

BLACK HOLE

According to 'MATTER (Re-examined)'

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Abstract: Physical parameters of stable galaxies produce sufficient mutual repulsion by their halos to overcome gravitational attraction between them. However, those very large galactic clouds (or central regions of stable galaxies), which do not develop sufficient spin speeds to develop into stable galaxies, succumb to gravitational collapse and form very large single macro bodies of very high matter density. Their huge sizes and very large matter content give them certain logical properties, one of which is to reduce and prevent outward radiation (of light) from the zone of their existence. This phenomenon makes them invisible, hence the name 'Black Hole'. An alternative concept, presented in the book 'MATTER (Re-examined)' envisages removing all mysteries about black holes and explaining logical sequences of their birth, life and death.

Keywords: Gravitational attraction, universal medium, galaxy, black hole, photon, radiation of light, galactic spin, entropy.

Introduction:

From observed parameters of cosmic bodies, certain regions of space appear to influence patterns of their motions. Apparently, no physical bodies could be detected in these regions to cause the intense gravitational attraction noticed to exude from the region. As gravitational attraction was assumed as a property of material bodies, the presence of a macrobody in this region was the only logical conclusion. It was common knowledge that even those macro bodies which caused much lower gravitational attractions radiated heat, light and other forms of matter and energy. Absence of any sort of radiation from the region of the assumed macrobody (that caused intense gravitational attraction on nearby macrobodies) was the reason for its name, 'black hole'. Contradictions between current physical laws and the behaviour of 'black holes', determined by observation of nearby macro bodies, lead to many illogical assumptions, mysterious phenomena and mathematical theories rather than an advance in research for logical explanations on gravitation and properties of radiation.

A 'black hole' is usually defined as 'a region of space from which nothing, not even light, can escape', intact. It is assumed to be a region occupied by a huge, invisible and very dense macrobody. Smaller macrobodies, alleged to have the mathematical properties of black holes, as described in a few modern theories, are mere fantasies.

A black hole, except for its volumetric size and quantity of matter it contains, is an ordinary macrobody. It has no illogical, mystical or magical properties (like infinite matter-density, event horizon, singularity, cause of spatial curvature, gravitational time dilation, etc.). It obeys all physical laws applicable to all other 3D material bodies in nature, under all conditions. It is the peculiar behaviour of radiations emanating from the region of a black hole which makes a black hole invisible. Different stages in the natural development of a galactic cloud (depending on its spin speed, 3D matter

content and radial size) result in the formation of a static, spinning and stable galaxy with a black hole at its centre or as a single black hole, moving freely in space.

The 3D matter content and 3D matter-density of a 'black hole' are so great that gravitational attraction on its constituent parts prevents their escape from the main macrobody. The 3D matter-density of a black hole is raised to a very high magnitude not by fusing elementary and fundamental matter-particles but by bringing them very near to each other and reducing interparticle spaces in the macrobody. Only the corpuscles of light (or similar radiations), which are the lightest and smallest three-dimensional matter-particles, may be radiated outwards from a black hole. However, during their motion away from a black hole, the 3D matter-contents of corpuscles of light (or other radiations) are progressively dispersed into the surrounding universal medium until (in most cases) the whole of their 3D matter-contents and light itself disappears before moving far out from a black hole. This is understood as prevention of light from escaping from a black hole.

Contemporary theories generally assume that light is gravitationally attracted to fall back into a black hole, and intense gravitational attraction towards a black hole prevents it from escaping farther into open space. This is in spite of the fact gravitational attraction is strictly restricted to entities with masses (3D matter-contents) and light is considered to have no mass. Alternatively, it is also assumed that action similar to gravitational attraction on light is made possible by curvature of space-time around a black hole, etc.

Actually, black holes do not prevent light from escaping from their region. 3D matter-contents from corpuscles of light are disbursed into the surrounding universal medium due to very high gravitational attraction towards the black hole. Light is lost during its radiation, away from the black hole. The role of a black hole is only to provide sufficient gravitational attraction for this process. Because of this phenomenon, astrophysicists searching for black holes have to rely on indirect observations. A black hole's existence can sometimes be inferred by observing its gravitational interactions with other macrobodies near its surroundings.

Black holes are routinely produced by galactic clouds, formed in the intergalactic region of space. Super-sized galactic clouds may condense into either a single black hole, an unstable galaxy or a stable galaxy with a black hole at its centre. Accidental collisions between unstable galaxies may form a supergalaxy with a possibility of a set of binary black holes at its centre. A black hole continuously radiates away its 3D matter-content in the form of photons (corpuscles of light or other radiations). This tendency gradually reduces its total 3D matter-content. Depending on the total 3D matter-content of a black hole, the rate of loss of 3D matter-content may vary and cause different phenomena, leading towards its death.

Matter cannot be compressed to infinite 3D matter-density or to zero volume. The highest 3D matter-density is that of a corpuscle of light, which is the same as that of a quantum of matter in the universal medium. Macrobodies, under high internal pressure, radiate away their 3D matter-contents. Under high external pressure, superior 3D matter-particles break down into constituent fundamental or primary matter-particles, rather than fuse together. Therefore, it is impossible to create a macrobody of infinite 3D matter-density.

All conclusions expressed in this article are taken from the book 'MATTER (Re-examined)' [1]. For details, kindly refer to the same.

Gravitational collapse of a macro body:

In all macro bodies, inter-particle gravitational attractions continuously attempt to bring their 3D matter-particles nearer. Consequently, all large macro bodies gradually reduce in volume. This process may be called 'gravitational collapse'. Gravitational collapse of a macrobody is a gradual process, and it will continue until the body's volume is reduced sufficiently so that collapsing efforts are compensated by its internal pressure, provided by inter-particle 'apparent repulsions'. Gravitational collapse acts as external compression on macrobodies. The magnitude of external compression gradually increases towards the macrobody's centre.

During the gravitational collapse of a large macrobody, all of its 3D matter-particles tend to move towards the macrobody's centre. However, depending on the relative positions of 3D matter-particles within the macrobody, especially in a macrobody with an uneven distribution of 3D matter-particles, each of them may have gravitational attraction of diverse magnitudes in directions different from radial lines of the macrobody. The resultant uneven directions of gravitational attraction on 3D matter particles give them not only a radial motion but also an angular motion about the centre of the macrobody. As a result of angular motions of constituent 3D matter particles, the whole of the macrobody develops rotary motion during gravitational collapse about its centre.

Internal pressure within a macrobody acts as external pressure on all its constituent 3D matter-particles. External pressure compels them to discard parts of their 3D matter contents. A lowered matter-content level gradually changes the physical state of a macrobody into a gaseous state. If 3D matter content is discarded and the 3D matter-particles are few, they may be absorbed by the surrounding universal medium to spread itself outwards. Outward displacement of the universal medium appears as 'gravitational repulsion' (which may create repulsive inertial motion).

When the number of quanta of matter discarded from 3D matter-particles is more than that which can be readily absorbed by the surrounding universal medium, they are converted into photons, which radiate away from the region. Large macrobodies (black holes, stars, large planets, etc.) radiate matter and energy in this manner, due to their gravitational collapse. They do not require hydrogen fusion or other nuclear reactions to produce matter and energy radiations from them, as is believed today.

The development of a galactic cloud depends on its total 3D matter content and the nature of its gravitational collapse. Depending on the physical size of the galactic cloud and parameters of its spin motion, it may develop into a single macrobody or into a number of separate macrobodies of various sizes in a group, or it may disperse all of its 3D matter particles in a few parallel planes in space. In due time, a galactic cloud with low or no spin speed collapses and condenses (under the action of gravitational attraction between its constituent 3D matter particles) to form a large macrobody called a 'black hole'.

Black hole:

Approximate spin speed, ω , of a stable galaxy, as given by equation (16/2) in the book 'MATTER (Re-examined)' is

$$\omega = \text{Tan}^{-1} \frac{MG}{4R^2c}$$

where ω is angular speed, M is total 3D matter-content (mass) of the galaxy, G is gravitational constant in the 3D spatial system, R is radius of galaxy and c is the speed of light.

Should the magnitude of angular speed, ω , or radius, R, of a galactic cloud become comparatively lesser (even in a galactic cloud that forms a stable galaxy, its central region has relatively lower angular speed with a smaller radius) or the galactic cloud have no spin motion during its formation, outward (centrifugal) radial motion of 3D matter-particles is too slow to compensate for their inward radial (centripetal) motion due to gravitational collapse. A galactic cloud or its central part shrinks at an accelerating pace to form a single, very dense macrobody called a 'black hole', with low spin speed or without spin motion at all. This macro body has no protection from gravitational attraction towards other macro bodies in space, as in the case of a stable galaxy. A black hole at the centre of a galaxy acts as an integral part of the galaxy. Since a stable galaxy has no translational motion, a black hole at the centre of a galaxy maintains its steady state in space.

The main difference between a black hole and a galaxy is in the distribution of their 3D matter-contents. In a black hole, the whole of its 3D matter-content is concentrated in a single, relatively small region, but the total 3D matter-content of a galaxy is distributed over a wide region in space in the form of small macro bodies and dust clouds.

Matter-density of black hole:

The 3D matter-density of foundational matter-particles (in all spatial dimensional systems) is the highest and constant. An all-encompassing universal medium, together with basic 3D matter particles in it, forms a single 'block of matter' of this (highest and constant) matter-density. However, when we consider superior 3D matter-particles or macrobodies separately, we consider only their constituent basic 3D matter-particles and ignore the universal medium in inter-particle space. Thus, depending on the concentration of constituent basic 3D matter-particles, a macrobody's matter-density is much less than that of its constituent basic 3D matter-particles. Basic 3D matter-particles, constituting fundamental particles of a macrobody, cannot be moved nearer without disastrous results. Therefore, it is impossible to increase the matter-density of a macro body so that it approaches or exceeds the matter-density of a basic 3D matter-particle [1].

Gravitational collapse of a non-spinning galactic cloud (or slow-spinning galactic cloud or central region of a spinning galactic cloud) brings its constituent atoms and molecules nearer and increases its internal pressure. We shall call this type of macro body a 'proto-black hole'. As internal pressure increases, its constituent primary matter-particles discard parts of their matter-contents in the form of free quanta of matter into the universal medium. If discarded quanta of matter are few, they are absorbed into the surrounding universal medium. If discarded quanta of matter are available in sufficient quantity, they form new photons, which radiate in various directions. The frequency (3D matter-content) of photons, radiated from this zone, gradually increases as gravitational collapse continues to increase with a proportional increase in the proto-black hole's internal pressure.

Fundamental matter-particles (like electrons and protons) or primary matter-particles (bitons) cannot merge their 3D matter-contents to form different types of 3D matter-particles (like neutrons). Each 3D matter-particle has its definite structure and form, which is controlled by the universal medium during its development. Primary matter-particles may combine to form superior 3D matter-particles (like electrons, positrons, protons, neutrons, etc.), but their 3D matter-contents cannot merge to form 3D matter-particles of higher 3D matter-density. The possibility of the merger of 3D matter-particles to form a macrobody of infinite matter-density (and resulting singularity) is a baseless imagination.

Loss of 3D matter-content, from primary 3D matter-particles, results in their expansion. Expansion of 3D primary matter-particles, in turn, increases the volume of all atoms and molecules of the proto-black hole. Therefore, as a proto-black hole loses its 3D matter-content during gravitational collapse, expansion of its constituent 3D matter-particles tends to reduce the sum total reduction in its (radial) size. Gravitational collapse tends to bring constituent 3D matter-particles of a proto-black hole nearer. As inter-particle gravitational attraction depends on the distance between 3D matter-particles, gravitational collapse tends to accelerate. Inter-particle gravitational attraction, during gravitational collapse, brings a proto-black hole's constituent 3D matter-particles nearer to increase its 3D matter-density and reduce its (radial) size. No external effort can merge 3D matter-contents of two 3D matter-particles, however large the effort may be.

Inter-particle distance in a proto-black hole is reduced due to gravitational collapse and due to expansion of primary matter-particles. Both these actions tend to increase the internal pressure of a proto-black hole. The internal pressure of a proto-black hole acts as external pressure on its own 3D matter-particles. Gradual increase in external pressure on primary matter-particles causes them to discard part of 3D matter content and expand in size. Expansion of primary matter-particles causes expansion of the proto-black hole itself. This is against size reduction of the proto-black hole by gravitational collapse. Empirical laws show that both gravitational attraction and 'field forces' are inversely proportional to the square of the distance between two material bodies of corresponding natures. Magnitudes of these efforts may vary due to the differences in values of constants of proportion in the equations.

3D matter-particles / bodies cannot be compressed beyond certain pressure and yet maintain their identity as 3D matter-particles / bodies. The highest matter-density of 3D matter is that of the

matter-core of a photon (the same as that of a quantum of matter). It is impossible to produce compression greater than gravitational pressure on the matter-core of a photon. Because that is the ultimate pressure that can be applied by the universal medium. The 3D matter-density of superior 3D matter-particles, structured by photons in various formations, is only a minute fraction of the matter-density of its constituent photons. In this case, we ignore the presence of the universal medium in inter-particle space and consider only 3D matter within the region to determine the 3D matter-density.

Attempting to compress 3D matter-bodies beyond reasonable limits causes their disintegration into primary and fundamental matter-particles. At the level of primary matter-particle, compression of a 3D material body tends to increase its volumetric size and to revert part of its 3D matter-content back into the universal medium. Hence, the notion that matter can be compressed to infinite matter-density (as is believed in Big Bang theory and other similar theories) is not reasonable. A very large macro body, under gravitational collapse, cannot compress its 3D matter-content indefinitely. As external pressure on its 3D matter-particles increases, they lose more and more 3D matter-content and expand to greater sizes. Expansion of a macrobody reduces the effective 3D matter-density of its material.

Stability of black hole:

During certain stages in the life of a black hole, expansion of its body due to loss of 3D matter-content may equalise or overcome the size reduction due to gravitational collapse. This stage may extend over a long period of time, and the black hole may be considered a stable macrobody during this period. Due to gradual increase in gravitational collapse, the black hole continues to lose 3D matter-content from all its primary matter-particles. However, (disregarding the additions from external sources) the total number of constituent primary matter-particles (hence, the total number of atoms in the body) remains steady until 3D matter-particles at its equatorial surface start to disintegrate due to very high linear speed.

Irrespective of its very large size or total 3D matter-content, a macro body remains as a stable black hole as long as the linear speed of 3D matter-particles at its equatorial surface (due to spin motion) does not have sufficient centrifugal action on them to overcome gravitational attraction towards its centre. Centrifugal action on these 3D matter-particles may vary as the black hole expands due to loss of its 3D matter-content. As and when the linear speed of 3D matter-particles on the black hole's surface reaches the speed of light, they break down to constituent photons and radiate in various directions.

A black hole, being a 3D material body, is continuously under gravitational attraction towards various macrobodies in space. A black hole, formed in the centre of a galaxy, remains more or less steady without translational motion. Gravitational attractions on this black hole towards numerous macrobodies in the galaxy in various directions nullify and produce no resultant translational effect of the black hole. All other black holes are moving macrobodies in space.

Invisibility of black hole:

As gravitational collapse of a proto-black hole progresses as a single macrobody and its internal pressure reaches high values, a large quantity of quanta of matter is available at its central region (where internal pressure is highest) at a very high rate. They form very high-frequency photons and radiate away from the region of their creation. Since the proto-black hole is a single macrobody, it has all its 3D matter-content (represented by rest mass) concentrated in one region of space. Therefore, the magnitude of gravitational attraction between the proto-black hole and photons radiating away from the region of the proto-black hole is very high.

A photon, from the instant of its creation, is an independent basic 3D matter-particle. A photon, moving away from the region of a black hole, is gravitationally (apparently) attracted towards constituent photons in the black hole as and when their disc-planes of their 3D matter-cores coincide. This gravitational attraction is an external effort on an outward-moving photon to slow it down in its

linear motion. An attempt to slow down a photon's linear motion reduces its 3D matter-content (frequency) rather than its speed [1].

Since a black hole is very large, it has numerous photons, disc-planes of which 3D matter-cores may coincide with the disc-plane of the 3D matter-core of an escaping photon at any instant. Because of the very large size of the black hole, the disc-plane of the 3D matter-core of an escaping photon coincides with the disc-planes of the 3D matter-cores of constituent photons of the black hole for a larger fraction of its spin angle. This increases the duration of effective gravitational attraction between the black hole and the photon. These two factors, together, ensure that a photon, moving away from a black hole, is under greater gravitational attraction towards the black hole for considerable time during every turn of its spin, compared to a photon moving away from a smaller or less-dense macrobody.

Gravitational attraction between a black hole and a photon that is moving away from the black hole acts against the photon's linear motion and attempts to reduce its linear speed. By the inherent nature of the universal medium, to sustain the linear speed of a photon at a critical constant value, external action is needed to reduce the photon's speed and let the photon's 3D matter-core gradually lose 3D matter-content. Due to very high gravitational attraction, most of a photon's 3D matter-content is lost before it moves much farther from the black hole. Even if the photon were of very high frequency at the beginning of its journey, its 3D matter-content would be lowered to such an extent that it would be below the visible (observable) range before long. Frequencies of all photons (escaping or moving away from the region of a black hole) reducing below the visible range makes the region of the black hole invisible to all outside observers.

Photons, escaping from the region of a black hole, continue to lose their 3D matter-contents even after they become invisible. This process continues until the whole of their 3D matter-contents are reverted to the universal medium and their 3D matter-cores cease to exist. Since, all through the process of losing its 3D matter-content, an escaping photon continues to move at its critical constant linear speed, quanta of matter reverted from the 3D matter-cores of escaping photons are dispersed in a very large area of space and are easily absorbed into the universal medium instead of forming new photons.

Until the quantity of 3D matter in a black hole has come down to a reasonably low level, the 3D matter-content of all photons radiated from its region of space is reverted into the universal medium before they can escape gravitational effects between them and the black hole. These photons are not returned to the black hole; instead, their 3D matter-cores are dispersed into quanta of matter and absorbed by the surrounding universal medium. No photons of visible range, from the region of a black hole, reach the observers in space until 3D matter-content of the black hole has diminished to a small magnitude. Until such times, the black hole will remain invisible to all outside observers.

Photons, which are radiated in directions slanting away from vertical to the surface of a black hole, may not always move away from the black hole. Gravitational attractions on them may compel them to orbit around before they are gradually pulled back into the black hole. During their return journey, towards the black hole, gravitational attraction tends to accelerate them. The tendency to increase the linear speed of a photon increases its 3D matter-content (with a corresponding increase in its frequency) rather than raising its linear speed. Therefore, these photons are blue-shifted. However, as they move towards the black hole, outside observers cannot see them, and the black hole maintains its invisibility.

Back ground radiation:

Gravitational attraction tends to slow down all photons radiated away from the region of a black hole. Photons continuously lose their three-dimensional matter content to the surrounding universal medium until they cease to exist. Towards the end of its life, a photon's 3D matter-content and frequency are very low. Associated structural distortions in the universal medium surrounding the 3D matter-core of the low-frequency photon resemble a very low-frequency electromagnetic wave. At the instant when the last of the 3D matter-content of the photon's 3D matter-core is reverted into the

universal medium, only a very low-frequency EM wave in the universal medium survives as a residue of the dead photon.

This low-frequency EM wave continues to radiate in the original direction of the photon's linear motion. Residue EM waves from dead photons (due to other reasons also) in space appear as 'background radiation' from space. As all photons at the end of their existence (as basic 3D matter-particles) contain a somewhat similar amount of 3D matter, their frequency is nearly the same. Because of this, EM waves appearing as background radiation are of constant frequency. 3D matter is more or less evenly distributed in space, unto the infinite extent of the universe. Distribution of dying photons is also on the same basis. Therefore, magnitudes of background radiations received from all directions in space are the same.

Evaporation of 3D matter:

Reduction in the total 3D matter-content of a black hole, due to radiation in the form of photons, may be understood as its evaporation. Evaporation, gradually, reduces 3D matter content of the black hole and energy associated with the lost part of the matter. However, the total number of primary and fundamental matter-particles in the black hole remains, more or less, constant. These 3D matter-particles would regain their lost 3D matter-content and associated energy as and when they are dispersed from the black hole into free space due to any reason. This phenomenon prevents large-scale destruction of 3D matter-particles from nature, even during the recycling of 3D matter from its three-dimensional status (where entropy gradually increases) to one-dimensional status in the universal medium (where magnitude of entropy is nil).

An evaporating black hole, towards the end of its stable life, increases in radial size, corresponding to the reduction in total 3D matter-content. Its 3D matter-density decreases, and radiations of various frequencies start escaping the gravitational influence about it. As the black hole becomes visible, it will lose its status as a black hole. It may then evolve into different types of macrobodies, currently considered mysterious.

Conclusion:

Very large galactic clouds or central regions of stable galaxies, which have relatively lower spin speeds, condense to become 'black holes'. They are so named because of their invisibility due to the non-survival of radiation from their region of space to reach observers far from them. Except for their large bulk and size, black holes are perfectly normal physical macrobodies in the cosmos. They have neither mysterious properties nor strange behaviour. Every physical law is applicable to a black hole, under all conditions, as it is for any other physical body in nature. Black holes are mechanical necessities of (galactic) formations of macrobodies in space. Black holes perform very important functions to preserve the perpetual steady state of the universe by recycling matter between its three-dimensional state (where entropy increases) and one-dimensional state in the universal medium (where entropy is zero) in both ways during different stages of their life. Black holes, during different stages of their development, are called by different names.

Reference:

[1] Nainan K. Varghese, *MATTER (Re-examined)*, <http://www.matterdoc.in/>

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