Evidence-Based Cosmology Black Holes as Rejuvenating Systems of the Universe

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Abstract: A bijective analysis is confirming, the expansion of universal space has never been directly observed, and this assumption is unproven thus far. The measurement of the gravitational redshift, which was confirmed using the Mossbauer experiment, proves only the gravitational redshift and nothing more because there is no causality between the gravitational redshift and hypothetical expansion. Thus, even if the universal space is assumed to expand, the gravitational redshift cannot be assumed to be proof of the expansion. In addition, the Doppler effect was never observed in an expanding space; thus, the claim that the cosmological redshift is partially caused by the Doppler effect, which is caused by the expansion of space, is an unproven assumption. Furthermore, the discovery of cosmic microwave background (CMB) radiation simply proves that the radiation is emitted by the entire universal space, but does not prove the existence of a recombination period. In evidence-based cosmology, every element in the model has a corresponding element in physical reality that is observed and measured. The evidence-based cosmology model is related to the real universe by a bijective function of set theory. Supermassive black holes in the centre of galaxies are rejuvenating systems of the universe. They rotate their local superfluid space which is the physical origin of galactic rotation curves.

Keywords: evidence-based cosmology; black holes; galactic rotation curves

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1. Introduction

In the Evidence-Based Cosmological model (**EBC**) all elements in the model of the universe have their bijective element in the physical reality, see Figure 1 below:
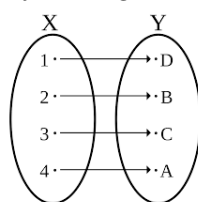
Figure 1. The bijective function is relating the model of the universe Y with the real universe X.

In Big Bang cosmology, a big initial explosion is not directly observed, and the expansion of universal space is not directly observed. In the **EBC** model, the fundamental elements which are jests coming from the centers of galaxies, are directly observed. Big Bang cosmology is similar to the geocentric system which was a pure belief with no observational evidence. The geocentric system is based on the belief that the Earth is the centre of the universe and the Sun and all other planets orbit around it. This system was functioning well, the calculations appeared to be accurate, and the system was not doubted until the Greek astronomer and mathematician, Aristarchus of Samos (310–230 BC), developed the heliocentric model that was later accepted as the accurate system [1]. Similarly, the Big Bang model is assumed to be correct despite the lack of scientific proof. In the Big Bang model, the initial explosion was not observed and has no bijective correspondence with the universe. Expansion

of space was not observed and has no bijective correspondence with the real universe. The recombination period was not observed and has no bijective correspondence with the real universe.

Bijective research methodology requires that each element in a given model of physical reality is observed or measured. For example, we cannot see gravity force, but we can measure its effects. This means gravity force exists. That time is a 4th dimension of space, we cannot see and we cannot measure. So, it is wrong to imagine time as a physical dimension of space. In cosmology, for more than 100 years we think that time is the physical reality in which the universe exists. Bijective research methodology is proving that time is not 4th dimension of space [2]. The universe exists in time-invariant superfluid space.

In the case of the Big Bang model, thinking strays away from the bijective research methodology which suggests that the existence of a given physical phenomenon should be accepted as true only after it has been observed and measured.

observation of phenomenon → measurement → acceptance that phenomenon is real

The expansion of universal space has never been observed or measured. The claim that the cosmological redshift is proof of universal expansion is a cognitive simplification outside the realm of scientific thought. An unbridgeable cognitive abyss exists between cosmological redshift and hypothetical expansion, and these two phenomena are not related by physical means. This is a classic example of "forced theory", wherein something serves as proof of something else that was never observed or measured:

no observation → no measurement → acceptance of phenomenon as a fact

In addition, why the hypothetical expansion of universal space would cause the cosmological redshift as a kind of Doppler effect is questionable. There is no physics model that describes how the expansion of space could cause the Doppler effect, which is a phenomenon that occurs when the light source moves closer to or away from the observer in a stationary space. The Doppler effect on Earth was performed in stationary space. The manner in which the Doppler effect works in an expanding space has not been tested. Thus, there is no phenomenological relationship between the Doppler effect and universe expansion. Thus, the claim: "Gravitational redshift is proof of universal space expansion" is an unfalsifiable one, and thus, cannot be considered scientific fact.

It has been observed that light from distant galaxies undergoes a loss of energy. We call this loss of energy the "gravitational redshift":

loss of energy → gravitational redshift

A strong cognitive bond exists between "gravitational redshift" and the observation of the loss of energy. However, the loss of photon energy, and therefore, the gravitational redshift, has no phenomenological relationship with the theoretical expansion of space. Even if the expansion of universal space were real, it would not cause a gravitational redshift. Loss of energy from distant galaxies was proposed by Swiss astronomer Zwicky. He name it the "Tired light effect" [3]. Cosmological redshift is an unproved preposition that has no experimental evidence behind it. Frankly, we can say it is a myth. We know in physics that redshift can have an origin in the Doppler effect or gravity, the third option of universal expansion being the cause of redshift was never proven by an experiment.

In the theory, we distinguish three types of redshift: Dopler redshift, gravitational redshift, and cosmological redshift [4]. The first two have a rigorous mathematical description and experimental confirmation, the last one has no mathematical description and there is no experimental evidence of its existence. Nobody ever built a mathematical model that would describe how in an expanding space light increases the wavelength, and nobody ever observed the motion of light in an expanding space. Cosmological redshift is a myth.

Another observation that leads us to conclude that the expansion of universal space is the CMB radiation. The CMB exhibits a thermal black-body spectrum at a temperature of 2.72548 ± 0.00057 K. This is the result of the measurement, which allows us to conclude that the universal space radiates CMB, which is highly uniform throughout space. However, the interpretation of CMB as the relict

radiation of the recombination period is only an unproven hypothesis; it is not a scientific fact. Again, the aforementioned incorrect methodology was adopted for building this hypothesis.

CMB measurement → the entire space emanates this radiation → CMB is the relict radiation

of the recombination period.

Although there is a strong phenomenological bond between the CMB measurement and the statement that the entire space radiates it, there is no phenomenological bond between the CMB measurement and the existence of the recombination period. The only proof of CMB radiation is the measured radiation; the entire space emanates this radiation. Traunmüller published his research back in 2020 where he showed the CMB is not proof of the Big Bang model [5].

In general, a given source of electromagnetic radiation can only exist at a spatial distance from the receiver, never at some fictitious temporal distance. Temporal physical distance in physics is a myth, temporal distance exists only in the human mind. A given electromagnetic signal can only move through space, never through time. The time when measured is its duration of motion in space from the source to the receiver. The idea, that CMB is radiation that has an origin in the physical past is flawed, it does not respect the fundamental discoveries of today's science, namely, that time has no physical existence. This was explained and proved by scientific means by Rovelli, Barbour, and Fiscaletti [6,7,8].

We experience the universal changes that are running in time-invariant space in a frame of psychological time, i.e., "past-present-future", while the universe itself is timeless. Therefore, the assumption that the universe began in some remote physical past is incorrect because time has no physical existence. Thus, a hypothetical "beginning in time" can be excluded because the universe develops in a time-invariant space, where there is no past, present, or future [9], implying that the universe is non-created and eternal. Time is an emergent physical reality created by the observer in the process of measurement. No measurement means no time. The universe is timeless in the sense that it does not exist in some physical time, the universe exists in time-invariant space [10]. Cosmologists need to get accustomed and fully accept that the universe does not run in some physical time, it runs in time-invariant non-created space. The idea that the universe had some beginning when time and space started is a religious idea that has no place in 21st-century science.

The third proof that the Big Bang model is erroneous is mathematical. The FLRW metric is not valid for Euclidean space, however, NASA has measured that universal space has a Euclidean shape with only a 0.4% margin of error. The metric of Euclidean space is such that Euclidean space can neither expand nor shrink [11]: "In the FLRW metric, the density parameter, Ω, ultimately governs superfluid space where the curvature is: negative ($\Omega < 0$), positive ($\Omega > 0$), or flat ($\Omega = 0$)." When the density parameter Ω is 1 in the FLRW metric, the universal space has a Euclidean shape, and the FLRW metrics predict that such a space can expand. This is contrary to the metrics of Euclidean geometry, wherein the distance between two points is always constant. In a 4-dimensional Euclidean space, the distance d between points ρ and q is calculated as follows:

$$d\sigma = \left(\sum_{i=1}^{4} (\rho_i - q_i)^2 \right)^{1/2} \qquad (1).$$

In the frame of Euclidean geometry, there is no possibility of distance d being changed. This means that the universal space of our universe cannot expand. It is Euclidean and so infinite. We can predict how the universe functions on the observation of the visible universe. This is the pragmatism of evidence-based cosmology that has no theoretical predictions, it is based only on astronomical observations.

The idea that universal space can expand, and has some curvature that can be measured is flawed [12]. Light is bending because of the different energy density of superfluid space that is defined by the presence of stellar objects: "The physical source of light bending when passing the Sun is the variable energy density of space and not the geometry of space. When light approaches the Sun's surface, the energy density of the space decreases, and light is refracted. When light moves away from the Sun, the energy density of space increases, and the light is refracted in the opposite direction, see Figure 2 below [13].
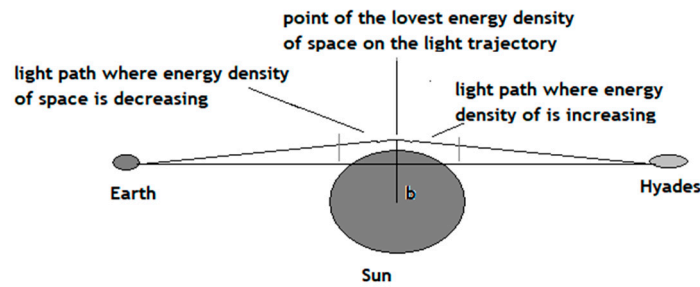
Figure 2. Light deflection caused by the variable energy density of space.

The same is valid when light is passing central black holes in galaxies. The bending of the light passing the galactic space has a physical origin in the variable energy density of superfluid space.

2. The Big Bang model does not conform to the requirements of the bijective research methodology

In the Big Bang model, the initial explosion was not observed and has no bijective correspondence with the universe. Expansion of space was not observed and has no bijective correspondence with the real universe. The recombination period was not observed and has no bijective correspondence with the real universe. The Big Bang model has a huge methodological and phenomenological weakness because the main elements of this model were not observed and were not measured.

The theory of Big Bang cosmology demonstrates how science should not work. The idea of a beginning occurring after a massive explosion is a myth, and all astronomical data have been interpreted in a way that agrees well with this myth. The first step to demystification is to raise awareness that the common image of the Big Bang cosmology is flawed. Figure 3 shows the first picture that one sees in their inner vision whenever cosmology is mentioned.
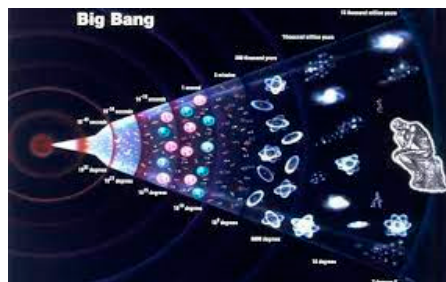
Figure 3. Inner vision of cosmology based on the wrong interpretation of astronomical data.

Only a five-year-old child could have such a magical, irrational imagination of the universe exploding from nothing. This indoctrination is the reason that the word "CMB" leads one to imagine a recombination period, and the term "cosmological redshift" leads one to imagine that galaxies are moving away from each other and that the universe is expanding. An adult person, who is completely free of imposed ideas from childhood, will be able to deduce that the Big Bang cosmology is a childish idea.

Questions thus arise apropos of why we disregard the fact that the redshift of light was never observed in an expanding space. We have only observed light in a space that is stationary; we do not have a theoretical model that describes how light moves in an expanding space and experiences energy loss. The lack of investigation into these aspects can be largely attributed to the human mindset. These facts are disregarded because the Big Bang cosmology is the most widely accepted

model, and thus, people are unwilling to doubt it. Since early childhood, the Big Bang model has been taught to everyone, especially if one's parents are scientists, and people rarely doubt what they perceive and experience during their first six years of life. Thus, the idea of the Big Bang model becomes embedded within the mind to a degree that is comparable to those of the ideas of nationality and faith.

Hawking and Hartle suggested back in 1983 that the universe started from an infinitely small point that is expanding. With regard to the issue of energy creation, the authors have found a mathematical solution: "In the quantum mechanics of closed universes we do not expect to find a notion of ground state as a state of lowest energy. There is no natural definition of energy for a closed universe just as there is no independent standard of time. Indeed, in a certain sense, the total energy for a closed universe is always zero the gravitational energy cancelling the matter-energy" [14]. Their proposal can be written in mathematical form as follows:

$$nE_m + \left(-nE_g\right) = 0 \qquad (2),$$

where E_m is the energy of matter and E_g is the gravitational energy, $n = 1,2,3$ .... Assigning the energy of matter a positive mathematical sign and the energy of gravity a negative mathematical sign still does not solve the increase of both energies in a growing universe. Hartle and Hawking avoided the problem of energy creation in the hypothetical inflation of the universe by covering it with a mathematical band-aid that does not fix the problem. Even in his later works, Hawking maintained his view of the universe, which seems more religious than scientific. In 2010 he believed that the universe appeared out of nothing:" If the total energy of the universe must always remain zero, and it costs energy to create a body, how can a whole universe be created from nothing? That is why there must be a law like gravity. Because gravity is attractive, gravitational energy is negative: One has to do work to separate a gravitationally bound system, such as the earth and moon. This negative energy can balance the positive energy needed to create matter, but it's not quite that simple. The negative gravitational energy of the earth, for example, is less than a billionth of the positive energy of the matter particles the earth is made of. A body such as a star will have more negative gravitational energy, and the smaller it is (the closer the different parts of it are to each other), the greater this negative gravitational energy will be. But before it can become greater than the positive energy of matter, the star will collapse into a black hole, and black holes have positive energy. That's why empty space is stable. Bodies such as stars or black holes cannot just appear out of nothing. But a whole universe can" [15]. Evidence-Based Cosmology (**EBC**) has no such insoluble problems, nor does it create a single unanswered question.

3. Black holes as rejuvenating systems of the universe

Evidence-based cosmology is using the "bijective research methodology", wherein all elements of the model are observable and measurable. In **EBC** the universe is a set X, and the model of the universe is a set Y, the sets are related by the bijective function. In the SC, supermassive black holes (SMBHs) have been considered the rejuvenating systems of the universe. At the centre of SMBHs, the energy density of space is low enough to cause atoms to become unstable and fall apart into elementary particles that form jets: "In intergalactic space energy density of space is *4,6412 ·* $10^{113}Jm^{-3}$. In the centre of SMBHs energy density of space diminishes hugely and consequently diminishes the amount of energy expressed by electron-volts. The mass of SMBH called Cygnus X-1 is $4,2169 \cdot 10^{31}kg$, its radius is 63000 m. Calculating the diminished energy density of space in the centre of Cygnus X-1 using Eq. (2) yields:

$$\rho_{cE} = 4,6412 \cdot 10^{113}Jm^{-3} - \frac{3 \cdot 4,2169 \cdot 10^{31kg} \cdot c^2}{4\pi \cdot 63000^3}$$

$$\rho_{cE} = 4,6412 \cdot 10^{113}Jm^{-3} - 3,5762 \cdot 10^{34}Jm^{-3}.$$

In centre of Cygnus X-1 energy density of space is less for $3,5762 \cdot 10^{34} Jm^{-3}$ than in the intergalactic space. We suggest that this diminishing of energy density is the physical cause of the diminishing of the electromagnetic forces that keep atoms together" [16].

SMBHs are rejuvenating systems of the universe. Old matter in the centre of SMBHs is transformed back into fresh energy in the forms of jets that are filling intergalactic space with fresh energy for the formation of new stars [17,18]. Jets emerging out of SMBHs have been well-documented [19]. The variable energy density of space that governs gravity has been precisely measured by the rate of clocks at a one-meter vertical distance [20].

In the **EBC**, the Milky Way moves towards the Great Attractor area of supercluster Laniakea. This motion has a bijective correspondence to real motion in the physical universe and is well documented [21,22]. The motion of the Milky Way in the Big Bang model because of hypothetical space expansion was never observed and is a working hypothesis, it is not a scientific fact.

In the SC, the supercluster Laniakea is moving in the direction of the Shapley supercluster that is moving in the direction of the Vela supercluster. The motions of these superclusters are well documented [23,24] and are well integrated into the bijective stationary cosmology, where universal space is stationary. In the Big Bang model, there is no observed motion of the galaxy or galaxy cluster that would be a result of universal space expansion. The motion of stellar objects as a consequence of space expansion is an unproven hypothesis. In Chapter (1) we have seen that gravitational redshift does not prove the motion of galaxies.

Eminent physicists have examined the weak points of Big Bang cosmology [25,26,27,28] and yet today, in 2023, this model is still taught in universities. Although stationary cosmology explains all astronomical data well and has no unbridgeable problems with explaining the beginning of the universe, it is still not as prevalent. The problem with today's progress in cosmology is that dozens of peer-reviewed papers have misinterpreted astronomical data and supposedly proved Big Bang cosmology right. The application of bijective research methodology has shown that the unsolvable problems of big bang cosmology can be solved with the comeback of stationary cosmology [29].

3.1. Rotating black holes are rotating local superfluid space

The idea that universal space is empty and curved has led to the geometrization of gravity and the introduction of gravitational singularities in the centre of black holes. From a physical point of view, gravitational singularities are problematic because infinite gravity plus concrete final gravity force still is infinite gravity [17]. With the introduction of the variable energy density of superfluid space (superfluid space), gravitational singularities are avoided. Black holes are represented as the rejuvenating systems of the universe [29].

Rotating superfluid space around the Earth is the physical cause of the Foucault pendulum effect. Back in 1851, the Foucault pendulum was proof that Earth is rotating [30]. In our model, the Earth is also rotating the local superfluid space. On the North Pole, Foucault's pendulum rotates in full circle in 24 hours following superfluid space motion that is on the surface rotating with the same angular speed as Earth.   Going closer to the equator the time of rotation is increasing, because the forces of the superfluid space on the pendulum are not equal as they were at the pole, see Figure 4 below.   Where the pendulum swings in the position that is closer to the equator, the orbital velocity of the superfluid space is bigger than where the pendulum swings in the opposite direction that is closer to the pole. This difference in the orbital velocity of superfluid space causes different forces that result in the pendulum rotation. At the equator, there is no effect of rotation because the forces of rotating superfluid space on the pendulum in the direction of Earth's rotation are equal, see Figure 4 below. Moving to the South Pole, the pendulum starts rotating in the opposite direction because the orbital velocity of superfluid space decreases going toward the South Pole. This causes the pushing force of the superfluid space is also decreasing going toward the South Pole.   When is exactly above the South Pole it needs 24 hours for the full circle, see Figure 4 below.
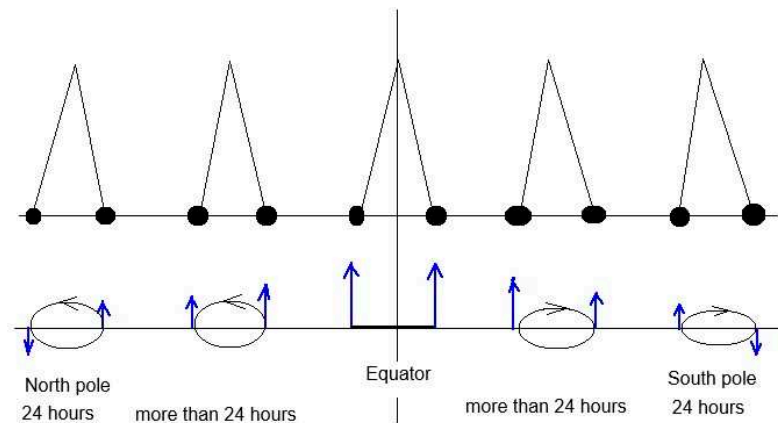
Figure 4. Forces of superfluid space on Foucault pendulum.

In our model fundamental universal space is n-dimensional. Superfluid space is 4-dimensional, and stellar objects are 3-dimensional [10].   Rotating 4D superfluid space is rotating in n-dimensional fundamental space that is at rest and asserts a given pushing force on the 3D pendulum.

Back in 2013 Russian physicist Samokhvalov carried out an experiment that proves that rotating objects cause the rotation of objects that are in their vicinity [31]. In the experiment, two discs are placed in a vacuum chamber. When the down disc is put into the rotation after a while also disk that is placed above the first disk starts rotating. Between discs, there is no physical connection. We predict that a rotating disk causes the local superfluid space around the disk to start spinning. The rotation of the local superfluid space exerts a given force on the second disk, which also begins to rotate. In the same way, SMBHs in the center of spiral galaxies are rotating local superfluid space of the galaxy. The rotating superfluid space is causing the orbital velocity of stars around the SMBH to be the sum of two velocities. The total orbital velocity of the star around the SMBH is the sum of its relativistic orbital velocity and the orbital velocity of superfluid space on its trajectory:

$$v_{total} = v_{rel} + v_{ss} \qquad (3).$$

We calculate the additional orbital velocity of Mercury caused by the pushing force of superfluid space v_{ss} in Mercury's orbit is $v = 0.00381 \, ms^{-1}$ [18]. If superfluid space would not rotate around the Sun, Mercury would not have its perihelion precession. If SMBHs in the centre of spiral galaxies would not rotate, there would be no galaxy rotation curves.

Russian physicist Sbitnev also has related the Samokhvalov experiment with the rotation of spiral galaxies and orbital speeds of stars in the spiral arms of the galaxies: "Self-organization of huge amount of gyroscopes presented by virtual pairs of particles and antiparticles and involved in a single rotating dance leads to a significant macroscopic effect. This effect is observed in the Samokhvalov experiment as the grasping in the technical vacuum of the initially unmoved disk by the rotating disk. On the cosmic scale this effect exhibits
itself in stabilization of the orbital speeds of spiral arms of galaxies. As a result, all stars rotate around the central core of the galaxy with almost equal speed, independently of how far from the center of the galaxy they are placed" [32].

In the Sbitnev model, superfluid space (superfluid medium in consideration) is irrotational: "The vorticity reaches a maximal value in the center of the vortex core. We may imagine that the vorticity spreads far from the plane of a spiral galaxy in the transverse direction due to the involvement in the vortex activity of enormous amount of the virtual gravitational dipoles. Such a direction is shown by dotted arrow in Fig. 2. It is instructive to recall here the Helmholtz theorems pointing to the certain properties of the vortex: (i) the strength of a vortex filament is constant along its length; (ii) a vortex filament cannot end in a fluid medium; it must form a closed path (like a smoke ring), end at a boundary (solid or free surface), or go to infinity; (iii) in the absence of rotational external forces, a fluid that is initially irrotational remains irrotational" [33].

Sbitnev model proposes that vortexes made out of pairs of particles and antiparticles lead to significant macroscopic effects in a nonrotating superfluid space. We propose that superfluid space is rotating, it is physically linked to the stellar objects, and it moves and rotates with them. We are proposing the "Ether Wind Experiment" in a vacuum chamber where a rotating flying wheel should rotate ether and cause the motion of the freely clamped plate, see Figure 5 below.
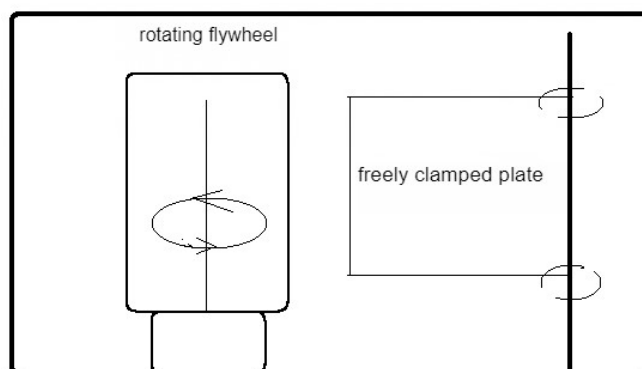
Figure 5. Ether wind experiment.

Regarding the existence of dark matter and dark energy, we are in total agreement with Sbitnev: "It is curious that the rejection of the ether as an ubiquitous special substance, at the initial stage of creation of the general theory of relativity (GTR), has led to the series of false hypotheses. Some of these hypotheses are the dark matter and dark energy. The both concepts are based on assumption of the absolute correctness of the equations of GTR and the hasty conclusions drawn from early astrophysical observations. The first one had somehow to explain stabilization of the orbital speeds of the spiral arms of galaxies. And the second one is to explain the discrepancies found in the Hubble's law, also called the law of expanding the universe. As a result, on the light there were assumptions about the existence of hitherto unknown substances, called dark matter and dark energy" [33]. In our model, dark matter is non-existent and dark energy is the ether that is a four-dimensional type of energy that is the physical origin of the universal space. It is not that universal space is filled with ether, ether itself is the physical origin of the universal space [18].

The idea that rotating physical objects could also rotate local "space-time" was also developed in a Ph.D. thesis of Hugo R. C. Ferreira [34]. In the model presented in this article, space-time is replaced with superfluid space, physical objects rotate superfluid space. The rotation of superfluid space is the physical cause of Mercury's precession and of the galaxies' rotational curves. The orbital velocity of dark energy on the Mercury orbit is 3.81 millimeters per second. The "dark matter" effect can be explained by the rotation of local superfluid space around central black holes of spiral galaxies. In this model, superfluid space is dark energy itself. The superfluid space model is built on Newton's ideas of the dynamic ether model where gravity is the result of the variable density of the ether. His model is a physical model of gravity, and Einstein's model is the mathematical model of gravity. Newton's model is superior in the sense that it can explain the physical origin of gravity [13].

4. Mathematical cosmology has created fictitious cosmological problems

Today's quantum cosmology sees the universe as a system that is existing in some physical time where the "free-falling observer" has his proper time [35]. This view is based on mathematical models developed on Special Relativity where we have different proper times and different inertial systems and common coordinate time in which all inertial systems exist. In the universe, there are no inertial systems, and there are no coordinate times, the only thing that really exists is a relative velocity of material changes (rate of clocks included) that depends on the variable energy density of superfluid space and is valid for all observers [36]. As we have seen in the Introduction, the universe exists in time-invariant space and this has to be taken into account. The idea, that the CMB signal is proving the initial explosion that has happened in some remote physical past [37] is against the fact that

material changes run in a time-invariant universal space that has a Euclidean shape. CMB signal is the radiation of the existent universal space. Why there is a slight difference in the intensity of CMB radiation coming from above and from below the Solar system we have a possible answer: Sun is rotating local superfluid space in the direction of its axial rotation. CMB that is coming from the "above" direction passes through rotating superfluid space in the opposite direction as CMB that is coming from the "below" direction.

Another fictitious problem in 20th-century cosmology was Einstein's universe with or without cosmological constants: "Soon after the successful formulation of the general theory of relativity (Einstein 1916), Einstein applied his new theory of gravity, space, and time to the universe as a whole. Assuming a cosmos that was static over time, and that a consistent theory of gravitation should incorporate Mach's principle, he found it necessary to add a new term to the general field equations in order to predict a universe with a non-zero mean density of matter - the famous 'cosmological constant' With a judicious choice of the cosmological constant, Einstein was led to a model of a finite, static cosmos of spherical spatial geometry whose radius was directly related to the density of matter" [38]. In **EBC** cosmology we do not have a problem with the cosmological constant. NASA has confirmed universe has a Euclidean shape and is infinite in volume. Gravity is governed by the Planck energy density ρ_{EP} of superfluid space, and gravitational constant G can be expressed by the Planck energy density:

$$G = \frac{c^2}{\rho_{EP} t_P^2} \qquad (4),$$

where Planck time t_P is the fundamental unit of the numerical order of material changes that runs in time-invariant space [39]. Every physical event in the time-invariant space can be dissected into single events where each of them has its own Planck time. The duration of an event is the sum of Planck times. For example, a photon moved from A to B. Distance from A to B is composed of Planch distances. The passage of the photon on one Planck distance is enumerated by one Planck time. Photon moves only in time-invariant space and time is the numerical order of motion. When an event is measured by clocks by the observer, he/she gets duration t, see Eq. (5) below [39]:

$$t = t_{P1} + t_{P2} + t_{P3} + \cdots + t_{PN} = \sum_{i=1}^{N} t_{Pi} \qquad (5).$$

The duration is an emergent physical reality that enters existence in the process of measurement. This has to be understood for cosmology progress. The Entire Big Bang cosmology prevalent study is some fictitious physical reality that is non-existent, and we will never know if it ever existed. Why not turn the story around: let's build cosmology on what we observe in the current existent universe. This is the aim of this article. **EBC** cosmology has no theoretical prepositions and no predestined mathematical model. We are not searching for some astronomical data that would prove or disprove our model. **EBC** is evidence-based. Jets coming out of SMBHs are providing fresh energy for the formation of new stars. This process is eternal, with no beginning, and no end. Man is born, and the man dies. This is not the case with the universe. This insight liberates scientific thought.   Expanding the universe was never directly observed and remains an unproved hypothesis. Back in 2014 research was published proving that measuring the brightness of the galaxies from the local universe confirms universe is not expanding [40]. We have shown in the Introduction of this article that the universe has a Euclidean shape and that we have shown that Euclidean cannot expand. So, the expansion of the universe is another fictitious problem: will the universe expand forever or gravity will prevail (they do not know how, but they predict) and the universe will stop expanding and will start shrinking? **EBC** cosmology has no problem with the expansion of the universe or any other problem that Big Bang cosmology has.

Universal superfluid space is infinite in volume. This means that in the universe there is an infinite amount of energy in form of matter and an infinite amount of energy in the form of space. We can write t the following equation:

$$E_m = \infty$$

$$E_s = \infty \qquad (6).$$

In **EBC** beginning of the universe with the appearance of matter and space is not a problem (as it is in the Big Bang model). The begging of the universe is a religious subject that is related to the religious concept of creation. For 90 years cosmology is dealing with this religious subject. The originator of Big Bang cosmology is Belgian catholic priest Édouard Lemaître back in 1927 that also was a theoretical physicist. Bach in 1981, many of the world's leading cosmologists gathered at the Pontifical Academy of Sciences, where Stephen Hawking proposed that the universe could have arisen from nothing. Back in 1983, he published together with Hurtle this religious idea in a famous article on how the universe started from nothing [14]. Hawking's idea is not scientific, it is religious. The origin of the universe in some remote inexistent past is a religious subject, and how the universe works is a scientific subject. **EBC** is searching how the universe functions as an open infinite system. We study the observable universe and we assume that the entire universe functions under the same physical laws.

The aim of this article is to show cosmologists that what we see and observe is more useful than what we do not see, and we believe that happened long ago. The entire 90 years long effort of Big Bang cosmology was to prove something nobody has seen. We think it is time to turn the game: what we see in the observable universe is enough to imagine how the entire universe works.

In the **EBC** model, the Mach principle is valid: "Local physical laws are determined by the large-scale structure of the universe" [41]. Large-structure of the universe is the Planck energy density of the entire intergalactic space. Every stellar object is diminishing the Planck energy density ρ_{EP} of space in its center exactly for the amount of its mass/energy. This principle is called "The extension of the mass-energy equivalence principle on the universal space" and is expressed by Eq. (6) below:

$$E = mc^2 = (\rho_{PE} - \rho_{cE})V \qquad (7),$$

where ρ_{cE} is energy density of space in the centre of the stellar object, and V is the volume of the stellar object [10]. There is an active energy relation between stellar objects and the universal space. We predict that the area with diminished energy density of superfluid space is moving and rotating with the stellar object, and in general moving and rotating with all physical objects from the micro to the macro scale. Intergalactic superfluid space is static, it is not expanding, it is infinite in its volume. Galaxies are diminishing the energy density of space. This creates pressure of the intergalactic space and push galaxies together. This is also valid for the metal balls of the Cavendish torsion balance. The metal balls are pushed together because the outer superfluid space is pushing them, see Figure 5 below.
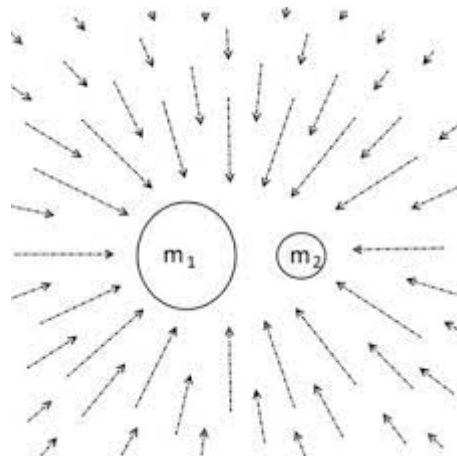
Figure 5. Two physical objects are pushed together by the outer superfluid space.

Superfluid space is a four-dimensional type of energy, matter is a three-dimensional type of energy. Physical objects are diminishing the energy density of space and diminished energy density of space generates gravity force. Gravity force is embedded in the superfluid space and is immediate. Gravitation is not propagating through space as electromagnetism does. 3D physical objects somehow are trapped in a 4D superfluid space. They always move towards the lover energy density

of space that is in the center of a given stellar object. Also, in the centre of the black hole energy density of space is at the minimum. There is no gravitational singularity in the center of a black hole [17].

5. Math is a tool and cannot become a law of physics

With the idea of Hendrik Lorentz that the beam of the Michelson-Morley interferometer which is in the direction of Earth's motion is shrinking, mathematics has overruled physics. Einstein kept this idea in special relativity and added new mathematical elements such as "coordinate time", and "time dilatation" in the sense that time is 4th dimension of space that can be dilated which was never experimentally observed [42]. Hawking's equation (2) is mathematically correct but it has no physical meaning. Also, the mathematical model of gravitational singularities of Prof. Penrose is mathematically correct but it has no physical meaning [17]. An overruling of mathematics over physics has led to the situation that today if you have a model that is mathematically correct, it will be published in a peer review journal. Editors and reviewers do not bother if the model has some correspondent physical reality or not. This is the crisis of physics that can be solved with the introduction of bijective research methodology where every mathematical element in the model must have a correspondent element in physical reality.

6. Hubble law is based on misinterpretations of astronomical observations

The hypothetical increase of distances between galaxies are increasing was never directly measured. It is only a wrong assumption based on the measure of redshift: "Hubble law states that the acceleration of the universe increases. The velocity of the expansion is defined on the basis of the redshift of a given galaxy. Universal space is expanding and so distances to the galaxies are increasing. The velocity of the galaxies is determined by their redshift that occurs because of the Doppler effect. There is no appropriate mathematical model existing that would describe the Doppler effect in an expanding space. Doppler effect is observed only in the stationary space where electric primitivity and magnetic permeability of space that define light speed are unchanged. We do not know how the Doppler effect would work in an expanding space where the energy density of the C4 SQS (superfluid space) would diminish, and the electromagnetic properties of space would be changed. Masanori's research confirms that gravity influences the electromagnetic properties of space: "It is known that the speed of light depends on the gravitational potential. In the gravitational fields, the speed of light becomes slow, and time dilation occurs. In this discussion, the permittivity and permeability of free space are assumed to depend on gravity and are variable." Applying the Doppler effect in Hubble law without knowing how the expansion of the universe changes the electromagnetic properties of expanding space seems unacceptable [11].

Hubble law predicts the existence of the "Hubble sphere" which is outside the scope of scientific thinking and has no support in astronomical observations: "Hubble law predicts the existence of the Hubble sphere, a spherical region of the observable universe beyond which objects recede at a rate greater than the speed of light due to the expansion of the universe. How galaxies could have velocity higher than light speed is also an unanswered question of Hubble law. Research published in 2013 has confirmed that photons form matter. This means that every physical object accelerated to light speed would turn into light. No physical object can move with light speed. Only photons can move with light speed. The Hubble sphere model is suggesting that beyond the Hubble sphere there are only photons in the universe and that they move faster than light speed. This seems unacceptable" [11].

Accelerated expansion of the universe is a myth similar to the myth of the initial explosion. If we had only one astronomical observation where we would directly measure that distances between galaxies are increasing, the expansion of the universe would have astronomical data support, but this is not the case. Redshift is not proof of the universe's expansion; it is proving only that distant galaxies have a redshift.

Initial explosion and expansion of the universe are two hypotheses that were never proved by astronomical observations. To keep them alive, we are supporting them with the wrong interpretation of astronomical data. For the 21st century, this seems an inappropriate way of scientific reasoning. Evidence-Based Cosmology is a promising alternative because it has no unprovable hypotheses as the Big Bang model has. Teaching students of physics only Big Bang cosmology without alternatives is a kind of religious indoctrination that is destroying free thought.

7. **Conclusions**

Our scientific mind is the prism through which we experience the universe, society, and ourselves. We must, therefore, clear this prism of all learned ideas and start thinking with fresh minds. We must respect the three pillars of physics: 1) perception, 2) creation of the model (mathematization of the phenomena we study), and 3) experimentation that will prove or disprove our model. This bijective research methodology is the most reliable methodology available for the development of physics and cosmology. Expansion of the universal space is an unproved preposition that is not passing the bijective analysis. Big explosion as the beginning of the universe also does not pass bijective analysis. The big initial explosion and expansion of the universal space cannot be directly observed and tested by an experiment. This is the weakest point of Big Bang cosmology that will never be solved.

Evidence-Based Cosmology (**EBC**) is a bijective model that is based on astronomical observations which are confirming that central black holes in the centers of galaxies are rejuvenating systems of the universe. The universe never started and will never end, it is an eternal system in permanent dynamic equilibrium.

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