

NOVAE

[According to 'MATTER (Re-examined)']

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Abstract: Towards the end of its stable life, a 'black hole' becomes a quasar and pulsar. Activities of a quasar or pulsar are managed by cyclic outward and inward radial motion of the universal medium from or towards its central region. Relative motion of the universal medium acts as an inertial effort on 3D matter-particles. As and when the outer envelope (mantle) of a pulsar is unable to withstand the outward effort due to an increase in its internal pressure and due to outward displacement of the universal medium, the pulsar explodes as a supernova. Intense external pressure on 3D matter-particles causes 3D matter-cores of their photons to merge and form very high-frequency photons.

Keywords: Black hole, pulsar, quasar, nova

Evolution of black hole:

A black hole, in a stable state, continues to collapse under gravitational attraction between its 3D matter-particles. Shrinking of its body increases internal pressure that compels 3D matter-particles to discard their 3D matter-contents into the universal medium in the form of free quanta of matter. Reduction in the 3D matter-content expands their volume and leads to a further increase in internal pressure. Most of the free quanta of matter, discarded from the 3D matter-particles, form disturbances in the universal medium. Some of the free quanta of matter, discarded from 3D matter-particles, migrate into the universal medium to expand its fabric. Outward expansion of the universal medium acts as a gravitational repulsion from the central region of the black hole towards its outer periphery. This inertial action maintains its outward radial direction throughout the stable state of the black hole and acts against its gravitational collapse.

High-frequency photons, created from the disturbances formed in the universal medium, radiate from the region of the black hole. Total 3D matter-content of a black hole being very high, gravitational attraction towards the outward-radiated photons tends to retard all radiated photons from its region. Attempting to reduce the linear speed of a photon reduces its 3D matter-content, rather than reducing its linear speed. 3D matter-contents of all these photons are reverted back into the universal medium. As a consequence, the black hole becomes invisible.

As and when the total 3D matter-content of a black hole diminishes to lower values, remnants of very high-frequency photons start escaping the influence of gravitational attraction (between them and the black hole) in the form of very low-frequency photons. A black hole may start to appear as a reddish object in space. The black hole will not remain invisible any longer. Initially, the photons escaping the gravitational influence of the black hole are of low frequency and are the remnants of very high-frequency photons. As the 3D matter-content of the black hole decreases, photons of higher frequency are also included in the radiation, and its brightness gradually increases. From the time a black hole becomes visible, it is usually called by other names.

Since internal pressure in the central region of the black hole is greater, 3D material bodies in this region begin to revert, initially to a liquid physical state and then to a gaseous physical state. A black hole, in this state, has an external gaseous envelope (a solid or liquid exterior), a fluid interior, and a gaseous central region. This is the state of most planet-sized macrobodies. Larger macrobodies may not have an outer solid or a liquid exterior at all.

As a black hole is a very huge macrobody, its exterior cover is very far from the central region. The difference between the internal pressure at the exterior cover and the central region is large and helps to maintain the exterior cover in a viscous state. Internal pressure of a black hole, towards its central region, is very high (due to the high rate of gravitational collapse and due to the high rate of expansion of atomic and

subatomic particles), so that the atoms are reduced to a very low 3D matter-content level. Towards the end of the stable life of a black hole, bonds between nuclei and orbiting electrons of atoms in the central region become very weak, and atoms start to lose their orbital electrons, changing the material elements into a plasma state. Loss of electronic envelopes by some of the atoms reduces their sizes drastically, and relieves high internal pressure in the surrounding region of the universal medium. This gives additional space for further expansion by neighbouring atoms.

Conversion of material elements into the plasma state takes place only in the central region of a black hole. After the conversion of material elements into the plasma state has started and the internal pressure in the surrounding region has reduced drastically, 3D matter-contents released into the surroundings by the 3D matter-particles are readily absorbed back by the atoms in the plasma state. There will not be enough free quanta of matter left in the region to form disturbances or new photons. Hence, there is very little radiation from the central region of the black hole, where material elements exist in a plasma state. This state of a black hole remains stable only as long as gravitational collapse can sustain the internal pressure at an appropriate level. At the same time, conversion of atoms into the plasma state and corresponding reduction in volume tend to reduce the internal pressure of the black hole. Space vacated by the atoms (being converted into the plasma state) is occupied by the collapse of the surrounding exterior part (in other physical states). This arrangement allows simultaneous heating of the surrounding exterior body and cooling of the black hole's central region.

A stage will come when (due to the lowered rest mass of the black hole) the rate of its gravitational collapse and dispersal of 3D matter-content from very high-frequency photons in the radiation (due to gravitational attraction) diminishes. The macrobody is no longer a black hole. Initially, very high-frequency photons escape as low-frequency photons. Gradually, the frequencies of radiated photons increase to include higher spectra.

Reduction in space available in the central region, due to gravitational collapse of the exterior cover and expansion of atoms in the central region, cannot compensate for the space evacuated by the loss of orbital electrons in atoms. Additional free space lowers internal pressure in the central region. Atoms in the central region suddenly find themselves in a low-pressure region and start to absorb quanta of matter from the surrounding universal medium. 3D matter-content levels of subatomic particles increase. They cool down and diminish in size. Reduction in their sizes (reduced sizes of atomic nuclei) enhances the pressure reduction in the region. Atoms in this region now absorb all free quanta of matter available in the region and more from the universal medium. Very few or no photons are created and radiated from this region. Macrobody becomes dark. The central region of the macrobody now appears dark and cool. It will be cooling down at a very high rate.

A high rate of depletion of universal medium in the central region of macrobody, due to absorption of quanta of matter by 3D matter-particles in the region, produces a constant motion of universal medium towards the center of macrobody, in an attempt to maintain its continuity. Constant inward motion of the universal medium towards a center point is similar to inward 'radial inertial action'. Inertial action is inward and acts as an additional compression on the exterior cover of the macrobody. It aids its gravitational collapse. Together, they maintain the collapse of macrobody at a rate sufficient to sustain its internal pressure steady without much variation. Space vacated by the atoms, converting themselves into a plasma state, is matched by the expansion of surrounding 3D matter-particles, due to loss of their 3D matter-content and contraction of the black hole's exterior cover, due to gravitational collapse.

Atoms in the central region are rebuilt by acquiring lost electrons. As and when most atoms in the central region regain their electronic envelopes, they are at a much higher 3D matter-content level and of much smaller sizes. Rebuilding of atoms gives a sudden boost to the volume of space occupied by them. Building up of atoms (in the central region of the macrobody) along with continuous gravitational collapse of the exterior cover increases internal pressure at a very high rate. In the mean time, exterior cover of the black hole has contracted by a great extent and settled down on a relatively smaller central region. Contraction of the exterior cover, in conjunction with rebuilding of atoms in the central region, leads to a sudden reduction in inter-particle space available in the central region and boosts the internal pressure there.

Once again, the heating process starts, and 3D matter-particles in the central region begin to expand rapidly. Atoms in the central region, getting heated, discard quanta of matter into the universal medium. Now, there is an excess of free quanta of matter in the central region, which form photons and radiate away, making the macrobody visible to outside observers. The low-frequency spectrum of radiation enhances the heating

process in the surroundings of the central region. Fabric of universal medium does not move inward, towards the central region of the black hole, anymore. Inward inertial actions on the exterior cover, due to the radial motion of the universal medium, end.

Many of the excess free quanta of matter, in the central region, migrate into the universal medium to enlarge its fabric in the region. The universal medium tends to expand outward and causes a relative displacement between the universal medium and the exterior cover of the macrobody. Outward radial motion of the universal medium from the central region produces an inertial action similar to gravitational repulsion on the exterior cover.

Quasars and Pulsars:

These stages of heating and cooling repeat cyclically as long as the exterior cover of the macrobody can withstand the outward efforts exerted by internal pressure and outward inertial action by the moving universal medium. If the central region of the macrobody is comparatively smaller, the exterior cover may withstand the internal pressure generated during the heating stage of the central region. In such cases, internal pressure in the central region increases until the atoms start their conversion again into the plasma state. This starts a new cycle of cooling. In this way, the central region of a macrobody (remnant of a smaller black hole) can heat up and cool down in rapid succession. During the heating process, photons of very high-frequency are radiated from the macrobody's central region. During the cooling process, no photons are radiated from the central region of the macrobody.

Due to rapid changes in internal pressure, a remnant of a black hole may radiate very high-frequency photons in a cyclic order. Intensity and duration of radiation are related to the parameters of the exterior cover of the macrobody. Many of the photons radiated from the central region may be the result of the breakdown of its primary 3D matter-particles. These photons start with extremely high frequency (cosmic rays) and are able to partially survive the gravitational effects due to the excessive matter content of the macrobody. They are likely to escape gravitational attraction towards the macrobody with a considerable part of their 3D matter-content intact to reach outside observers as high-frequency radiation.

The rapidity of the radiation cycle depends on the 3D matter-content of the macrobody. The cycle of heating and cooling of the macrobody's central region continues until the 3D matter-content of the macrobody has reduced considerably. During heating, high-frequency photons are radiated from the region of the macrobody, and during cooling, the macrobody becomes invisible (with no radiation from its region). Depending on the length of the radiation cycle, these macrobodies, radiating (high-frequency) photons periodically, are called by various names, such as 'pulsars', etc. Quasars have a very long periodic cycle by which radiation from their region of space may last for a considerable length of time. Whereas pulsars have very rapid cycles of radiation and a silent period.

Unlike a stable black hole that helps to revert matter from its 3D state (photons) to 1D state (quanta of matter), quasars and pulsars help to create high-frequency photons (basic 3D matter-particles) from 1D quanta of matter. They do this during every pulse, for a long period during their life, by cyclically absorbing and discarding quanta of matter from the surrounding universal medium. Unlike black holes, which help to revert 3D matter from basic 3D matter-particles into the universal medium, quasars and pulsars help to create basic 3D matter particles (photons) from the universal medium at a very high rate.

Novae:

Gravitational collapse of a large macrobody is a gradual process. An explosion or implosion can take place only under sudden changes, when the outer crust cannot maintain stability against changes in internal pressure. Therefore, huge explosions (like a nova) require additional outward impulses, in addition to an increase in internal pressure during heating.

A nova is caused by a huge explosion of an extremely large macrobody, like a very massive star or a black hole, in space. An explosion takes place when a body's outer cover (preferably in a solid or very dense liquid physical state) cannot withstand sudden and very high outward radial effort created within. During the gravitational collapse of a very large macrobody, it is heated from within. This is a gradual process, and since the whole macrobody is made of similar material, usually, its outer cover is also heated, but at a lesser rate, corresponding to the macrobody's volume. Therefore, mere internal heating alone cannot produce an explosion of the scale required for a nova. Development of excessive internal pressure may at the most be able to crack

open the outer crust of the macrobody or splinter it into a few segments until internal pressure is relieved (like a volcano on earth). To drive the splintered parts away from the centre of the explosion, far out into space in all directions, additional outward radial effort from the central region of the macrobody is required.

As the frequency of pulses increase, exterior cover of the pulsar is literally shaken. Unless the shrunken exterior cover can withstand the combined outward effort by rapidly rising internal pressure and outward-flowing universal medium, the pulsar explodes. Most probably, a (spinning) pulsar disintegrates into smaller fragments, which fly away over a very large region in space. Splintered fragments are not only thrown outwards by the explosion, but they are also carried away by the outward-moving universal medium. This is the mechanism of the explosion of a 'supernova'.

Internal pressure within a pulsar, at the time of its explosion, is extremely high. No subatomic particles can survive at the extremely high pressure created at the time of the explosion of a nova. Low 3D matter-content level, in conjunction with high external pressure, breaks down the nucleons to release their constituent primary matter-particles, free. Photons of primary matter-particles are driven nearer to merge their 3D matter-contents. Merger of their 3D matter-contents creates photons of very high 3D matter-content, which are radiated along with other radiations and debris. Thus, large quantities of 3D matter-particles are converted into very high-frequency photons (cosmic rays). 3D matter-contents of these photons revert into the universal medium, in due course of time. Each supernova reduces 3D matter in the universe by a large quantity. This is how 3D matter is reverted into 1D matter of the universal medium, in nature.

Cyclic pulsing actions by the universal medium may continue for a long time before the outward inertial action becomes capable of exploding the exterior cover of the pulsar and carrying its fragments far out into space. Splintered fragments continue their outward motions until their motion can be arrested by mutual gravitational attractions or they fall into other macrobodies in space.

At no stage in the evolution of stellar macrobodies can a 3D material body equivalent to a neutron be envisaged. A neutron is a subatomic 3D matter-particle with definite components, structure and size. A combination of a proton and an electron does not make a neutron. They will partly annihilate each other. A larger or heavier neutron cannot be formed. Consequently, assumptions of 'neutron stars' and similar macrobodies should be treated as pure imaginations.

Reference:

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

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