Re-examination of Penrose's and Kerr's singularities and the origin of protons in astrophysical jets

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Abstract

Penrose's model predicted that in the center of the black hole space-time curvature is infinite and consequently gravity force there is infinite. Kerr's model predicted ring gravitational singularity inside a black hole. In 2014 NASA measured universal space has Euclidean shape. This means that stellar objects cannot curve universal space and that the space-time singularity model has no physical existence. In the center of black holes energy density of superfluid space is so low that the electromagnetic properties of space are changed. This causes electromagnetic forces between the nucleus and orbiting electrons to become unstable. In the center of a black hole, atoms are falling apart into elementary particles. Black holes are rejuvenating systems of the universe, they transform old matter into fresh energy in the form of elementary particles. Astrophysical jets are the outcome of this process.

Keywords: space-time singularity, astrophysical jets, energy density of superfluid space

1. Introduction

In 2014 NASA measured inner angles between three stellar objects. The sum of their inner angles was exactly 180^0. This confirms universal space has a Euclidean shape: "Thus the universe was known to be flat to within about 15% accuracy prior to the WMAP (Wilkinson Microwave Anisotropy Probe) results. WMAP has confirmed this result with very high accuracy and precision" [1]. In 1965 curvature of space was considered real, today we know space is flat. We have to re-evaluate space-time singularity in the light of NASA measurements. Recent research confirmed that universal space is time-invariant. There is no physical time in the universe as a 4th dimension of universal space. The only time that exists is the duration of a material change in time-invariant space [2]. In Penrose's sketch which is in his 1965 article [3] (see Figure 1 below), we see an arrow that depicts the flow of time. In the universe, there is no flow of time, the flow of change runs in time-invariant space. Black holes exist in time-invariant space. The physical properties of black holes have nothing to do with the observer. In Penroses's sketch, we see designed an "outside observer". In his sketch, the radius of the black hole is 2 meters, and the infinite curvature of space is inside the space-time cone and is designed by the straight line that comes out of the black hole. Hypothetical singularity should be in the

center of the black hole not on its border where stated and is prolonged in the center of the space-time cone. Penrose's sketch design seems pure speculation that is based on some mathematical models which are non-realistic, they have no counterpart in physical reality.
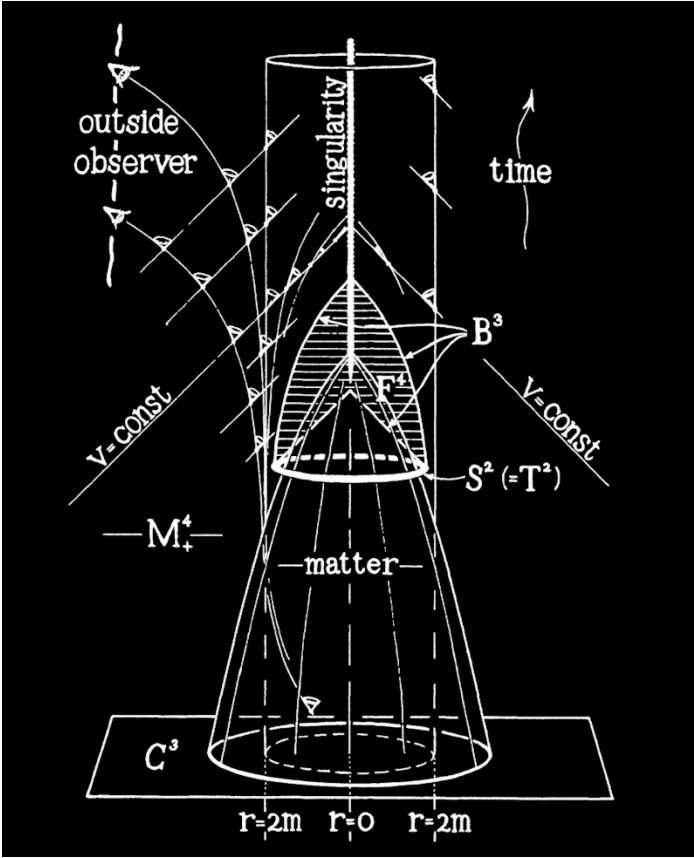

Figure 1: Space-time singularity

2. Penrose's space-time singularity contradicts mathematical laws and contradicts physical laws

Let's predict that Penrose's singularity is possible. We have a straight line in universal space where there is a singularity. The unsolvable question is how this singularity is diminishing with the distance from the line. We know in mathematics that the cardinal number of natural numbers can never turn into a finite natural number. We know in physics that gravity diminishes with the square of distance. Having infinite value for gravity only in one point of the universal space, the entire space would have infinite gravity. Penrose's singularity is against these basic rules of mathematics and physics. In mathematics infinity is an indispensable tool, its use in physics is problematic and leads to contradictions. In this article is proposed that singularities should be abolished from physics because "infinity" is not a metric term. We do not know its meaning, and its use in physics is highly problematic. It has created physics that is out of the reach of experimental research methodology. Penrose's singularity is not a scientific fact, it can

2

be seen as a working hypothesis that is based on vagus speculations that contradict the common sense of physics.

Geometrization of gravity has brought in physics exotic models as closed time-like curves (CTC) where one could travel into the past, kill his grandfather and so it could not be born [4]. In 1935 Einstein and Rosen proposed the existence of wormholes where a black hole is connected with a white hole [5]. Still today their model is the basis for speculations about travel in time through these wormholes. It is clear today, that motion occurs in time-invariant space where time is the duration of motion and that time travel is categorically excluded. An astronaut can only move through universal space but not through time because time is the mere duration of astronaut motion in space [6]. We have to admit, that "black hole" is an inappropriate term because where a black hole is situated there is no hole in space, a better term is "dark star" which means that the star has such a strong gravity that light cannot escape.

3. Curvature of space and gravity inside black holes

It is proposed in this article, that the geometrization of gravity where stars are supposedly warping space is a mere mathematical model that describes some fundamental physical properties of the superfluid universal space. In the intergalactic space energy density of superfluid space is at its maximum and has the value of Planck energy density. A given physical object diminishes the Planck energy density of space ρ_{PE} in its center by exactly the amount of its mass and energy, according to the following equation:

$$\rho_{cE} = \rho_{PE} - \frac{mc^2}{V} \qquad (1),$$

where m is the mass of the object and V is volume of the object. Eq. (1) can be written as follows:

$$E = mc^2 = (\rho_{PE} - \rho_{cE})V \qquad (2).$$

Eq. (2) describes the extension of the mass-energy equivalence principle on superfluid space [6]. Every physical system tends toward a homogeneous distribution of energy. The same holds for superfluid universal space. Eq. (1) confirms that also in the center of the stellar object, the sum of the energy density of matter and the sum of the energy of superfluid space has the value of Planck energy density. The curvature of superfluid space in GR is a mathematical description of its energy density, more space is curved less is its energy density.

In the model presented in this article, stellar objects are not curving space, they are diminishing space energy density. In the center of a black hole, the energy density of space is so low that atoms become unstable. They fall apart into elementary particles. The transformation of matter into fresh energy in the form of elementary particles creates high pressure and a black hole can explode in a supernova. The force of fresh energy pressure in the chamber where atoms decay into elementary particles is bigger than gravity forces, see Figure 2 below.
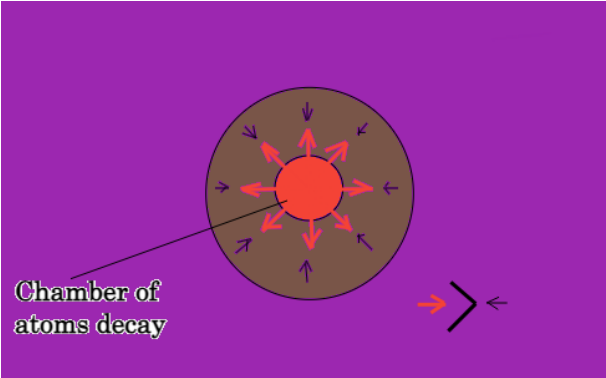

Figure 2: Fresh energy pressure and gravity forces in supernova

The mechanism proposed in this article is giving new light on the supernova explosion, whose mechanism is not clear yet: "SNIa explosions are driven by fast thermonuclear burning in 12C/16O white dwarf (WD) stars with a mass close to, or below, the Chandrasekhar-mass limit of ≈ 1.4 solar masses (4) - the maximum mass of a WD supported against the gravitational collapse by the electron degeneracy pressure. Beyond this general statement, however, the exact mechanisms of SNIa remain unclear (5–8), with a number of possible scenarios" [7].

When the black hole is supermassive it cannot explode because the gravity force is bigger than the pressure of free energy in the chamber. The pressure of fresh energy creates the tunnel in the direction of the supermassive black hole's rotational axis. Through this tunnel, fresh energy is thrown out into the intergalactic space in the form of an astrophysical jet, as we can see in Figure 3 below.
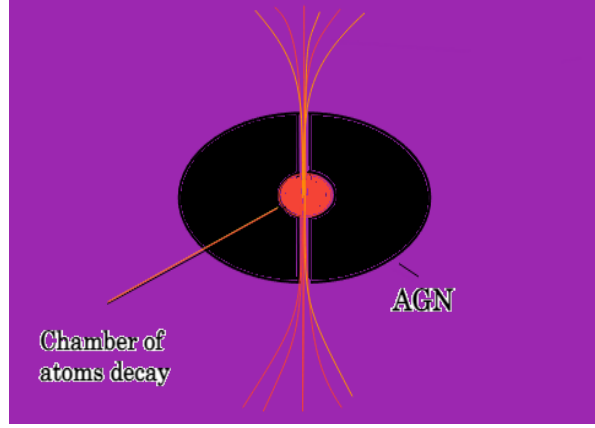
Figure 3: AGN with the chamber of atom decay and outcoming jet

Every AGN (active galactic nuclei) has in its center the chamber where atoms are decaying in elementary particles. The matter of the walls of the chamber is transformed into fresh energy which is ejected in the form of jets into the intergalactic space, AGN is eating itself. AGNs are rejuvenating systems of the universe [6].

Using Eq. (1) we will calculate the energy density of superfluid space in the center of a proton, Moon, Earth, Sun, and some supermassive black holes:

- In the center of the proton: $\rho_{cE} = \rho_{PE} - 5.45 \cdot 10^{34} Jm^{-3}$.
- In the center of the Moon: $\rho_{cE} = \rho_{PE} - 3.01 \cdot 10^{20} Jm^{-3}$.
- In the center of the Earth: $\rho_{cE} = \rho_{PE} - 4.97 \cdot 10^{20} Jm^{-3}$.
- In the center of the Sun: $\rho_{cE} = \rho_{PE} - 1.27 \cdot 10^{20} Jm^{-3}$.
- In the center of a supermassive black hole ASASSN-14li energy density of superfluid space is: $\rho_{cE} = \rho_{PE} - 4.55 \cdot 10^{24} Jm^{-3}$.
- In the center of supermassive black hole GRS 1915+105 energy density of superfluid space is: $\rho_{cE} = \rho_{PE} - 8.62 \cdot 10^{32} Jm^{-3}$.
- In the center of a supermassive black hole Cygnus X-1 energy density of superfluid space is: $\rho_{cE} = \rho_{PE} - 3.58 \cdot 10^{34} Jm^{-3}$.

The model of the variable energy density of superfluid space suggests that the extremely low energy density of superfluid space in the center of black holes causes electromagnetic forces between the nucleus of the atom and orbiting electrons to become too weak and atoms fall apart into elementary particles [8].

Black holes are "eating" themselves, that's why they tend to shrink. Schwarzschild's collapse of black holes is not due to the infinite gravity in the center, but instead, it is caused

by the extremely low energy density of superfluid space in their center. Toward the center of the black hole (black star), the gravity force diminishes according to Newton's Shell theorem, as it diminishes in all other stellar objects, see Figure 4 below [9].
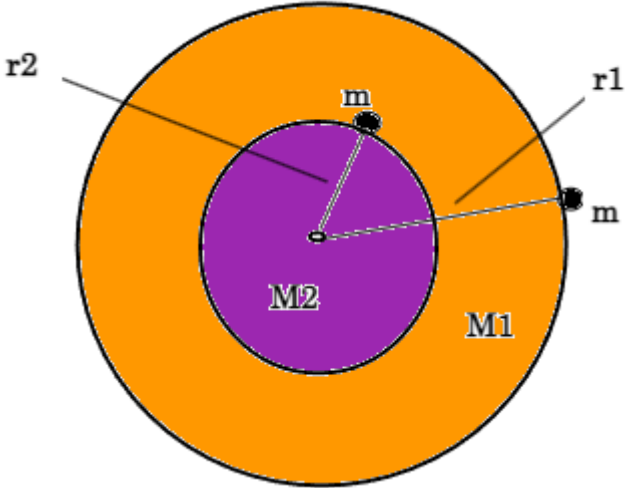

Figure 4: Newton's Shell theorem inside a black hole

$$F_{g-surface} = \frac{m(M_1+M_2)G}{r_1^2} \quad (3),$$

$$F_{g-inside} = \frac{mM_2G}{r_2^2} \quad (4).$$

There is no scientific literature available that would explain why Newton's Shell theorem should not be valid in stars with extremely high density of matter. Bending of light is not proving the curvature of space. Light is bending because of the change in the energy density of superfluid space, which causes a change in the refraction index [10]. When light moves in the direction of the Sun, the energy density of space is decreasing, when light moves away from the Sun, the energy density of space is increasing, see Figure 5 below:
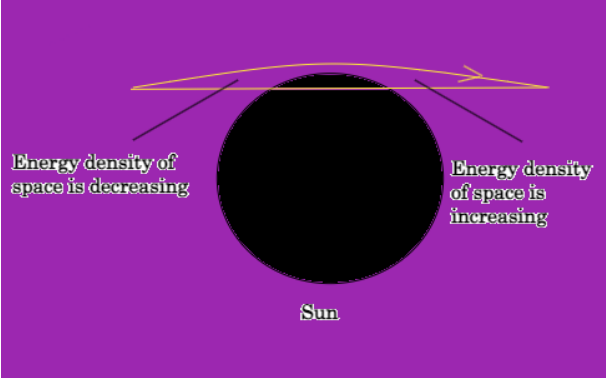

Figure 5: Light is bending because of the decrease and increase of energy density of space

The idea that inside black holes high curvature of space defines gravity is a working hypothesis that has not been proved yet. Schwarzschild metrics define the relation between the mass m of the stellar object and its radius R, where the object forms a black hole, see Eq. (5) below:

$$R = \frac{2Gm}{c^2} \qquad (5).$$

Combining Eq. (2) and Eq. (5) we get:

$$R = \frac{2G(\rho_{PE} - \rho_{cE})V}{c^4} \qquad (6).$$

We insert the equation for volume and we get:

$$1 = \frac{8G\pi(\rho_{PE} - \rho_{cE})R^2}{3c^4}$$

$$R^2 = \frac{3c^4}{8G\pi(\rho_{PE} - \rho_{cE})}$$

$$R = \sqrt{\frac{3c^4}{8G\pi(\rho_{PE} - \rho_{cE})}} \qquad (6).$$

Eq. (6) tells us that Schwarzschild radius is directly related only to the energy density of superfluid space ρ_{cE} in the center of the black hole. Velocity of light and gravitational constant are constants. As in the center of the black hole, matter falls apart into elementary particles, the black hole has a tendency to shrink to the zero radius. The "gravitational collapse" of black hole is occurring not because of the infinite gravity in the center, actually it could be named "atoms decay collapse".

In principle, only a black hole with infinite mass could have on its surface infinite gravity and could attract a given massive object with mass m with infinite gravity, see Eq. (7) below:

$$F_g = \frac{m \cdot \infty \cdot G}{r^2} = \infty \qquad (7).$$

It is clear that a given stellar object only can have a finite mass, so infinite gravity is out of question. You cannot squeeze infinite mass into a star that will have a finite radius, so a star with infinite mass would also have an infinite radius and thus occupy all of universal space,

which makes no sense. If we want to progress in cosmology, singularities of any type should be abolished from physics. The only infinity that exists in the universe is its Euclidean infinite vastness of universal space.

The idea that the curvature of space carries gravity led into 100 years of misunderstanding of how is with gravity inside the event horizon. Increasing curvature of space inside the event horizon was never observed and should be thus appropriately handled as an unproven working hypothesis.

Today in physics it is automatically accepted that stellar objects curve space and so light bends when passing the Sun [11]. As we have seen in this article (see Figure 5) bending of light can be explained differently. Curvature of space around Sun should be proved by measuring inner angles between Sun, Earth and for example Saturn. Their sum should be bigger than 180^0. This would prove space around Sun is curved, see Figure 6 below.
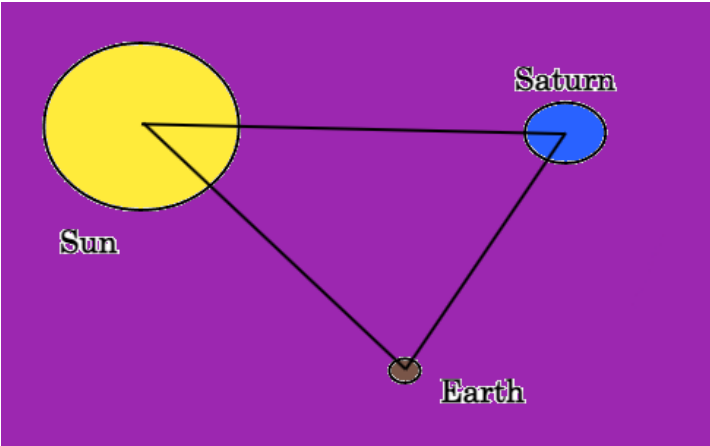

Figure 6: Sum of inner angles in triangle Sun-Saturn-Earth

Our Milky way is a part of huge galaxy cluster called Laniakea. Our galaxy in moving towards the Great Attractor [12, 13], see Figure 7 below. Gravity force of The Great Attractor is working despite the fact that intergalactic space has Euclidean shape. This proves that gravity works also in Euclidean space.
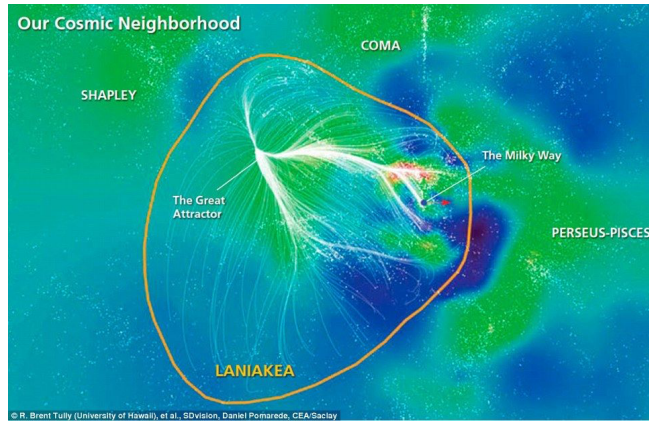
Figure 7: Laniakea and The Great Contractor

Gravity is pushing force of 4-dimensional superfluid space towards the lover energy density of space that is created by the presence of two or more 3-dimensional physical objects [6], see Figure 8 below.
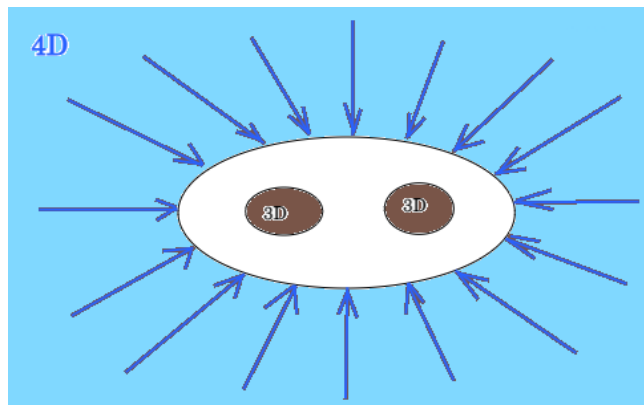

Figure 8: Gravity is a pushing force of superfluid space

Three-dimensional physical objects are somehow locked in the four-dimensional area with lover energy density of superfluid space. Gravity vector is pointing from higher energy density to lower energy density of space.

In the center of a proton, the minimal energy density of superfluid space is for the order 10^{10} higher than in supermassive black hole ASASSN-14li. The extremely low energy density of superfluid space in the center of the proton suggests that the proton remains a stable particle also in the center of black holes because of its internal structure whose stability is not dependent on electromagnetism.

Besides other particles, protons also compose astrophysical jets coming out of AGN [14]. Blandford-Znajek's mechanism explains the electromagnetic component of the jets [15], but it cannot explain the presence of protons. The model presented in this article suggests that

the origin of protons in astrophysical jets is a consequence of the decay of atoms at the center of AGN.

Roy Kerr recently published an article wherein the abstract is a clear description of how singularities have been brought in physics despite there is no proof yet of their existence in the physical world. Kerr is clear that the model of singularity needs to be proved by all scientific means, it is not enough to cite Roger Penrose: "The consensus view for sixty years has been that all black holes have singularities. There is no direct proof of this, only the papers by Penrose [1] outlining a proof that all Einstein spaces containing a "trapped surface" automatically contain FALL's. This is almost certainly true, even if the proof is marginal. It was then decreed, without proof, that these must end in actual points where the metric is singular in some unspecified way. Nobody has constructed any reason, let alone proof for this. The singularity believers need to show why it is true, not just quote the Penrose assumption" [16]. Kerr's criticism of gravitational singularities is a clear signal that we need a revision of the model of curvature of space as a carrier of gravity. This also implies that curvature of space inside Kerr's rotational black holes [17] is an example of impeccable mathematical model that has no counterpart in physical existence, see Figure 9 below.
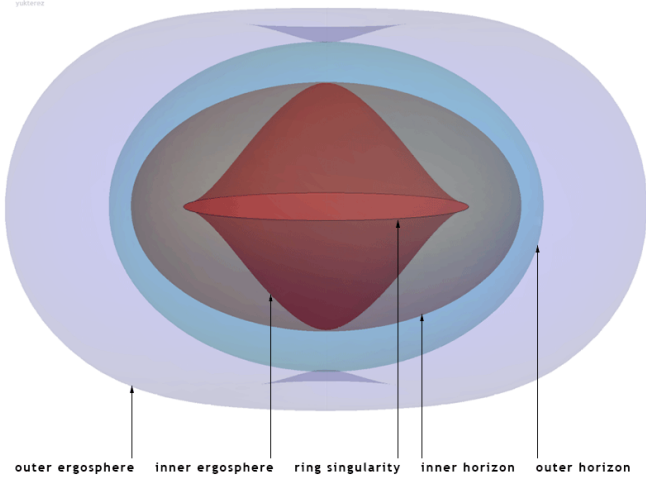

Figure 9: Kerr's ring singularity

In the black hole there is no outer ergosphere, there is no inner ergosphere, there is no inner horizon, and there is no ring singularity. The only physical reality that exist is outer horizon. If ring singularity would have physical existence, it could not diminish with distance which means the entire universal space would have infinite singularity. If we want progress physics any type of singularities should be abolished from physics.

Because of their high rotational velocity black holes are interacting with the energy of superfluid space, they integrate this energy in-between their atomic structure which increase

their mass. Black holes have because of their high rotational velocity huge relativistic masses. For example: "Mass of Cygnus X-1 that would not rotate would be $4.2169 \cdot 10^{31} kg$. Actual relativistic mass of the rotating Cygnus X-1 is $136129 \cdot 10^{32} kg$ [18].

4. Conclusions

With GR, the geometrization of gravity has led to a wrong understanding of gravity inside the event horizon of black holes. There is nothing mysterious inside the event horizon. All physical laws are in place, there is no gravitational singularity. Black holes tend to shrink because, in the center of black holes, matter is transformed into fresh energy that forms astrophysical jets.

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