

# 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 3D matter-density. Their huge sizes and very large 3D matter-contents 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 and hence the name, 'Black Hole'. An alternative concept, presented in the book 'MATTER (Re-examined)' envisages to remove all mysteries about black holes and to explain 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 intense gravitational attraction noticed to exude from the region. As gravitational attraction was assumed as a property of three-dimensional matter-bodies, presence of a macro body in this region was the only logical conclusion. It was a common knowledge that even those macro bodies, which caused much lower gravitational attractions radiated heat, light and other forms of 3D matter and energy. Absence of any sort of radiation from the region of assumed macro body (that caused intense gravitational attraction on nearby macro bodies) was the reason for its name, 'black hole'. Contradictions between current physical laws and behaviour of 'black hole', determined by observation of near-by 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 as a region occupied by a huge, invisible and very dense macro body. Smaller macro bodies, alleged to have mathematical properties of black holes, as described in few modern theories are mere fantasies.

A black hole, except for its volumetric size and quantity of matter it contains, is an ordinary macro

body. 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 matter-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 natural development of a galactic cloud (depending on its spin speed, 3D matter-content and radial size) results in 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.

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 main macro body. 3D matter-density of a black hole is raised to very high magnitude not by fusing elementary and fundamental 3D matter-particles but by brining them very near to each other and reducing inter-particle spaces in the macro body. Only corpuscles of light (or similar radiations), which are lightest and smallest 3D matter-particles, may be radiated outwards from a black hole. However, during their motion, away from a black hole, 3D matter-contents of corpuscles of light (or other radiations) are progressively disbursed into surrounding universal medium until (in most cases) 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 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 between 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 its region. 3D matter-contents from corpuscles of light are disbursed into surrounding universal medium due to very high gravitational attraction towards black hole. Light is lost during its radiation, away from black hole. Role of 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 apparent gravitational interactions with other macro bodies, near its surroundings.

Black holes are routinely produced by galactic clouds, formed in intergalactic region of space. Super-sized galactic clouds may condense either into a single black hole, unstable galaxy or into a stable galaxy with a black hole at its centre. Accidental collision between unstable galaxies may form super galaxy 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 total 3D matter-content of a black hole, rate of loss of 3D matter-content may vary and cause different phenomena, leading towards its death.

3D matter cannot be compressed to infinite matter-density or to zero volume. 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. Macro bodies, under high internal pressure, radiate away their 3D matter-contents. Under high external pressure, superior 3D matter-particles breakdown into constituent fundamental or primary matter-particles, rather than fuse together. Therefore, it is impossible to create a macro body of infinite 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 its 3D matter-particles nearer. Consequently, all large macro bodies gradually reduce in volume. This process may be called 'gravitational collapse'. Gravitational collapse of macro body is a gradual process and it will continue until 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 each part of macro body. Magnitude of external compression gradually increases towards macro body's center.

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

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

When number of quanta of matter, discarded from 3D matter-particles, is more than that can be readily absorbed by surrounding universal medium; they are converted into photons, which radiate away from the region. Large macro bodies (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.

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

### **Black hole:**

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

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

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

Should magnitude of angular speed,  $\omega$ , or radius, R, of a galactic cloud are comparatively lesser or galactic cloud has 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. (Even in a galactic cloud that forms a stable galaxy, 3D matter-particles in its central region has relatively lower linear speed due to smaller radius of path). Galactic cloud or its central part shrink at an accelerating pace to form a single, very dense macro body called black hole, with low spin speed or without spin motion at all.

Reversion of 3D matter, radiated from black hole causes outward expansion of universal medium. Although this phenomenon provides certain degree of gravitational repulsion, in most cases, gravitational attraction due to its total 3D matter-content is likely to exceed the gravitational repulsion. This macro body has no protection from gravitational attraction towards other macro bodies in space, as in the case of stable galaxy. A black hole at the center of a galaxy acts as an integral part of the galaxy. Since stable galaxy has no translational motion, black hole at the centre of galaxy maintains its steady state in space.

Main difference between a black hole and a galaxy is in the distribution of their 3D matter-contents. In a black hole, whole of its 3D matter-content is concentrated in a single, relatively small region but 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.

### **3D matter-density of black hole:**

3D matter-density of foundational matter-particles (in all spatial dimensional systems) is the highest and constant. All-encompassing universal medium, together with basic 3D matter-particles in it, form a single 'block of matter' of this (highest and constant) matter-density. However, when we consider superior 3D matter-particles or macro bodies, separately, we consider only their constituent basic 3D matter-particles and ignore universal medium in inter-particle space. Thus, depending on concentration of constituent basic 3D matter-particles, macro body's 3D matter-density is much less than that of its constituent basic 3D matter-particles. Basic 3D matter-particles, constituting fundamental particles of a macro body cannot be moved nearer without disastrous results. Therefore, it is impossible to increase 3D matter-density of a macro body, so that it approaches or exceeds 3D 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 as 'proto-black hole'. As internal pressure increases, its constituent primary matter-particles discard parts of their 3D matter-contents in the form of free quanta of matter, into universal medium. If discarded quanta of matter are few, they are absorbed into surrounding universal medium. If discarded quanta of matter are available in sufficient quantity, they form new photons, which radiate in various directions. Frequency (3D matter-content) of photons, radiated from this zone, gradually increase as gravitational collapse continues to increase with proportional increase in 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 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. Possibility of merger of 3D matter-particles to form macro body 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 volume of all atoms and molecules of proto-black hole. Therefore, as a proto-black hole loses its matter-content during gravitational collapse, expansion of its constituent 3D matter-particles tends to reduce sum total reduction in its (radial) size. Gravitational collapse tends to bring constituent 3D matter-particles of proto-black hole, nearer. As inter-particle gravitational attraction depends on distance between 3D matter-particles, gravitational collapse tends to accelerate. Inter-particle gravitational attraction, during gravitational collapse, brings 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 internal pressure of proto-black hole. Internal pressure of 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 proto-black hole itself. This is against size-reduction of proto-black hole by gravitational collapse. Empirical laws shows that both gravitational attraction and 'field forces' are inversely proportional to square of distance between two 3D matter-bodies of corresponding natures. Magnitudes of these efforts may vary due to differences in values of constants of proportion in equations.

3D matter-particles / bodies cannot be compressed beyond certain pressure and yet maintain their identity as 3D matter-particles / bodies. Highest matter-density of 3D matter is that of 3D matter-core of a photon (same as that of a quantum of matter). It is impossible to produce compression greater than gravitational pressure on 3D matter-core of a photon. Because, that is the ultimate pressure that can be applied by universal medium. 3D matter-density of superior 3D matter-particles, structured by photons in various formations, is only a minute fraction of 3D matter-density of its constituent photons. In this case, we ignore presence of universal medium in inter-particle space and consider only 3D matter within the region to determine 3D matter-density.

Attempt 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 matter-body tends to increase its volumetric size and to revert part of its 3D matter-content, back into 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 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 macro body reduces effective 3D matter-density of 3D matter in it.

#### **Stability of black hole:**

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

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

A black hole, being a 3D matter-body, is continuously under gravitational attractions towards various other macro bodies 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 macro bodies in the galaxy in various directions, nullify and produce no resultant translational effect of the black hole. All other (independent) black holes are moving macro bodies in space.

#### **Invisibility of black hole:**

As gravitational collapse of a proto-black hole progresses as a single macro body and its internal pressure reaches high values, large quantity of quanta of matter are available at its central region (where internal pressure is highest), at 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 macro body, it has all its 3D matter-content (represented by rest mass) concentrated in one region of space. Therefore, magnitude of gravitational attraction between proto-black hole and photons, radiating away from the region of 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 black hole, as and when disc-planes of their 3D matter-cores coincide. This gravitational attraction is an external effort on 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 linear speed [1].

Since black hole is very large, it has numerous photons, disc-planes of whose 3D matter-cores may coincide with disc-plane of 3D matter-core of escaping photon, at any instant. Because of very large size of black hole, disc-plane of 3D matter-core of an escaping photon coincides with disc-planes of 3D matter-cores of constituent photons of black hole for larger fraction of its spin angle. This increases duration of effective gravitational attraction between 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 macro body.

Gravitational attraction between black hole and a photon that is moving away from a black hole acts against photon's linear motion and attempts to reduce its linear speed. By inherent nature of universal medium, to sustain linear speed of photon at critical constant value, external action to reduce photon's speed, let photon to gradually lose 3D matter-content from its 3D matter-core [1]. Due to very high gravitational attraction, most of photon's matter-content is lost before it moves much farther from black hole. Even if the photon was of very high frequency at the beginning of its journey, its 3D matter-content will be lowered to such extent that it is below visible (observable) range before long. Frequencies of all photons (escaping or moving away from the region of a black hole) reducing below visible range makes the region of 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 whole of their 3D matter-contents are reverted to universal medium and their 3D matter-cores cease to exist. Since, all through the process of losing its matter-content, an escaping photon continues to move at its critical constant linear speed, quanta of matter reverted from matter-cores of escaping photons are dispersed in very large area of space and are easily absorbed into universal medium, instead of forming new photons.

Until, quantity of 3D matter in a black hole has come down to reasonably low level, 3D matter-contents of all photons, radiated from its region of space, are reverted into universal medium before they can escape gravitational effects between them and black hole. These photons are not returned to black hole; instead, their 3D matter-cores are disbursed into quanta of matter and absorbed by surrounding universal medium. No photons of visible range, from the region of a black hole, reach observers in space until 3D matter-content of black hole has diminished to 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 black hole. Gravitational attractions on them may compel them to orbit around, before they are gradually pulled back into black hole. During their return journey, towards the black hole, gravitational attraction tends to accelerate them. Tendency to increase linear speed of a photon increases its 3D matter-content (with 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. They continuously lose their 3D matter-contents into surrounding universal medium until they cease to exist. Towards the end of its life, a photon's 3D matter-content and its frequency are very low. Associated distortions in universal medium, surrounding 3D matter core of low-frequency photon, resemble very low-frequency electromagnetic wave. At the instant, when last of 3D matter-content of photon's 3D matter-core is reverted into universal medium, only very low-frequency EM wave in universal medium, survives as a residue of the dead photon.

This low frequency EM wave continues to radiate in the original direction of 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 somewhat similar amount of 3D matter, their frequency is nearly same. Because of this, EM waves

appearing as background radiation is (almost) of constant frequency. 3D matter is more or less evenly distributed in space, unto infinite extent of universe. Distribution of dying photons is also on the same basis. Therefore, magnitudes of background radiations received from all directions in space do not show large variations.

**Evaporation of 3D matter:**

Reduction in 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 black hole and energy associated with lost part of 3D matter. However, 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 black hole into free space, due to any reason. This phenomenon prevents large scale destruction of 3D matter-particles from nature, even during recycling of 3D matter from its three-dimensional status (where entropy gradually increases) to one-dimensional status in universal medium (where magnitude of entropy is nil).

An evaporating black hole, towards end of its stable life, increases in radial size, corresponding to reduction in total 3D matter-content. Its 3D matter-density decreases and radiations of various frequencies start escaping gravitational influence about it. As it becomes visible, it will lose its status as a black hole. It may then evolve into different type of macro bodies, 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 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 macro bodies in 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 macro bodies in space. Black holes perform very important functions to preserve perpetual steady state of universe by recycling matter between its three-dimensional state (where entropy increases) and one-dimensional state in 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.info>

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