REVIEW OF RESEARCH

SOME PHYSICAL ASPECTS OF BLACK HOLES AND THEIR THERMAL-STATES

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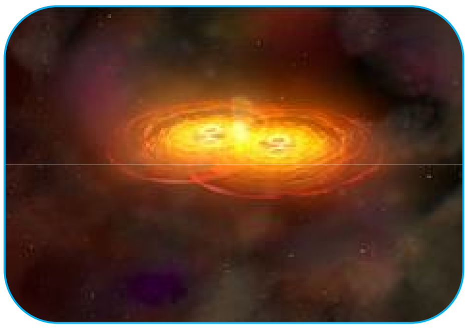


ABSTRACT:

Presently, intensive study on the shape and size of black holes is going on among the scientists working in the field of astrophysics. Every week some new characteristics regarding the black holes are found published in different esteemed journals. In this paper some simple laws of physics have been proposed, which supports the formation of black holes. Some characteristics of the black holes reported in literatures have also been explained easily on this proposition.

KEYWORDS: *Gravitational pull, White dwarf, black holes, Milky Way.*

1. INTRODUCTION:

Black hole is an area in space from which nothing can escape from it, not even a light particles, (photons). This is due to the fact that the gravitational pull possessed by it is so strong that it does not allow anything to get escaped from it. The general theory of relativity predicts that a sufficiently compact mass can deform space time to form black hole. In many ways a black hole acts as an ideal black body as it reflects no light. When living star is exhausted of its fuel, the nuclear reaction responsible for its energy generation ceases. So, the continuous nuclear blast taking place within the star stops. Now, there is no internal force to encounter the gravitational pull in the star. Due to gravitational pull the size of the dying star goes on decreasing which in turn goes on increasing the gravitational pull. This process goes on multiplying in to the dying star, till the size becomes point like structure having no volume of its own. This state of the matter in space is being called as the black hole.

2. GRAVITATIONAL PULL OF CELESTIAL BODIES:

The gravity force on the surface of the earth is described by Newton's law of gravitation. On a mass of one Kg object the gravity force applied by the earth is given as: GM/ R^2 .Where G is the gravitational constant. Its numerical value is given as: 6.63×10^{-11} Newton –meter^2 – Kg^{-2}. .Here R is the radius of the Earth. Its numerical value is: 6400000 meter. M is the mass of the Earth, whose numerical value is : 5.972×10^{24} Kg. Substituting these values ,it is found that the average value of gravity force acting on a body of one Kg mass is approximately 10 Newton. This type of force of attraction is exerted by each and every celestial body. This is also a fact that all the celestial bodies are of spherical shape. So, the gravitational force exerted by a celestial body not only depends upon its mass but also it depends upon the radius of the celestial body. The first factor is the mass of the body and the second factor is the radius of the spherical celestial body. The gravitational pull is directly proportional to the mass of the body and inversely proportional to the square of the radius of the sphere. Thus, the magnitude of this pulling force increases as the mass of the body increases. But this growth of pulling force does not increase linearly. The main cause of this decrease of this force is the increase of the radius of the celestial body with the increase of the mass of the body. If we consider the increase of mass only, then by increasing the mass 8 times, we find that the gravitational force increases by two times. But in the case of black hole, with increase of mass of the black hole its gravitational attraction increases very fastly.The root cause of this tremendous increase in the pulling force is that with the increase of mass of the black hole its size also decreases due to its own gravitational pull. With the increase of mass of the body the size of the body begins to decrease due to internal pulling forces. This becomes the root cause of the formation of the black hole. The cohesive force or the adhesive force acting between two molecules or atoms also goes on increasing; this also helps the formation of the black holes under some suitable circumstances.

3. BLACK HOLE CHARACTERISTICS:

When we imagine a tremendous amount of matter packed so densely that its gravitational pull on any particle is so large that nothing can escape from its gravitational pull, neither moon nor a planet and nor even a light particle (photon) [1,2]. That is why this state of body is called a black hole. From such body even there will be no reflection or refraction or scattering of light particles. Since from a black hole light cannot escape ,so It is also impossible for us to sense the other bodies in the neighbourhood of the black hole directly through our instruments, no matter what kind of electromagnetic radiation we use. The key is to look at the whole's effects on the nearby environment. In this context we can say that when a star happens to get too close to the black hole. It pulls on the star and rips it to shreds. When the matter from the star begins to bleed toward the black hole, it moves faster, so it becomes hotter and it begins to glow brightly. In this way the ambient of the black hole can be studied and the photographs may be possible.

4. BLACK HOLE INITIATIONS:

As it is reported that when a star several times greater than that of our sun goes on exhausted of its fuel such as hydrogen and other light gasses, the nuclear reaction of fusion which is the source of production of energy within the star diminishes. The internal pressure within the live star produced due the nuclear blast begins to diminish. It is called the dying star or white dwarf [3-5]. But it is still in unstable condition. The pressure inside the white dwarf goes on decreasing consequently; the gravity force goes on increasing. When the pressure inside it is overwhelmed by its gravity force and there is non to obstruct the gravity force within the star, then the equilibrium between gravity force and the pressure force is disturbed. Now the gravitational pull within the star goes on increasing and the size of the star also goes on decreasing. The remaining core collapses into a spot of infinite density and almost no volume. Now this state of the star is called the black hole [6-8]. It is reported that the smallest size of black holes ranges from the size of one atom having mass equivalent to masses of several mountains. The largest black hole is called super massive black hole. It is situated at the centre of galaxies. They're each more than one million times more massive than that of the Sun. But how these beasts are formed is still being examined [9].

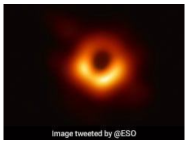
5. COALESCE PRINCIPLE OF CELESTIAL BODIES:

Generally, all the bodies in the nature are spherical in shape. If there are two celestial bodies being attracted towards each other due to gravitational pull, they will tend to form a single body .There may be several causes one of them may be their surface energy minimization. As for example, let us suppose that Mass of each body is M and radius is R. The surface energy of both the bodies in separate form will be = Twice of ($4\pi R^2 S$). Where S is the surface tension. When the two bodies will coalesce, the resultant surface area will become = $\sqrt[3]{4}$ Times of ($4\pi R^2 S$). It is apparent that this surface area is smaller than the surface area of the bodies when they are in separate status. Thus, it is natural that two or more white dwarfs will have tendency to be united into one form for minimising their surface area, so that the surface energy will become minimum.

If we consider that the celestial bodies are moving around each other as in the case of other celestial bodies then their total energy will be sum of potential energy and kinetic energy. $E = \frac{-Gm1m2}{r}$ +

$\frac{mr^2}{2}\omega^2$. *Here* $m1$ *and* $m2$ are the masses of two bodies , m is the reduced mass of the system, r is the separation between them.Since the potential energy is negative and the kinetic energy is positive .Hence there will must be a condition when the total energy will be optimum. To achieves this condition both the bodies will coalesce in the form of one body. In this way the probability of formation of black body takes place.

If we consider that the bodies such as white dwarf are at high temperature and they are in charged state. The particles in the white dwarf must be in concentric circular motions. Hence magnetic force of attraction will take place between the whirling particles of the white dwarfs. This force is responsible for minimising the size of the composite bodies. This is the reason that the whirling motion of charged particles appear in the neighbourhood of the black holes.



Black hole photograph from literature. Science | Edited by Niharika Banerjee | Saturday April 13, 2019 ,The first-ever black hole to be photographed has been named "Powehi".

The name Powehi, meaning embellished dark source of unending creation, was deliberated upon by astronomers and renowned Hawaiian language professor, Larry Kimura.

The whirling motion of charged particles in black holes, copied from literature.

Near black hole the bodies are attracted with tremendous force of attraction. Due to perturbation by other bodies the motion becomes centripetal in nature. Some bodies make direct collision with heavier body. Under certain circumstances some mass of the body is converted into energy of high frequencies .Some of which are in visual range. So, in the neighbourhood of black hole some light appears.

6. ISOLATION OF BLACK HOLES:

It is estimated that once a black hole is formed, in the range of 20000 light years there will be no other bodies found. These bodied will be swallowed by the black hole. Even light particles cannot pass through the neighbourhood of the black hole.

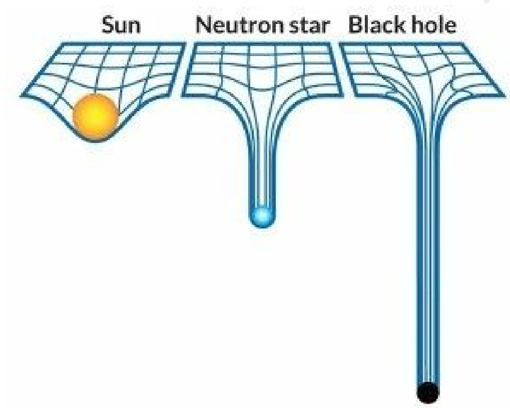
It is safe to observe a black hole if we stay away from its event horizon .It is similar to the gravitational field of a planet. This zone is the point of no return, when we are too close to the back hole there will be no any hope of rescue. But we can safely observe the black hole from outside of this arena.

7. DIFFERENT STAGES OF STARS:

When a white dwarf is formed, initially its temperature is very high. But because it has no source of energy, it would gradually cool as it radiates its energy. Therefore, that its radiation, which initially has a high colour temperature, will lessen and redden with time. A white dwarf takes very long time to cool. Then it begins to crystallize starting with core. Therefore , a star at low temperature will no longer emit significant heat or light, and it is called a cold black dwarf. Because the length of time it takes for a white dwarf to reach this state is calculated to be longer than approximately 13.8 billion years. So, it is thought that no black dwarfs yet exist. The oldest white dwarfs still radiate at temperatures of a few thousand Kelvin's.

It is estimated that a supernova may occur about once in every 50 years in a galaxy of the Milky Way [10,11]. An star can always be exploding somewhere in the universe. Some of those aren't too far from Earth. About 10 million years ago, a cluster of supernovae created the "Local Bubble," a 300-light-year long, peanut-shaped bubble of gas in the interstellar medium is present that surrounds the solar system. However, it depends in part on its mass. Presently our sun doesn't have enough mass to explode as a supernova. However, if once the sun will become out of its nuclear fuel, perhaps in a couple billion years, it will swell into a red giant that will likely vaporize our world, before gradually cooling into a white dwarf [12]. But with the right amount of mass, a star can burn out in a fiery explosion.[13,14].When an old star is about to die it's volume goes on shrinking keeping the mass the same which increases its density. Now this creates a very large depression in the body creating a very strong gravitational pull. Finally it may form a black hole. In a black hole millions and billions of tons of mass is packed in a relatively small volume which creates a point of almost infinite density leaving a "hole" in the structure.

White dwarf



Just like this but in 3-D. This depression is so deep that its gravitational pull is also almost infinite. This force of gravitation is so strong that the escape velocity even exceeds the velocity of light. In this figure the relative strength of gravitational pull has been shown in the living star, in the white dwarf and in the black hole.

8. CONCLUSION:

Thus, a black hole is a point of infinite density on the space time curvature. The formation of black hole starts from a star which is a matter in space and it ends in nothingness in space. Black holes are also said to be get way between different dimensions under some defined circumstances of a minimum size of stellar mass. The chain of fusion reactions taking place into the star comes to an end. Therefore, the remaining stellar material collapses under its own gravity to a very dense remnant. This has been very well validated in the photographs of the event horizon of a black hole recently published as the first direct observational evidence of a black hole.

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