
Newtonian Analysis of the Big Bang Model and Time-invariant Cosmology

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Abstract

Isaac Newton believed that gravity requires the universe to be centreless and infinite in all directions. For Issac Newton, the idea that the universe exploded out of nothing was unthinkable. He believed that time plays no role in the universe; the universe is eternal. In post-Newtonian cosmology, universal space is time-invariant. Time, as the duration of stellar objects' motion in space, is an emergent physical quantity that enters existence through measurement. The universe is uncreated and eternal. AGNs are rejuvenating systems of the universe. The model of the stationary universe is based on direct reading of astrophysical data and is far superior to the Big Bang theory. We re-examine the origin of the universe in some distant physical past and find that it is a theoretical mistake based on a misinterpretation of astrophysical data.

Keywords: cosmology, CMB, cosmological redshift, AGN, time.

1. Introduction

The Standard Cosmological Model finds its empirical foundation in four fundamental independent facts, i.e. the formation of large-scale structures, the recession of the galaxies, the existence of the cosmic background radiation and the nucleosynthesis of light elements. Despite its apparent successes as regards these predictions, it must however face several issues such as the problem of the origin of the galaxies, the problem of the null curvature of space and the problem of the dimensions of the universe. Moreover, also the idea of inflation implies that the values of baryon density, dark matter density and dark energy density must be adjusted by following fine-tuning procedures in order to assure an agreement with experimental results. Although inflation is explained in terms of a phase transition of the universe due to the decay of a great unified force, in the inflationary model, cosmology's greatest conundrum, i.e. the initial singularity – the beginning of time and the origin of everything – remains a puzzling dilemma and it does not seem possible to predict the occurrence of inflation ([Turok, Steinhard, 2005](#)).

In order to avoid the problems of the Standard Cosmological Model and inflationary models, an alternative compelling path is represented by the view of the cyclic universe, which implies that big bang cannot be considered as the real origin of the universe, but constitutes only an intermediate phase inside the cyclic processes. Cyclic models were originally discussed by Tolman 1930s ([Tolman, Ward, 1932](#); [Tolman 1934](#)) The cyclic cosmology in a flat universe entered physics only in two papers of 2002 by Steinhardt and Turok ([Steinhard, Turok, 2002a](#); [Steinhard, Turok, 2002b](#)). These two authors suggested that the universe is characterised by a periodic sequence of expansions and contractions, which begins with a “big bang” and ends in a “big crunch” thus emerging in a big bang once again. The new cyclic cosmology proposed by Steinhardt and Turok provides a surprisingly complete picture of cosmic history in which high energy inflation is no longer required, exploiting the currently observed dark energy to solve the flatness and homogeneity puzzles. In this framework, each big bang leads to processes of baryogenesis, dark matter formation, nucleosynthesis and galaxy formation, and ends with an epoch of low energy acceleration of the type we see today. An appealing result of the cyclic model of Steinhardt and Turok lies in bypassing the entropy and black hole issues by considering a phantom dark energy which is characterized by a great increasing in order to reproduce the enormous high energy density at the beginning and end of a cycle, thus introducing the possibility of deformations of the Friedmann equations ([Baum, Frampton, 2007](#); [Brown et al.,2008](#); [Caldwell, 2002](#); [Caldwell et al. 2003](#)).

On the other hand, a cyclic cosmology that avoids the initial singularity has been recently explored in the context of a holographic dark energy with two different infrared cutoffs. In this regard, Sheykhi, Tavaief and Moradpour have found that both the interacting and the non-interacting universes are characterized by cycles of sequential contractions and expansions, by invoking a holographic dark energy of the form

$$\rho_{DE} = km_p^2 L^{-2} \quad (1).$$

where k is a constant, m_p is Planck’s constant and L is a length which is related to the size of the universe (maybe to the Hubble parameter) ([Sheykhi, 2017](#)).

In the present paper, in epistemological affinity with this kind of results – and, above all, by providing a natural development of the paradigm originally introduced by Steinhardt’s and Turok’s ideas – we introduce a novel model of cyclic cosmology where the concepts of big bang and singularity are not present and are replaced by the idea of a timeless (time-invariant) universe in dynamic equilibrium where a fundamental symmetry exists between energy of

matter and energy of space. We call this model as “Time-invariant cosmology” (TIC). This model, which is based on the non-physicality of time and on astronomical observations, implies that, in the active galactic nuclei (AGNs) in the centre of galaxies, old matter is transformed into fresh energy that AGNs throw in intergalactic space in the form of jets or winds. In this vision, AGNs are rejuvenating systems of the time-invariant universe with no beginning and no end (Sorli et al., 2026)

TIC builds a cosmology model on astronomical observations; TIC has no theoretical standpoints. For TIC, the most fascinating astronomical observations are astrophysical jets, which are produced in AGNs (Nizamov, Pshirkov, 2023). Astrophysical jets are fresh energy for the formation of new stars. Supermassive black holes in the center of galaxies transform their own old matter into fresh energy in the form of astrophysical jets. In TIC, AGNs represent the rejuvenating systems of the universe (Fiscaletti, Sorli, 2026).

TIC categorically denies the existence of a physical entity named the physical past in which the universe could have started. The only universe that exists physically is the one we can observe. Ideas about the universe's beginning in some distant physical past, are non-empirical interpretative frameworks; we lack experimental evidence of a physical past and a physical future. TIC is built only on astronomical observation; it is an evidence-based cosmology. TIC is not mathematical cosmology; in ADC, mathematics serves as a tool. What makes sense in mathematics, does not always make sense in physics. TIC prioritizes the results of astronomical observations over theoretical mathematical constructs.

The structure of the paper is the following. In the *Introduction* is represented Time-invariant Cosmology (TIC) which is based only on astronomical observations. In section two, *Initial singularity and inflation are conceptually problematic models* it is shown that initial singularity and inflation period contradict the first law of thermodynamics. In the section three, *Cosmological redshift model has no theoretical and no experimental basis*, we showed that cosmological redshift associated with the expansion of the universe has no solid theoretical and no solid experimental basis. It is an unproved preposition lacking mathematical model. In section four, titled *AGNs are rejuvenating systems of the universe*, we present the model where AGNs are the rejuvenating systems of the universe. In section five, titled *Newtonian analysis of the Big Bang cosmology and Time-invariant cosmology*, we show that the Big Bang model is based on the misinterpretation of astrophysical data and a misunderstanding of time. In the universe, time has only a mathematical existence.

2. Initial singularity and inflation are conceptually problematic models

The standard Big Bang cosmological scenario describes the early universe as originating from an initial state characterized by extremely high, formally divergent values of density, temperature, and pressure. In this framework, space-time evolution is extrapolated back to a limiting regime often referred to as an initial singularity. The Big Bang cosmology model scenario of the universe is that before everything started, there was nothing. The universe exploded out of a mathematical point, where pressure, temperature, and density were infinite (Hartle, Hawking, 1983; Hawking, Mlodinow, 2010).

The empirical methodology of science is characterized by the following steps: observation of a phenomenon, formulation of a mathematical model, and experimental or observational testing of its predictions. In cosmology, however, the application of this scheme to the earliest epochs is necessarily indirect, since the relevant regimes are not directly accessible to observation. From this perspective, the initial singularity and inflationary phase represent extrapolations of the standard theoretical framework beyond currently testable regimes. In particular, their compatibility with thermodynamic principles at the Planck scale remains a subject of ongoing discussion.

In the Big Bang theory, the empirical methodology of science is not taken into account. The initial explosion model and the inflation model are beyond the rational perception and experience of the world because they do not obey the first law of thermodynamics. Epistemologically, they can be said to be irrational.

In attempts to address the energetics of inflation and thus to solve inflationary irrationality, Hawking have considered the possibility that the total energy budget of the universe may sum to zero, with positive matter-energy compensated by negative gravitational energy. Within this description, the global energy balance remains formally vanishing. However, the physical interpretation of such a decomposition, as well as the operational definition of gravitational energy in cosmological space-time, is not unique and depends on the adopted framework. The origin of the separation between positive and negative energy contributions therefore remains model-dependent. The source of positive energy of matter and negative gravitational energy remains unknown. The energy of E_m matter and the energy of gravity E_g cannot be positive or negative; their values are absolute: $|E_m|$, $|E_g|$. Hawking's mathematical solution to the inflation puzzle is a deceptive trick, not a physical solution that satisfies the first law of thermodynamics (Sorli A., et al., 2023a).

3. Cosmological redshift model has no theoretical and no experimental basis

The Doppler effect is a well-known physical phenomenon. The Doppler effect has never been observed in expanding space. The interpretation of a redshift of light from galaxies caused by the expansion of the universe does not currently have a direct laboratory analogue. There is no theoretical microscopic model of how the frequency of light would change because of metric expansion at the level of local physical processes. All Doppler effect experiments on Earth have been done in non-expanding space.

The claim that the shift of light from galaxies to the red spectrum proves that the universe is expanding is therefore model-dependent. Within standard cosmology, redshift is interpreted as a combination of kinematic (Doppler-like) and relativistic effects in curved space-time. In contrast, within the present framework, redshift is interpreted as a manifestation of gravitational energy exchange: light, when moving in the opposite direction of gravity, has a loss of energy. This was predicted by Einstein ([Einstein A. 1911](#)) and measured on the Earth's surface by Pound and Rebka in 1959 ([Pound, Rebka, 1959](#)). From this perspective, the observed redshift can be consistently described as a gravitational effect associated with photon propagation when pulling out of gravitational field.

Today, high-precision distance measurement technology makes it possible to measure the hypothetical expansion of the universe on the Earth's surface: "If universal space expands this means that also distances on Earth are expanding. The only question is if these small dilations are measurable. At a distance of 113 km, the velocity of space expansion is $2.665975305 \times 10^{-13}$ m/s. In one year, this yields 0.0000084132 m. The distance of 0.0000084132 m is 8413 nm. If the universe expands at the declared rate of 72,8 km per Mps, the distance of 113 km will increase by 23 nm per day" ([Sorli, 2025b](#)). The real motion of galaxies is caused by gravity, the fundamental force of the dynamics of the universe that governs the motion of entire galaxy clusters, including the local supercluster Laniakea, towards the Great Attractor ([Courtois et al., 2025](#); [JWST, 2025](#)).

3.1. Gravitational field and gravitational redshift

The physical origin of gravitational field is variable energy density of a fundamental dynamical quantum vacuum, which acts as a dark energy. In intergalactic space, the energy density of dark energy is at its maximum, which is equal to the Planck energy density ρ_{PE} . In the centre of a stellar objects, the energy density of dark energy ρ_{CE} diminishes accordingly to the mass of a stellar object, on the basis of the following equations:

$$\rho_{PE} = \rho_{cE} + \frac{mc^2}{V}$$

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

where m is the mass of the stellar object and V is its volume (Sorli A. et al., 2023b).

Gravitational mass m_g of a given stellar object can be expressed by the diminished energy density of dark energy in its center, on the basis of equation

$$m \approx m_g = \frac{(\rho_{PE} - \rho_{cE})V}{c^2} \quad (3),$$

where m_g is the gravitational mass of a stellar object, V is the volume of the stellar object, and ρ_{cE} is the energy density of dark energy in the centre of a stellar object. Gravitational force acting between two physical objects is expressed by the equation (4) (Sorli A. et al., 2023b).

$$F_g = \frac{m_{g1}m_{g2}G}{r^2} \quad (4).$$

The following equation (5) describes gravitational redshift:

$$z = \frac{\Delta\lambda}{\lambda} = \frac{2Gm}{r^2c^2} \quad (5),$$

where z is the redshift, $\Delta\lambda$ is the change in wavelength, λ is the original wavelength, G is the gravitational constant, m is the mass of the celestial body, r is the radius from the center of the mass to the point of emission, c is the speed of light in a vacuum (Modern Physics, 2025).

We can combine Eq. (3) and Eq. (5) and we get:

$$z = \frac{\Delta\lambda}{\lambda} = \frac{2G(\rho_{PE} - \rho_{cE})V}{r^2c^4}$$

$$z = \frac{\Delta\lambda}{\lambda} = \frac{2G(\rho_{PE} - \rho_{cE})4\pi r^3}{3r^2c^4}$$

$$z = \frac{\Delta\lambda}{\lambda} = \frac{8G\pi r(\rho_{PE} - \rho_{cE})}{3c^4}$$

$$z = \frac{\Delta\lambda}{\lambda} = \frac{8G\pi}{3c^4} r(\rho_{PE} - \rho_{cE}), \frac{8G\pi}{3c^4} = G_R \text{ (gravitational redshift constant)}$$

$$z = \frac{\Delta\lambda}{\lambda} = G_R r(\rho_{PE} - \rho_{cE}) \quad (6).$$

$$G_R = 6,902795291 \cdot 10^{-44} m^{-1} kg^{-1} s^2$$

Eq. (5) confirms that the gravitational redshift of a stellar object depends on the energy density of dark energy in its center and on its radius. When the radius gets short, the mass density increases, and the energy density of dark energy in the centre decreases. Imagine we have two stars with the same mass, and one has $1/2$ of the radius of the other. The smaller star will have a bigger gravitational redshift. In gravitational blueshift, a photon gains energy from the gravitational field. In gravitational redshift, a photon loses energy because of the gravitational field (see Figure 1).

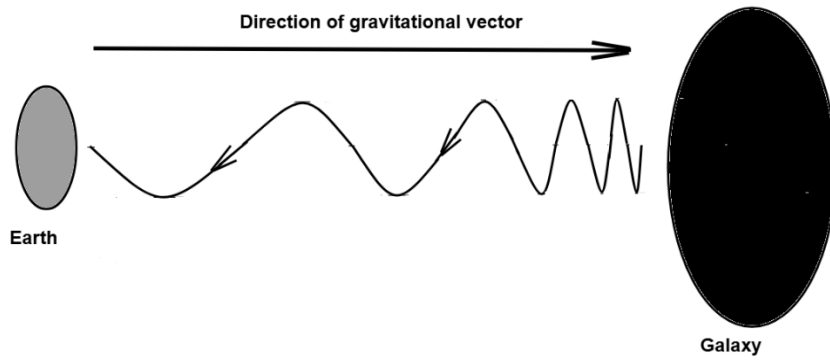


Figure 1: Gravitational redshift

In gravitational redshift and blueshift, photon exchanges energy with the gravitational field. When a physical object is in free fall, it gains gravitational energy from the gravitational field that turns into kinetic energy of the falling object. When a physical object is thrown in the opposite direction of the gravitational vector, it will experience a reduction of its kinetic energy.

The cosmological redshift model lacks a physical explanation for how the expansion of space reduces the energy of the photon: “The dark lines of an absorption spectrum are shifted toward the right or red end of the spectrum. This shift is the result of the expanding universe. As light travels from great distances to Hubble's mirrors, it is stretched to longer and longer red wavelengths, or cosmologically redshifted, as the universe expands. Astronomers can look for known features in an object's spectrum, like these absorption lines, to see if they are shifted from their normal position on the spectrum. The difference between their normal position and their new position is called their cosmological redshift” (NASA, 2024).

Within this interpretation, the stretching of space is assumed to induce a corresponding stretching of wavelength. However, this representation is phenomenological and has no direct laboratory analogue confirming the dynamical behavior of space itself at the level of photon

propagation. On the other hand, gravitational redshift – which is considered in TIC – is directly observed in the laboratory, it is real physics. In Figure 4, we see how the photon moves in the opposite direction of the gravitational vector, resulting in a loss of energy; gravitational redshift has a physical explanation. By contrast, the cosmological redshift has no physical explanation for how a space that stretches takes energy away from a photon.

The cosmological redshift is represented by a rubber band on which a sine wave is drawn. When the band is stretched, the sine wave is stretched (Doherti, 2001). This presentation is not appropriate, since the stretching of the rubber band has nothing to do with the decrease in photon energy. The redshifts that are proven by experiments are the Doppler redshift and the gravitational redshift. Cosmological redshift is a theoretical extrapolation that is not directly testable, and the expansion of the universe is also a non-empirical assumption and appears only as a problematic inference by starting from large-scale observations. In this regard, it is worth to be mentioned that, in a 2023 paper, Sean Yuxiang Wu demonstrated that Hubble's law can be derived without expanding space (Wu, 2023).

The physical basis of the Doppler effect of light is well understood (Fang et al. 2021), the physical basis of gravitational redshift is well understood (Peebles, Ratra, 2003), and cosmological redshift is a speculation without empirical evidence, which depends on the adopted cosmological model framework. Cosmology cannot be built on metaphysical speculations. These concepts can be summarized in the following scheme:

- Model-dependending reasoning with forced extrapolations: universe is expanding (1) → expansion causes cosmological redshift (2)
- observational reasoning: we measure gravitational redshift of light from galaxies (1*) → universe is not expanding (2*).

We see that (1) is not an empirical measurable fact, and therefore (2) depends on the adopted cosmological model. On the other hand, (1*) corresponds to an experimentally verified fact, and so (2*) appears a natural result, i.e. a physically grounded interpretation within gravitational interaction frameworks.

3.2. Dark energy has no antigravitational properties

In the EBC model, dark energy does not possess antigravitational properties; instead, variable energy density of dark energy carries gravity. In today's physics, dark energy is deeply related to Einstein's cosmological constant Λ (Peebles, Ratra, 2003). Einstein introduced a

cosmological constant in his model of a static, finite universe in 1917 to prevent expansion or gravitational collapse (Einstein, 1917). After the development of relativistic cosmology and the interpretation of galactic redshifts, expanding-universe models became the dominant framework in the following decades. Einstein later abandoned his cosmological constant (Nussbaumer et al., 2014). Until the late 1990s, the prevailing idea was that the cosmological constant is zero. With the idea that the acceleration of the universe might accelerate, the idea arises that the cosmological constant may have a positive value (Weinberg, 1989).

A central conceptual issue in this context is that there is still no universally accepted physical mechanism describing how dark energy, or a cosmological constant term, could generate an effective expansion of space. The interpretation of dark energy remains closely related to Einstein's cosmological constant within the field equations of general relativity and the assumptions of whether its value is zero or whether it has a positive or negative mathematical sign is subject to discussion.

The authors of this paper argue that we cannot ascribe antigravitational properties to dark energy because such an inference is not supported by a direct microscopic physical model, but rather is based on the misinterpretation of gravitational redshift derived from problematic cosmological interpretation of large-scale observational data and on speculations about the value of the cosmological constant.

In this context, Traunmüller Hartmut also exposed the empirical weakness of the interpretation of dark energy as a physically real antigravitational component, that causes the universe acceleration: “Dark energy is an unpredicted, fictitious form of energy with anti-gravitational properties. It is an embodiment of the cosmological constant Λ , which Einstein introduced as a fudge factor (in the form of an integration constant) when he still believed that the universe ought to be static. This Λ was reintroduced in order to make the observed magnitude versus redshift relation of distant type Ia supernovae compatible with the BB paradigm” (Hraunmüller, 2018). Within the TIC framework, the energy density of the vacuum is instead interpreted as a dynamical background field whose spatial variations are responsible for gravitational phenomena, without invoking intrinsic antigravitational behavior.

3.3. The FLRW metric is not compatible with the Euclidean metric

Euclidean space has the metrics that does not allow expansion. NASA measurement in 2014 confirms universal space has a Euclidean shape (NASA, 2014). Flatness of the universe is confirmed by research in 2020: “The strongest constraint (equation 6e) shows that the Universe is spatially flat to a precision of ~ 0.0018 , in agreement with the results in PCP18” (Efstathiou, Gratton, 2020) In an n -dimensional Euclidean space, the distance d between points p and q is calculated accordingly by Eq. (7) (Sorli et al., 2022b).

$$\sqrt{\sum_{i=1}^n (p_i - q_i)^2} \quad (7).$$

We do not have any possibility in the frame of Euclidean geometry that the distance d would be changed. We cannot expand or shrink Euclidean space. Hubble law calculates that accelerated expansion of the space increases by the distance by Eq. (8):

$$v = H_0 D \quad (8),$$

where v is the velocity of the expansion, H_0 is Hubble constant and D is the distance between the galaxy from the observer measured in megaparsecs (Mpc). The hypothetical velocity v in the Eq. (8) is determined by measuring the redshift of the galaxy. Nobody ever measured this velocity v directly. In TIC Hubble law has no physical meaning. In astronomy, we assume that the redshift we measure is due to the expansion of space (Kirshner, 2004). The unsolvable methodological problem is that we do not have a single experimental confirmation of this. Also, we also do not have a mathematical model that describes how light loses energy and experiences redshift in an expanding space (Sorli et al., 2023a).

The Hubble law is a hypothesis that was never proved using rigorous scientific methodology, which requires that the redshift is not interpreted in the way they like, but in the way experimental physics sees it. In experimental physics, the observed redshift from distant galaxies can only have a gravitational origin. Hubble constant of 72,8 km per Mps (Riess et al., 2024) as no physical existence and is a result of the misinterpretation of the gravitational redshift, see Chapter 3.1. Eq. (8) has no physical meaning. The redshift of light coming from the observed galaxy tells us only about the strength of the galaxy's gravitational field and so about the amount of its mass. According to TIC, the universe was not created and is not expanding. Lerner and his colleagues' results also suggested the universe is not expanding (Lerner et al., 2023).

The theoretical model of cosmological redshift is based on FLRW metrics: “The comprehension of the recessional velocity of extragalactic objects hinges upon the redshift-distance relation derived from homogeneous solutions of Einstein’s field equations within the framework of the Friedmann-Lemaître-Robertson-Walker (FLRW) metric” (Tremblin, Chabrier, 2024). In the FLRW metric, the density parameter ultimately governs the curvature of universal space. When Ω is greater than 1, the universe is closed; it has positive curvature, and a drawn triangle’s angles add up to more than 180° . When the density parameter Ω is less than 1, universal space has negative curvature; it is open (hyperbolic), and a drawn triangle’s angles add up to less than 180° . When Ω is 1, the universal space has a Euclidean shape; a drawn triangle’s angles add up to 180° . FLRW metrics predict that such Euclidean space can expand. This is against the metrics of Euclidean geometry, where the distance between two points is always constant; see Eq. (18). FLRW metrics cannot be applied to Euclidean space. We do not have any possibility in the frame of Euclidean geometry that the distance d would be changed. We cannot expand or shrink Euclidean space. This means that such a space is homogeneous and isotropic. But in spherical geometry or hyperbolic geometry, the situation is different. For example, in a spherical geometry considered as a model for universe, all relative distances increase at a rate proportional to their magnitudes. When using spherical geometry, universe is closed. In the hyperbolic case which is an open universe, when the radial coordinate increases away from the origin, the circumferences increase more rapidly with proper radius. One can describe the differences between these three types of space geometries with Eq. (9) below:

$$d\sigma = \sqrt{\frac{\sum_{i=1}^n (p_i - q_i)^2}{\left(1 + \frac{k}{4} \left(\sum_{i=1}^n (p_i - q_i)^2\right)\right)^2}} \quad (9)$$

where in Flat space $k = 0$, in spherical space $k > 0$ and in Hyperbolic space $k < 0$.

“Equation (9) confirms that when $k = 0$, the distance d cannot increase or decrease. The idea that universal space has been inflating immediately after the hypothetical explosion is inspired by the fact that in mathematics, we can increase the radius of the Riemann manifold, and its volume will increase. In this section, we have shown that we cannot apply Riemann geometry in cosmology, because universal space has a Euclidean shape and cannot expand. We do not have a single direct measurement that would prove that universal space is expanding. The idea that universal space could expand has no mathematical basis and has no support in astronomical observations” (Sorli et al., 2022b).

Vavryčuk published an article in 2022 in which he admitted that hypothetical cosmological redshift and real gravitational redshift are calculated by the same formula. He wrote: “The gravitational and cosmological redshifts are calculated by the same formula and describe the same physical process. Both redshifts reflect a distortion of time produced by changes in the gravitational field. While the gravitational redshift originates in spatial variations of the gravitational field, the cosmological redshift originates in temporal variations of the gravitational field” (Vavryčuk, 2022). Finally, the cosmological redshift model has no physical explanation. Why should light increase in wavelength and experience a loss of energy when moving in expanding space? Nobody has ever explained this. The physical origin of the Doppler effect of light is well explained; the physical origin of gravitational redshift is well explained: light, when moving in the opposite direction of gravity, experiences a loss of energy.

4. AGNs are rejuvenating systems of the universe

Roger Penrose predicted that the mass density in the centre of the black hole is infinite (Penrose, 1964). The mass density of the proton is $2,31 \cdot 10^{17} \text{kgm}^{-3}$. In the centre of a black hole, matter decays into protons. If we imagine that in a cubic meter of volume there are only protons, then in a cubic meter, there are $2,31 \cdot 10^{17} \text{kg}$ of protons. Penrose's proposal about infinite mass density at the center of a black hole contradicts the fact that a proton has a maximum mass density, and a higher mass density cannot exist. His idea of a black hole where the gravitational force towards the center increases because the density of matter there is infinite is false. It is shown that when going towards the center of a black hole, the energy density of dark energy diminishes in the same way as in all other stellar objects. This means that, also inside black holes, gravity obeys the Newtonian Shell Theorem. The gravitational force in the centre of a black hole is zero (Sorli A. et al. 2024b)

Schwarzschild metrics suggest that a black hole has a singularity in the center where physical laws break down. These singularities have been debated for more than 100 years, and no final solution has been found (Lehmkuhl, 2025).

Our treatment of the issues regarding black holes is very simple and elegant. The Schwarzschild singularity is only a mathematical model that has no physical existence; the energy density of the dynamic quantum vacuum in the centre of a black hole is so low that atoms become unstable. A black hole eats itself not because of infinite gravity in the center but because of the extremely low energy density of dynamic quantum vacuum in its center.

Schwarzschild radius r_s of a black hole marks the area in the black hole, where low energy density of dynamic quantum vacuum causes changes of electrostatic forces in the atoms and causes matter to decay into elementary particles on the basis of equation:

$$r_s = \frac{2GM}{c^2} = \frac{2G(\rho_{PE} - \rho_{cE})V}{c^4} \quad (10).$$

Transformation of matter into elementary particles creates in the center of a black hole fresh energy and enormous pressure (Fiscaletti, Sorli, 2026).

A supernova is the explosion of a black hole. When a black hole is too big to explode, as is the case with SMBHs, the fresh energy pressure opens the hole in the direction of the black hole's axis of rotation (see Figure 2).

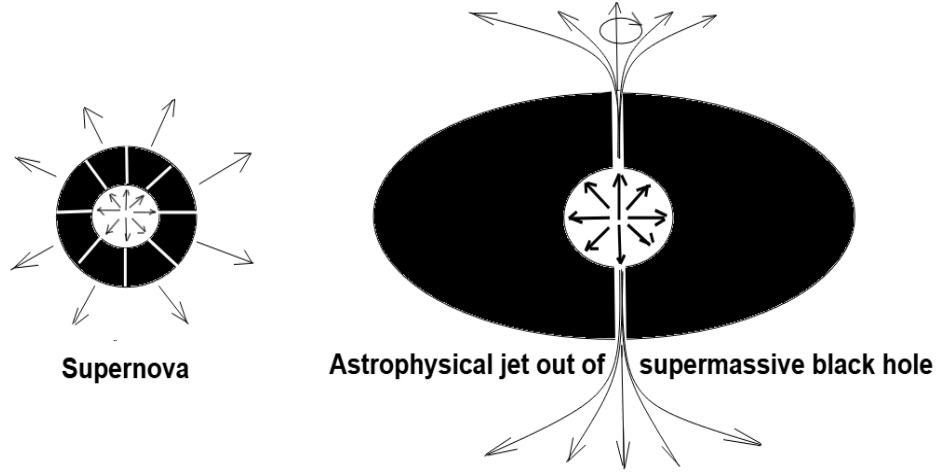


Figure 2: Explosion of supernova and astrophysical jet from SMBH

The introduction of the singularity into physics, where the laws of physics break down, is, according to the authors, a reckless historical mistake that has led physics in the wrong direction. A physical model that shows matter decaying into dark energy in a black hole challenges the physical existence of the Schwarzschild singularity, which is just a mathematical concept that has led physics in the wrong direction for more than 100 years. Also, the initial singularities of the Big Bang cosmology are more a philosophical debate than real physics. Categorically eliminating the singularity from physics seems to be the best way to progress black hole physics and cosmology (Sorli A. et al. 2024b).

On the other hand, we emphasize that the idea that singularities belong more to philosophy and religion than to physics is entering mainstream physics: “Perhaps surprisingly, both event horizons and spacetime singularities are generally considered to be mathematical

idealizations that, while useful approximations to reality, fall short of fully capturing the underlying physics. Specifically, the teleological nature of event horizons makes them inherently undetectable in any finite time experiment. Similarly, spacetime singularities are generally thought to reflect our incomplete understanding of the behavior of spacetime and matter under extreme conditions. Fundamentally, both concepts hinge on the notion of infinity: event horizons involve infinite time, while spacetime singularities correspond to infinite curvature, or equivalently, infinite energy and matter density. It is generally anticipated that these idealizations will be replaced by more appropriate concepts as the infinities are resolved into finite quantities” (Raúl Carballo-Rubio *et al.*, 2025).

In our model of black holes, gravitational collapse is replaced by the electromagnetic collapse of atoms in the inner core of black holes and neutron stars. Extremely diminished energy density of dynamic quantum vacuum diminishes the value of reduced Planck constant, this changes electromagnetic properties of space, and atoms become unstable. In the centre of a black hole with $2,9\odot$, the Planck energy density of dynamic quantum vacuum diminishes by $-1,62 \cdot 10^{26} Jm^{-3}$. This diminishes the value of the reduced Planck constant in the centre of a black hole $\hbar_{bh}$ according to relation

$$\hbar_{bh} = \frac{(\rho_{PE} - 1,62 \cdot 10^{26} Jm^{-3}) l_P^4}{c} \quad (11).$$

Diminished reduced Planck constant in the centre of a black hole $\hbar_{bh}$ increases electric permittivity $\epsilon_{0_{bh}}$, see Eq. (1):

$$\epsilon_{0_{bh}} = \frac{1}{\mu_0 c^2} = \frac{e^2}{4\pi\alpha\hbar_{bh}c} \quad (12),$$

where e is the elementary charge, α is the fine structure constant, c is the speed of light, and $\hbar_{bh}$ is the reduced Planck constant in the center of a black hole. A lower value of the reduced Planck constant increases the electric permittivity, and this decreases the electric forces between electrons and the nucleus, which causes, according to the Coulomb law, the electromagnetic collapse of the atoms, according to equation:

$$F_{bh} = \frac{1}{4\pi\epsilon_{0_{bh}}} \frac{q_1 q_2}{r^2} \quad (13).$$

In the black star, the increased electric permittivity ϵ_0 causes the electrostatic forces between the orbiting electrons and protons in the nucleus to diminish, and the atoms decay. It also happens that the diminished reduced Planck constant $\hbar_{bh}$ changes the Cornell potential, which defines the stability of nucleons (Fiscaletti, Sorli, 2026). Changed Cornell potential causes nuclei to decay. In black holes, atoms decay into electrons, protons, and neutrons. That’s why astrophysical jets generated in SMBHs also contain protons (Sorli A. et al. 2024b).

Electromagnetic collapse is the consequence of a huge diminishment of energy density of the dynamic quantum vacuum, which increases electric permittivity and decreases magnetic permeability, see Eq. (14).

$$\begin{aligned}\epsilon_0 \mu_0 c^2 &= 1 \\ \mu_{0bh} &= \frac{1}{\epsilon_{0bh} c^2} \\ \rho_{pE} > \rho_{cE} &\rightarrow \hbar > \hbar_{bh} \rightarrow \epsilon_{0bh} > \epsilon_0 \rightarrow \mu_{0bh} < \mu_0 \rightarrow F > F_{bh} \quad (14).\end{aligned}$$

Increased electric permittivity and decreased magnetic permeability destabilize forces between the nucleus and orbiting electrons of the atom. Also, it destabilizes forces inside the nucleus. On Earth neutron is unstable; its lifetime when isolated is around 15 minutes. In a neutron star, neutrons are stable; here is explanation: presuming that the electron is a photon with toroidal topology ([Williamson, Mark, 1997](#)), in a neutron star electron has a lower energy, because the photon that builds the electron has lower energy as shown in Eq. (15):

$$E_{photon} = 2\pi\hbar_{bh}\nu \quad (15).$$

Lower energy of the electron causes the bond with the proton in neutron star to become stable. While in intergalactic space the value of reduced Planck constant is defined by equation

$$\hbar = \frac{\rho_{pE} l_P^4}{c} \quad (16),$$

we consider that the diminished energy density of the vacuum in the centre of the dark compact object determines a corresponding diminishing of the value of Planck reduced constant according to relation

$$\hbar_{BH} = \frac{\left(\rho_{pE} - \frac{Mc^2}{V}\right) l_P^4}{c} \quad (17),$$

where ρ_{pE} is Planck energy density of dynamic quantum vacuum in intergalactic space, M is the mass of the dark star and V is its volume ([Fiscaletti, Sorli, 2026](#)). In this picture, active galactic nuclei (AGNs) are mechanisms of local conversion of the old matter into fresh energy in the form of astrophysical jets. Understanding of how black holes function is essential for our understanding of how the universe functions. AGNs in the center of galaxies are disintegrating

their own matter and sending it out in intergalactic space in the form of astrophysical jets and winds. AGNs play a pivotal role in the universe's rejuvenation process.

5. Newtonian analysis of the Big Bang cosmology and Time-invariant cosmology

The ideas of the origin and the initial explosion are not scientific; they are model-dependent and forced extrapolations based on problematic interpretations of large-scale observations. The TIC does not need a hypothetical origin which must be justified. TIC is falsifiable, and the Big Bang cosmology is not falsifiable. Initial explosion is a matter of belief, of faith. The TIC has a huge advantage over the Big Bang cosmology. Supermassive black holes in the centre of galaxies transform old matter into fresh energy in the form of astrophysical jets (Nizamov, Pshirkov, 2023; Sorli A., et al., 2023a). This process has no beginning and will have no end. The universe is recreating itself; its entropy is constant. It has no irrational theoretical premises and is completely Evidence-based. TIC cosmology is based on direct reading of astronomical data:

- Time is the duration of motion of stars in time-invariant space
- Astrophysical jets are the fresh energy for the formation of new stars
- CMB is the radiation of the universe space
- Gravitational redshift is caused by galaxies gravity.

Big Bang cosmology is based on misinterpretation of CMB and gravitational redshift. The adoption of the Big Bang model in science is a sign that the scientific method of the 20th century has succumbed to the methodology of religion. The history of religions shows us that the religions developed a believes that are not rational; they cannot be comprehended with logic and empiricism. Religious believes are a matter of irrational blind belief. This is also the case with the initial explosion of the Big Bang cosmology. 21st-century science needs to take a critical stance from initial explosion out of nothing. This is the only way to progress cosmology. Big Bang cosmology is religious simply because the beginning and creation of energy cannot be explained by empirical scientific means. The initial explosion and inflation belong to the domain of religious thought. TIC research methodology is scientific (see Figure 3).

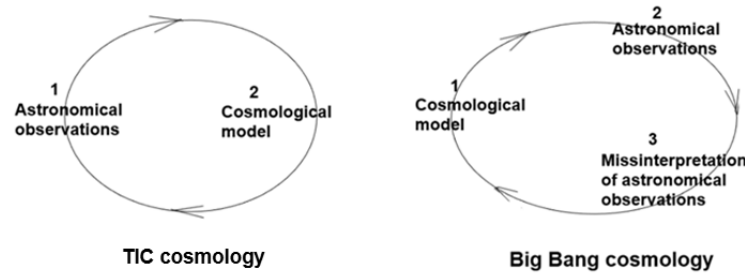


Figure 3: TIC cosmology and Big Bang cosmology

TIC cosmology uses a bijective research methodology, where the universe is a set X , and the model of the universe is a set of Y . Each element in the model Y has exactly one correspondent model in the set Y . The set X and the set Y are related to the bijective function. The Big Bang cosmology is an extension of biblical cosmology, where the Creator creates the universe in 6 days. In Big Bang cosmology, six days are stretched over several billion years. The cosmology of the Big Bang does not have a direct reading of astronomical observations. To fit the model, they need a misinterpretation. The research methodology of Big Bang cosmology is religious: we have the myth of the initial explosion, and we have to believe in it. If you don't believe it, you're labelled a science dissident.

NASA measured in 2014 that the universal space has a shape of Euclidean geometry: “Recent measurements (c. 2001) by a number of ground-based and balloon-based experiments, including MAT/TOCO, Boomerang, Maxima, and DASI, have shown that the brightest spots are about 1 degree across. Thus, the universe was known to be flat to within about 15% accuracy prior to the WMAP results. WMAP has confirmed this result with very high accuracy and precision. We now know (as of 2013) that the universe is flat with only a 0.4% margin of error. This suggests that the Universe is infinite in extent; however, since the Universe has a finite age, we can only observe a finite volume of the Universe” (NASA, 2014). NASA's discovery confirms that only Euclidean geometry is suitable for describing the universe. Riemann's finite geometry is not suitable. Einstein's 1917 idea of describing the universe with a finite Riemann space (Kragh, 2015) was inadequate. The Euclidean space metric is such that it cannot expand; the distance between two points of the space is constant (Sorli A., et al., 2023a).

The infinity of universal space gives the solution to Olbers' paradox. The sky is dark at night because the light of stars that are in a finite area of the universe is not bright enough. The light of the infinitely distant stars will never reach us. NASA's discovery confirms that the universe is infinite in terms of volume, the amount of dark energy, and the amount of matter.

These are real infinities that make the universe a mystery. The initial singularity of Hawking and gravitational Penrose exist only as mathematical models. The idea that the universe expanded from a mathematical point into an infinite universe exceeds the scope of empirically supported scientific imagination and is philosophical in nature.

Big Bang cosmology is very rarely criticized in peer-reviewed scientific journals, despite its religious origin, which is the antithesis of empirical science. Empirical science conceives that a phenomenon is real only when it is observed and measured. This is not the case with the Big Bang cosmology. Assis and Neves published an article in *Aperion* in 1997, which objectively evaluated the Big Bang model: “In most textbooks nowadays we see the statement that Gamow and collaborators predicted the 2.7 K temperature prior to Penzias and Wilson, while the steady-state theory of Hoyle, Narlikar and Gold did not predict this temperature. Therefore, the correct prediction of the 2.7 K is hailed as one of the strongest arguments in favour of the Big Bang. However, these two models have one very important aspect in common: both accept the interpretation of the cosmological redshift as being due to a Doppler effect, which means that both models accept the expansion of the Universe. But there is a third model of the Universe which has been developed in this century by several scientists including Nernst, Finlay-Freundlich, Max Born and Louis de Broglie (1966). It is based on a Universe in dynamical equilibrium without expansion and without continuous creation of matter. We reviewed this subject in earlier papers (Assis 1992, 1993). Although it is not considered by almost any textbook dealing with cosmology nowadays, this third model proves to be the most important one of all of them. Our conclusion is that the discovery of the CBR by Penzias and Wilson is a decisive factor in favour of a Universe in dynamical equilibrium, and against models of an expanding Universe, such as the Big Bang and the steady-state” (Assis, Neves, 1995). The cosmological model presented in this article is one in which the universe is in a state of dynamic equilibrium.

In TIC model, all kinds of electromagnetic signals exist in space only; also, elementary particles and galaxies exist in space only, not in time. CMB exists in space only. The idea that CMB exists in some physical time and that was created in the remote physical past belongs to the history of physics. We do not have single experimental evidence that the universe exists in some physical time, and we have to abolish this hypothesis.

CMB is the radiation of the black body that exists in actual space. At 2.7 K temperature this black body radiates CMB radiation. The idea that CMB is the radiation of dark energy,

which is the energy medium of space and represents 67% of the energy of the universe, is the most convenient rational option we have.

In the TIC model, the CMB is the black-body radiation at 2.7 K temperature in the existing universal space. In Big Bang cosmology, the CMB is radiation that was formed in the recombination period, 380,000 years after a hypothetical explosion, and is preserved in space to this day. The Big Bang Theory predicts that the temperature of the universe at the recombination period was about 3000 K (Maoz, 2016). At 3000 K, the blackbody radiation has a peak wavelength of 966 nm. During the recombination period, this type of radiation was produced. As universe cooled, this radiation, has transformed into CMB radiation with a peak wavelength of 1073249 nm, as shown in Figure 4.

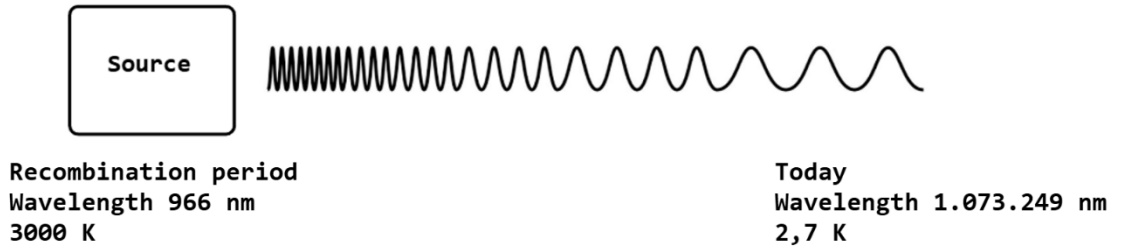


Figure 4: The origin of the CMB according to the Big Bang model

Wien's law tells us the relation between temperature T and wavelength λ , see Eq. (18).

$$\lambda = \frac{0,0029}{T} \quad (18).$$

This equation is valid when the source of radiation changes temperature. It is not valid in the case that radiation is produced, it moves in space where temperature changes, and because of this, its wavelength will change. The Big Bang model claims that radiation produced in the recombination period is transformed into the CMB radiation because the universe has cooled. According to Wien's law, the frequency can change only if the temperature of the source has changed. Today, the hypothetical source of CMB in the recombination period is long ago gone. This confirms that CMB cannot be the relic radiation created in the recombination period. CMB is the radiation that has its source in the existent universal space.

The cosmology of the 20th century has introduced several models (the recombination period is the source of CMB, cosmological redshift, and dark energy, which expands the universe), that have never been proved in the lab or directly observed in astronomical observations.

A paper published in September 2023 states that the actual age of the universe is 27 billion years instead of 13,8 billion years: “In this paper, we have attempted to show that an extension of the CDM model with deemed dynamical cosmological constant, when hybridized with the tired light concept and parameterized with Pantheon + data, provides a model, dubbed CCC + TL, that is compliant with the deep space observation of *JWST* on the angular sizes of high redshift galaxies. It stretches the cosmic time, especially at high redshifts, to allow the formation of large galaxies. It eliminates the need for stretching and tuning existing models to produce such structures in the early Universe, thus amicably resolving the *impossible early galaxy* problem” (Gupta R., (2023). This publication appears six months after the James Webb Telescope discovered six galaxies that are too big and too old to fit the Big Bang model (Labbé et al. 2023). Doubling the Big Bang model age will not save it because time has no physical existence.

5.1. Time has no physical existence, so CMB cannot propagate through time

The dark energy model has several similarities with the model of superfluid space (Fiscaletti, Sorli, 2023), the model of quantum vacuum (Sorli, 2025), and the old model of ether. These are different terms that describe the energy substrate of space. In current cosmological estimates, this substrate is associated with approximately 67% of the total energy of the universe, while 28% of energy represents hypothetical dark matter, and 5% ordinary matter.

If time exists only as an emergent mathematical quantity measuring the ordering of events inside a time-invariant space, the idea that CMB is the radiation from the recombination period about 380000 years after the initial explosion cannot be considered correct, because nothing could happen in some remote physical past. The change that we observe in the present space is the only one that exists. This means that CMB cannot have a source in some physical past, because there is no such past. CMB is the radiation of something that exists in the present space, and this is dark energy. CMB is the radiation of dark energy that builds the universal space (Sorli A., et al., 2023a).

In physics textbooks, we can read that the CMB is proof of Big Bang cosmology and that the CMB proves the existence of the recombination period. This interpretation is not supported within the TIC framework. The fact is that the CMB discovery proves that universal

space radiates this type of radiation. CMB is proving only itself; it cannot prove anything else. The official interpretation of CMB can be considered as a forced extrapolation of experimental facts. On the basis of the TIC framework, it makes no sense such theoretical assumption, namely, that a given radiation we observe in the present is proof for the existence of some events in the physical past that were never seen. We measure CMB always in the present moment because it is the only one that exists.

In the 21st century, seeing the evolution of the universe in some linear physical past is no longer acceptable; it can be said that it is unscientific. The undisputable scientific fact is that time is merely the information of changes that run in time-invariant space that we experience as Now (Sorli A. et al., 2026). Linear temporal perspective in cosmology belongs to history. Today's cosmology is aware that the universal changes run in the Now. A given signal only moves in space and time is its duration. The idea that we see with telescopes in some remote physical past is false. The universe is homogeneous in space and also homogeneous from the perspective of the flow of universal change. This means that after 10^{10} generations, our descendant's will see the universe the same as we see it today. Homogeneity of the universe is not only spatial-invariant but also time-invariant in the old meaning of the term "time"; it was always as it is today and will look as such forever. Seeing the universe from a gardener's perspective, where a seed develops into a plant, is not appropriate. The universe is not something that evolves. The universe is uncreated, eternal (Sorli A., et al., 2023a). The right scientific orientation in the study of the universe is to discover how it functions – functional cosmology; the origin of the universe is an extrapolation beyond currently accessible observational domains, that could also lead to religious research perspectives.

The common understanding of the majority of physicists today is that material changes run in space-time continuum which is composed of Now's that follow each other, see Figure 5.

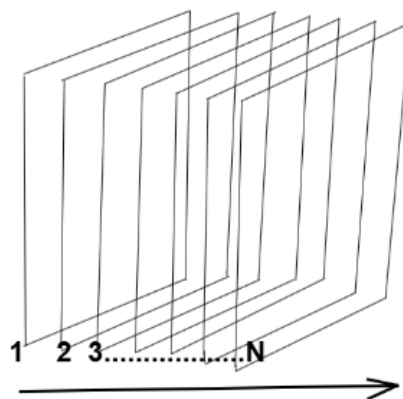


Figure 5: Slices of Nov's

According to ADC, the truth is the opposite. The material changes follow each other in the same Now. With this understanding, we step out of the linear temporal cosmology into the evidence-based cosmology (EBC cosmology) of Now. This is the radical, inevitable step based on the empirical fact that there is no experimental evidence for a physical past. Imagine that you go to the laboratory for several days and conduct an experiment that you have to repeat several times. The fact is that you run the experiment every day in the same time-invariant space that you experience as Now. Every morning, we wake up in the same Now, but we believe that yesterday we woke up in the previous Now. This is because we experience material changes in the flow of psychological time that runs in our brain (Sorli A. et al., 2026).

Theoretically, the initial explosion could happen in the time-invariant space. The problem is that there is no evidence for this. CMB could not be the remaining radiation from the recombination period persisting in the time-invariant space because every radiation requires a source. The idea that CMB has persisted in some physical time is false because no signal can move in time because there is no physical time. The only rational explanation, according to TIC cosmology, is that CMB is the radiation of the existing space.

The universe is time-invariant, and this means the cosmological principle is also time-invariant. The universe is homogeneous and isotropic on a large scale. In other words, the universe looks the same from any vantage point, and there are no preferred locations or directions in space. Theoretically, the universe could have been different a few million years ago, but we do not have any empirical evidence, and so the idea of the initial explosion is purely metaphysical. We can discuss the universe's physical past, but we must also understand that what occurred 13,7 billion years ago took place in the same time-invariant space where we live. Speculation about what happened in some distant past cannot advance cosmology because it is metaphysical. The advance in cosmology is exploring how the universe works today, and understanding that it worked the same way 13,7 billion years ago and will continue to do so forever.

Within the TIC framework, both the cosmic microwave background (CMB) and cosmological redshift are treated as observational phenomena that require interpretation within a time-invariant description of space. In standard cosmology, these two phenomena are explained through distinct mechanisms: relic radiation propagation for the CMB and metric expansion of space for redshift.

In contrast, the approach of TIC considers both effects as emerging from the same underlying observational structure of space, rather than from independent historical processes. In this sense, they are interpreted as complementary manifestations of the current energetic and geometric properties of the universal space substrate.

This suggests that cosmological observables traditionally associated with distinct epochs may instead be reformulated within a unified description based on present-time observational states, without requiring reference to a physically real temporal evolution of space-time.

5.2. Time from entanglement and Time-invariant cosmology

Page and Wootters' research has made a decisive contribution to quantum mechanics, where time is seen as a physical reality that emerges from quantum correlations (Page, Wootters 1983; Favalli, Smerzi, 2022; Favalli, 2024). Their idea is that a clock that provides time for a given system is entangled with the system: “This work shows that there is not a “quantum time”, possibly opposed to a “classical” one; there is only one time, and it is a manifestation of entanglement” (Foti *et al.*, 2021).

Our research suggests that entanglement does not occur in space and time; it occurs only in space that is timeless (time-invariant). In the universe, time has only a mathematical existence; it is the numerical order of universal changes (Fiscaletti, Sorli, 2015). A given physical object is entangled with all other physical objects in the universe via time-invariant space, in which there is no physical past and no physical future. Travels in time-invariant space are categorically excluded: “Experimental data confirm clocks are mechanisms which run in space; clocks measure numerical order of material changes in space observed by the observer. Considering that the observer could exist in time is a wrong proposition. Time as a mathematical parameter puts an end to speculations that time exists as a physical reality in which the observer exists and is able to travel. The possibility of time travel is categorically excluded. The observer can travel in space only, and time is the duration of his/her (Gorjup *et al.*, 2024)

The mechanism of Page and Wootters removed time as a physical reality from quantum mechanics: time from entanglement → space is time-invariant → quanta and massive objects move only in space not in time → time as duration is an emergent physical reality. The next step is to remove time as a physical reality generally from physics. From the micro to the macro

level, from the quanta to the galaxies, it is now accepted that they move only in space, not in time. Abolishing time as a physical reality is the unavoidable paradigm shift in the progress of physics. The consequences for cosmology are immense: seeing the universe from the perspective of physical time belongs to 20th-century physics; it is a history of science. The universe exists in time-invariant space and is always observed in the same time-invariant space we experience as NOW.

The model of time as an emergent physical reality that arises out of entanglement between a clock and a system is closer to the physical world than a model of time in which clocks and systems exist. In today's physics, physical time is still a stubbornly persistent scientific illusion. The greatest physicist of the past century believed that the space-time model has physical existence. Richard Feynman predicted that a positron is the proton moving backwards in space-time. Rigorous analysis confirms that the time-symmetry is a scientific illusion ([Sorli, Celan, 2021a](#)). The NOW is the only existing physical reality. The universe exists and changes in the NOW; this is confirmed by elementary perception and by physical measurements. Nobody has ever made any physical measurements in the past or future. The past exists only in the human memory. If we want to make progress in physics, we will have to accept these facts. The cosmology of the Big Bang is based on the existence of physical time, which we know is non-existent. This means Big Bang cosmology is no longer appropriate. TIC is a proposal of a cosmological model based on the non-existence of physical time. To progress cosmology and physics in general, we have to understand that time as duration is an emergent physical reality. Duration has no existence on its own without the measurement ([Fiscaletti, Sorli, 2015](#)). So, time is not physical reality; time is a scientific tool that allows us to define the velocity of a given physical object that moves in time-invariant space.

5.3. Time perception and time experience and cosmological consequences

In space, we can only experience movement. The time in which the movement takes place has never been experienced by anyone. The motion of an object in space is seen by the eyes and elaborated in linear time that has its origin in the neuronal activity of the brain. Buhusi discovered that linear time past-present-future has a neurological origin in the neuronal activity of the brain ([Buhusi, Meck, 2005](#)). The observer experiences the motion of a physical object in space in the frame of neurological time, see Figure 6.

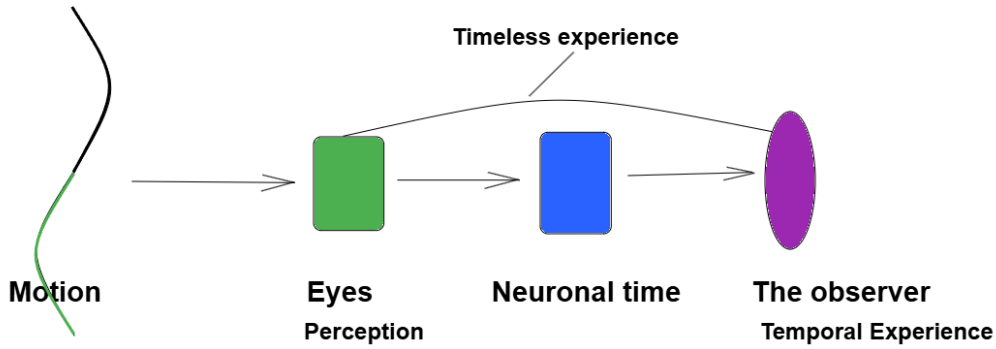


Figure 6: Temporal and Timeless experience

Buhusi himself considered that in the exes we perceive some physical time in which motion occurs. His view is not correct. In the eyes, we perceive the motion of a physical object in space that itself is time-invariant. The observer experiences motion in the frame of neuronal time, and so he/she experiences motion happening in time. Observer projects his neuronal time in the physical world. He thinks that motion appears in space and time, which is not true. The undeniable fact is that motion happens in time-invariant space only. The observer has the potential capacity to experience motion directly outside of neuronal time. In this so-called timeless experience, he experiences motion as it appears in the eyes.

A timeless experience is entering the mainstream of physics. Experiencing the universe through space-time model is coming to its end. The coming evolution of physics is experiencing the universe in time-invariant space model, which we experience as Now. It is important to understand that, also in physics, we experience the world through mental concepts. When we believe that the space-time model has physical existence, we will experience motion happening in space and time. Once we are aware that linear time exists only as neuronal time, then we can experience motion as it is perceived in eyes. The coming evolution of physics will be internal; the consequence will be that the entire physical community on this globe will step out of neural time (Sorli, Celan, 2022).

The cosmological implications of this analysis are enormous: the universe has no physical past and no physical future; the universe is always the Now. This marks the definitive end of the Big Bang cosmology, which sees the evolution of the universe in some physical time that we have never seen, and its existence has never been experimentally proven.

The idea that the universe exists in physical time is deeply rooted in the scientific mind: “Since space and time are interlinked, distant objects with increasing redshift are further back

in time because it takes their light so long to reach us. Along with measuring the expansion of the universe, Hubble can employ its infrared detectors to receive light from early galaxies billions of years ago” (NASA, 2024). Space and time are not interlinked. Our senses (sight) confirm that material changes run in space only, not in time. Changes are irreversible. When change $X+1$ enters existence, change X is no longer in existence. When change $X+2$ enters existence, change $X+1$ is not in existence anymore. And we experience the flow of changes in space always and only in NOW. In space, there is no physical past, and there is no physical future. To progress physics, we should get accustomed to this undeniable fact and accept it fully.

As early as the 20th century, the scientific imagination of the development of the universe at some physical time was inappropriate. In the 21st century, this scientific imagination has become inadmissible. Mainstream physics today knows without a doubt that there is not a single experiment that would prove the existence of physical time. Insisting that time is a 4th physical dimension of space and that the universe evolved in some physical time is the main cause of today's crisis in physics.

The cosmological principle is widely accepted in today's cosmology; the universe is homogeneous and isotropic. In the old cosmological paradigm, the cosmological principle was meant to be valid also in time. In the TIC cosmology, the cosmological principle is time-invariant. The universe as it looks today will look forever. The universe was not born and is not developing in some physical time; universe exists Now and will exist for ever in the same Now. The idea that the universe has an origin in some remote physical past is not scientific because we do not have a single experimental piece of evidence that would prove the existence of a physical past.

5.4. Space-time cosmology is mathematically incorrect

Einstein has interpreted the time t as the 4th coordinate X_4 of a Minkowski manifold. In his book *Relativity: The Special and General Theory* published in 1929 he wrote: “If we replace $x, y, z, \sqrt{-1}ct$ by x_1, x_2, x_3, x_4 , we also obtain the result that $ds^2 = dx_1^2 + dx_2^2 + dx_3^2 + dx_4^2$ is independent of the choice of the body of reference. We call the magnitude ds the “distance” apart of two events or four-dimensional points. Thus, if we choose as time variable the imaginary variable $\sqrt{-1}ct$ instead of the real quantity t , we can regard the continuum space-time, in accordance with the special theory of relativity, as an “Euclidean” four-dimensional continuum, a result following by the consideration of the preceding section” (Einstein, 1920).

In the above citation, Einstein suggests that we can choose the time variable t as the imaginary variable, which can be written as follows:

$$t = \sqrt{-1}ct \quad (19).$$

Eq. (19) is mathematically incorrect: on the left side of the equation, we have t , and on the right side we have the same t multiplied by $\sqrt{-1}ct$.

In physics textbooks, we read that space-time has three spatial and one temporal dimension: $(3 + 1) - d$ (Gonzalez-Ayala et al., 2016), also written as 3D + T. In SR, the fourth temporal dimension is $X_4 = ict$: i is an imaginary number, c is the speed of light, and t is time as a duration. In Newtonian physics, speed multiplied by time is spatial distance, which means that X_4 is not temporal; it is a spatial coordinate. Space-time is 4D. The progress of physics requires the acknowledgment that considering time as the 4th physical dimension of space is a historical mistake; space is time-invariant (timeless). Seeing physical reality and the universe from the perspective of some linear physical time belongs to the history of physics.

In SR, Einstein introduced proper time and coordinate time. In SR, time is geometrized. Einsteinian physics introduced a new research methodology based on mathematics, where there is no need for fundamental physical entities to be observed by the senses. Nobody ever observed time as a 4th dimension of space. In Minkowski manifold the 4th dimension is spatial; it is a multiplication of light speed and time as velocity. The imaginary number i was introduced because, in Einstein's vision, the fourth coordinate is a mathematical model rather than a physical reality. From a mathematical point of view, in the original version of SR, the 4th coordinate is spatial, and there is no proper time in a given inertial system; there is only a proper velocity of clocks that is valid for all observers. In a famous thought experiment with the train passing the station, the clock on the train runs slower for both observers, and the clock on the station also runs faster for both observers: "In the famous thought experiment on the train station, the relation between the rate of clocks can be described by Selleri's transformation. In this perspective, SR can be described by Galilean transformation for spatial coordinates X , Y , Z , and with Selleri's transformation for time. The introduction of "coordinate time" and "proper time" in the original version of SR leads to misunderstanding because we cannot have two different types of time. In physics, time is the duration of motion in space" (Sorli et al., 2022a).

In this article, we argue that fundamental physical entities of space and time should be perceived by the senses. In this article, we argue that fundamental physical entities of space and

time should be perceived by the senses as is valid in Newtonian physics. In Einsteinian physics time was geometrized as a spatial coordinate that cannot be observed by the senses. Later on, the imaginary number was removed from the equation, light speed c was defined as 1, and time became the 4th coordinate: $X_4 = t$. This simplification led to the complete misunderstanding of time. Time has become physical; although time in the universe has only a mathematical existence, it is the numerical order of events. Time as duration is the man-made tool, an emergent physical quantity (Fiscaletti, Sorli, 2015).

In Einsteinian physics, mathematics has overruled physics. The beginning was the introduction of length contraction by Hendrik Lorentz in 1890 to save the model of ether. He claimed that the beam of the Michelson-Morley experiment that pointed in the direction of Earth's motion was contracted. The introduction of length contraction is a mathematical trick that was adopted by Einstein in SR and leads to contradiction: “Let us take two light clocks where a photon moves between two mirrors. One path of the photon between mirrors means one tick of the clock. In a moving inertial system o' , we put one light clock A horizontally in the direction of motion along the X axis and another light clock B vertically with respect to the X axis. According to the length contraction, clock A should shrink, and so a photon would have a shorter path, and clock A would tick faster than clock B. The special theory of relativity does not predict that two clocks in the same inertial system should have a different rate. SR can be elegantly described with the Galilean retransformation for X_1 , X_2 , and X_3 , and Selleri transformation for time” (Sorli, Fiscaletti, 2012).

The geometrization of time done by Einstein has established an intellectual environment for speculation that time has not only one but three dimensions: “The first temporal dimension (t1) corresponds to quantum-scale phenomena, operating at the Planck time scale. This dimension governs quantum mechanical behavior and fundamental particle interactions. The second temporal dimension (t2) manifests at the interaction scale, mediating the interplay between quantum and classical phenomena. This dimension is crucial for understanding particle generations and weak interactions. The third temporal dimension (t3) operates at cosmological time scales, governing large-scale structure evolution and gravitational phenomena” (Kletetschka, 2025). The problem with this proposal is that there is not even a single piece of evidence that time has physical existence as a 4th dimension of space. Claiming that time has three dimensions and that space emerges from time is not based on experimental data and is not convincing.

In Big Bang cosmology, the idea of time as a 4th physical dimension of space plays an essential role. In TIC, time does not play any role; time is a man-made emergent physical quantity that makes it possible to measure the velocity of material changes in the time-invariant space. This paradigm shift is expressed in the title of Julian Barbour's book: "The End of Time - The Next Revolution in Our Understanding of the Universe" ([Barbour, 1999](#)). Seeing the universe in some physical time belongs to the 20th century of physics. In the 21st century, the new paradigm will take place where the universe is time-invariant. Time is a man-made scientific tool for calculating the velocity of material change that occurs in the time-invariant space we experience as the NOW. Ervin Schrödinger's profound insight will be fully accepted in mainstream physics: "For eternally and always there is only now, one and the same now; the present is the only thing that has no end" ([Sorli et al., 2026](#)).

The space-time model belongs to the physics of the 20th century. In their book "The Large Scale Structure of Space-Time", published in 1973, Hawking and Ellis considered time to be a physical dimension in which the universe exists. In the chapter one, "The role of gravity", they use a Minkowski diagram with a future light cone and past light cone [90]. We know in 21 century that the model of Minkowski space-time model belongs to the history of physics. The photon moves through time-invariant space, and time is the duration of its motion from point A to point B. In the physical universe, there is no past light cone and no future light cone. The idea that with telescopes we can see in the remote physical past is false: "The idea of observational time travel involves looking at light that has travelled vast distances across space. When JWST observes distant cosmic objects, it effectively looks back in time to when those objects first emitted light" ([ICO OPTICS, 2026](#)). Yes, we receive light that has travelled to us from distant stars, and we receive the picture of a star that, in the moment of receiving it, no longer exists. The physicality of the star has changed. But we have to understand that the star is changing in the time-invariant space. Transformation 2 follows transformation 1, and transformation 3 follows transformation 2. All transformations run in the identical time-invariant space. Nobody has ever seen the physical past or moved in the physical past because it is non-existent.

In 1949, Gödel published an article within the framework of Einstein's general theory of relativity, he produced cosmological solutions to Einstein's field equations which contain closed time-like curves (CTC), that is, curves in space-time which, despite being closed, still represent possible paths of bodies ([Gödel, 1949](#)). Gödel publication of the CTC model has opened the discussion on time travel. One could travel into the past, kill his grandfather, and

could not be born. Gödel was aware that this »grandfather paradox» confirms that time has no physical existence. He expressed his view in a famous quotation in 1949: “In any universe described by the theory of relativity, time cannot exist” (Sorli et al., 2013). Gödel's statement was not well understood, and the CTC model opens discussion on time travel that is still relevant. In TIC, time-travel are categorically excluded. Stephen Hawking was clear that CTC should not exist: “It seems the back reaction would prevent closed timelike curves from appearing. These results strongly support the chronology protection conjecture: The laws of physics do not allow the appearance of closed timelike curves” (Hawking, 1992).

The most accurate understanding of time is in Newtonian physics: time is the duration of material change, i.e., motion in space. In our model, space is time-invariant and is the physical basis of entanglement. In this context, Page-Wootter's idea that time arises from entanglement is correct. The nonexistence of physical time requires a paradigm shift in the cosmology model where time does not play any role. Einstein's geometrization of time is mathematically incorrect and requires re-evaluation, which has been applied in this article on the subject of cosmology.

TIC model abolished space-time model and introduced infinite time-invariant Euclidean geometry. The universe is infinite in its volume and has an infinite number of stars, an infinite amount of mass, and energy. Olbers' paradox solution is in the fact that the luminosity of the stars in the final universe is not strong enough to make the night a day; the light from stars that are at infinite distances never reaches us (Sorli, Celan, 2021b).

In TIC model, 5% of the energy is in the form of ordinary matter; 95% is in the form of the energy of the superfluid quantum space that is dynamic. AGNs at the centers of galaxies are rotating about their axes, which also causes the rotation of the superfluid quantum space inside the galaxy and, consequently, galaxy rotation curves (Sorli et. al., 2024a; Sorli, 2025a). The introduction of dark matter, which should explain galaxy rotation curves, seems to be a wrong theoretical proposition (Nelson, Williams, 2024). In general, the introduction of new elements into cosmology is not an appropriate research methodology. The Big Bang introduced a magical explosion out of nothing. The TIC that advocates a stationary universe is based solely on astrophysical data.

TIC is in tune with Newton's view of the universe: “Isaac Newton believed gravity demands that the Universe be without a centre or an edge, and of infinite extent in all directions. According to Newton, a finite and bound Universe would 'fall down into the middle of the

whole space, and there compose one great spherical mass'. In an infinite Universe, he believed, 'the fixed stars, being equally spread out in all points of the heavens, cancel out their mutual pulls by opposite attractions" ([ESA, 2026](#)). The introduction of a finite spherical universe with a curved space that has originated from a mathematical point is unacceptable from the point of view of Newtonian physics. In the Big Bang model, mathematics has overruled physics.

Newton understood time as a flow of changes in an absolute space: "Absolute, true and mathematical time, of itself, and from its own nature flows equably without regard to anything external, and by another name is called duration: relative, apparent and common time, is some sensible and external (whether accurate or unequable) measure of duration by the means of motion, which is commonly used instead of true time ..." ([Newton, 1864](#)).

In our model, the flow of Newtonian mathematical time is defined as the numerical order of changes that run in time-invariant space. The common misconception in today's physics is that material change, i.e., motion, requires time as a physical reality in which change happens. Change does not require time; the numerical order of change is time. Einstein discovered that the rate of clocks is relative; in general, the velocity of change is not absolute; it is relative, but it occurs in the time-invariant space. The physical non-existence of time proposed by Page and Wootters is a challenge for today's physics, which will also bring a turning point in cosmology: time has no role in the universe; the universe is timeless, eternal, which means uncreated.

Newtonian universe is infinite in its volume: "Until the 20th century everybody believed that the universe is naturally static: not expanding and not contracting. Even Albert Einstein, after the discovery of general relativity, continued to hold this belief for several years. The Newtonian theory of universal gravity, in which all bodies attract one another, reinforced the growing belief that the universe must be edgeless and therefore infinite. For if the universe were finite and bounded by a cosmic edge, it would have a center of gravity, and the attraction between its parts would cause it, said Newton, to "fall down into the middle of the whole space, and there compose one great spherical mass." This argument led him finally to abandon the finite Stoic cosmos in favor of the infinite Atomist universe" ([Harrison, 2000](#)). Measurements confirmed that universal space is infinite; it has a Euclidean shape ([NASA, 2014](#); [Efstathiou, Gratton, 2020](#)). These experimental data confirm that the universe is infinite not only as a model but also in physical reality. This means that in the universe, we have an infinite number of stars, and the sum of their mass is infinite. The observable universe is only a small, finite portion of the universe.

According to Newtonian analysis, the scientific merit of a given model depends on experimental evidence. Known experimental evidence shows that light can only increase its wavelength in the Doppler effect and the Pound-Rebka effect. This confirms that today's interpretation of the origin of the CMB and cosmological redshift has no experimental evidence, and the Big Bang model can be classified as pseudoscientific (Sorli, 2026).

6. Conclusions

Time-invariant cosmology has no theoretical predictions on the universe origin out of nothing. Instead, it searches for how the universe functions in the observable finite area and predicts that the entire infinite universe follows the same physical laws: active galactic nuclei (AGNs) are rejuvenating systems of the universe that is eternal and uncreated.

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