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Research Paper

A survey paper on the identification and behavioral aspects of Black Holes

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Abstract: *Our universe is so vast that the observable universe is just 5% as per some study. In this observable universe there are billions and billions of stars, galaxies and other massive formations. Black holes are one among them. But it gains attention due to its extreme gravitational force that even light can't escape from this and hence can't be seen. However, its behavior can be experienced and thus can not only identify but also analyses them in detail. This paper gives some light on the research made on black holes by some of the eminent professionals and thus summarizes it so that, this forms a stepping stone for further research.*

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1. Recent progress on the black hole information paradox

(Raghu Mahajan)

By giving a precise overview of black holes material, problems and qualitatively description. The latest research proposes that the page curve is followed by the Von Neumann entropy of hocking radiations, hence it is consisting the unitary information by preserving time evolution. The bedrock of modern classical physics is representatively formed by the electro dynamics theory wrote by maxwell and einstein's general relativity. Here the word classical terms as counter point to quantum. The theory of gravity prosed by Newton is modified classically by the accounts for the difference between what is seen and what is expected without it. Black holes are very strange but are solidly formed of general relativity. Few experiments have concluded that the black holes exists both via the direct imaging of black hole at the center of the M87 galaxy. There are also the observations of gravitational waves that are made when black holes collide and merge.

Black holes are former stars that uses up the nuclear fuel as they have no other sources of force going out to stop the attracting force of gravity from shrinking the matter of the star to "Nothing". The infinite force of gravity is at the center of the former star is replaced by the "singularity" that terms infinitely dense. There is a surface called the event horizon encloses the singularity and the radius of Black Hole is called the SCHWARZSCHILD RADIUS. The relationship between the mass of the black hole (M) and its SCHWARZSCHILD RADIUS (RS) is given by[1].

$$RS = \frac{2GM}{C^2}$$

If there is an object with mass which is equal to earth's mass has SCHWARZSCHILD RADIUS equal to 9mm. In simpler terms if we shrink the earth's radius lesser than 9mm it would become a black hole. Same way if there was an object whose mass was equal to twice the mass of sun it would have SCHWARZSCHILD RADIUS equal to 3 Kms. There is a region termed as "INTERIOR" which is situated between the singularity and the event horizon of the black hole where the force of gravity is extremely strong that even light cannot escape this region which travels in the speed of 3×10^8 m/s through a vacuum.

The only number one entropy constructed out of the huge matrix that encodes the final state of the hoking radiations is the Von Newmann entropy. Still, none of the mathematical calculations has come to a firm decision as it would be useful and knowledgeable to know as much as possible about the final state. Also, the full conclusion that can be drawn of the non-locality suggested by the existence of island remains to be worked out. There is also another important question which is not answered is the fate of singularity in a complete theory of Quantum

Gravity and how it affects the final hocking radiation. These questions have been a mystery for researchers for decades.

2. A study of formation and evolution of black hole.

(Neeraj Kumar Mishra, Priyanka Vaidya)

Based on all the previous assumptions of many scientists it has come to a conclusion that black holes are formed when huge star reaches the end of its journey and exhausts the internal thermos nuclear fuels and the star would gravitationally start to collide into itself while blowing out the outer layer.

A black holes a field in the space time which is inviable and cannot be seen due to the extreme force of gravitation which exerts every single particle even radiations such as light. According to the number of observable universes There are approximately forty quintillion black holes. As the star dies with the passage of time the number of black holes increases. The size of black holes varies. It could be as small as an atom or as big as a planet. The size of the blackhole does not matter with the mass of the black hole. Even the smallest black hole can weigh up to the mass of a huge mountain. There are a lot of black holes which are surrounded by gas and luminous stars and are present in the center of many galaxies. GAIA black hole is almost 1500 light years away from the earth turns out to be the closest blackhole to the earth.

By putting upon the 66 billion times the mass of the sun forms the mass of black hole TOW 618 which is considered as the ultra-massive black hole due to its enormous size. Based on the number of black holes it is almost negligible to count as there are so many blackholes. Still after a lot of observations and research there are hundreds of black holes that have been discovered in milky way galaxy. According to general relativity theory if the space time is decreased in its volume, it would form a blackhole. Blackholes are former black body and does not reflect light. The assumptions of the quantum field theory the event horizon emits hocking radiation. once the black hole is formed it continues to grow by observing the mass around it. The solar mass of the black hole would increase to millions by merging with other black holes. Stars which shine brightly and orbits the black hole determine the mass and location of black hole.

3. Relativistic theory of Black Holes

(Daniele Sasso)

The theory of gravity is the most authorized theory to understand the means of blackholes. Based on the relativistic theory black holes captivates anything even at very high energy such as celestial system, light and also quantum rays respect to one's observations. American physicist J A Wheeler termed it as black hole as everything went into it including light was unable to come out making it appear black. In the 18^{th} century Laplace and Michell assumed that the existence of a celestial body with a greatest mass has the ability to escape the speed of anything greater than light which was not able to withstand the strongest gravitational force exerted by any celestial body. In 1919 Eddington during the event of total solar eclipse he measured the diversion of light coming the remote star passing near the sun. so, he concluded that if there was a greatest celestial mass in place of sun and produce a greater deflection of light entering the event horizon could not get out by any chances.as time passed Karl Schwarzschild observed that if the force of gravity wants to exert something easily the mass of the body should be less. If the mass was increased it would be difficult for the force to exert. So, he concluded that size of the black hole is not concerned with the mass which is the greatest. An overview of few published papers tells that black hole doesn't exist. Still after a few experiments scientists have observed that black holes were captivating everything that passed through its event horizon. The theory of gravity proposed by either Newton or einstein tells us that black holes have the greatest mass which causes a very strong gravitational field. In Newton's theory (F_G) gravitational force on any (m) mass in a point at (r) distance from the center of gravity is shown by

$$F_G = \frac{G M m}{r^2}$$

Here G = 6.67 X 10^{-11} Nm2 Kg2 is the constant of universal gravitation. M is the mass of the celestial body that is generating the gravitational field more the M is more the gravitational force and more the r would be small. If a body wants to leave the surface of M celestial mass, the body should have an escape force Fe= ma_e. in the opposite direction to the direction of force of gravity. The observation of relativistic theory the binary star system has a different behavior according to the reciprocal position between the two stars inside the binary system. Here the relativistic theory described representing an alternative way with respect to the gravitational theory for explaining astronomical nature and physical behavior of black hole.

Conclusion

From the above-mentioned research articles, it is most probably evident that black holes do exists including in our Milky Way galaxy. It also gives an indication about its existence and behavioral aspects. Even the light gets absorbed and hence can't be seen. However, the luminous stars moving around the black holes will give information about the respective black hole. However, the information obtained so far about the black holes are significantly less. Hence, further research on various parameters of black holes is indeed required.

Author :

Ms. Chinmayi V born on 09-Nov-2011 is an amateur research student having keen interest in outer space research. She is in her 7thGrade. She has submitted many articles about space in her schooling and won many rewards. She is intending to build her career in the field of space research. This being a stepping stone for the same.

References

[1]. L D Landau and E M Lifschitz, The Classical Theory of Fields, Course of Theoretical Physics, Vol.2 (Pergamon Press, Oxford, 1975) ISBN 978-0-08-018176-9.
[2]. Clifford M Will, the confrontation between general relativity and experiment, Living Rev. Rel., Vol.17, No.4,2014, arXiv:1403.7377 [gr-qc].
[3]. Wald, R. M. (1997). "Gravitational Collapse and Cosmic Censorship". Black Holes, Gravitational Radiation and the universe springer. pp. 69-86.
[4]. Schutz, Bernard F. (2003). Gravity from the ground up. Cambridge University Press. P. 110.
[5]. D. Sasso Not Linear Element, Cosmological Redshift and Deflection of Light in the Gravitational Field, viXra.org, id; 1111.0036, 2011
[6]. S.J. Crothers, The Black Hole Catastrophe, viXra.org, id: 1111.0032, 2011