also. It means to say that the mass of a body for radiating as a star in the universe must be of such category so that the gravitational pressure exerted on its surface can force the matter to go for such a change by interaction which may be the cause for the development of radiant pressure. The stars can be assumed similar type of celestial bodies of relatively high mass comparable with that least mass whose gravitational pressure on the surface is able to create the gravitational pressure under which the matter is interacted to go for a change by collision with an emission of radiant energy.

Thus, the universe is the home of star systems spread over in the vicinity of each other. The family of the central body may be small or large. The mass of the central body of each star systems may differ from each other. Stars of various categories their existence in the universe by the respective comparison of temperature and luminousity is shown in the Hertz Sprung Russell diagram in figure 3. Stats are nominated as according to their size with respect to spectral classification. Stars of main sequence are viewed in the milky way galaxy. The sun is one of the hundreds of billions of stars in the Orion arm of milky way galaxy. The solar system is located about 26000 light years far from the galactic center. It is possible to measure the size of observable universe, which is currently has been estimated to be 93 billion light year in diameter. As it is obvious that a point in a space is surrounded by a open place of infinite space. On the basis of this finding, it can be said indeed that the universe is spread over infinitely. It is evidenced furthermore by observing the solar system that is so vastly surrounded by the boundary up to which the sun exerts its effect of gravitational force. Its active gravity is limited up to a certain distance in the presence of other star systems. It is a similar phenomena as an artificial satellite when it revolves around the earth is orbited by the gravitation of earth. But when going towards the moon, if it revolves around the moon, it is said to be orbited by the gravitational force of the moon. Thus, the bodies which revolve around and including the central body are not

gravitationally affected mutually by any other revolving system present in the vicinity in space.

V. CONCLUSION

Stars of different size and mass as imagined in this investigation are found same when the theory is correlated with the simple model of Hertz Sprung Russell diagram of universe of stars. In this investigation, the star systems are assumed to be spread over in the lap of universe. The solar system is one of them. An universe is designed in such a way that it appears as fixed. Because, the universe is the home of its star systems. The star systems are in equilibrium state of motion. Hence exist with out any dependence upon each other. Every thing in a star depends upon its mass. It exists due to its mass. It shines due to its mass. But, it remains statically bound by making a family of exo-planets which revolve around the head of the family so called the shining star. The inertial property of mass of a star would be comparatively very high in comparison to each of the body associated with due to revolving motion around the star. Thus stars of different masses are predicted to hold the universe. Because a star system for remaining in equilibrium state of motion at a rest position needs to be separated by a neighbouring star sufficiently. Hence due to such conditions, stars are found at different distances. The uncounted stars need a very large space to occupy. The infinite size of universe is sufficient for stars to shine. The stars shine due to their big mass responsible for creating such a gravitational pressure on the surface so that the matter in it is compelled to generate radiant energy. The collision between constituents of a star material may be the main cause of transformation of gravitational energy within a star into radiative energy.

ACKNOWLEDGEMENT

They author wants to dedicate this research paper in memory of his guide Dr. J. C. Joshi and Dr. D. D. Pant for providing research facilities during luminescence investigation carried in past as a fellow of council of scientific and industrial research.

REFERENCES

- [1]D. Halliday "Fundamental of Physics", Thomson's Publication, India, pp. 82 - 84, 2010.
- [2] N. C. Pandey "Revolutionary motion of a body under the action of resolution of acceleration due to gravity involved", International Journal of Scientific Research in Physics and Applied Sciences, Vol. 8, Issue 4, pp. 27 - 34, 2020.
- [3] S. G. Gupta "Classical Mechanics" Pragati Publication, India, pp. 216, 2010.
- [4] R. Kaitchuck, G. Turner and J. Childers "A Search For Exoplanets in Short- Period Binary Star Systems", Journal of Astronomy and Space Sciences, vol. 29, Issue 1, pp. 41 - 45, 2012.
- [5] S. Prakash "New Intermediates Physics", Nageen Publication, India, pp. 493 – 520, 2011.



Figure 2. Interaction model showing formation of iron oxides by collision between constituents of different densities in soft white marble stone under the gravity of earth.



Figure 3. Hertzsprung Russel diagram showing main sequence of milky way galaxy.