Why black holes and galaxies cannot grow infinite (Draft)

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Abstract Nowadays black holes in physics are considered real objects; supermassive black holes exist in the centers of most (all?) galaxies. The creation of black holes is a theory based on space-time. A new theory called space-matter theory has another explanation. The action-reaction phenomenon between space and matter causes that space waves. Masses decrease the energy of the space wave increasing its wavelengths. Lots of masses set up this effect causing very long waves. Black hole is made in a galaxy if the masses of celestial bodies are big "enough". Space regions can be depleted, where the density of the space wave is so small that space as space ceases to exist. This "lack of space" is replaced with space we don't know or with matter we can't find in our physics books.

Keywords black hole, gravity, space, space wave, space-matter, tunneling

1. BLACK HOLES IN SPACE-MATTER

Black holes were long considered a mathematical curiosity, a singularity according to the theory of general relativity. General relativity states that a sufficiently compact mass can deform space-time to form a black hole.[1] [2] How? A compact mass collapses to zero radius. Its surface gravity becomes infinite just as its density. A black hole is not just a big mass with big gravity, it is a region of space-time exhibiting such strong gravitational effects that particles with or without mass cannot escape from inside it[3]. The singularity in physics is disputable, since the infinity gravity doesn't come into being. The value of the external gravitational field of a black hole outside of its horizon is the same as that of any other object of the same mass.[4]

Nowadays black holes in physics are considered real objects; supermassive black holes exist in the centers of most (all?) galaxies. Time, space and matter we know cease to exist in the black hole, although the mass of a black hole is a positive value, and the black hole can also have more other physical characteristics. Black holes are able to grow by absorbing mass from their surroundings. By absorbing other stars and merging with other black holes, supermassive black holes may form whose masses are millions of solar masses. Following the logic of general relativity, black holes are considered to be born when very massive stars collapse. This theory tries to find how a black hole comes into being in our real world. Observations and calculations show there is a supermassive black hole in our Milky Way that has 4.3 million solar masses and its radius is less than 2×10^{-3} light years[5]. In quantum mechanics there is another process that could create black holes. In principle, black holes could be formed in high-energy collisions that achieve sufficient density. This is a different method of creating black holes, but even in this process mass and energy create the black hole.

From the above-mentioned two aspects are clear:

- Black holes may exist in our Universe, in other words, we may describe the black holes with the space-time theory or with another model e.g. with the space-matter model.

- The creation of a black hole is a theory based on space-time. The new theory, called space-matter theory has another explanation for how black holes can be created in the real Universe. This study is about this concept.

Black holes in the galaxies cannot be understood from the viewpoint of space-matter theory, if we don't know the basics of the space-matter model. The space-matter model uses the common roots of many phenomena that we know as different phenomena, but we think, they have no connections with each other. Saying this, to understand black holes, we have to understand how tunneling and gravity work according to space-matter theory.

2. PITCH OF SPACE-MATTER THEORY

Where there is no matter, there is space; where there is no space, there is matter. There is no "empty" region. Space is what matter uses as space. Space is not dependent on its texture; it can be made out of matter or non-matter. Time is one characteristic of the given space. In many spaces, the faster-than-light phenomena (fast waves) are reality (see e.g. the non-local quantum correlation, tunneling or the expanding rate of the early Universe).

Matter causes waves in space. Solely through the use of space waves, we can express spatial distance, time and energy. Why? Because space waves have the shortest wavelength, the fastest speed, and the smallest energy expressed in our terms[6].

- Every spatial distance can be expressed using the wavelength of space waves. In our physics terms: This is the shortest unit of distance (λ_{space}).
- Every unit of time can be expressed using the periodicity of space waves. In our physics terms: This is the shortest unit of time.
- Every amount of action (energy) can be expressed using the value of the action of space waves. In our physics terms: This is the smallest unit of energy (h_{space}).
- Space and matter exist, if two objects exist, and one of them acts as space while the other one acts as matter.
- We cannot generally answer the question: "What is space made of?" Space depends on its relationships. Space is what matter senses as space;
- The actual time of the matter originates from the given space where it is.

2.1. How can we derive our time units from the space wave?

If we understand Space in the common meaning, that is, the actual space is *the Space* we call space ($Space_{act}$=Space) and we wish to express the time function of Space waves in terms of physics' units of time, we may do so. If we take as our unit of time one second, the Space waves show us how to divide that unit into the smallest possible parts of time. The time appears as the frequency of the Space wave, or in other words, the action of the Space wave. One second is as long as the Space wave expresses $E_{\sec}$ energy. It is calculable according to the model of space-matter.

2.2. How can we derive our spatial distance from the Space wave?

If we understand Space in the common meaning ($Space_{act}$=Space), and we wish to express our terms of physics' units of distance using the characteristic of Space wave made by mass, we may do so. If we take as our unit of spatial distance one meter, the Space waves show us how to build that unit from the smallest possible spatial parts. The shortest spatial distance is given by the wavelength of the Space wave. 1 meter = $k_{TIME} \times \lambda_{TIME}$, where k is the wave number of space wave (time wave). Using waves that have energy, we can give one meter as energy, too.

2.3. Meter, kg and second expressed in eVolt

If we understand Space in the common meaning ($Space_{act}$=Space), and using the action of time waves (Space waves), we can express mass, energy, time and spatial distance in the same dimensions, for example in eVolt. The following is based on the cosine model (two dimensional).
First see the well-known value[7]:

$$1\ kg \text{ represents } 5.61\times10^{35}\ eV \qquad (1)$$

Now let's see the new results using the cosine model:

$$1\ meter \text{ represents } 7.32\cdot10^{-33}\ eV\ , \qquad (2$$

$$1\ second \text{ represents } 1.22\cdot10^{28}\ eV\ . \qquad (3)$$

There is one more surprising conclusion: time, spatial distance and energy can be given in meters and in seconds, too. For example:

$$1\ second \text{ represents } 1.66\times10^{60}\ meters\ . \qquad (4)$$

The values come from the cosine model. If the model is more accurate (for example it is a three-dimensional model accepting the changing values of gravitational force), the above mentioned values will change, but the principle remains the same.

The above-written is surprising, but it has old roots. There must be a way to convert – for example – spatial distance into mass and mass into spatial distance, since the special theory of relativity[8, 9,] shows the connection of mass and spatial distance using:

$$s'\cdot m' = s\cdot\sqrt{1-\frac{v^2}{c^2}}\cdot m\cdot\frac{1}{\sqrt{1-\frac{v^2}{c^2}}} = s\cdot m = \text{constant}_{s\,m} \qquad (5)$$

The transformation of kgs into meters was meaningless, but we can now express both in eV.

The above mentioned is based on the "common meaning of space". On the other hand, the matter can use spaces other than this. In tunneling, matter uses another matter as space.

3. EXAMPLE OF A SPACE MADE OUT OF MATTER: TUNNELING IN SPACE-MATTER

The tunneling is a very good example, where $Space_{act}$≠Space. Tunneling shows, there are different spaces. In this case, $Space_{act}$=$Space_m$, and Space≠$Space_m$. Space iswhat matter uses as space[10].

3.1. The mystery of tunneling

Quantum tunneling refers to the quantum mechanical phenomenon where a particle (with or without mass) tunnels through a barrier that it classically could not surmount.
First Nimtz et al[11, 12] measured the faster-than-light (superluminal) tunneling velocity with microwaves in 1992. The puzzle is that the jump of the particle over the barrier has no time (it spends zero time inside the barrier) and the particle is undetectable in this condition. Where is the particle? The tunneling does take time, so this time can be measured. See Figure 1.

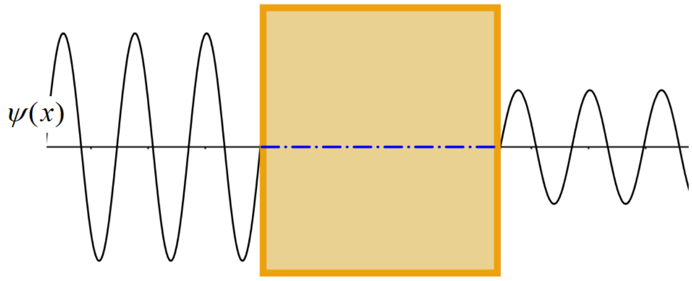

Figure 1. The wave function of tunneling particle.

$\psi(x)$ is the wave function of the tunneling particle outside the barrier. The particle cannot spend time inside the barrier, because the wave function has no missing part (and no missing time). The tunneling method of the particle marked with a blue, interrupted line is unknown and immeasurable. If the wave doesn't spend time inside the barrier, what is the tunneling time? Nimtz supposes that the measured barrier traversal time is spent at the front boundary of the barrier.

The second riddle in tunneling: experiments show that the tunneling particles are faster than light, and these facts are not compatible with the theory of relativity[13]. The growing velocity of the particle with a rest mass (for example electron) causes growing mass, and if v→c, then m→∞. Since the mass (of electron) won't be ∞, and the tunneling is fact, we have to suppose that v=c never occurs. There is a discrete jump in the velocities, and after v<c occurs v>c. How is it possible?

Nimzt[14] measured that the tunneling time τ approximately equals the oscillation time T,

$$\tau \approx T = \frac{1}{f_{tun\ part}}, \tag{6}$$

where $f_{tun\ part}$ is the frequency of tunneling particle (the tunneling time equals approximately the reciprocal frequency of the wave of particle). Eq. (7) shows how the barrier traversal time is connected with energy

$$\tau \approx \frac{h}{E_{tun\ part}}, \tag{7}$$

where $E_{tun\ part}$ is the energy of the tunneling particle. That is, the bigger the energy of the particle, the higher its velocity, the shorter its tunneling time. Eq. (6) and Eq. (7) give us the solution in space-matter.

3.2. The mystery of tunneling is solved

If L is the length of the barrier, then the velocity of the tunneling particle can be given as

$$v_{tun\ part} = f_{tun\ part} \times \lambda_{tun\ part} = \frac{L}{\tau} \tag{8}$$

$$\frac{1}{T} \times \lambda_{tun\ part} = \frac{1}{\tau} \times L \tag{9}$$

$$\lambda_{tun\ part} \approx L \tag{10}$$

Eq. (10) shows that the wavelength of the tunneling particle $\lambda_{tun\ part}$ is as long as the length of the barrier. It means, the tunneling particle has one wave inside the barrier. This is the fastest speed of the tunneling particle. Of course, the whole solution is Eq. (11)

$$\lambda_{tun\ part} \approx \frac{L}{n}, \tag{11}$$

where n=1,2,3,…, but every n>1 makes the tunneling particle slower.

In Figure 2. I completed Figure 4. with Eq. (10).

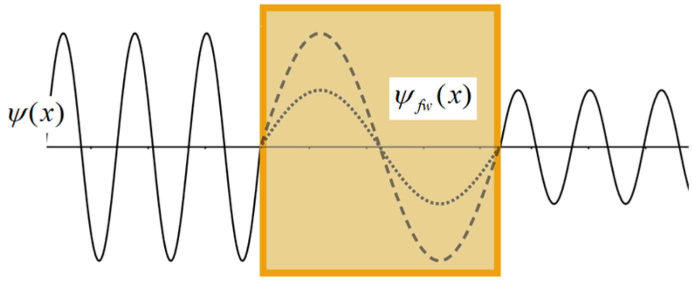

Figure 2. The function inside the barrier is a fast wave $\psi_{fw}(x)$. We know the frequency of the fast wave, but not its amplitude.

The space of fast wave (see Reference 5) $\psi_{fw}(x)$ is different from the Space, since its space is inside the barrier. From our viewpoint the barrier is matter. $\psi_{fw}(x)$ uses the matter as space, where $Space_{act} = Space_m$. $Space_m$ has very long "space wavelengths" $\lambda_{mass} >> \lambda_{Space}$. This is correct, since matter's wavelengths must be much longer than the wavelengths of Space. λ_{mass} is a very special data; in this case, this is the wavelength of $Space_m$, that is, the barrier made out of matter acts as space this way. On the other hand, the $\psi_{fw}(x)$ is a "normal" wave, which means there are no half (or part) waves inside the barrier. Using Eq. (5) we can calculate the $h_{\Psi_{fw}}$. $\psi_{fw}(x)$ is a fast wave that acts like fast light does, so the above-mentioned equations of fast light can be applied here. Since $\psi_{fw}(x)$ is a fast wave which is a new fundamental force, it isn't measurable (or not the same way we measure $\psi(x)$). The fast wave has a small "rest" $h_{fast\ wave}$ value. The "rest mass" of the barrier is much bigger than the "rest energy" of the fast wave, therefore time is able to come into being. Remember Figure 3. The barrier is able to appear as space and time for the tunneling particle. The tunneling particle shows that if two objects with different scales of rest energy meet, time comes into being. Time is always between space and matter, so in this case the barrier is space. See Figure 4.

Note there is no difference between $\psi(x)$ and $\psi_{fw}(x)$ from the viewpoints of the given particle, since its frequency level and (whole) energy remained unchanged.

$$f_{\Psi} / f_{space} = f_{\Psi_{fw}} / f_{space_m}. \tag{12}$$

$\psi(x)$ and $\psi_{fw}(x)$ are one and the same wave using different spaces (more in Reference 5). $\psi(x)$ uses $Space_{act}$ = Space, and $\psi_{fw}(x)$ uses $Space_{act} = Space_m$.

4. GRAVITY IN THE SPACE-MATTER MODEL

The space-matter model allows us to discern new features of gravity. The main part of the gravity in space-matter model is the existence of gravitational waves. LIGO detected[15] gravitational waves, they exist. According to space-matter theory gravity is the difference of the wavelengths of space waves.

4.1. Gravity in the Space-Matter Model

Masses change the wavelength of Space waves. There will be longer and shorter wavelengths of Space waves around the masses. The different wavelengths mean different forces. The gravity is when Space pushes masses:

$$\sum \vec{F}_{space} \neq 0, \quad (13)$$

where $\vec{F}_{space}$ are vectors of the force (action) of Space waves from the viewpoint of mass. Mass moves the direction of the resultant vector (except in special cases not detailed here).

Among bodies experiencing gravity, the frequency of Space waves decreases. That is, the Space "pressure" between the bodies decreases. Gravity arises, because the portions of Space with higher force (action) shift the masses. If on one side of a mass the Space wave has f_{s1} frequency, and on the opposite side of this mass the Space wave has f_{s2} frequency and $f_{s1} < f_{s2}$, then the mass goes into the direction of f_{s1}. The greater f_{s2} frequency the greater force (action) of Space moves the mass forward; see Figure 3.

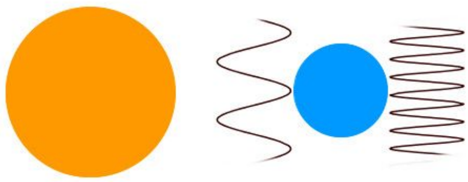

Figure 3. Space wave model of gravity (model, not proportional).
Big (yellow) and small (blue) masses and Space waves.

5. DENSITY OF SPACE WAVE

If the mass decreases the energy of the Space wave, it increases the wavelength of the Space wave, where $Space_{act}$=Space. Lots of masses set up this effect, causing very long waves. Space regions can be depleted, where the density of the Space wave is very small. Space wavelengths (λ) with different amounts of masses and their densities:

$$\lambda_{less\ mass} < \lambda_{more\ mass}, \quad (14)$$

$$h_{Space} / \lambda_{less\ mass} > h_{Space} / \lambda_{more\ mass}. \quad (15)$$

The densities are different. Existing $Space_{act}$=Space needs a minimum density.

$$h_{Space} / \lambda_{\max} > D_{\min}. \quad (16)$$

$D_{\min}$ is the value where space stops existing as Space. If the actual density approaches this density,

$$D_{Space} = D_{\min}, \quad (17)$$

then the Space wave reached its maximum wavelength . If

$$D_{Space} < D_{\min}, \quad (18)$$

then Space *as Space* will disappear. How?

6. SPACE WAVES IN BLACK HOLES IN GALAXIES

In a black hole Eq. (18) will be true. Space disappears. Here $Space_{act} \neq Space$, Space will be replaced by *matter* or $Space_{other}$. There are three basic scripts.

- Space tears. The tearing of space is possible according to the string and M-theories[16]. The tearing of Space may create a $Space_{new}$ or $Matter_{new}$. The created $Matter_{new} \neq matter$. The newly created $Matter_{new}$ will act as $Space_{act}$ for the matter (mass) entered the black hole. That results in a new condition of the mass having entered the black hole, since its $Space_{act}$ changed. The mass will adopt the new $Space_{act}$, and it changes its characteristics. In other words, it "takes off" its mass costume and "picks up" a new dress. In the new $Space_{act}$, mass appears as a fast wave. This script is based on the tunneling. The tunneling is a real and working way that shows this is a possible opportunity.

- Space ($Space_{act}$ = Space) turns into matter. Space can turn into matter according to quantum mechanics. But now the created $matter_{new}$ will be different from matter (mass) we know, since the known matter (mass) forced this change and the matter needs a space.

- Laczkovich[17] has solved the circle-squaring problem. Taking this, there can be a possible decomposition between particles independent of their shapes and measurability. So, the Banach-Tarski Paradox (BTP) or a similar operation can work in a black hole. Let's see one single Space wave with small density. Let's see it as a three dimensional Space particle. Using the BTP, the Space particle goes to finitely many pieces. These pieces will be reassembled into two Space particles. One Space particle is measurable from the viewpoint of Space. This is a Space particle. The other Space particle is immeasurable from the viewpoint of Space. This particle is a kind of matter we don't know. If this particle repeats the BTP, there will be two Space particles and one unknown matter particle. This unknown particle uses these two Space particles. The mass we know can use this unknown matter as space. In this case in Space there are two effects of two different matters but the value of gravity remains unchanged, since the mass we know turned into a fast wave the same as in the case of tunneling.

7. WHAT IS A BLACK HOLE MADE OF?

Nowadays physicists mean, when very massive stars collapse to zero radius, a black hole is created. This statement can be correct or can't.

Can we give a different solution for how black holes are creted? Yes, we can. We don't need the collapse of a very massive star. We need lots of big masses inside a galaxy. Masses increase the wavelengths of Space wave. If there are many masses in the given portion of Space, the Space waves will be very long. If these long waves result in $D_{Space} < D_{\min}$, Space tears, and because of the small density of Space waves, a black hole will be created. Where does the black hole come into being? It depends on the topography of Space waves of masses—typically in the centers of galaxies.

In a black hole mass is supposed to disappear. How? Masses in a black hole act like the mass in the tunneling. If the $Space_{act}$ has been changed, matter changes its form. That is, the mass will be transformed into a fast wave that travels in the $Space_{act}$. Where does this $Space_{act}$ lead? To a new Universe? No, black holes don't lead to a new Universe. Mass remains in our Universe, but it will use a different $Space_{act}$ as non-mass, since mass *as mass* cannot use this $Space_{act}$. What is $Space_{act}$? Either $Space_{act}=Space_{new}$ or $Space_{act}=Matter_{new}$.

8. WHY BLACK HOLES AND GALAXIES CANNOT GROW INFINITE

Using both the special theory of relativity and space-matter theory, and studying the size of galaxies, we can calculate the value of $D_{\min}$. On the other hand, the tearing of the Space is not an infinite lack since galaxies have finite sizes. That means even $Space_{new}$ and $Matter_{new}$ cannot endlessly grow.

After a black hole has been created, it can continue to grow by absorbing mass from its surroundings. How big can a black hole be? A black hole is the tearing of Space. If a black hole in the middle of a galaxy started absorbing masses from its surroundings, it would become smaller—sooner or later. Why? Because masses "sucked in" from the black hole's surroundings are parts of the system that keeps the tearing "alive". "Sucking in" means that masses will be stuck in the black hole. In the galaxies, masses are moving. We know the moving bodies change their masses and gravities with their velocities. So, the gravity of the system cannot be the same without the existence of the given "sucked" masses, since the "sucking in" is just one picture of the movie. It is just one state of the gravity of a given mass that was present at a given velocity. The masses that disappeared in the black hole won't change their gravities any more. The masses around the black hole not "sucked in" can replace the lost gravity just in a given range. The more masses disappear in the black hole, the sooner comes the decreasing of the black hole, since masses around it cannot travel faster than light in Space. There is a point where the gravity of the system will decrease, the black hole will be smaller, its gravity will be smaller. I think flares can show this phenomenon.

If the black hole decreases, the bodies around the black hole will travel more slowly. The system will find its equilibrium via iterations. There is equilibrium, since we live in a stable galaxy.

The same effect regulates the sizes of galaxies.

Where is the mass "sucked in"? These masses disappear as masses, they will be fast waves. The metamorphoses of how mass turns into fast wave and fast wave into mass are fast and observable in the tunneling. The fast waves are able to leave and enter the black hole without getting stuck in, since they are not connected with its gravity.

9. GRAVITY IS GRAVITY. OR NOT?

The gravity of a black hole cannot work the same way as the gravity of a mass. This statement comes from the fact that the black hole is not a mass. The gravity pictured in Figure 3 exists as changes of wavelengths of Space wave made by masses. In the black hole the Space waves are missing. These "missing" Space waves act on every mass in the galaxy. We can model it like this: the Space waves between the black hole and the given mass depend on the mass of the object. Every mass creates its own Space waves that depend on the given mass. That is, the Space waves between the masses and the black hole are "normalized", that is the effect of distance between masses and black hole is missing. A draft function of this connection may be like this:

$$\frac{m_i}{\lambda_{i,Space}} = \frac{m_{i+j}}{\lambda_{i+j,Space}}, \tag{19}$$

at every value of i and j, where m_i mass creates the $\lambda_{i,Space}$.

Eq. (19) also explains why the stars rotate around a black hole differently than the planets around a star.

9.1. Calculations?

I don't intend to build a detailed model of a black hole; all I wanted is to show a different way we can think about black holes—using a new theory called space-matter.

List of References

[1] Wald, R. M. (1997). Gravitational Collapse and Cosmic Censorship" arxiv.org:9710068.

[2] Overbye, D. (2015). Black Hole Hunters. NASA. Retrieved 8 June 2015.

[3] Wald, R. M. (1984). General Relativity. University of Chicago Press. https://books.google.hu/books?id=9S-hzg6-moYC&redir_esc=y

[4] Seeds, M. A.; Backman, D. E. (2007). Perspectives on Astronomy.

[5] Gillessen, S.; Eisenhauer, F.; Trippe, S.; et al. (2009). "Monitoring Stellar Orbits around the Massive Black Hole in the Galactic Center". The Astrophysical Journal. 692 (2). *arxiv:0810.4674*

[6] Lajtner, T. (2016) Four mysteries solved: double-slit, spooky action, tunneling, and accelerating Universe Int. Res. J. Pure App Phys V 4. I3. (IRJPAP)

[7] http://physics.nist.gov/cgi-bin/cuu/Convert?exp=0&num=1&From=kg&To=ev&Action=Convert+value+and+show+factor

[8] Einstein A (1905) Zur Elektrodynamik bewegter Körper. Annalen der Physik 17, 891-921.

[9] Einstein A (1907) Relativitätsprinzip und die aus demselben gezogenen Folgerungen- Jahrbuch der Radioaktivitaet, 4, 411-462.

[10] Lajtner,T. (2016) Thought foece moves real objects—energy amplifier by nature http://vixra.org/abs/1610.0373

[11] Nimtz, G. Enders, A. and Spieker, H. (1994) Photonic tunneling times. J. Phys. I France 4 565-570 http://jp1.journaldephysique.org/articles/jp1/abs/1994/04/jp1v4p565/jp1v4p565.html

[12] Nimtz, G. (2010) Tunneling Violates Special Relativity http://arxiv.org/pdf/1003.3944v1.pdf

[13] Gerlitz, T. G. M. (2015) Superluminality and finite potential light-barrier crossing. Int. Jour. of Res. in Pure and App. Phys. 5(2): 19-24. http://urpjournals.com/tocjnls/45_15v5i2_1.pdf

[14] Nimtz, G. (2013) Tunneling: From Milliseconds to Attoseconds http://arxiv.org/pdf/0903.2582v1.pdf

[15] https://www.ligo.caltech.edu/system/media_files/binaries/302/original/detection-press-release.pdf (2016).

[16] Brändle, M., Lukas, A (2014). "Flop Transitions in M-theory Cosmology" (PDF). http://cds.cern.ch. CERN. Retrieved 28 July 2014.

[17] Laczkovich M (1988) Sejtes es bizonyitas 75-79. (Typotex Kiado, Budapest).