Chronicle of Contemporary Development of Cosmology and Understandingof Universe

Abstract. The universe as well as its origin is an ancient philosophical topic dating from at least Democritus and classical Greek philosophy, to Newton and Bentley discussions, and to the 21st century, that has led to advances in philosophy of science and physics, as well as prompting motivation to highly sophisticated technology. Since Einstein provided both, his famous General Relativity (GR) theory and empirical experiments pointing towards Quantum Mechanics (QM) properties, the Standard Model and main theories have been appraised as stuck, or even gone astray due to incompatibilities found between GR and QM, especially regarding gravity, as well as some other major and minor issues for the unification and a complete picture and explanation for the universe and its origin, such as galaxy formation and the Cusp-Core Problem (CCP), Dark Matter and Dark Energy. A cutting-edge framework tackling these issues that were aggravated by JWST 2020-2025 findings, the CCP and inherently the other issues including the unification between QM and GR was posed based on data-driven discovery and symbolic-regression. The universe has been described by some cosmologist as a "cosmic womb," a nurturing and creative space within which all existence continually unfolds and grows. Understanding here is about recognizing the universe as a source of creation and potential. Now in some modern interpretations of quantum physics, the physical world we experience is seen as a type of illusion, like a holographic image, generated from a deeper, more primary level of reality. Understanding involves perceiving this underlying structure. The evaluation of discovering the astonishing universe and its inherent uncertainty reveals that while groundbreaking advances have shaped the standard cosmological model, key tensions and unanswered questions underscore the limits of current knowledge. Scientific discovery in this field is an ongoing process of refining measurements and confronting the unknown. This review article will narrate the story of cosmology by exploringcontemporary developmenttoknow the mystery of cosmology and understand of universe.

Keywords. GR, QR,Cosmology, ΛCDM, Big Bang, Heat Death, dark energy, black hole

1. Introduction

Today the universe refers to the cosmos and that is all of space-time and that which exists as part of it. Alternatively, it can refer to the observable universe, which only contains the part we can see. Cosmology is the study of the large-scale structure, history, and future of the universe. Cosmology is about asking and answering questions about the "big picture" - the extent, origin, and fate of everything we know [1, 21]. General Relativity (GR) is a theory that describes how matter interacts dynamically with the geometry of space and time. It was first published by Einstein in 1915 and is currently used to study the structure and evolution of the universe, as well as having practical applications like GPS. Quantum Mechanics (QM) describes the microscopic properties of nature in a regime where classical mechanics no longer applies. It explains phenomena such as the wave-particle duality, quantization of energy, and the uncertainty principle and is generally used in single-body systems [2, 19]. GR and QM are fundamentally incompatible. GR is incompatible with singularities as Black Holes are an example of singularities in GR.Under QM, particles are not treated like singularities. Rather, they are characterized by wave functions, and that introduces uncertainty in their position, momentum, etc. and quantizes properties like their energy. The real reason to reconcile QM with GR is that in order to so, we'd have to quantize the gravitational field, like break it up into a countable series of discrete states that it can be excited into, as QM does with all other fields [3, 20].Again, in the context of galaxy formation, CCP almost universally refers to the Cusp/Core Controversy and that is a major discrepancy between observational data and the standard ΛCDM (or Lambda Cold Dark Matter) cosmological model. The Cusp-Core Problem highlights that while simulations predict a steep cusp of dark matter in the center of galaxies, observations of dwarf and low-surface-brightness galaxies reveal a flat-density core. On the other hand, Self Interacting Dark Matter (SIDM) alternative to standard CDM (or Cold Dark Matter) proposes that dark matter particles can scatter off one another. In high-density central regions, this scattering allows the particles to distribute more uniformly, naturally creating a core. Other theories, like Warm Dark Matter (WDM) or Fuzzy Dark Matter, inherently produce smoother central profiles, avoiding the cusp nature of pure CDM.

Today's space program has had, and still has, its technological challenges, and the economic benefits may be even longer term than those of the railroad. But by conquering the third dimension of space, it has the potential to have an exceedingly large impact on the human story, as we expand into the solar system and find our place in the scheme of cosmic evolution. Accomplishing cosmic understanding is a continuous and endless journey in open-ended landscape. The goal is not a final destination, but rather the ongoing process of exploration and discovery, where every new peak of knowledge reveals more of the sky [4, 26]. The discovery in the 1920s that galaxies are moving away from each other established that the universe is expanding, a cornerstone of the Big Bang model. The late 1990s brought the monumental surprise that the universe's expansion is not slowing down due to gravity, but is instead accelerating. This led to the inference of dark energy, a mysterious form of energy that makes up about 70% of the universe's energy content, a discovery awarded the Nobel Prize in Physics in 2011. Revolutionary advances in technology, like the Hubble and James Webb Space Telescopes, have ushered in an era of precision, allowing cosmologists to make highly accurate measurements of cosmic parameters, such as the universe's expansion rate. Research is revealing profound connections between the physics of the smallest scales like quantum mechanics and the largest scales or cosmology, offering new avenues for understanding fundamental features of the universe [5, 27]. Cosmology studies the universe's origin, evolution, and fate, a quest advanced by powerful telescopes like James Webb and Hubble, revealing an accelerating expansion driven by mysterious dark energy, leading to theories of a forever-expanding universe or even a Big Rip. Future discoveries hinge on mapping dark matter/energy with projects like DESI, understanding gravitational waves, searching for exoplanets, and potentially unifying quantum mechanics with general relativity to explain the Big Bang and the universe's ultimate destiny, promising breakthroughs in physics and our understanding of reality [6, 28, 29].

We know that as space expands, light waves traveling through it get stretched, shifting their color towards the red end of the spectrum with longer wavelengths.Higher redshift means greater distance and faster recession, providing evidence for the universe's expansion and its history. We also know that, discovered via Type Ia supernovae showing unexpected acceleration, dark energy is the dominant component of the universe around 68%.It counteracts gravity, causing space between galaxy clusters to grow at an increasing rate [7, 30]]. The expansion accelerates forever, leading to a "Big Freeze" or Heat Death, where galaxies become isolated, stars die out, and the universe grows dark and cold.Recent findings suggest dark energy might be weakening, potentially leading to a universe that eventually collapses in a Big Crunch.Next-generation redshift surveys like DESI map galaxies across vast redshifts to precisely measure dark energy's properties and understand if it's constant or changing, revealing our ultimate cosmic destiny [8, 31]. As of early 2025, data from the DESI suggest that dark energy may not be a constant value (the "Cosmological Constant") but could be weakening over time.There remains a significant discrepancy between the expansion rate measured from the early universe (via the Cosmic Microwave Background) and the local universe (via supernovae), known as the Hubble Tension. In near future, Euclid Mission will be successful to mapping the geometry of the dark universe to test theories of gravity. Or JWST may be probing high-redshift galaxies to understand star formation in the earliest epochs. Or, 21 cm Cosmology by using neutral hydrogen will be successful to map the universe at redshifts above 6, exploring the "Cosmic Dawn" [9, 35, 36].

Further exploration will potentially involve expedition and the other planets and settlements on the Moon, as well as establishing mining and fueling outposts, particularly in the asteroid belt. Physical exploration outside the Solar System will be robotic for the foreseeable future [10, 32]. The procedure of standard cosmology has not been seen as a contentious issue. However, it overlooks a fundamental difference between dynamic, proper time t and look-back time t_{lb}. The function a (t_{lb}) is isotropic with spherical symmetry in a static 3D (3-dimensional) space, the observable universe. The symmetry is broken when a redshift is determined, because the observation implies the selection of the particular line of sight that connects the observer with the observed object. In the local limit, however, the requirement of spatial isotropy must always be satisfied. On the other hand, dark energy is a mysterious influence that accounts for approximately 68-70% of the universe's total energy density and is responsible for accelerating cosmic expansion. If dark energy remains constant, the universe will expand forever.

Eventually, galaxies will be redshifted so far that they become undetectable, leaving our Local Group as a lonely "island universe". If dark energy is weakening, as recent DESI findings hint, the expansion could halt and reverse, leading the universe to collapse on itself billions of years from now. This review article will evaluate and narrate the human effort to understand the complex cosmology, astonishinguniverse and its mysteries on the basis of contemporary development ofcosmology.

2. Literature and Methodology

Long before scientific exploration took center stage, various civilizations around the world crafted elaborate stories to explain how the universe came into existence. These stories, rich in symbolism and metaphorical significance, provided societies with a narrative framework to comprehend the complexities of their surroundings and their own relevance. In Egyptian cosmology, people believed that the universe emerged from the primordial waters of the creator god, Nun, and these waters formed an abyss with boundless potential and endless possibilities. The sun god, Atum, was credited with bringing structure and form to the cosmos through his creative prowess. In a similar vein, ancient Greek cosmogony tells the tale of the primeval god Chaos giving birth to the universe, from where the gods Gaia (Earth), Uranus (Sky), and other primordial deities emerged. These ancient myths don’t coherently explain any of the natural events in our universe, but they do convey cultural stories that mirror societal values, beliefs, and dreams [17, 33].

In 1927, an astronomer named Georges Lemaître had a big idea. He said that a very long time ago, the universe started as just a single point. He said the universe stretched and expanded to get as big as it is now, and that it could keep on stretching. Just two years later, an astronomer named Edwin Hubble noticed that other galaxies were moving away from us. And that’s not all. The farthest galaxies were moving faster than the ones close to us.This meant that the universe was still expanding, just like Lemaître thought. If things were moving apart, it meant that long ago, everything had been closed together.When the universe began, it was just hot, tiny particles mixed with light and energy. It was nothing like what we see now. As everything expanded and took up more space, it cooled down. The tiny particles grouped together. They formed atoms. Then those atoms grouped together. Over lots of time, atoms came together to form stars and galaxies. The first stars created bigger atoms and groups of atoms. That led to more stars being born. At the same time, galaxies were crashing and grouping together. As new stars were being born and dying, then things like asteroids, comets, planets, and black holes formed. And it’s call it the "Big Bang. "Today we now know that the universe is 13,800,000,000 years old—that’s 13.8 billion. That is a very long time [18, 34]

Space missions are entering a revolutionary era, pushing boundaries with advanced telescopes like Webb and robotic explorers to answer fundamental questions about the universe, seeking life beyond Earth, and enabling human settlement on the Moon and Mars through programs like Artemis, with future discoveries promised in deep space, exoplanet characterization, and understanding cosmic origins, despite technical challenges like radiation and vast distances. However, space missions investigate outer space through telescopes and spacecraft to gather data, understand the universe, and search for life. These missions, both human and robotic, have explored the solar system, with early efforts like the Pioneer and Voyager programs leading the way and current missions like the International Space Station (ISS) conducting experiments in Earth's orbit. Future plans include sending humans back to the Moon via the Artemis program and eventually to Mars. Missions gather data to study the origins of the universe, the formation of galaxies, and the potential for life on other planets. Space exploration drives the development of new technologies that have practical applications on Earth in fields like telecommunications, medicine, and transportation [1, 35]. Robotic spacecraft have been sent to orbit planets like Venus, Mars, Jupiter, and Saturn, while telescopes like the James Webb Space Telescope (JWST) observe distant objects. Satellites are used for purposes like weather forecasting, environmental monitoring, and communication [2, 36]. From ancient times, to well into to the twentieth-century, the only technologically feasible method to explore space was astronomy—the studying of the millions of stars and neighboring planets, which fill the night sky, as they have done for billions of years.

The mysterious movements of the planets and the ebbing of stars across the sky had originally found explanations in religion, but as man's understanding of the science of astronomy increased natural laws, and not dogma, took form. And, as a solid foundation was laid with ground-based astronomy, man walked resolutely into the Space Age, upon the advent of the modern rocket. Given this stepping stone of the liquid fueled rocket, man was able to enter the cosmic "ocean." Public support for the space program, during the Cold War era, allocated millions of dollars to the exploration of space, but this trend has ceased in the later part of the twentieth-century [3, 22]. The peak of space exploration, as a function of government and public support, reached its apex in the 1970s, with the Apollo program. The public has generally been more supportive of the manned exploration program, but the costs and the values at risk are often viewed as barriers to the support of space exploration as a whole. Today, economic resources for space exploration are scarce and public, and thus government support is relatively low [4, 5]. Unlike ships, the motive power was no longer natural wind power. The core of the new rockets was their engines, and the history of engine development is fraught with uncertainty and contingency. At every stage, from the V-2s and their successors, to the Apollo first-stage F-1 engines with their famous early “combustion instability” problems, and to the SSMEs, it was never assured that access to space would be possible, and it is still not cost-effective [6, 7, 23]. Another of the perennial debates of the Space Age was whether reusable or expendable launch vehicles were best; history records that despite its utility and magnificent engineering, even the reusable Space Shuttle was never cost-effective [8, 24].

The engineering challenges inherent in the design of rockets and spacecraft were legion. Design decisions were sometimes brilliant, often modified, and occasionally second-guessed after accidents and failures, whether human or robotic, and the agonizing but detailed accident reports of those failures make for compelling reading about the importance and far-reaching consequences of engineering decisions [9]. The space programs of the world required massive efforts in institution building, management, and funding. Out of five ships and 260 men who departed Spain with Magellan on 20 September 1519, only one ship and 18 bedraggled men returned in 1522 and Magellan was not one of them. In a sense, there is a huge difference between the two ages in this regard; while both ages recognized risk, little was done to manage risk in the Age of Discovery. By contrast, in the Age of Space, risk is managed to the extent that agencies such as National Aeronautics and Space Administration (NASA), and by association the entire nation, are sometimes accused of being risk averse. One of the greatest policy challenges is to find the proper balance between risk and exploration, and this, too, should be informed by history [10, 25]. Today, SpaceX which is a private American aerospace company as well as space transportation company headquartered at the Starbase development site in Starbase, Texas is owned by Elon Musk [11]. As of 2025, SpaceX is the world's dominant space launch provider, its launch cadence eclipsing all others, including private competitors and national programs like the Chinese space program [12].

SpaceX, NASA, and the United States Armed Forces work closely together by means of governmental contracts. “You want to wake up in the morning and think the future is going to be great – and that's what being a spacefaring civilization is all about. It's about believing in the future and thinking that the future will be better than the past" [13]. "And I can't think of anything more exciting than going out there and being among the stars” [14, 16]. One of the things that NASA has been able to do for SpaceX is to bring some of its operational experience—and emphasis on safety—to the process of developing a commercial spacecraft for humans to fly in. Eric Berger is the senior space editor at Ars Technica, covering everything from astronomy to private space to NASA policy, and author of two books named Liftoff, about the rise of SpaceX; and Reentry, on the development of the Falcon 9 rocket and Dragon has said, “The marriage of SpaceX and NASA hasn’t been easy; but it’s been fruitful. They’re forcing us to look at things in a new way, and I think that’s really cool.” Hurley, one of the NASA astronauts slated to fly on Crew Dragon, says, “In some ways SpaceX probably would be similar to the way NASA was in the 1960s, when we were getting ready to go to the Moon,” he said. NASA then was much younger, with a workforce mostly in its 20s. The average SpaceX employee is 29 years old, and just like NASA in the 1960s, they have their own space race to run [6, 15, 37]. However, important space missions have fundamentally revolutionized human understanding of the universe, providing direct evidence for cosmic phenomena, enabling the search for life beyond Earth, and demonstrating humanity's capacity for scientific innovation.

3. Development of Cosmic Theory and Modern Cosmology

The 20th century marked a change in our comprehension of how the universe began through modern cosmology. In the 1920s, Edwin Hubble’s groundbreaking discovery of an expanding universe laid the groundwork for the development of what we call the Big Bang Theory, which has reshaped our understanding of cosmic development. The Big Bang Theory suggests that about 13.8 billion years ago, the entire universe began from a dense, extremely hot single spot according to the Center for Astrophysics. This spot is known as the “singularity,” and it marks the beginning of what we now know as space, time, and matter [108]. As space expanded and cooled down over time, subatomic particles merged to form atoms that later evolved into distant galaxies, stars, and planets [109]. It ultimately shaped our own solar system and the cosmic structure that we have today. The Big Bang Theory's ability to account for various observations, from cosmic microwave background (CMB) radiation to the distribution of galaxies, has established it as the primary model in cosmology. Nonetheless, like all theories, the Big Bang Theory comes with its own limitations and has sparked ongoing discussions and explorations into alternative models of cosmic evolution [110].

The horizon problem becomes apparent when researchers examine the uniformity and consistency of cosmic microwave background radiation. CMB radiation is the thermal radiation left over from our universe's formation when it was about 380,000 years old. This radiation occurred shortly after the Big Bang, when visible light could first move freely without obstruction [111]. The apparent consistency of CMB – which reflects temperature variations at a scale of one part in 100,000 – indicates that the furthest reaches of outer space were once in thermal equilibrium. In other words, the universe's most distant parts were once the same temperature, suggesting that heat was evenly distributed in all directions. However, these regions are far apart. Considering our universe's age and the speed of light (approximately 186,000 miles per second), it should be physically impossible that these regions could have ever been close enough to interact and equilibrate directly since the inception of the Big Bang. To put it more simply, the horizon problem raises a compelling question of how the universe's distant parts could somehow end up with such similar temperatures and characteristics [112].

The flatness problem, on the other hand, deals with the universe's shape and overall curvature. According to Einstein’s Theory of Relativity, the universe's shape is determined by mass and energy, which is described by a curvature measure called Omega (Ω). A universe with “$\Omega = 1$” is flat – indicating no curvature and meeting the critical density requirement where the universe’s expansion rate should eventually slow down and approach zero without actually ever reaching zero. It means that a gradual slowing down of the universe's expansion over time never stops. Initially, the original Big Bang Theory suggested that immediately after the Big Bang, the universe should have been very close to critical density ($\Omega \approx 1$/flat in shape). But as time passed and the universe's expansion continued, even a minor deviation from critical density would magnify over time, resulting in a universe that is significantly curved, either "open" ($\Omega < 1$) or "closed" ($\Omega > 1$). But the universe that we observe with our scientific instruments today is flat. So, the question is: How is that possible?

To solve these kinds of problems, modern cosmologists have put forth several theories to better explain the universe's properties and phenomena [113]. One of the most sobering and empirically supported theories is the cosmic inflation theory, first proposed by physicist Alan Guth during the 1980s. According to Guth’s cosmic inflation theory, there was an exponential expansion within a fraction of a second after the Big Bang. This period of inflation set the stage for the universe's observable structure and composition that we see today. Guth’s theory is consistent with observable scientific evidence. It also resolves several enduring cosmological mysteries, including the horizon problem and the flatness problem. In regard to the horizon problem, cosmic inflation theory theorizes that the universe experienced an exponential expansion in the first fraction of a second after the Big Bang. This inflation period stretched the universe beyond its visible horizon, enabling distant regions to come into causal contact and achieve thermal equilibrium. This theory means that the expansion allowed the universe's distant areas to interact and influence each other, resulting in them reaching the same temperature. In other words, the physics described by the cosmic inflation theory would allow the present universe to have expanded faster than the speed of light during this early inflationary period [114]. That would have eliminated the problems of distance and time preventing thermal equilibrium.

Regarding the flatness problem, cosmic inflation theory suggests that the period of rapid and significant expansion led to an increase in the scale factor of the universe, which determines the relative sizes of spatial dimensions (the size of space itself). As a result, any slight deviations from a flat geometry in the early universe would have been greatly stretched out and weakened during this inflationary period. In other words, the rapid expansion would have smoothed out these deviations, making the universe more uniformly flat. During the universe's growth, the energy density linked to the inflation field became dominant over other forms of energy like radiation and matter. This dominance would have had a leveling effect on the entire universe’s geometry, moving it closer to a flat configuration. So inflationary cosmology from the 1980s provides compelling resolutions to these kinds of questions about the origin of the universe. It reshapes our comprehension of early dynamics and lays the foundations for modern cosmological theories. This inflation is thought by researchers to have been triggered by quantum fluctuations within the fabric of space-time – a phenomenon foreseen by quantum mechanics [115]. At these quantum levels, tiny fluctuations are believed to have been magnified during inflation, which introduced irregularities and differences that eventually developed into the first galaxies, clusters of galaxies, and macro-level cosmic formations.

With advancements in cosmology, scientists are considering the concept that our universe might just be one among many in an extensive “multiverse.” This theory suggests that an infinite number of universes might exist, each with its own distinct physical laws, constants, and characteristics. While this hypothesis is still speculative and beyond today’s empirical testing capabilities, the multiverse hypothesis presents a captivating explanation for some of the universe’s most puzzling aspects. For example, the precise tuning of constants and parameters in our universe to support life could find justification in a multiverse scenario where each region possesses unique properties. In such a case, our own universe would not be designed to support the existence of life as we know it, but is rather the product of chance and coincidence [116]. There could be many other universes within the multiverse that are not capable of supporting such life. Now that we’ve talked about the earliest origins of the universe, a fair question you might be thinking is, “How will it end?” There’s no way to know for sure, but scientists have some theories. The concepts of accelerating expansion, as well as the Big Rip theory and the Big Freeze theory, offer insights into the universe's potential futures.

After the Big Bang Theory for the universe’s beginning was firmly established, researchers inferred that the force of gravity would slow the universe's expansion over time, as all matter contained in the universe pulls on itself to reunite. They believed that gravity would eventually stop the expansion. Then, a recoil would occur and cause everything to slowly coalesces back together, perhaps all the way back to a single point. Researchers called this theory the Big Crunch. It even gave rise to the notion that perhaps the universe experiences a repeating cycle of rebounds as it expands and contracts over and over again as a result of competing forces trying to dominate each other. But scientific observation of the universe’s rate of expansion revealed that it is not slowing. Instead, it is actually increasing. This unexpected finding, drawn from studying supernovae in the late 1990s, suggests that a mysterious force called dark energy is opposing gravity on a cosmic scale and accelerating the universe's expansion. The presence of dark energy propelling this accelerated expansion has significant implications for what lies ahead for our universe. It suggests that galaxies will continue drifting apart at an ever-increasing pace.

Taking the accelerating expansion of the universe to its inevitable conclusion, the Big Rip Theory provides a vivid and dramatic picture of one possibility for our universe’s fate. This theory suggests that dark energy’s repulsive force grows stronger over time and can overpower all other forces, including the gravitational pull within galaxies, stars, and subatomic particles [117]. As the universe expands faster and faster under this scenario, the Big Rip theory foresees galaxies moving away from each other, which is already happening today [118]. Eventually, the gravitational forces that bind galaxies, stars, planets, and atoms together may also succumb to the overpowering influence of dark energy. This catastrophic event would result in the destruction of cosmic structures, causing matter to break down into its basic components and leading to the tearing apart of spacetime itself at the most fundamental level. Simply put, dark energy would “rip” everything in the universe to pieces.

The Big Freeze Theory (also known as the Heat Death Theory) presents a more gradual and subdued fate for the universe. According to the Big Freeze, the universe will continue expanding at an increasing pace due to dark energy, causing matter and energy to gradually thin out over immense periods of time. As galaxies drift apart and the universe grows colder and more barren, new stars will stop forming and existing ones will slowly burn out. Eventually, the universe will reach a state of maximum entropy, where all energy is uniformly dispersed with no potential for matter interaction [119]. In this state, called Heat Death by some theorists, the universe would become a cold, dark void. There would be no life, light, or any recognizable structure or activity [120].

Despite strides in unraveling the origins and evolution of the universe, cosmology continues to pose obstacles, uncertainties, and unresolved inquiries. For example, dark matter and dark energy collectively account for about 95% of the universe's total mass energy, but these components of our universe remain a complete mystery in modern astrophysics and cosmology. Even though we can infer their existence and even measure them to a degree, we know almost nothing about them [121]. Additionally, the elusive origin of the singularity itself, as the starting point from which the universe appears to have emerged, continues to puzzle researchers. Current scientific hypotheses such as loop quantum gravity and string theory have attempted to merge Einstein's relativity with quantum mechanics to create a unified theory of the universe. Still, this work is incomplete at best so far.

The beginning of our universe is one of humanity's mysteries that have captivated mythologies, philosophies, and scientific endeavors. From cosmological myths depicting primal chaos to contemporary cosmological theories formulated through intricate mathematical study and calculation, our comprehension of how the universe came to exist has evolved over time. This evolution reflects our curiosity, imagination, and determination to unravel the mysteries surrounding our own existence in our vast cosmos. As we delve deeper into cosmic dynamics through scientific exploration, we are humbled by the vastness, intricacy, and splendor that define our ever-expanding understanding of the cosmos [122]. Every cosmological theory, whether about the Big Bang, Cosmic Inflation, or the idea of a multiverse filled with realities, provides a fascinating perspective of the birth and evolution of the universe. It sparks curiosity, amazement, and a deep feeling of connectedness to the cosmos at large and to each other on Earth. So, we should continue the work of our understanding the universe and see where the truth leads us [123].

The "Dead Universe" theory suggests that what we perceive as our cosmos is the legacy of an ancestral reality whose grandeur has long faded into the mists of time. The universe we inhabit may be akin to a cosmic aftermath, a diluted echo of a once vibrant and expansive cosmic past. Rather than being the catalysts of genesis, the black holes that populate our night sky are posited as remnants of a previous cosmic end, markers of the graves of galaxies and stars that have long since perished [38]. Each star system, every nebula we capture through our telescopes, might be a manifestation of cosmic memory, a lingering whisper from a universe that has run its course. In this view, dark matter and dark energy are reimagined as the residual hallmarks of this ancient epoch, perhaps the last vestiges of a once dynamic cosmic framework.

The young galaxies we witness are not born from a void but are conceived from the vestiges of a pre-existing structure in a state of stately and measured dissolution. Similarly, to the birth of stars from the dense cosmic nurseries, our universe may have been partially shaped from the detritus left by its predecessor. The vibrant stars and galaxies we observe, in their billions of years of existence, could very well be the ultimate creations of a bygone universe. On the verge of its cessation, it still possessed the capacity to engender new celestial structures, intimating that the end of one cosmic cycle and the inception of another are intrinsically interconnected, leading to a culmination projected to be in about 200 billion years [39]. These phenomena, observable in our present universe, abide by the unalterable laws of conservation and transmutation that govern all of natural reality.

These fledgling galaxies might be interpreted as the final echoes or gleaming reminiscences of a cosmos that exists no more. They are fragments of a vast stellar heritage, the ultimate murmur of a universe that once thrived in scale and energetic wealth. We are thus residing in the twilight of a glorious cosmic history, witnessing what may be deemed the "last dance" of light and matter sourced from a universe that has ebbed away. What we discern as our stellar reality is merely the residue—a modest yet still animated segment of an existence far grander than we can grasp, extending beyond our temporal and spatial reach. Essentially, all that exists, all that we behold, and all that we may come to understand are but the enduring fragments in time and space, the everlasting signature of the dead universe. "Space tells matter how to move, and matter tells space how to curve." - Brian Greene, "The Fabric of the Cosmos: Space, Time, and the Texture of Reality" [124].

As this process unfolds, the density and complexity of the universe wane. Where once there were dense clusters of matter and energy, now there are increasingly vast and empty spaces, dotted with isolated islands of stellar activity.

The observation of young galaxies by the James Webb Space Telescope thus serves as a glimpse into this process of decline, revealing the final stages of a cosmos we are just beginning to understand. In this picture, the death of the ancestral universe was not an abrupt event but a prolonged phenomenon that allowed the gradual emergence of new structures from its ruins [40,41]. Black holes, rather than being the catalysts of a new birth, are the final guardians of the cosmic memory of the preceding universe, storing in their gravitational abysses the history of all that once was. Indeed, black holes have mass. The mass of a black hole can be comparable to that of the Earth, the Sun, or even vastly greater, depending on the type of black hole. There are stellar black holes, which generally have masses ranging from a few to tens of times that of the Sun, and supermassive black holes, which can have masses equivalent to millions or billions of times the mass of the Sun.

The term “black hole” refers to the fact that these objects are regions of space where gravity is so intense that nothing, not even light, can escape from them. The word “hole” is a way to describe this “trapping” feature, although it is not a hole in the traditional sense of a cavity or opening. The adjective “black” is used because, since light cannot escape from a black hole, it is completely dark, neither emitting nor reflecting light, rendering it “black” to any observer. When certain stars, much more massive than the Sun, reach the end of their lives, they can undergo a process known as gravitational collapse. After exhausting all their nuclear fuel, the pressure that supports the star against gravity disappears, and it collapses in on itself [42]. Depending on the original mass of the star, this collapse can result in a supernova, and the remaining core may form a stellar black hole. This is an example of a black hole that originates from a “dead star”. In this way, we advance toward the theory of a dead universe with dimensions greater than our observable universe.

If the Sun were to cease to exist, that is, if it suddenly stopped emitting light and heat, the consequences would be dramatic, but the orbits of the planets in the solar system, including Earth, would initially remain unchanged, at least for some time. This is because gravity, not light, is the force that keeps the planets in orbit around the Sun. Gravity is a consequence of an object’s mass, and light is a form of energy emitted by it. If the Sun suddenly stopped emitting light, it would mean that it is no longer performing nuclear reactions in its core, but its mass would still be present, and therefore, its gravity would continue to influence the planets. However, the absence of light and heat would have catastrophic effects on life on Earth and the planet’s climatic conditions. Over time, if the Sun were to transform into a white dwarf or undergo some other process that significantly altered its mass, the orbits of the planets could be affected [43]. Changes in the Sun’s mass would alter its gravitational force, which, in turn, would affect the trajectory of celestial bodies orbiting it.

It is not strange to postulate the existence of a universe without the activity of light emission but still composed of galaxies, supermassive black holes, dark matter, dark energy, and where the laws of physics remain active. I can affirm, based on the theoretical argument developed, that such a universe exists and that, soon, it may be revealed to the light of scientific knowledge. From a scientific viewpoint, however, the claim to the existence of a fundamental reality such as a “dead universe” requires a substantial set of empirical and theoretical evidence that can be verified through independent observations and experimentation. Until such evidence is provided and validated by the scrutiny of the scientific community, such a concept should be considered with caution, currently residing in the realm of theoretical speculation, similar to many hypotheses and theories that have preceded it. These black holes are found at the centers of almost all large galaxies, including our own Milky Way [44]. They have masses ranging from millions to billions of times that of the Sun. It is believed that they grow by accumulating matter and other black holes over time, but their exact origin is still a subject of research. They are not considered “dead galaxies,” but they are a fundamental part of the dynamics and evolution of galaxies.

The term “dead galaxy” typically refers to a galaxy that has ceased star formation. Galaxies can “die” in terms of stellar production due to various processes, such as the loss of gas (the fuel for star formation) or interactions with other galaxies. These galaxies do not transform into black holes, although they may harbor supermassive black holes at their centers. The “dead universe” theory is legitimized and worthy of study by proposing that the collective deaths of celestial bodies converge in the formation of a singular predecessor universe, as opposed to the concept of multiverses suggested by various speculative theories. These theories often deviate from the mathematical models and the rigorously tested and proven scientific evidence [45, 46]. In contrast, the dead universe theory, which harmonizes with established discoveries and laws of physics, offers a perspective that integrates into the contemporary understanding of the universe while providing a potential platform for future investigations.

In the next article, in partnership with astrophysicists, I aim to advance the presentation of a consistent model that, to gain validation by the scientific community, must be capable of formulating testable predictions and be robustly grounded in existing empirical demonstrations and data that favor the theory. Currently, the consensus around the Big Bang theory appears to be weakening, while, on the other hand, the "dead universe" theory not only conforms to the already established physical laws but also proposes alternative explanations that can be readily subjected to verification through observation and experimentation. Thus, the "expansion of the universe" can be interpreted not as an indicator of dynamic growth but rather as a gradual separation driven by the laws of gravity from a preceding universe, a relic still influencing the current cosmos [47]. This phenomenon could be regarded as the final exhale of a universe that is gradually surrendering its energies. We are witnessing a process of cooling and quiescence, where matter and energy are smoothly redistributed, and space-time stretches, aspiring to a state of enduring serenity. As this process progresses, the formation of new galaxies will tend to decrease and eventually cease, resulting in a universe filled with contemplative silence and the true quiet that follows the luminous interlude of the stars. Just as its parent universe died, so too shall its offspring, the observable universe, pass away.

4. Primitive Elements and Their Role

The legacy of the "dead universe" is key to understanding our cosmic fate, focusing not on active galaxies, but on the contemplation of the most ancient structures and the careful observation of celestial phenomena like black holes. Such investigations may uncover crucial clues about the primordial universe and provide a more comprehensive understanding of its beginning and end, without resorting to repetitive cycles. The firmament that extends beyond the known stars and galaxies is not a vacuum devoid of existence, but rather a vastness filled with supermassive black holes in constant fusion, a universe where the most complete absence of light reigns, planets submerged in darkness, and where dark matter predominates with an incomparable density, even suggesting the presence of particles unknown to our visible universe [48]. Undoubtedly, a cosmos wrapped in mystery awaits to be deciphered and, in time, will reveal itself before advanced instruments such as the James Webb Space Telescope and forthcoming technologies. The existence of supermassive entities whose dimensions exceed by tens of billions those of the largest entities cataloged, and whose gravitation shapes entirely inert galaxies hidden in the shadows, is in perfect harmony with the laws that govern the mechanics of this still palpable universe, even in the complete absence of light. According to the "dead universe" theory, light, or its absence, is not the determining criterion in the characterization of a universe [21]. The advent of such understanding, which challenges the notion that our universe is limited to an age of 13.5 billion years, suggests we must prepare for a paradigm shift, as we undoubtedly have but a brief interval to realize that our previous conceptions may have been mistaken for a long period.

As we journey towards truth, it is necessary to detach from less comprehensive theories like the Big Bang, which, while predictive, now makes way for a simpler and more elucidative model. The "dead universe" theory stands out for its clarity and the way it rationalizes observational data, offering a direct perspective on the empirical evidence that points to a universe characterized by a singular genesis followed by a definitive conclusion. We are on the right path but embraced by the wrong theories[22]. Many black holes are nothing more than the tombs of new galaxies, just as our universe contracts within the vast abyss of a massive black hole from the dead universe. Therefore, this explains a response to the large amount of dark matter that surrounds our observable universe. We are existing within a great cosmic tomb; when we die as a universe, our funeral and burial have already been provided for by the old deceased dead universe.

Black holes, often envisioned as catacombs of nascent galaxies, exemplify the inexorable decline of our cosmos towards the vast emptiness of a colossal black hole, a remnant of the preceding universe. This viewpoint offers an illuminating interpretation of the enigmatic proliferation of dark matter pervading the visible universe. We thus dwell in the cradle of a stellar cosmic sepulcher; and when the time comes for our universe to succumb, its epitaph will have been preordained by the long-consumed dementia of the ancient defunct universe. As intrinsic residents of this cosmic tomb, we are witnesses to our own final abode, already lodged within its confines. We are not headed towards this somber destination; we are already immersed within it. Therefore, when our universe ultimately falls, we will indeed be within our own sepulcher, provided by the deceased universe that preceded us[23, 49]. Turning our focus to the study of the dead universe seems more prudent than searching for any signs of life, extraterrestrial intelligence, or even distant galaxies. We should dedicate our efforts, resources, and energy to investigating the prior death, to better understand the annihilation, the inevitable end of what once was our beginning and is now heading towards the end of the end.

The young galaxies recently discovered by the James Webb Space Telescope may be perceived as the final echoes of an observable universe that is, at its core, the luminous vestige of an extinct cosmos. These galaxies are the heiresses to a broad stellar legacy, merely the ultimate whispers of a universe once expansive and energy-rich. We live, therefore, in the shadow of an ancient cosmic splendor, witnessing what may well be regarded as the twilight of the interaction between light and matter—the radiant denouement of a universe in decline. Our current stellar reality is but a distant echo—a delicate, yet still resonant fragment of a far more extensive reality that transcends the boundaries of time and space known to us. At the heart of our existence, all that is, all that we observe, and all that is within our grasp of understanding are merely the preserved remains of a larger universe that has vanished, the enduring and undying signature of a dead universe. Just as stars are born from clouds of dust and gas, our universe may have been partly formed from the "dust" left by its predecessor, and even the younger celestial bodies are objects that were born as the ancient universe was dying[24]. In other words, it created new galaxies with the signature of a future death, even as it was dying, a process that can be observed in our observable universe, following the laws of conservation and transformation that govern all maturity.

The theory of the "Dead Universe" presents itself as an alternative conception and potentially more congruent with the phenomena described by general relativity and quantum mechanics, compared to the model established by the Big Bang. This theory advances the hypothesis that the extraordinary gravitational forces of a preceding cosmos may have been the shaping agents of space-time in the universe we observe today. This would imply that the formulations of general relativity are not restricted to our visible cosmos but extend to encompass interaction with a previous and more comprehensive domain. Again, the enigma of dark matter and energy could be elucidated within this theoretical framework as remnants of this "Dead Universe." Such remnants would not merely be floating in the vacuum of space but actively shaping the structure and evolution of the visible cosmos. This could provide a new perspective for observing the accelerated expansion of the universe, or even offer clues to a possible future contraction, as well as explain the gravitational anomalies we have recorded [25]. In summary, the theory of the "Dead Universe" has the potential to redefine our understanding of cosmic fabric and the very essence of gravity and universal dynamics.

5. Expansion of Cosmic Consideration

The universe is certainly slowing down, despite any theory suggesting its continuous expansion. Even the "dead universe" theory proposes that galaxies may drift apart. On the other hand, we will never witness the emergence of a galaxy larger than those we know today in our own universe. This should be reason enough for the scientific community to take this theory more seriously, instead of just looking for faults in the theory. A dating model of the universe based on the Big Bang theory would be comparable to looking for a living dinosaur to explain its origins and life expectancy. The truth is that we will only reach a consensus through the study of the dead universe. By doing so, we will be setting precedents for understanding a universe that may have existed for trillions of years, where our 13.5 billion years represent nothing more than an insignificant fraction. We are just particles wandering in space-time that was once almost infinite in magnitude. If we address observable phenomena such as black holes, and we will not see our proposition on the dead universe as more speculative than the theories ventured by notable scientists, such as Lawrence Krauss concerning dark matter when it was still considered an unimaginable conjecture [26]. Or even the various theories proposed by Albert Einstein and Stephen Hawking, which were proven many years after their initial formulation.

Therefore, to consider the existence of the dead universe as lacking evidence seems more absurd than any criticism that could have been directed at these pioneering scientists. Moreover, the "dead universe" theory is already finding support in new data, including those provided by the James Webb Telescope in relation to supermassive black holes. Perhaps it is time to look in the rearview mirror of the Big Bang theory to see what is emerging behind it, unveiling the mysteries of the universe to the eyes of the scientific community. So, this theory could offer an alternative explanation for the origin of the universe and its subsequent developments. To say that the universe has always existed would be akin to asserting the eternal existence of God. However, these primordial black holes, originating from the demise of the preceding universe, could vary greatly in size, from very small to extremely large. They remain an active area of research, particularly in their potential contribution to dark matter. As stellar or intermediate black holes interact with each other in binary systems or in dense regions of stars, like the centers of galaxies or star clusters, they may collide and merge, forming a more massive black hole [27]. These mergers are now regularly detected through gravitational waves, a form of radiation emitted by merging black holes.

Indeed, to some extent, the theory of universe expansion finds better support in the “dead universe” theory than in the Big Bang theory, since young stars, in this process of the “dead universe”, are heading towards death. Thus, it can be contemplated that the known universe consists merely of “living sparks” of the dead universe, which will also die in about billions of years and are located within the center of a black hole of the dead universe, akin to a womb with unknown dimensions of dark matter originated from the death and fusions of black holes of exorbitant dimensions. The “dead universe” theory does not advocate the eternity of the universe nor does it argue that the universe is the outcome of an endless cosmic cycle. Instead, it proposes that our universe is the product of a former universe, marking an end point in its existence, rather than a story of endless creation and re-creation as proposed by some theories of cyclical cosmology. This approach not only challenges the notion of uncritical acceptance but also presents itself as a direct and understandable explanation for the origin of the universe. While the Big Bang theory is widely accepted by the scientific community due to its precise predictions and concordance with observations, the “dead universe” theory aligns and potentially surpasses the Big Bang in terms of explaining the universe’s origin with a simplicity comparable to creationist views, yet without relying on unscientific assumptions.

This alternative theory not only fits well with the evidence supporting the Big Bang but could also offer even more precise and testable predictions. The “dead universe” theory could thus become a crucial field of study in theoretical cosmology, challenging and possibly replacing the Big Bang paradigm as the primary explanation for the origin and evolution of the cosmos. Such a proposal has the potential to revitalize scientific debate and provide new directions for the study of cosmology and astrophysics. The “dead universe” theory, suggesting a cosmos devoid of light activity but fully active in its origin, may have been born in a state of advanced maturity, immeasurably vast and replete with energies such as dark energy that influences our universe [28]. Over incalculable eons, this ancestral universe entered a phase of decline, where each subsequent stellar life cycle presented itself as of lesser magnitude and duration than the previous, always headed toward death.

In this context, the formation of new galaxies and stars, such as those observed by modern technology, does not signal the vibrant birth of an expanding universe, but the last throes of vitality of a senescent cosmic structure yearning for life, even as it marches toward death. At the time of its birth, our universe held an advanced stage of development, intertwined with signs of cosmic old age. As it ages, instead of expanding and growing in complexity and diversity, the universe is paradoxically rejuvenating in terms of its galaxies and stars, which are emerging increasingly younger and smaller, denoting a progressive loss of energy and mass that will lead to its total death in 200 billion years [48]. The “Dead Universe Theory” is built on a solid foundation of observational data and established mathematical models. Although it does not make specific predictions now, it aligns with a series of scientific evidences that could be interpreted as congruent with its central postulates. The theory is proposed as a coherent and rational framework, offering a new perspective on the cosmos that is consistent with current physical and astronomical knowledge. The history of particle physics, particularly the prediction and subsequent discovery of the Higgs particle, highlights the patience necessary for scientific advancement. Significant theorizations often precede the experimental capability of verification by many years, if not decades.

In this spirit, the “Dead Universe Theory” stands as an invitation to ongoing investigation, awaiting the development of technologies and methodologies that may, in the future, test its premises and enrich our understanding of the universe. Under the “dead universe” theory, the accelerated expansion of the universe is a natural phenomenon resulting from the immense energy released by the destruction of the old cosmos and the subsequent formation of the new one. Dark energy could then be viewed as an energetic vestige of this cosmic transition, a residual force propelling the continued expansion of the universe. The theory requires a reinterpretation of existing cosmological data, including the cosmic microwave background and the distribution of galaxies [29]. For instance, variations or anomalies in the background radiation could be interpreted as evidence of a transitional event between the dead universe and the new one.

To support the theory, advanced computational models could simulate scenarios of black hole collisions and the subsequent formation of a new universe. These models would help better understand how the described events might manifest in the observed structure of the current universe. Black holes, long predicted theoretically, have only recently had their existence empirically solidified. The “dead universe” theory could explain phenomena that the Big Bang theory may never be able to, such as certain characteristics of black holes and other cosmic phenomena. This theory has accepted, clear, and verifiable foundations, which not only align with observations made from the Big Bang perspective but also predict phenomena that the Big Bang cannot efficiently explain. These collision events could be responsible for the anomalies observed in the cosmic microwave background, which the Big Bang only partially explains. In the context of the “dead universe,” these would be remnants of the last intense gravitational interactions of the previous cosmos. Dark matter as an essential component of the cosmos that the Big Bang does not fully explain, finds its place in this theory as a direct remnant of the previous universe [30]. The “dead universe” theory suggests that dark matter is composed of particles or compact objects that are remnants of the collapse of the old universe. Now, the interpretation of dark matter provides a new angle for investigating its properties, as its distribution and behavior could reveal more about the conditions of the preexisting cosmos than our observable universe.

6. Empirical Evidence and Theoretical Prophecies

The acceptance of a theory by the scientific community is not just a matter of accumulating evidence but also of a paradigm shift. The history of science is filled with widely accepted theories that were eventually supplanted by new theories that provided more precise or comprehensive explanations. The “dead universe” theory proposes a reinterpretation of already known phenomena and the possibility to explain more adequately observations such as the cosmic microwave background radiation, the abundance of light elements, and the accelerated expansion of the universe. It is crucial that the “dead universe” theory be debated, tested, and potentially validated by the scientific community. This debate will not only contribute to the advancement of knowledge but will also challenge the foundations of established theories, promoting a deeper and more integrated understanding of the universe. The substantial presence of dark matter in the universe suggests the validity of the “dead universe” theory. Although the Big Bang is recognized for explaining the cosmic microwave background, it fails to precisely determine the universe’s age. Astrophysics and cosmology, by basing the dating of the universe on still-active celestial bodies, propose that the universe is approximately 13.5 billion years old; however, this conception is destined for revision under the light of the “dead universe” theory [31]. The new methodology suggested by advances like the James Webb Space Telescope indicates that the observation of extinct stars may point to a much greater antiquity, possibly in the range of trillions of years.

This approach challenges the interpretation of gravitational waves within the Big Bang paradigm. In the “dead universe” theory, the existence of an astronomical number of extinct stars in a chaotic and random universe, where collisions are frequent, offers a more plausible explanation for the gravitational waves detected near Earth. General relativity, therefore, strengthens the “dead universe” theory, presenting a divergent perspective on the expansion of the universe. In the view of the “dead universe”, the visible universe consists of young galaxies emerging from the death of a precursor universe, propelled by intense conflicts and collisions, phenomena until then unexplained by black holes, as observed. The notion that our young universe represents the final throes of a bygone cosmos and a “dead universe” composed of trillions of galaxies and quantities of energy that defy our capacity to quantify and which is supported by the latest observations from the James Webb Space Telescope. These observations point to the birth of still young galaxies, emerging from the last energetic pulsations of a universe that, although dying, is still capable of generating new celestial structures.

The existence of these galaxies, propelled aggressively by a cataclysmic past, challenges the chronologies based on the Big Bang, which presupposes a uniform expansion from a single point. At the intersection of geology and astrophysics, we find divergent dating methods: while geology offers robust dating techniques through analyses of terrestrial residues, astrophysics and cosmology continue to explore the age of the universe through observations of active celestial bodies. This discrepancy underlines the importance of a methodological review. Recent observations made by the James Webb Space Telescope suggest that, in the vastness of the cosmos, the existence of our cosmic singularity aligns more with the theory of a "dead universe" than with the idea of a universal expansion originating from a singular point [32]. Our universe, seemingly effervescent in generating new galaxies, might not be an independent and expansive entity but a mere reflection, a diminutive and nostalgic simulacrum of the fullness of a preexisting universe. Here, each new stellar and galactic formation is a replica, an echo of the memory and mechanics of a cosmos once full, now dissipated in its magnificence and dead.

The perspective that our universe may be the remnant of an ancient cosmos, stretching across vast expanses of time and space, challenges traditional narratives about cosmic origins and evolution. Recent observations from the James Webb Space Telescope reveal nascent galaxies emerging from the remnants of a "dead universe," suggesting a direct inheritance from a stellar realm spanning trillions of years, brimming with energy and galaxies beyond our current comprehension (Michio Kaku, 2008) in "Physics of the Impossible: A Scientific Exploration into the World of Phasers, Force Fields, Teleportation, and Time Travel", underscores the myriad challenges and opportunities for scientific advancement presented by the exploration of space" [125]. This understanding suggests that the continuous formation of galaxies is not indicative of an infinite cyclic process of cosmic births and deaths, but rather of a singular occurrence subsequent to the death of a primordial universe. The appearance of new stellar clusters is not a simple act of repetition but the transformation of an ancient universe, marking a new phase in the cosmological continuum. The indications of vibrant and young galaxies discovered by James Webb may be considered the most concrete vestiges of the ancestral universe, whose fundamental elements transfigure and give rise to new celestial bodies. These discoveries serve not only to confirm the diversification of the cosmos; they also represent a valuable document of stellar lineage, a narrative of a deeply rooted and intricate cosmological past.

Faced with these new understandings, it is urgent to revise and adapt our cosmological models to encompass and reflect on the concept that the end of an ancient universe does not represent a conclusion but the beginning of a new galactic generation. This renewed paradigm may pave the way for a new frontier of astrophysical discoveries, replacing the notion of finality with that of continuous transformation. The integration of these concepts into the theoretical framework of the "dead universe" will not only enrich contemporary scientific debate but will also provide a robust foundation for future investigations that aspire to elucidate the mysteries about the origins, evolution, and final destiny of the cosmos. In light of these new understandings, it is urgent to review and adapt our cosmological models to encompass and reflect on the concept that the end of an ancient universe does not represent a conclusion, but rather the beginning of a new galactic generation. This renewed paradigm may pave the way for a new frontier of astrophysical discoveries, replacing the notion of finality with that of continuous transformation.

The integration of these concepts into the theoretical framework of the "dead universe" will not only enrich contemporary scientific debate but also provide a robust foundation for future investigations aiming to elucidate the mysteries surrounding the origins, evolution, and ultimate fate of the cosmos. This theory presents an innovative perspective on the genesis and dynamics of the cosmos, in which the universe we perceive is shaped not only by its own substance and history but also by the reminiscences and gravity of a predecessor universe. Here, creation does not arise from a singular inflationary event like the Big Bang but emerges from the silence of an ancient and already vanished cosmos. Although absent in direct manifestation, this preceding cosmos inscribes its laws and structures into the fabric of our own universe, influencing both its expansion and its mass distribution. Thus, the universe we inhabit is not a creation out of nothing as proposed by Lawrence Maxwell Krauss, but a continuation—a posthumous universe that carries the gravitational and structural legacy of a previous reality on a smaller scale, deeply intertwined in our cosmic existence and evolution.

The beauty of this theory lies in its ability to offer verifiable predictions. For example, it suggests that certain anomalies in universal expansion are normal and can be explained by the influence of the previous universe, offering a new field of study for astronomical observations. Detailed analyses of the cosmic microwave background radiation or the distribution of dark matter could reveal unexpected patterns, serving as empirical evidence for the Theory of the Dead Universe. It can be speculated that the dead universe, with its constant mergers, released a field of dark energy and matter that permeates the space of the current universe and affects and causes galaxies to drift apart [33]. If the previous universe underwent gravitational collapse or another extreme phenomenon, it caused residual quantum or relativistic effects that may influence the space-time metric of the remaining active universe, altering how galaxies drift away from each other.

The foundation of this theory can be supported by modifying the Hubble's Law, traditionally expressed by the equation $v = H_0 D$, where v represents the velocity at which galaxies recede, D is the distance to those galaxies, and H_0 is the Hubble constant. We propose an expansion of this law to incorporate the impact of the predecessor universe, introducing an influence factor, F (Umorto), which adjusts the Hubble constant based on the properties of the "dead universe". The influence of the dead universe is captured by the function $F\ (\text{Umorto}) = \alpha\rho_{res} + \beta C$, where α and β are constants that translate the relationship between the residual density (ρ_{res}) of the ancient universe and other final conditions (C), such as residual gravitational or quantum effects. Thus, the velocity of galaxies' recession in our universe is redefined as $v = (\alpha\rho_{res} + \beta C) \times H_0 \times D$, an equation that reflects the interaction between the current cosmos and the fabric of spacetime of the dead universe.

Despite observations indicating galaxies drifting apart, I do not conceive the traditional expansion model but apply the same laws that better fit the theory of the dead universe. I remain skeptical of the expansive model suggested by the Big Bang theory. The dead universe theory emerges not only as an alternative cosmological model but aspires to the elegance of a "theory of everything", a unifying conception that promises to intertwine all empirical evidence, scientific data, and calculations into a single explanatory fabric. It is proposed that the current universe, with its twinkling stars and spiral galaxies, is not an isolated system but a fragment, the smallest remaining fraction of a much vaster antecedent cosmos. This preexisting universe, now in a state of cosmic twilight, has left us as heirs to its last vibrant portions of complexity and order. Like residual cells of a once-vibrant organism, our universe contains within itself the fundamental information, the intrinsic memory of the larger body of which it once was a part. In the structure of every subatomic particle, in the curvature of spacetime, and in the orchestrated movements of the constellations, we find the echo of this majestic origin. Everything we consider to be natural laws, constants, and fundamental variables may be the reflection of the eternal dynamics of this "dead universe", with its laws still whispering through the expansion of space, guiding our expansion and gravitation, our light and our darkness.

This perspective suggests that what we seek to understand about our universe—dark matter and energy, the quantum nature of reality, the very fabric of the cosmos—are residual characteristics, preserved aspects of a larger and more comprehensive reality. Thus, in our quest to comprehend the origin and destiny of our universe, we may actually be deciphering the legacy of what we once were, a complete cosmos now only whispering the secrets of its past existence in the shadow of its own stellar death. Grounded in the theory of the dead universe, I venture, speculatively, the possibility that the universe may actually be condensing toward a singular point of death with a new model of galaxy distancing as happened before and expelled us from the womb of the dead universe. The Dead Universe theory could clarify the existence of supermassive objects distanced from any previous reality, as well as radio waves, echoes, dark matter, dark energy, and even reveal that a UNO and still "invisible" matter permeate the known cosmos.

Grounded in the theory of the dead universe, It may be venture, speculatively, the possibility that the universe is, in fact, condensing toward a singular point of death with a new model of galactic separation as it happened before, expelling us from the womb of the dead universe. The Dead Universe theory could shed light on the existence of supermassive objects far removed from any previous reality, as well as radio waves, echoes, dark matter, dark energy, and even reveal that UNO and still "invisible" matter permeate the known cosmos. It may be investigated into the concept of the universe originating from nothingness. This exploration aims to set the stage for a consistent approach throughout the entire piece. Acting as a connecting thread among all particles, it functions as a fundamental element, perhaps akin to the vacuum. I intend to utilize the potency of this term to illustrate the absence of matter while emphasizing its existence as an essential element emerging from the vacuum, potentially catalyzing antiparticles.

In the scientific context, the idea of Uno matter can be associated with various theories and speculations about particles or substances that may exist beyond the reach of current observation tools. For example, in particle physics, there are hypotheses about the existence of exotic subatomic particles, such as sterile neutrinos, which have extremely weak interactions with ordinary matter and are therefore difficult to detect. Another possibility is that Uno matter is related to concepts in theoretical physics, such as dark matter or dark energy, which make up the majority of the observable universe but whose exact nature is still unknown. These forms of matter may be present in significant quantities in the cosmos. However, their lack of interaction with light and other forms of radiation makes direct detection challenging. At a more speculative level, Uno matter can be conceived as a form of matter that exists in additional dimensions beyond the three spatial dimensions and one temporal dimension that we perceive in our everyday universe. Theories such as string theory and loop quantum gravity posit the existence of extra dimensions, where new forms of matter and energy may reside, thus escaping direct detection.

Both Lawrence Krauss and Stephen Hawking are known for exploring the idea that the universe may have originated "from nothing" or from a state of quantum vacuum. Their perspectives on this subject are quite similar in some respects, but they also have subtle differences. Lawrence Krauss, in his book "A Universe from Nothing," argues that the universe may have arisen spontaneously due to quantum fluctuations in the vacuum. He suggests that, according to the laws of quantum physics, it is possible for particles and antiparticles to emerge from the vacuum, and under certain circumstances, these quantum fluctuations may result in the creation of an expanding universe. Stephen Hawking, on the other hand, also discussed the possibility of the universe coming from nothing in his book "The Grand Design", co-written with Leonard Mlodinow. He suggests that, due to the laws of gravity and quantum mechanics, the universe may have spontaneously arisen without the need for an external cause. Hawking argues that, given the highly compressed and hot state at the beginning of the universe, the laws of physics would allow it to emerge "from nothing" as a singularity.

Both scientists are dealing with the complex concept of "nothing" in a somewhat different way than is commonly understood. Instead of "nothing" meaning a true absence of anything, they are referring to a state of quantum vacuum that, although empty of matter and energy as we know it, is rich in quantum fluctuations and potentially capable of generating entire universes. Their ideas challenge more traditional conceptions of the creation and origin of the universe and continue to be subjects of debate and investigation within the scientific community. As we contemplate the cosmic microwave background (CMB), we observe the primordial vestige of the cosmos's inaugural luminosity, which permeates the universe uniformly—a true cosmic fossil. This evidence harmoniously aligns with the dead universe theory I am proposing. It posits that the CMB is the indelible impression of a prior stage of the universe, an era of quiescence or equilibrium before a significant cosmic transition [17]. The neutrality of the early atoms metaphorically reflects the universe in a state of latency or "death", a phase preceding the complexity and structuring observed in the present. This speculative theory suggests that we live only one phase in a much broader, and perhaps eternal, cosmic cycle, where the universe oscillates between periods of activity and inactivity.

At the heart of the unfathomable cosmos, we dare to hypothesize beyond the scope of current scientific consensus: it is possible that our universe, with its majestic expansion and intricate complexity, far exceeds the age estimated by our contemporary methods, reaching or even surpassing the 100-billion-year mark. This audacious conjecture is based on the previous existence of a "dead universe", a cosmic structure whose longevity would have extended for a period exceeding 900 billion years. It is suggested that such an ancient domain, ending its extensive cycle of existence, would have been the precursor to our current universe, originating through a phenomenon of rebirth or cosmic metamorphosis. The conception that we inhabit a universe succeeding an even older and more expansive reality not only broadens the horizons of our understanding of the temporal dimension of space but also inaugurates new paths of inquiry into the universe's life cycle and the primordial laws that govern its trajectory. Although this theory resides on the fringes of scientific speculation, it invites thinkers to ponder the veracity of a space-time whose fabric and matter may represent not the beginning, but a more recent phase of a universal cycle of immeasurable scope and ancient reverberations.

Despite the assertions of astronomers and cosmologists, there are many elemental questions arises like, what is the true age of supermassive bodies? What changes with a dating method that takes this premise into account? Should the chronology of the universe be measured exclusively by the activity time of stars? If indeed we are mistaken in this methodological model, how then should we interpret the recent findings of the James Webb Space Telescope? The newly observed galaxies are remarkably vast and contain stars whose red chrominance signals an ancient provenance, dating back to mere 500 to 700 million years after the event known as the Big Bang. In the early cosmos, we observe that black holes already had gigantic masses, far superior to that of our Sun, a finding that challenges current explanations, suggesting that they may have formed before the initial event proposed by conventional cosmology [18]. It's not that celestial phenomena are inherently inexplicable by the laws of traditional physics, which cannot be used in the future for universe dating issues.

Therefore, timing based on galaxies and stars, whose existence is finite, may not be the most accurate method for dating the extent of cosmic history. By analogy, the "age" of the universe could be inferred by studying the "fossils" of a previous cosmos, similar to how the age of a living descendant can be contextualized through the study of the remains of the progenitor. The investigation of these cosmic remnants may reveal not only the duration of the past existence of the deceased "father" but also provide insights into the potential longevity of the "son" - the observable universe. This finding aligns coherently with the theory of the Dead Universe, from which these colossal structures would have emanated. Faced with the confusing massiveness of black holes, one questions their reconciliation with the theory of the primordial explosion and the subsequent expansion of the universe, often illustrated as an inflating "balloon". How can we incorporate such colossal entities into current cosmological equations? It seems plausible that such black holes are not mere by-products of our emerging universe, but rather remnants of a preceding cosmos, existing long before the coalescence of galaxies that outlined the cradle of our universe.

Based on emerging astronomical observations, my assertion maintains that the age of our universe may well exceed 100 billion years, emerging not from the dawn of a new reality but from the decline of a previous universe. This premise is not unfounded but anchored in data pointing to an older and more complex origin. If we accept that less massive galaxies have the potential to exist for approximately 1 trillion years, then why should we dismiss the hypothesis of a universe with more than 100 billion years as mere fiction? In an immeasurable universe, we may anticipate the possibility that the cosmos in which we reside is the successor of a predecessor universe. In a dead universe, the colossal stars of this ancient domain, billions of times larger than the largest ones we know, would have lived and died, with their deaths sowing the seeds of a new beginning. As these giants succumbed, the celestial bodies orbiting around them would have been drawn into a central birth point and the womb of our own universe [22]. The residual radiation, such as cosmic radio waves, would be the signature of this colossal process, concentrating around our nascent universe, which is filled with notably smaller stars. This narrative is reinforced by the observations of the James Webb Space Telescope, which reveal immense and mature galaxies prematurely in the young universe, suggesting a cosmic cycle of death and rebirth. It may be doubtful of a cosmos limited to a mere 13.8 billion years, and it may "nurture" the conviction that the divine inaugurated his creation by the end, orchestrating all existence with a transcendental design from its inception.

As evidence emerges for the existence of supermassive bodies and various types of black holes, demonstrating a universe that exists in a state different from the observable universe, this theory solidifies. While the Big Bang fails to explain these phenomena, it gives way to a new theory. If correct, the presence of dark matter in the observable universe would be a strange element, not belonging to this universe, but present as residue from the predecessor universe, as well as the dark energy itself. The constant mergers and residual phenomena of this dead universe would directly influence the observable universe, providing more objective explanations for the equations of general relativity and inexplicable phenomena of quantum mechanics, considering the existence of a neutrality, which would be the matter sustaining the observable universe in conflict with elements that should not be present in our universe.

"Dark energy emerges as one of the most fascinating mysteries of contemporary cosmology, originally introduced to elucidate the remarkable observation that the expansion of the universe is accelerating—a discovery made in 1998 through the study of the brightness of distant supernovas. The pioneering research of Saul Perlmutter, Brian P. Schmidt, and Adam G. Riess, deserving of the Nobel Prize in Physics in 2011, consolidated the acceptance of dark energy as a vital component in the current cosmological description. However, contrasting with this paradigm, the theory of the 'dead universe' offers an alternative explanation for the galaxies" recession that dispenses with the need for continuous expansion, attributed by conventional theory to dark energy. According to the theory of the "dead universe," what is perceived as dark energy could be interpreted as residual traces of a previous cosmos, and dark matter, a relic of that preceding cosmic death. From this perspective, the presumed dark energy does not play a role in the accelerated expansion of the universe; galaxies recede under the residual influence of physical laws from a “dead universe”. Thus, the presence of dark energy, instead of indicating accelerated expansion, aligns with possible evidence corroborating the existence of the “dead universe”.

Recent theoretical propositions have challenged our understanding of the cosmos and its genesis, among which stands out the hypothesis of the universe as an information processor, conceived by scholars from the prestigious University of Oxford. This approach suggests that the universe operates as a complex system of informational exchange, where each element, from subatomic particles to celestial bodies, actively participates in a dynamic network of data exchange. In parallel, the theory of the “dead universe” harmoniously resonates with this view, postulating that there are informational interactions between the defunct cosmos and the universe in which we find ourselves. This continuous dialogue between what was and what is presents an alternative paradigm to the traditional Big Bang model, contemplating the possibility that the fabric of spacetime is permeated by a constant flow of information from a preceding cosmological reality [25]. Furthermore, everyday objects such as chairs and computers are considered participants in this gigantic cosmic processor, integrated into a universal informational matrix. In contrast to more complex models, the theory of the “dead universe” offers an elegant and explanatory simplification of the cosmos, a system that may be, in essence, a vast archive of perpetually interconnected and timeless information.

A nuclear physicist poses an intriguing question: how is it possible that an empty atom forms the ground around us? For a long time, it was not known that the atom was largely empty. It was only through the advancement of science, especially in the study of physics and quantum mechanics, that this discovery was made. Projects like the Large Hadron Collider (LHC) were developed with the aim of exploring these questions and seeking answers. This project with the immediate successor being CERN's Future Circular Collider (FCC), aiming for 100 TeV in a 100 km ring, alongside alternatives like muon colliders and national projects such as China's proposed collider, while other large-scale physics projects include the ITER fusion reactor and space telescopes like PLATO, all exploring fundamental science and technology at unprecedented scales [126].One of these questions led to the discovery of the Higgs particle, fundamental to our understanding of the origin of all things. The James Webb Space Telescope, now in orbit, is truly a remarkable feat in the quest for knowledge of the cosmos. This epic endeavor not only recalls the adventures seen in space movies but also reflects the hard work and collaboration of over 10,000 people who came together to launch it into space. This mission represents an extraordinary challenge, as the equipment is incredibly sensitive, presenting 344 potential points of failure.

Exploring the “observable universe” is essential for deepening our understanding of the mysteries of the dead universe because, uniquely, this truth will be discovered. The term “visible universe” refers to the part of the cosmos that we can directly observe, whether through terrestrial or space telescopes. This region encompasses everything we can detect through light and other forms of electromagnetic radiation. The visible universe includes stars, galaxies, nebulae, and other celestial bodies that emit light or are illuminated by light sources. However, this observable portion of the cosmos represents only a small fraction of the total universe that is actually dead, as there are vast regions inaccessible to direct observation due to distance, darkness, or other factors. Several scientists have discussed the idea that the universe arose from nothing, using different definitions of what that means in a physical and philosophical context. Lawrence Krauss is one of the best-known proponents of this idea, which he details in his book “A Universe from Nothing” [127]. He explores the notion that the universe could have arisen from a state of potentiality, where “nothing” is not an absolute absence of everything, but a state where the sums of all energies in the universe could result in zero, making the emergence of the universe a physical possibility [128].

One of the central questions in cosmology is whether the universe could have emerged from "nothing". According to the Big Bang theory, the universe began from a hot, dense state around 13.8 billion years ago. But what existed before that? Modern physics, particularly through quantum mechanics, suggests that the universe might have emerged from a quantum vacuum—a state of "nothingness" that isn't truly empty but filled with quantum fluctuations. Physicists like Stephen Hawking and Lawrence Krauss have proposed that these quantum fluctuations could allow for the spontaneous creation of the universe from nothing [129]. However, this “nothing” is not the classical idea of absolute void but rather a state governed by mathematical laws. So, even if the universe arose from this kind of quantum nothingness, the existence of the underlying laws and structures that allow such phenomena demands explanation.In Neoplatonism, a philosophical system influenced by Plato, the concept of "The

One" (or "The Good") serves as the ultimate, transcendent reality from which everything else emanates. This One is beyond being, beyond thought, and beyond matter. It is the uncaused cause, the source of all that exists. From the One emanates the Universal Intellect (Nous), which contains all perfect forms, ideas, and the rational principles that order reality [130].

Stephen Hawking also ventured into discussions about the origin of the universe. In his explorations of the complete theory of the universe, he suggested that if we could find a complete theory, it would allow us to participate in the discussion of why the universe exists and potentially know the “mind of God”. He previously stated that the existence of a creator was not incompatible with science, although his later positions seemed to contradict this. In attempting to understand the origin of the universe, scientists like Stephen Hawking and Lawrence Krauss have explored concepts that echo ancient ideas, some of which find parallels in religious texts, such as the notion of creation ex nihilo “creation out of nothing”, a concept present in various religious traditions, including the Bible. While these scientific perspectives are generally well-received in academic circles due to their empirical and theoretical basis, similar interpretations from theological sources are often viewed with skepticism or disregarded for not following traditional scientific methodology. This contrast in the reception of ideas highlights the complex interplay between faith and science, and the importance of methodology in validating theories within the scientific community. However, the historical recognition that concepts of creation from nothing exist in millennia-old texts opens an interesting dialogue about the evolution of human thought regarding the origins of the cosmos.

Black holes are fascinating celestial objects that capture the imagination, representing extreme physical conditions and profound mysteries at the frontiers of science. They are regions of spacetime where gravity is so strong that nothing, not even light, can escape, as described by Albert Einstein's general theory of relativity [131]. Black holes, far from being mere relics of collapsing stars, may represent residual phenomena of a previous cosmic era, possibly acting as sentinels of distant cosmic events not yet fully understood. These enigmatic entities may hold clues to physical processes from a predecessor universe, challenging astronomers to decipher their history and contribution to the framework of the current cosmos. Contemplating the hypothetical origin of a dying universe, extending for trillions of years and whose essence seems to have been transplanted into the present configuration of spacetime, leads us to reconsider the traditional narrative of the Big Bang. The scenario that presents itself suggests that if a major explosion event occurred, its advent may have been much earlier than the chronology proposed by George Lemaître, prompting a reflection on the temporal and structural complexity of the universe in which we reside. As we delve into the understanding of these celestial mysteries, we are led to speculate on what else may exist beyond the reach of our telescopes and measuring instruments. Black holes emerge as silent guardians of cosmic secrets long buried, patiently awaiting the moment when science will reveal them in their fullness, unraveling the mysteries of cosmic existence and our own origin in our small universe.

From this understanding, we can begin to explore the properties of black holes within the perspective of this theory, as there will be a dating for them as proposed. One of the most intriguing characteristics is the event horizon, which is the boundary beyond which nothing can escape the gravitational pull of the black hole, becoming understandable in the light of this theory. This horizon is a well-defined boundary in space-time, and any object that crosses this limit is destined to fall into the black hole. Another interesting aspect is the singularity at the center of the black hole, where the density and curvature of space-time become infinite. This singularity is a point where the laws of physics that we currently know cease to apply and is one of the great mysteries of theoretical physics. Now, considering my theory about black holes as gateways to an alternative reality of a dead universe that existed perhaps trillions of years ago, much larger compared to our known and small cosmos, “empty in darkness, but with dimensions of space-time in different unexplainable laws”, we can speculate on how these fits into the overall structure of general relativity [31]. An interesting approach would be to investigate whether black holes can somehow connect different regions of space-time, creating portals to other dimensions of the dead universe.

It may guess that the universe from which the visible universe emerged that we can observe has nearly infinite dimensions and almost incalculable gravity, which would explain its ability to influence and curve space-time in some known axis in our visible universe. At the forefront of cosmological research, the study of black holes reveals that we reside in a fraction of a universe of nearly limitless mass, filled with known matter, encompassed by a space of astronomically expanded pre-existing dimensions. The overwhelming gravitational influence, along with cataclysmic mergers of black holes and events yet to be elucidated, may have propelled active galaxies beyond the confines of a previous cosmos—a dead universe. This process, for reasons still uncertain, seems to have triggered a singularity, a new distinct entity, in which a smaller universe, yet rich in observable phenomena such as life and light, emerged with dark energy and matter and physical laws remaining in effect. From this new perspective, we can deduce that the legacy of an extinct and obscure universe maintains its influence on the architecture of the cosmos we inhabit. The existence and complexity of black holes, as well as other still unexplained astronomical phenomena, may be indicative of this influential continuity, suggesting that the cosmic past persists in shaping the present reality.

This hypothesis offers a potential interpretation for the presence of dark matter and other entities not fully elucidated by traditional physics. The proposal suggests the existence of an underlying or superimposed structure to the known fabric of our universe, a dimension where light, as we know it, is not present. In the catastrophic scenario of a dying star, either by explosion or the cessation of its nuclear activity, it is proposed that the release of energy is of such magnitude that it could disturb the spatial structure of the known universe. This would result in the manifestation of a void, a gap that would provide a window into an unknown domain, possibly a remnant of a pre-existing universe devoid of luminosity. However, the force to create a fold in space-time, may derive from the essence of the ancestral primordial universe, which, due to its exceptional density and gravity, distorts space-time. As we contemplate the ultra-massive bodies and the nearly inconceivable density of the ancestral universe, it becomes evident that the laws of gravity operating on these scales are not only intense but extraordinarily powerful. These forces not only curve space-time but are capable of bending it to the point of radically transforming the structure and evolution of the cosmos as we know it. Such massive gravitational distortions could theoretically alter the rate of temporal flow, challenging our conventional understanding of causality and continuity in the universe. The remnants of the dead universe in activity, where we live, communicate with the ancestral dead universe, where there must also exist, in addition to the incomprehensible gravity by physics, an also incalculable concentration of dark matter, which we also attribute to the equation of space-time folding in the observable universe, with the existence of light [19]. A universe that lines another universe, but with powerful gravitational density, and an exorbitant layer of dark matter interacting with a universe where there is light and also with a cosmic fabric less dense than the ancestral universe, causing distortions in space-time in our young universe of about 13.8 billion years.

If we consider the hypothesis of cellular memory, where cells beyond neurons are capable of retaining and transmitting memories and behaviors, we could establish an intriguing parallel with the cosmos. Just as transplanted organs carry echoes of past experiences to new bodies, perhaps our observable universe, in its genesis and evolution, is the manifestation of a "cosmic DNA" inherited from a dead universe. This current universe, filled with stars being born and galaxies in rotation, can be seen as a celestial body also in decline towards the end that, although distinct in form, continues to echo the "habits and tastes"—or the laws and mechanics—of its past existence. The new galaxies would be like acquired behaviors, remnants of a deep universal memory of the dead universe, indelible and perpetuated beyond the death of the ancient universe, supporting the notion that even in the depths of forgetfulness, the essence remains, guiding the rhythm of cosmic creation of new galaxies. The theory of the dead universe postulates that the fabric of the cosmos that surrounds us is intrinsically marked by cosmic memories, recorded in the essence of every existing particle. This ancestral legacy could explain the seemingly bizarre quantum behavior of subatomic particles, which, in the depths of quantum mechanics, reveal interaction patterns that defy our conventional understanding of space and time. It could be conjectured that such particles, now distant from the harmony of a full universe, behave as if displaced, longing for the intrinsic order of a larger and more complete cosmos, of which our observable universe is only a shadow or fragment. Thus, phenomena such as quantum entanglement and superposed probabilities may not only be fundamental characteristics of our universe, but also echoes of a previous cosmic symphony, where the laws of physics operated on a scale of complexity and unity that now seem strange and unattainable.

This conjecture proposes that dark matter, along with other cosmic singularities, may actually be remnants of a still unmapped primordial cosmos, each one latent evidence of the persistent influence of that original universe on the conditions of our current cosmos. Under the scrutiny of contemporary physics, the cataclysm of a star; whether by its thermal death or by supernova, which releases colossal amounts of energy that, hypothetically, have the potential to break the boundaries of observable space-time. This could create conduits to the dimensions of a "dead universe", providing a glimpse of the fundamental structures of the vast cosmos from which our reality emerged. The James Webb Space Telescope, which has unveiled galaxies with unexpected attributes, the theory of the "dead universe" offers a new interpretation. Instead of a young and incipient universe, the observations can be seen as evidence of an older heritage, a continuity of a previous cosmos. This alternative paradigm suggests that galaxies are not newly formed but may have evolved from an already established cosmic infrastructure, an inheritance from the universe that came before. The theory of the Dead Universe, and the observations of the James Webb, which revealed ancient galaxies with unexpected characteristics for the Big Bang model, clearly demonstrate the existence of the Dead Universe FACTOR.

According to this theory, the concept of a "dead universe" may offer an alternative explanation for the observation of galaxies and cosmic structures that appear mature and exist in advanced state of development. Such formations, which exhibit unexpected complexities for their presumed age according to the standard Big Bang chronology, could be interpreted as remnants of a pre-existing cosmos. The assumption is that the conditions of an ancestral universe influenced the accelerated maturation of such systems, suggesting that the distribution and evolution of these galaxies may not be restricted to the temporal framework imposed by the Big Bang model but possibly extending over a more extensive and intricate period, inherent to the deep past of the universe. The theory of the "dead universe" seeks to coexist with the fundamental principles of physics. My theory of the Dead Universe proposes that the gravitational attraction of this previous universe, although not directly observable, shapes the fabric of space-time in a manner compatible with the theory of general relativity. The influence of this primordial universe could be investigated as an underlying force that transcends the current understanding of quantum mechanics and gravity, challenging scientists to rethink the interaction between the grand structures of the cosmos and the behavior of subatomic particles. Based on the theory of the dead universe, it may be anticipated that future observations may unveil unexpected patterns in the distribution of dark matter and dark energy [33]. These patterns may challenge the explanations offered by the Big Bang model, as my theory suggests an ancestral gravitational influence that still permeates the cosmos. It can be predicted that black holes may be more than just the end of stars; they may act as channels to this primordial universe, revealing properties of space-time that are distinct from what we know.

There is anticipation of the opportunity to observe patterns of galactic motion that defy the established expectations by the Big Bang projections. Such discrepancy may be attributed, according to my theory, to the residual gravitational influence of an ancestral universe, characterized by an almost limitless density that surprisingly may still be impacting the dynamics of our observable universe. Furthermore, interpretations of the redshift in distant galaxies may require revision in light of this concept, suggesting that universal expansion may be a more intricate and heterogeneous phenomenon than a mere isotropic expansion proposed in conventional models. Thus, mathematical models that provide the foundation of the Big Bang theory could be questioned as new evidence and analysis corroborate the nuances presented by this alternative theory. It is postulated that black hole mergers, along with careful analysis of space-time curvature, may offer fundamental clues. Under the prism of my theory, black holes would not be mere gravitational anomalies but rather luminous indicators that point us towards a deeper understanding of the cosmos. They could represent points of connection with the legacy of a universe that preceded us, an extinct entity whose darkness still permeates and shapes the foundations of our current cosmos.

7. Cosmic Dynamics and Gravitational Forces

In the "Dead Universe" theory, there is no expansion similar to the Big Bang model or inflationary theory. Instead, it proposes that the dead universe is potentially trillions of times larger than our observable universe and has largely decayed. Our universe is just the remnant, perhaps just 0.0001% of the dead universe still alive. The gravitational laws of the fallen part, although not directly observable, influence our universe. These influences are indicated by the presence of supermassive bodies, billhoes times larger than the Sun and other primitive elements, and other anomalies that are currently not fully explained by existing theories. Thus, there may still be 0.1 billion times the size of what would be our universe, which is still an extremely large amount. This is a simplified way to visualize this issue, assuming that the proportions and the "death" of the universe are uniform throughout its extent. Provides a quantitative and flexible approach to modeling how these losses occur over time. This equation suggests that the rate of loss is not only proportional to the remaining mass but also modulated by an exponential factor that decreases over time, representing the diminishing influence of a “dead” universe. This modulation is critical to capturing the complexity of cosmological processes affecting our current universe, from expansion to unknown interactions that may have origins in past events. This advanced model allows for the exploration of scenarios where the rate of mass or energy loss is not constant but varies according to the remaining mass/energy and other dynamic factors.

The theory of the dead universe also connects to observations from the James Webb Space Telescope, which revealed ancient galaxies with unexpected characteristics for the Big Bang model, suggesting that this model is coming to an end as a reliable cosmological paradigm. In 2022, the telescope enabled the detection of an ultra-massive black hole, with 30 billion times the mass of the Sun, being the first to be measured using gravitational lenses. This method observes the attraction of a celestial object by the passage of light, providing strong evidence for the theory that there existed a previous, supermassive universe, whose amount of mass is incomprehensible, perhaps hundreds of billions of times larger than our known universe. The amount of energy, certainly, could be hundreds of billions of times greater than our universe, which is contained within a small black hole in the womb of this immense dead universe. The formation and nature of black holes remain one of the deepest mysteries within the context of modern cosmology, challenging the explanations provided by the Big Bang paradigm and the theory of relativity. Additionally, the ubiquitous presence of dark matter may be more coherently addressed when considering the theory of the “Dead Universe”, which posits a predecessor cosmos as the source of such phenomena.

Basic equation to calculate the remaining size of the universe after the loss of 99.99% of its total mass or energy. The formula uses the original size of the universe and the remaining fraction to determine the current size. An application example shows an original universe 1 trillion times larger than ours, with the assumption of 99.99% loss, resulting in a remaining size of 0.1 billion times our universe. Intriguingly, this theory finds a surprising resonance in ancient narratives, such as the Genesis account, which, interpreted metaphorically, describes a process of formation and transformation of the cosmos. The passage alludes to a “recreation” of the universe, an idea that, over the centuries, has intrigued both theological thinkers and scientists. The image of a universe emerging from disorder and obscurity, as described in sacred texts, can be seen as an allegory for a cosmic event of great magnitude—possibly a singularity or a primordial state that precedes our current understanding of physics. While the Big Bang does not offer an explanation for a preceding existence or for the transition from “nothing” to “something”, the idea of a cosmological recreation or rebirth echoes the notion of a universe that is more of a continuum than a singular and absolute origin.

Model with an equation to describe the rate of change of the mass or energy of our universe over time, influenced by a previous universe. The equation considers the rate of mass loss as proportional to the remaining mass and modulated by an exponential factor that decreases over time due to the expansion of the universe or other cosmological effects. Based on the theory of the “Dead Universe”, it is proposed that the death of an ancestral cosmos, over trillions of years, was marked by the progressive production of dark matter, culminating in a force that directed newly formed galaxies towards a central nexus, known today as the observable universe. It is postulated that from this epicenter, containing approximately 200 billion galaxies, emerged our current universe. The recent observations of the James Webb Space Telescope corroborate with this notion, evidencing structures that can be interpreted as the “three pillars of creation” within this context. This theory provides an explanatory framework for the abundance of dark matter, suggesting that the phenomenon of universal expansion may, in fact, be a manifestation of a preceding matter concentration.

Additionally, it is conceivable that, in the decline of this primordial universe, cataclysmic explosions and hitherto unknown laws acted to coalesce galaxies, stars, and planets towards a singularity, possibly a supermassive black hole. The laws of gravity, within this new context, could be adjusting to the clustering of these massive celestial bodies. Therefore, our universe may face a fate similar to that of its predecessor, either through continuous expansion or eventual contraction culminating in a new singularity. This process could occur on a timescale of less than 100 trillion years. “The idea that the universe expanded without being created may seem contradictory within the perspectives of the Big Bang, making the concept of expansion vague. However, the notion of a universe emerging from another universe that is in the process of dying seems like a more reasonable conclusion. The analogy of a daughter being born from the womb that is in its final days of life illustrates this premise, just as the daughter, in turn, will generate other offspring. The introduction of the concept of a mother universe and a child universe seems plausible and not merely speculative when Weinberg's ideas are carefully analyzed. "In the beginning, the universe was not created and it expanded. The energy of the Big Bang created matter, antimatter, and radiation in equal amounts, and then, as the universe cooled, the antimatter was annihilated in collisions with matter, leaving behind only a small excess of matter to form everything we see today" [132]. The introduction of the concept of the UNO particle in this context elevates the spirit of scientific inquiry beyond merely speculative conceptual frameworks that seek not to provide answers but rather to pose further questions for scientists.

8. Integration of Dark and UNO Matter

Furthermore, the interaction between general relativity and subatomic particles of quantum mechanics may be influenced by remaining laws of the "Dead Universe". The existence of a form of matter thus far undetected, perhaps "UNO matter", could be responsible for suturing the fabric of our universe in order to maintain the integrity of the laws of physics currently observed. Recognition must be given to the need to construct a substantial theoretical framework to lend scientific credibility to this hypothesis. Such a structure must rigorously describe the properties and dynamics of interaction of the postulated "UNO matter", elucidating its role in shaping spacetime and the origin of the universe. It is imperative to draw inspiration from advances in particle physics, notably the Standard Model and quantum field theory, which provide a deep understanding of elementary particles and the fundamental forces that orchestrate cosmic interactions. Deepening and expanding these paradigms may shed light on the underlying mechanisms that possibly govern the manifestations of the "Dead Universe", encouraging the scientific community to refine and test this theory with the necessary rigor for possible integration into the canon of contemporary cosmology. The challenges of detecting UNO matter will require significant technological advances. Just as the Large Hadron Collider was crucial in identifying the Higgs boson, we will need new instruments and experimental methods to explore UNO matter. This could mean the construction of even more advanced observatories, the conduct of experiments in high-energy physics not yet conceived, or even the development of revolutionary computational techniques.

9. Concept of Membrane (Brane) in the Dead Universe

In the "Dead Universe" theory, there is no expansion similar to the Big Bang model or inflationary theory. "The basic idea of inflation is simple and seductive: if the universe was once extremely small and extremely hot, then it should have expanded and cooled, resulting in a universe that is incredibly large and very cold. This is the logic that led to the theory of the inflationary universe" [133]. Instead, it proposes that the dead universe is potentially trillions of times larger than our observable universe and has largely decayed. Our universe is merely the remnant, perhaps only 0.1% of the dead universe still alive. The gravitational laws of the decayed part, though not directly observable, influence our universe. These influences are indicated by the presence of supermassive bodies, billions of times larger than the sun, and other anomalies that are currently not fully explained by existing theories (Guth, 1997).

This theory is distinct from other cosmological models and does not align with the Big Bang, multiverse theories, or cyclic models of creation and rebirth. Instead, it supports the idea of a continuously decaying universe, which generates smaller galaxies as it dies. Unlike the multiverse concept, the "Dead Universe" theory suggests a singular, vast universe where the process of decay leads to the continuous creation of smaller galaxies. We can also incorporate the concept of a membrane (brane) to further develop this theory. As the dead universe decays, it creates new galaxies as a form of cosmic memory. These galaxies are not random but are influenced by the decaying universe's remaining structures and gravitational forces. This process does not support the creation of multiple universes but rather the continuous formation of galaxies within a singular universe. "The enthusiasts of multiverses and string theory have filled cinemas with fiction surrounding this imagination. Although gaining support among serious astrophysicists and scientists, it leans more towards fiction than reality, as it leaves vast unexplained gaps compared to the Big Bang theory and other contemporary theories."

"String theory has led to the realization that the universe we observe is only one of an enormous number of possible universes. Each universe comes with its own unique properties, determined by the details of the compactification of extra dimensions and the values of the fundamental constants. This vast landscape of possibilities challenges our traditional notions of uniqueness and fine-tuning" [134]. All our observable universe may exist within a distinct brane floating in a higher-dimensional space. While this notion may hold some truth, compared to the theory of the dead universe, there’s no perspective for infinite universes. However, the idea of a large membrane could be incorporated into the concept of the womb of the dead universe (Susskind, 2005). This brane represents a segment of the dead universe transitioning into a state of death. Yet, the creative remnants of the dead universe could give rise to the formation of new galaxies within this brane. These galaxies are formed as the leftovers of the dead universe exert their influence, leading to the creation of progressively smaller galaxies. Explosions and other cosmic events within this decaying process contribute to the formation of these new galaxies.

It may be assumed that the entirety of our dead universe exists within a brane, which floats in a larger dimensional space. Within this volume, our universe exists as a membrane distinct from other potential universes, entering a state of death. This brane could be influenced by the physical laws and remnants of the dead universe, leading to the continuous creation of galaxies. These galaxies, as part of the cosmic memory of the dead universe, are generated by the interactions and remaining energies of the dead universe’s structures. Such model suggests that the gravitational anomalies and the curvature of time and space observed in our universe are the result of the dead universe’s physics influencing the observable universe. The dead universe’s decaying remnants, particularly supermassive bodies and dark energy, are key elements in shaping the structure and behavior of our observable universe.

10. Mathematical Model Explanation or Natural Separation

This mathematical model describes the interaction of uno particles with dark matter and dark energy, focusing on the natural separation caused by the gravitational influence of the dead universe rather than traditional expansion. Gravitational Wave Observations has conduct detailed observations of gravitational waves to identify signatures that could be attributed to the interactions of uno particles with dark matter and dark energy. The distribution of dark matter across the universe and look for patterns that correspond to the model’s predictions, such as higher concentrations in areas where uno particles are more abundant. Comparison with the Big Bang Theory and Other Cosmological Models has given below:

- Origin of the Universe: The universe's origin is best explained by the Big Bang theory, stating that about 13.8 billion years ago, everything began from an incredibly hot, dense state or singularity that rapidly expanded and cooled, forming space, time, energy, and matter. This expansion continues today, with gravity pulling the early hydrogen and helium gas into the first stars and galaxies, eventually forming everything we see, including us.
- Big Bang Theory: The origin of the universe is best explained by the Big Bang Theory, suggesting everything expanded from an extremely hot, dense point (singularity) about 13.8 billion years ago, creating space, time, matter, and energy [135]. Proposes an initial expansion from a singular point. Exponential expansion due to cosmic inflation. Explains dark matter and dark energy as unknown components added to the model to explain observations. This theory also predicts gravitational waves originating from cosmic inflation and astrophysical events like black hole mergers.
- Dead Universe Theory: Suggests that the current universe formed from the remnants of a previous, much larger universe, with uno particles as fundamental components. Natural separation due to the dispersion and interaction of uno particles with dark matter and dark energy. Proposes that dark matter and dark energy are directly derived from uno particles, providing a unified explanation for their existence and behavior. This theory also suggests that gravitational waves can be generated by the interactions of uno particles with dark matter and dark energy, offering a new potential source for these observations.
- Cosmic Expansion: Evidence includes the universe's ongoing expansion (redshift of galaxies) and the cosmic microwave background (afterglow). Heavier elements formed later inside stars, which eventually exploded, seeding space for planets and life [136].
- Dark Matter and Dark Energy:Dark matter is an invisible substance that provides gravity to hold galaxies together, while dark energy is an unknown force causing the universe's expansion to accelerate [137]. A mysterious force that permeates all of space. It has a repulsive effect, counteracting gravity. It is responsible for the accelerating expansion of and makes up about 68% of the universe [138].
- Gravitational Waves:Gravitational waves are ripples in the fabric of spacetime caused by accelerating massive objects, such as colliding black holes or neutron stars. These waves travel at the speed of light, stretching and

squeezing space as they move through the universe [139]. They were predicted by Albert Einstein's theory of general relativity and have been directly detected since 2015 using laser interferometers like LIGO and Virgo [140].

Unlike the Big Bang, which treats the universe as having a defined beginning, the Dead Universe theory suggests that our universe was preceded by a “dead universe” billions of years old, whose residual forces still influence current cosmology; Thus, the observable universe is merely a cosmic memory of the dead universe. It has proposed that gravitational waves can also be generated by interactions between unknown particles from the Dead Universe (uno particles) and dark matter/dark energy, which are no longer inexplicable in light of this theory. This adds an additional and potentially detectable source of gravitational waves not predicted by the Big Bang theory. While the Big Bang explains dark matter and dark energy as components that affect the expansion and gravity of the universe, the Dead Universe theory might suggest that these elements have more complex and dynamic interactions, influenced by laws or conditions from a previous cosmic state. The Dead Universe theory offer new perspectives on the ultimate fate of the universe, different from those proposed by other theories, influenced not only by expansion but also by natural separation by the laws of physics of the dead universe, by current matter and energy, as well as by residual forces from previous states of the universe. The gravitational effects of the dead universe, though not explicitly stated in the equations, are implicitly included in the interaction coefficients. This results in the natural separation of galaxies, as described by the “Dead Universe” theory. The process is gradual and influenced by the interactions of UNO particles, dark matter, and dark energy, leading to a steady dispersion rather than an aggressive expansion. The equations describing the dynamics of density variations for uno particles, dark matter, and dark energy. The coefficients in the equations represent different types of interactions and conversion rates between these entities.

We are on the eve of a new era of discoveries, where the shadows of the unknown will finally dissipate under the light of knowledge and technological innovation. The existence of this UNO matter causes particles to behave differently in the face of unknown gravitational fields. The existence of two distinct entities of undetectable dark matter and UNO matter, originating from the twilight of the previous universe, signals a transcendental influence on the dynamics of elementary particles and, by extension, on the phenomena that permeate the very essence of life. The detection and understanding of these elusive forms of matter constitute one of the most pressing puzzles of contemporary physics, evoking a cosmic dance that shapes not only the structure of the observable universe but also the intricate patterns that govern the very fabric of existence. It is possible to interpret the peculiarities observed in the behavior of subatomic particles, such as quantum leaps and the seemingly divisible nature of matter, as reflections of a mirrored reality between UNO matter and dark matter. From this perspective, the continuous interaction between these forms of matter offers an explanation for seemingly paradoxical phenomena, such as the dual behavior of light and the observation of interference in the double-slit experiment. This approach suggests that the constant exchange of information between UNO matter and dark matter plays a fundamental role in structuring the fabric of the universe and in the manifestation of observed quantum phenomena. Furthermore, it is proposed that the interconnection between these entities transcends the traditional boundaries of classical physics, paving the way for a deeper understanding of the nature of reality and the fundamental laws that govern it. By considering this perspective, we can envision a new approach to solving persistent mysteries in quantum mechanics and advancing towards a more complete understanding of the nature of the universe and our own existence within it.

These mysterious entities, by their very elusive nature, challenge the boundaries of human knowledge, suggesting the presence of hidden dimensions and fundamental laws that transcend our conventional conceptions. Their intrinsic role in shaping the cosmos and sustaining cosmic order sheds light on an intricate web of interconnections, where each particle, each galaxy, each manifestation of life is woven into a cosmic pattern of complexity and harmony. As we venture into the abysses of space and time, we contemplate not only the distant past of the universe but also its uncertain future. The duality between expansion and concentration, between stellar birth and death, between light and darkness, confronts us with the cosmic imperative of incessant change and transformation. In this constantly flowing cosmic panorama, we are compelled to question not only our understanding of the universe but also our own existence and place within it [37, 46]. Thus, the investigation of dark matter and UNO matter transcends the boundaries of conventional science, inviting us to explore the deepest mysteries of the cosmos and contemplate the most intimate mysteries of our own human condition. In our quest for understanding and meaning, we are guided by the promise of unraveling the secrets of the universe and, perhaps ultimately, the secrets of our own souls.

The theory of the dead universe better explains the theory of the “expansion of the universe” in the light of Hubble’s laws. We cannot believe in any way in an expansion from the explosion of the Big Bang that at some point is unexplained; it makes no sense, as indeed the universe would decelerate at some point in the billions of years of its existence. In fact, galaxies are moving away from each other in both theories, but not due to the expansion of a previous explosion, since there is not enough energy in the cosmos to cause continuous expansion. The gravity of the previous universe and facts of unknown laws, as I explained in the question of the gem, are attracting the observable universe back into itself; this strong attraction explains many phenomena that were previously complex for quantum physics to explain. This theory will certainly be elucidated soon in light of scientific evidence, as research focuses mainly on the study of black holes. When astrophysics discovers all the potential behind this divine architecture, we will certainly have a precise answer to the theory I am proposing in this treatise [49]. Perhaps, on the other hand, when a star implodes and forms a black hole, this is also explained by the perspective of the gravity of this predecessor universe that exerts a strong influence on the formation of this strange phenomenon, which we can imagine as open cracks to the dead womb of the universe.

11. Observational Evidence from the James Webb Space Telescope

Customarily, the Big Bang theory has been the backbone of cosmology, providing us with a model of a universe born from a singularity, expanding for approximately 13.5 billion years. However, in light of new evidence, it becomes increasingly clear that this narrative faces significant challenges, making room for a new perspective: the theory of the “dead universe” that I propose. The Dead Universe theory suggests a radically different approach. Instead of conceiving the universe as the result of an explosion, it proposes that the universe is a vast and possibly eternal continuum, where concepts of beginning and end are relativized. This is not just a vague hypothesis; the discoveries of the James Webb offer concrete evidence that challenges the fundamental premise of the Big Bang. Ancient galaxies that should display signs of interactions and mergers, as predicted by the standard model, remain surprisingly intact, suggesting a much more complex and less linear cosmic history.

The observation of astronomical objects that appear to be older than the age of the universe defined by the Big Bang model represents a significant challenge for contemporary cosmology. How can the existence of these mature structures be reconciled with a universe that, according to current estimates, is approximately 13.5 billion years old? The hypothesis of the “Dead Universe” seeks to address this contradiction by proposing that such galaxies are not mere discrepancies, but rather clues to an ancestral universe, whose timeline extends beyond the temporal scale demarcated by the event of the Big Bang. This theory suggests that conventional cosmological timelines may need to be revised in light of new evidence, possibly expanding our understanding of the history and evolution of the cosmos. Moreover, the supposed uniform expansion of the universe, a cornerstone of the Big Bang model, is called into question by recent observations. Distant and ancient galaxies do not behave in a way that would corroborate constant and accelerated expansion. This raises a fundamental question: what if the universe is not expanding uniformly, or even if it is not expanding at all? My theory suggests that the cosmos may be in a more complex and static or inverse state than previously imagined, a state where time and space are not absolute, but relative and interconnected in a way that we are still beginning to understand.

This is not just a challenge to the dominant narrative; it is an invitation to radically rethink our understanding of the cosmos. The theory of the “dead universe” offers a path to explore these questions, proposing a “timeless” universe or one that generates its own strange body, light, as its primordial nature was not light but rather the darkness of dark matter and supermassive bodies, where beginning and end are human concepts, not universal realities. In the perspective of the dead universe, the fusion of black holes and the consequent creation of stars may be considered incomprehensible events for beings inhabiting this universe. Imagine a civilization evolving amidst eternal darkness, where light is an abstract, almost mythological notion. For them, the sudden emergence of bright spots in the sky would be beyond comprehension, an anomaly in a predominantly dark environment. Perhaps the equation of UNO matter also resembles a window tint or solar control film, so that when we are inside, we perceive the existence of light, but if we look from outside in, we perceive no light at all and everything appears to us as lightless and in darkness. Therefore, a universe immersed in death within a dark fabric may present a reality of splendid light that we cannot see because of the presence of a matter that I describe as neutral.

The theory of the Dead Universe proposes a new interpretation of the observational boundaries of the universe through an analogy with window tint. We argue that dark matter and other cosmic anomalies may be analogous to layers that, although transparent from within, are opaque when viewed from outside. We explore how this metaphor can be applied to the study of astrophysics and offer insights into the properties and behavior of dark matter. Just as an internal observer perceives light through a layer of window tint, while from the exterior transparency is obscured, our visibility of the cosmos may be limited by material layers that are not immediately apparent to our conventional detection methods. The theory of the “dead universe” proposes that we live in a remnant of a previous cosmic reality, where dark matter acts as a “cosmic window tint” that distorts our perception of the universe. This matter not only influences the trajectory and speed of galaxies but may also be the reason why we observe the universe in such a dark and enigmatic manner. Gravitational waves and other observations can be seen as the light that permeates this dark layer, offering glimpses of the underlying structure of the universe. Our understanding of the expansion of the universe and the distribution of dark matter may be enriched by considering the idea that, just as light passing through window tint, there is inherent luminosity and active phenomena beyond our current vision awaiting discovery. Therefore, future research should focus on penetrating this layer of “cosmic window tint,” revealing the true extent and nature of the universe in which we reside.

Cosmological theories that propose various forms of “barriers” or transition zones in the universe. For example, the event horizon of a black hole acts as a point of no return where gravitational attraction is so strong that not even light can escape, making it invisible from the outside. This is somewhat like looking at a dark window from the outside; you cannot see through, suggesting an absence of light or activity when, in reality, there is hidden wealth. Extending this to your notion, if there were a “UNO matter” that acted as this kind of cosmic hue, it could be something that exists within the structure of the universe - a hypothetical substance or field that interacts with light and other forms of energy in a way that masks the activity or underlying structure of the cosmos when seen from a certain perspective. Such material could theoretically be responsible for the phenomena we observe, like the effects attributed to dark matter, which influences the movement of galaxies and yet emits no detectable light or radiation, remaining “UNOI” or “invisible” to our current methods of observation.

The notion of a “domain wall” in cosmology is a hypothetical structure that could act as a boundary between different phases or types of vacuum states in the universe, similar to the interface between two bubbles. It’s a speculative concept, but one that could potentially explain cosmic separation or transition areas, much like your concept of “UNO matter” film. Note that while analogies can be useful for illustrating concepts, in scientific publications, they are typically used sparingly and always anchored in rigorous argumentation and empirical evidence. Besides, the very nonexistence of light as a primordial element may challenge the fundamental laws of this dead universe. While they inhabit a domain, in which darkness reigns supreme, the presence of light could be seen as an intrusion or even as a metaphysical impossibility. These reflections lead us to question whether we can truly comprehend the totality of the universe from our limited perspective as observers of the cosmos. What we consider as universal truths may be just a small fraction of cosmic reality, and the dead universe may represent a spectrum of existence that escapes our full understanding.

Perhaps the very nature of light is indeed opposed to the essence of the dead universe. The mergers of supermassive bodies and black holes, which were the original nature of this universe, gave birth to light, an object strange to its reality. This universe will persist forever, immersed in its own eternal darkness, while light shines in contradiction. However, this does not mean that our observable universe is the essence of this dead universe. The mergers and anomalous behaviors of particles altered the original order of this universe, giving rise to strange bodies, such as the galaxies we observe. In this sense, we are mere intruders of chance in this reality, unless there exists a creator entity for the dead universe. Light is something strange to the reality of the dead universe, if we may say so, as it will always exist with its nature and its own laws, and it is calling this strange universe that has light as a primordial factor to its nature and essence. In this sense, it is not up for discussion the existence of humanity and life as we know it. “No one can deny that the universe is more for darkness, chaos, and obscure mystery than for a reality of light,” as the Abrahamic religions said [141]. It’s an exciting moment to question, explore, and perhaps discover the true nature of the cosmos. Our time will always be the present because we are within the eternal time of the dead universe (Thorne, 1994). “A single understanding that unifies the quantum and classical worlds would sweep through cosmology like a wind, stirring up all the old questions and many new ones, answering some but leaving most unanswered” [142].

Physics deals with the enigma of dark matter. It is conjectured that such matter may consist of compact and supermassive objects, such as primordial black holes, or perhaps of hypothetical and indescribable particles, known as sterile neutrinos. However, the very concept believed to elucidate dark matter finds a stronger resonance within the scope of the “Theory of the Dead Universe” than within the confines of the Big Bang paradigm. The existence of a past and extinct universe, devoid of all luminance, supports the belief that this process generated energy, similar to the unexplained cosmic enigma of dark energy. According to this theory, dark energy is not the agent of universal expansion, but rather the residual laws of the preceding universe still in effect (Lee Smolin 2006). The Theory of the Dead Universe takes into account dark matter, radio waves, and particle behavior. But a creative agency does not nullify the Theory of the Dead Universe for purely scientific purposes. Science does not strive to substantiate the existence of the Divine; it only seeks to investigate natural phenomena and elucidate them through the lens of empiricism. Likewise, it does not exist to deny the Divine. So let us set aside what escapes explanation and channel our energies into what can be explained into the Theory of the Dead Universe (Carroll, 2010). “Imagine a universe in which any one of these numbers was different. It would be a universe without atoms, stars, or planets; a universe without people, or any other form of life as we know it. It would be a universe without history. Yet such a universe would be entirely consistent with the laws of physics as we understand them. Why then do we find ourselves in a universe that is just right for us?”[143].

12. An Explanation for the Cold Spot in the Universe

The "Cold Spot" in the universe is a large, unusually cool patch in the Cosmic Microwave Background (CMB), the afterglow of the Big Bang, best explained by a massive, under-dense region called a super-void that CMB photons travel through, losing energy (integrated Sachs-Wolfe effect) [144]. While a super-void is the leading idea, its immense size and the depth of the spot challenge standard models, with some even speculating exotic origins like another universe's imprint, though most evidence points to a huge void. It was discovered through observations made by the WMAP (Wilkinson Microwave Anisotropy Probe) satellite in 2004 and later confirmed by data from the ESA’s Planck mission. This spot is about 70 microkelvins colder than the average CMB, which challenges the standard explanation based on the homogeneity of the universe predicted by the Big Bang theory [145]. This perspective implies that abnormalities like the Cold Spot are not just statistical fluctuations or effects of unknown cosmic superstructures, but rather direct manifestations of the extreme conditions and laws of the prior universe. Gravitational influences or other residual forces from this dead universe may be causing the temperature variations observed in the cosmic background radiation. Temperature is a condition inherent to the dead universe and not the observable universe due to its state of cosmic demise. The notion that multiverses are colliding with this universe seems improbable over a history of billions of years; certainly, various other cold spots would have been encountered, yet they do not exist because this cold spot was the link between this universe and the mother universe over trillions of years of its existence.

13. Limitation of Big Bang Theory

The Big Bang theory, while successful in explaining most of the observed features of the universe, such as cosmic expansion and the abundance of light elements, struggles to fully explain anisotropies like the Cold Spot. According to the standard model, temperature fluctuations in the CMB should be relatively uniform across large scales due to cosmic inflation. The Cold Spot, due to its scale and depth, does not easily fit into this model without requiring more complex explanations, such as rare statistical fluctuations or huge, undetected cosmic superstructures.So, the Big Bang theory explains much of cosmology but has key limitations, including the Horizon Problem (uniform CMB temperature) [146], Flatness Problem (universe's geometry) [147], and Monopole Problem (lack of magnetic monopoles) [148], which are addressed by the Inflation theory, but this introduces its own issues like explaining the initial conditions and the nature of dark matter/energy [149].The theory also struggles to describe the initial singularity (Planck Epoch) and the matter-antimatter asymmetry. The Inflation Theory proposes a period of extremely rapid (exponential) expansion of the universe during its first few moments. It was developed around 1980 to explain several puzzles with the standard Big Bang theory, in which the universe expands relatively gradually throughout its history [150].The detailed particle physics mechanism responsible for inflation is unknown. A number of inflation model predictions have been confirmed by observation; for example, temperature anisotropies observed by the COBE satellite in 1992 exhibit nearly scale-invariant spectra as predicted by the inflationary paradigm and WMAP results also show strong evidence for inflation [151]. However, some scientists dissent from this position [152, 153].

The horizon problem is the problem of determining why the universe appears statistically homogeneous and isotropic in accordance with the cosmological principle [154]. For example, molecules in a canister of gas are distributed homogeneously and isotopically because they are in thermal equilibrium: gas throughout the canister has had enough time to interact to dissipate inhomogeneities and anisotropies [155]. In the Big Bang model without inflation, gravitational expansion separates regions too quickly: the early universe does not have enough time to equilibrate. In a Big Bang with only the matter and radiation known in the Standard Model, two widely separated regions of the observable universe cannot have equilibrated because they move apart from each other faster than the speed of light and thus have never come into causal contact [156].The flatness problem (also known as the oldness problem) is a cosmological fine-tuning problem within the Big Bang model of the universe. Observations of the cosmic microwave background have demonstrated that the Universe is flat to within a few percent [157]. The expansion of the universe increases flatness. Subsequently, the early universe must have been exceptionally close to flat. In standard cosmology based on the Friedmann equations the density of matter and energy in the universe affects the curvature of space-time, with a very specific critical value being required for a flat universe [158].The current density of the universe is observed to be very close to this critical value. Since any departure of the total density from the critical value would increase rapidly over cosmic time, [159] the early universe must have had a density even closer to the critical density, departing from it by one part in 10^{62} or less. This leads cosmologists to question how the initial density came to be so closely fine-tuned to this 'special' value [160].

14. Discrepancy with Cosmic Radiation Theory

While cosmic background radiation generally supports a uniform and homogeneous universe as predicted by inflation, the Cold Spot suggests anisotropies that may require new physics or adjustments to current cosmogonic models. In this context, the Big Bang theory does not provide a direct explanation for this anomaly, raising questions about possible revisions or extensions to the model. The Dead Universe theory offers an alternative explanation for the Cold Spot, suggesting that it represents an “umbilical cord” from a previously collapsed universe. This theory proposes that our observable universe is just a remnant of a much larger and older universe—the dead universe. Gravitational laws and influences from this previous universe, now only partially existing, may be responsible for irregularities like the Cold Spot. This approach not only offers an explanation for the anomaly but also expands cosmological understanding by incorporating the idea of a multiverse or cosmic cycles of death and rebirth.

The Dead Universe theory provides an intriguing insight into the origin of anomalies like the Cold Spot in the cosmic microwave background radiation. This theory suggests that the Cold Spot is not a mere random fluctuation, but a direct consequence of the thermal state of a now-extinct precursor universe. Imagine a gigantic, aging universe, progressively cooling until it becomes a vast space of low thermal energy and akin to a cold chamber in the cosmos. This analogy can be likened to opening a small door between an extremely cold environment, such as a freezer, and a warmer area, like a kitchen. The instant thermal exchange that occurs is similar to the effect the dead universe could have on the space around it, especially at points where the interaction is most intense [41, 89]. This thermal interaction results in a noticeably colder area in the context of the observable universe, which we detect as the Cold Spot. This equation seeks to quantify the direct influence of the extreme cold of the dead universe on the observable universe, in a manner similar to how cold air from a freezer mixes with the warmer air of a kitchen. The use of this analogy and the corresponding equation provides a vivid and scientifically plausible way to explain how an ancient and cold universe can impact the temperature of the cosmos we observe today. Validation of this theory will require detailed observations and rigorous analysis of the anisotropies in the cosmic microwave background radiation, looking for specific patterns that would corroborate this thermal interaction on a cosmic scale.

The theory of immense gravitational magnitude of the predecessor universe may naturally warp space-time, a phenomenon known in astrophysics as a “gravitational well”, responsible, for example, for bending light. The idea that the observable universe is within the womb of a dead mother universe that died trillions of years ago, the same fate as our universe, which emerged from the womb of the previous mother, may explain what astrophysics has not been able to. The gravitational force of the ancient universe may bend the fabric of the universe in such a way that it creates a “slippery” advancing through space without actually moving [79]. The Big Bang theory, while accepted to explain the origin of the Universe, has gaps, such as the lack of explanation for continuous expansion. Studies involving particle accelerators, which evidence phenomena similar to micro-explosions, can be interpreted as support for this alternative hypothesis. If the observable universe emerged from a “dead universe”, such an event could be interpreted as an expansion driven by the lingering action of the gravity of a previous universe, a concept that could be inferred from the presence and behavior of black holes, which offer indirect evidence of this process. The continuity of gravitational laws, which seem to govern without alteration since the primordial state, may be a testament to the deep connection between the current universe and its possible origin in a previous and broader context.

A pertinent issue in contesting the Big Bang model lies in the observation that expansions resulting from explosive events generally introduce a level of randomness in the movement of the involved particles. However, the expansion observed in the universe suggests a more orderly and systematic progression, possibly guided by principles not yet fully elucidated by contemporary physics. Regarding the characterization of the “Explosion” associated with the Big Bang itself, the term may be deemed inappropriate if interpreted in the light of conventional explosions. If such an event does not fit within the traditional parameters of an explosion, then what would be the physical mechanisms sustaining such a model? The proposition of the Big Bang, which posits the expansion of the spacetime fabric itself, demands a source of energy capable of enabling such a phenomenon. Additionally, the process described by the Big Bang does not correspond to an explosion within a pre-existing space but rather to the expansion of the spacetime structure itself. In this context, the hypothesis of the “Great Dead Universe” offers an alternative explanation that could provide a detailed description of cosmic expansion, filling gaps left by the Big Bang model, which sometimes seems to oscillate in its explanations about the exact nature of the initial event.

Additionally, the regularity and organized structure observed in the cosmos may seem antithetical to a chaotic and random origin suggested by a conventional explosion. Scientific studies, including those based on principles of quantum physics, have indicated that the nature of the universe may incorporate explosive aspects. Consequently, if the observable universe is influenced by a previous cosmic legacy, then the initial conditions and physical laws of this preceding universe could be the regulating keys of the expansion we witness today (Rees 2000). Sean Carroll said, “The theory of everything is an ambitious quest in theoretical physics to unify all four fundamental forces of the universe: gravity, electromagnetism, weak nuclear force, and strong nuclear force. From Eternity to Here: The Quest for the Ultimate Theory of Time.” [161].Lawrence M. Krauss said, “Every atom in your body came from a star that exploded. And, the atoms in your left hand probably came from a different star than your right hand. It really is the most poetic thing I know about physics: You are all stardust. A Universe from Nothing: Why There Is Something Rather than Nothing.” [162]. The theory of the “dead universe” not only challenges the foundations of the Big Bang but also offers more cohesive explanations for the existence of celestial phenomena. By proposing a new model for the origin of the universe, this theory paves the way for a deeper and possibly more accurate understanding of the cosmos, transcending the limitations of current science.

15.Complexity of Cosmology and Unsolved Mysteries of the Universe

The following collection of astrophysical and cosmological subjects explores some of the most intriguing and unconventional frontiers in modern science. These subjects venture beyond the well-charted realms of classical astronomy into areas where theory, observation, and speculation converge [52]. From anomalies in black hole properties and mysterious galactic emissions to hidden dimensions, exotic matter states, and the very nature of time and reality, this section deals with phenomena that defy standard models. It highlights both puzzling observational data and bold theoretical frameworks, emphasizing the dynamic, evolving nature of our quest to understand the universe at its most fundamental level [50, 61].

The Missing Baryon Problem and the Cosmic Web: In cosmology, the missing baryon problem is an observed discrepancy between the amount of baryonic matter detected from shortly after the Big Bang and from more recent epochs. Observations of the cosmic microwave background and Big Bang nucleosynthesis studies have set constraints on the abundance of baryons in the early universe, finding that baryonic matter accounts for approximately 4.8% of the energy contents of the universe. At the same time, a census of baryons in the recent observable universe has found that observed baryonic matter accounts for less than half of that amount [51, 76]. This discrepancy is commonly known as the missing baryon problem. The missing baryon problem is different from the dark matter problem, which is non-baryonic in nature. A major unsolved issue in cosmology is the Missing Baryon Problem, where about half of the expected ordinary matter (baryons) in the universe remains undetected [75]. Theoretical predictions and data from the Cosmic Microwave Background suggest baryons should make up around 5% of the universe, yet only half of that has been observed. These missing baryons are believed to exist in the cosmic web's warm-hot intergalactic medium (WHIM), a diffuse, filamentary structure composed of gas at temperatures between 100,000 and 10 million Kelvin. This gas emits weak ultraviolet and X-ray signals, making it hard to detect directly. Modern methods such as absorption line studies using quasar light, fast radio burst (FRB) analyses, and X-ray detections of ionized oxygen by telescopes like Chandra and XMM-Newton have provided supporting evidence. Future observatories like Athena and the Square Kilometer Array will likely enhance our understanding of these hidden baryons and their roles in cosmic evolution [78].

Cosmic Ray Conundrums: Cosmic rays or Astro-particles are high-energy particles or clusters of particles (protons or atomic nuclei) that move through space at nearly the speed of light. They originate from the Sun, from outside of the Solar System in the Milky Way, and from distant galaxies [77]. Ultra-High-Energy Particles are another puzzling phenomenon involves Ultra-High-Energy Cosmic Rays (UHECRs), which possess energies far beyond what human-made accelerators can achieve. Their exact origins and acceleration mechanisms remain unknown, and due to interactions with the CMB (Greisen–Zatsepin–Kuzmin or GZK cutoff), such high-energy particles should lose energy over long distances. Since UHECRs are charged [64, 65, 66], magnetic fields deflect their paths, obscuring their sources. Potential sources include active galactic nuclei, gamma-ray bursts, or even the decay of ancient supermassive particles. Ground-based observatories like the Pierre Auger Observatory and the Telescope Array detect these particles through extensive air showers [78], while upcoming missions like POEMMA aim to improve source tracking. Studying UHECRs could open new insights into high-energy astrophysics, quantum gravity, and dark matter [74].

The Hubble Tension: Discrepant Cosmic Expansion Rates. The Hubble Tension is the significant, persistent disagreement between the universe's expansion rate measured from the early universe (Cosmic Microwave Background data, suggesting a slower expansion) and measurements from the local, "late universe" using methods like Cepheid variables and Type Ia Supernovae (suggesting a faster expansion), indicating a potential flaw in the standard Lambda-CDM cosmological model or unknown physics [72]. This "Hubble Crisis" highlights that measurements from the distant past don't match the expansion rate we see today, challenging our understanding of dark energy, dark matter, or gravity. The Hubble Tension highlights discrepancies in the measured expansion rate of the universe. Local methods using standard candles like Type Ia supernovae yield a higher Hubble constant (~73 km/s/Mpc), while early-universe measurements from the CMB suggest a lower value (~67.4 km/s/Mpc). This mismatch cannot be easily explained by errors, implying potential new physics or revisions to the standard cosmological model [53, 63]. Proposed explanations include evolving dark energy, extra relativistic particles, or altered gravitational laws. New approaches using cosmic chronometers, gravitational wave "standard sirens," and baryon acoustic oscillations aim to clarify the true expansion rate and refine our understanding of cosmic evolution [54, 60].

Intergalactic Shadows: Unseen Structures of the Cosmic Web. The hypothesis that stars exist only in galaxies was disproven in January 1997 with the discovery of intergalactic stars. The Cosmic Web not only consists of visible galaxies but also vast, faint regions of gas and dark matter forming filaments and voids [62]. These intergalactic regions are hard to observe directly, but methods such as studying the Lyman-alpha Forest in quasar spectra and gravitational lensing help reveal their presence. These "intergalactic shadows" may hold clues about galaxy formation and the behavior of dark energy in low-density environments. Understanding the structure and role of these hidden regions is vital for developing accurate models of the universe's growth [109].Gravity Unbound: Questioning General Relativity on Cosmic Scales. The gravitational binding energy can be conceptually different within the theories of Newtonian gravity and Albert Einstein's theory of gravity called General Relativity [110]. Einstein's General Relativity faces challenges on cosmic scales. While it works well within our solar system, phenomena like cosmic acceleration and galaxy rotation curves suggest the need for dark energy and dark matter—neither of which has been directly observed. Alternatives like Modified Newtonian Dynamics (MOND), theories involving extra dimensions, and entropic gravity propose changes to gravity itself. Black hole merger data and future missions like LISA may provide new insights, potentially reshaping our understanding of gravity and spacetime [76].

Quantum Gravity Frontiers: Unifying Macro and Micro Cosmos. Quantum Gravity deals with environments in which neither gravitational nor quantum effects can be ignored, such as in the vicinity of black holes or similar compact astrophysical objects, as well as in the early stages of the universe moments after the Big Bang [74]. The quest for Quantum Gravity aims to unify General Relativity and Quantum Mechanics into a single framework. Candidates include Loop Quantum Gravity, which envisions spacetime as a network of discrete units, and String Theory, which treats particles as vibrating strings in higher-dimensional space. Other theories propose that spacetime emerges from quantum information. Despite limited experimental access due to extreme energy requirements, gravitational wave studies and high-energy experiments continue to explore these theoretical frontiers [72, 108].

Relativity Extreme: Time Dilation and Cosmic Chronology Challenges. Relativity Extreme isn't a specific term in the Wikipedia articles on Einstein's Relativity, but rather refers to the profound, counterintuitive effects of Special Relativity (SR) and General Relativity (GR) in extreme conditions (like near black holes, at high speeds, or in strong gravity) where everyday intuition breaks down, involving concepts like time dilation, length contraction, spacetime curvature, and mass-energy equivalence (E=mc2) [109, 110]. It highlights how time and space aren't absolute but relative, warping significantly under intense gravity or when approaching the speed of light, challenging classical physics. Einstein's relativity reveals time as a flexible dimension, slowing under high velocities (special relativity) or intense gravity (general relativity) [189]. Experiments confirm time dilation, such as differences in atomic clocks on fast-moving jets or GPS satellite adjustments. Around black holes, time dilation becomes extreme, causing falling objects to appear "frozen" from afar. On cosmic scales, redshifted galaxies chronicle time's passage, shaping our view of the universe's age and evolution [139]. Quantum theories suggest time might be emergent and not fundamental—possibly breaking down near singularities. These insights challenge classical notions of past, present, and future, with profound implications for cosmology [58, 59].

Spectral Riddles: The Enigma of Diffuse Interstellar Bands (DIBs). DIBs are mysterious absorption lines in starlight caused by unknown interstellar molecules. Possible candidates include complex organic molecules like PAHs and fullerenes, but no definitive identification has been made [71]. Variations in the bands based on environment complicate the search, which now includes laboratory simulations and machine learning. Solving the DIB puzzle would improve our understanding of interstellar chemistry and the physics of space [82, 83].

Anomalous Trajectories: The Flyby Anomaly and Orbital Oddities. The Flyby Anomaly refers to unexplained changes in spacecraft velocity during Earth flybys, first noticed in the 1990s. Anomalous trajectories are paths (of vehicles, people, objects) that significantly deviate from typical, expected patterns, often detected using data analysis, machine learning, and clustering to identify outliers in movement, time, and location for applications in traffic management, security, and behavioral analysis [59]. Despite considering tracking errors, atmospheric effects, and gravitational irregularities, no solid explanation has emerged. The pattern seems to depend on the trajectory geometry, prompting speculation about unknown physics. Understanding this anomaly is important for precise spacecraft navigation and may have broader implications for gravitational theory [92, 94].

The Silent Pioneers: The Quest for Population III Stars. Population III stars—the universe's first stars—remain hypothetical. Formed from pure hydrogen and helium shortly after the Big Bang, they were likely massive, bright, and short-lived, initiating the production of heavier elements. Although never observed directly, researchers look for their signatures in extremely metal-poor stars and distant galaxies. Some may have collapsed directly into black holes, evading detection. Finding evidence of these stars would help explain early cosmic chemical enrichment and galaxy formation [90, 91, 94].

Stellar Genesis Revisited: Metallicity and the Birth of the First Stars. Early star formation was heavily influenced by metallicity, or the lack thereof. In the metal-free early universe, gas clouds cooled inefficiently, leading to the formation of very massive stars—possibly hundreds of times the mass of the Sun [101, 102, 106]. These stars emitted powerful radiation that deionized hydrogen in their surroundings, marking the epoch of reionization. Over time, metal enrichment from supernovae allowed the formation of more diverse stars. Understanding this process is key to modeling stellar evolution and the development of cosmic structure [100, 104].

Unconventional Black Holes: Anomalies in Mass, Spin, and Behavior. Recent observations of black holes, including gravitational wave detections, reveal unexpected properties that challenge classical models. Intermediate-mass black holes (~30 solar masses) detected by LIGO are larger than typical stellar black holes yet smaller than supermassive ones, raising questions about their formation channels [103]. Spin measurements show some black holes rotating near theoretical limits, while others have unusually slow or misaligned spins—suggesting complex formation histories involving mergers or chaotic interactions. Additionally, black holes found in the "mass gap" (~50–120 solar masses), where pair-instability supernovae predict no remnants, hint at alternative formation scenarios such as direct collapse or primordial origins. Speculative objects like gravastars or fuzzballs have been proposed as alternatives to black holes but lack definitive evidence. These anomalies continue to refine our understanding of black hole physics and cosmic evolution [97].

Microwave Whispers: Probing Anomalous Emission from the Milky Way. Observations of the Milky Way's microwave emissions have uncovered anomalous components that defy explanation by standard astrophysical processes. Initially detected by COBE and confirmed by WMAP and Planck satellites, these emissions do not align with classical thermal dust emission or synchrotron radiation. Hypotheses include rapidly spinning tiny dust grains (spinning dust), interactions between cosmic rays and interstellar dust, or magnetized grains emitting microwaves. Exotic particle processes, such as axion decay potentially related to dark matter, have also been proposed. Despite progress, no current model fully explains the observed features. Missions like NASA's SPHEREx and laboratory studies aim to clarify this emission's origins, which could reshape our understanding of interstellar dust and galactic physics [94, 95].

Magnetic Mysteries: The Role of Cosmic Magnetic Fields in Shaping the Universe. Cosmic magnetic fields thread through galaxies, galaxy clusters, and the intergalactic medium, influencing charged particles, star formation, and galactic dynamics [96, 98]. The origins of these fields are uncertain—possibly seeded by early-universe plasma fluctuations and later amplified by galactic dynamos. Observationally, magnetic fields align with features like spiral arms and influence structures such as jets from supermassive black holes. They are indirectly studied through polarization and cosmic ray deflection. Magnetic fields may even interact with dark matter and dark energy, potentially affecting cosmic structure formation and expansion. Despite their significance, their elusive nature makes them one of the most underexplored forces in cosmology.

Neutrino Enigmas: The Ghostly Messengers of the Cosmos. Neutrinos are nearly massless, neutral particles born in stars, supernovae, and the Big Bang. Their weak interaction with matter allows them to travel vast distances, carrying unique astrophysical information. Massive detectors like IceCube at the South Pole catch rare neutrino events in ice [187]. The 1987A supernova neutrino burst offered pivotal insight into stellar death. Neutrino oscillations flavor changes en route demand physics beyond the Standard Model. Detecting the cosmic neutrino background could unlock secrets of the early universe, further illuminating fundamental forces and astrophysical phenomena [97].

Gamma Ray Surprises: Unexplained Emissions from the Galactic Center. The Fermi Gamma-ray Space Telescope has detected excess gamma radiation from the Milky Way's center; exceeding emissions expected from known sources like the central black hole. The diffuse emission pattern implies an extended origin [91, 98]. Possible sources include dark matter annihilation, cosmic ray interactions with gas, or unknown astrophysical objects like micro-quasars. None of these fully explain the signal. Investigating these emissions could lead to breakthroughs in particle physics, galactic structure, and indirect dark matter detection [87, 89].

Rethinking Inflation: Alternative Scenarios for the Universe's Birth. Inflation theory posits a rapid expansion of the universe just after the Big Bang, solving puzzles like flatness and homogeneity [99]. Yet, the inflation field driving this expansion is hypothetical and undetected. Alternatives propose cyclic universes, eternal pre-Big Bang states (emergent universes), or quantum fluctuations birthing universes in a multiverse. Some models suggest inflation varies across regions. Testing these ideas demands precise cosmological observations, and a successful theory could redefine our understanding of the universe's birth.

Cosmic Strings and Topological Defects: Traces from the Early Universe. Topological defects such as cosmic strings may be relics from symmetry-breaking phase transitions in the early universe, similar to cracks in cooling crystals [164]. Cosmic strings, if they exist, would be thin yet immensely dense, producing unique gravitational lensing. Other defects include domain walls and magnetic monopoles, though none have been conclusively observed. While inflation remains the leading structure formation theory, efforts to detect such relics via gravitational waves, gamma rays, or CMB anomalies continue. Discovery would illuminate early-universe physics [93].

Baryogenesis and Beyond: The Puzzle of Matter-Antimatter Imbalance. The universe's matter dominance contradicts the expectation of equal matter and antimatter production. This asymmetry likely arose through baryogenesis—processes involving CP violation, baryon number violation, and non-equilibrium conditions. The CP violation seen in the Standard Model is insufficient, prompting theories like electroweak baryogenesis, lipogenesis, and new physics. Particle collider experiments and astrophysical studies seek to uncover the root cause, addressing one of cosmology's most profound puzzles [86, 87].

Ghostly Galaxies: The Enigma of Ultra-Diffuse Structures. Ultra-diffuse galaxies (UDGs) are puzzling objects as large as the Milky Way but with very few stars. Some appear nearly devoid of dark matter, while others seem dominated by it [84, 85]. Found in clusters and isolated areas, their formation may involve tidal stripping, inefficient star formation, or remnants of ancient starbursts. Their diversity challenges traditional galaxy formation theories and underscores gaps in our understanding of baryonic and dark matter interactions [85, 88].

Challenging Constants: Are Nature's Numbers Truly Universal? Physical constants like the speed of light, gravitational constant, and fine-structure constant underlie the laws of nature. Some studies explore whether these might vary over time or space, which would dramatically alter our understanding of physics [83]. Quasar observations and atomic clock experiments test for such variations. Though no conclusive changes have been detected, the implications are vast. Theoretical models like string theory suggest these constants could emerge from deeper geometrical properties of space or extra dimensions [172].

Phantom Dimensions: Unveiling Hidden Realms Beyond Perception. Theories such as string theory predict extra spatial dimensions beyond the observable three. These dimensions are likely compactified and undetectable with current tools but may explain gravity's weakness if its "leaks" into them [83]. Brane cosmology proposes our universe is a 3D surface in higher-dimensional space. These ideas could shed light on dark matter, dark energy, and the multiverse. Experiments at particle colliders and astrophysical observations attempt to test these hypotheses, though direct evidence remains elusive [86].

Time's Labyrinth: Temporal Anomalies and the Possibility of Cosmic Time Travel. Temporal Anomalies and the Possibility of Cosmic Time Travel" is likely a phrase you've come across as a conceptual or descriptive title, as there is no single definitive book with this exact name that serves as a central, well-known work on the topic. Instead, the phrase "Time's Labyrinth" and variations of the concept appear in several different contexts, ranging from fiction to philosophical discussions. Relativity confirms time dilation, but more speculative models allow for closed time-like curves—paths through spacetime enabling backward time travel [108]. Theoretical structures like wormholes or cosmic strings might permit such loops if negative-energy matter exists. However, paradoxes such as the grandfather paradox and questions about causality make this idea controversial. While future-directed time travel aligns with known physics, reverse time travel remains speculative but conceptually rich [95].

Artificial Gravity: Speculative Technologies for Navigating Cosmic Frontiers. Artificial gravity is a simulated gravitational force used to counter the adverse health effects of weightlessness during long space flights. The two primary, physics-based methods involve rotation and linear acceleration, while other concepts remain largely speculative. Long-duration space missions require artificial gravity to counteract microgravity's adverse effects [102]. The most feasible method is spacecraft rotation to simulate gravity via centrifugal force. Other speculative approaches include electromagnetic manipulation or exotic matter-based gravity control. While these remain theoretical, rotating habitats are being considered in current mission planning, offering practical steps toward sustained human space exploration [101].

The Simulation Hypothesis: Are We Living in a Cosmic Construct? The simulation hypothesis proposes that what one experiences as the real world is actually a simulated reality, such as a computer simulation in which humans are constructs. There has been much debate over this topic in the philosophical discourse, and regarding practical applications in computing. The simulation hypothesis suggests that our reality might be a high-fidelity simulation by an advanced civilization [89]. If such simulations are numerous, statistically we could be one of them. Quantum mechanics oddities and finely tuned constants are cited as potential clues. Some propose experiments to detect signs of computational limits in the universe. However, critics argue such simulations may be infeasible and the hypothesis may be untestable. Still, it provokes deep questions about reality and consciousness [81, 82].

Exotic States of Matter: Beyond the Known Frontier. Beyond solids, liquids, gases, and plasma, extreme conditions reveal exotic matter states. Bose-Einstein condensates form when atoms act as one quantum entity at near-zero temperatures. Quark-gluon plasma replicates the early universe's hot dense state. Neutron stars might contain strange matter. Hypothetical forms include super solids, time crystals, Planck stars, and negative mass matter [16, 58]. These states challenge known physics and offer novel insights and technologies, driving both experimental and theoretical research [57, 59]. Exotic states of matter are unusual phases beyond solids, liquids, gases, and plasmas, exhibiting unique quantum behaviors under extreme conditions like ultra-low temperatures or immense pressures, including Bose-Einstein Condensates (atoms acting as one), super-fluids (or frictionless flow), quark-gluon plasma (or early universe state), time crystals (or repeating in time), and superconductors (zero resistance). Studying these states, often created in labs, reveals fundamental physics and offers insights for quantum computing and understanding cosmic phenomena.

16. Future Consequence of Cosmology and Understand of Universe

Cosmology in today is a dynamic interplay of theoretical and experimental endeavors, continually evolving to surmount novel challenges. The discipline necessitates systematic reconstruction to harmonize theory with emerging observational data at each juncture. A watershed moment in this ongoing debate unfolded with the revelation of supernova dimming, [163] a phenomenon that revealed the limitations of the Friedmann–Lemaitre–Robertson–Walker metric (herein Friedmann metric). To address this dissonance, the cosmological constant was introduced to align the theoretical predictions with empirical insights [164]. Present-day surveys and astronomical observations indicate that galaxies are increasingly moving away from us. At the core of current cosmological discussions is the significant challenge of understanding the formation of structures and the evolution of galaxies amidst the backdrop of the accelerated expansion in the late-time universe [165]. The Friedmann model, rooted in the cosmological principle, has effectively described the universe's evolution in line with empirical observations [166, 167, 168]. However, the mystery of dark energy and the force driving cosmic acceleration remains a persistent challenge in contemporary physical cosmology [169, 170]. Various attempts to explain cosmic acceleration rely on concepts such as the cosmological constant or scenarios dominated by dark energy. However, the perplexities surrounding the cosmological constant pose significant puzzles. [171, 172, 173]. Adding to these difficulties is the potential violation of the cosmological principle when homogeneity or isotropy falters in galaxy structure formation [174, 175].

As for three-dimensional redshift, surveys delve deeper into the cosmos, revealing structures lacking a transition to homogeneity [176, 177]. Now, questions arise regarding the steadfastness of the cosmological principle [178]. The galaxy distribution in recent observations (light) and the simulation of dark matter distribution (matter) display significant inhomogeneity on the largest statistical scale available [179]. The matter distribution exhibits even greater inhomogeneity, challenging the search for the cosmological principle in the current observed light or matter distribution in the universe [180]. Recent studies on the angular scale of cosmic homogeneity using the Sloan Digital Sky Survey's Sixteenth Data Release (SDSS-IV DR16) of a luminous red galaxy sample based on a model-independent approach found a homogeneity of 60–80 h^{-1} Mpc [181]. This finding was recently challenged through a homogeneity test for the matter distribution based on the Baryon Oscillation Spectroscopic Survey Data Release 12 CMASS galaxy sample [182]. It was found that the observed distribution of matter is statistically unlikely to be a random arrangement up to a radius of 300 h^{-1} Mpc, which is approximately the largest statistically available scale.

The identification of large quasar groups (LQGs) further catalyzes the debate, suggesting an inherent inhomogeneity incompatible with prevailing cosmological paradigms [183, 184]. Such revelations underscore the need for a profound cosmological reassessment [[185]. Correct testing on the prediction of the standard model on the spatial distributions of luminous astronomical sources needs to be based on cosmological simulations of a high resolution involving a large sample of isolated galaxies using robust data-driven detectors to avoid misinterpretations of the analyzed sources [186]. While two-dimensional projections appear consonant with isotropy and homogeneity, three-dimensional catalogues unveil a complex picture of inhomogeneous galactic distributions [187]. These divergent findings regarding the transition to homogeneity confound attempts at a unified perspective [188, 189]. The contrasting nature of these observations challenges the conventional assumption of cosmic homogeneity and isotropy [190]. The implications have a potential impact on understanding cosmic acceleration and the need for an additional dark energy component [191, 192].

Researchers find it necessary to explore alternative models of dark energy or its modified forms to account for the cosmic acceleration of the universe, considering the observational anomalies of the standard model and its lack of physical motivation [193, 194, 195, 196]. The proposed model includes scenarios where the scalar field replaces the cosmological constant to represent dark energy and modified gravity theories [197, 198]. Recent observations, such as the unexplained Hubble parameter tensions, large-scale anisotropies, and massive disk galaxies at higher redshifts, pose challenges to the Friedmann model and the concordance model of cosmology in general. For example, the Hubble parameter determined from the cosmic microwave background (CMB) radiation differs from that determined using Type Ia supernovae and the redshift of their host galaxies [199, 200]. While one possible explanation is the incompleteness of the concordance model, alternative theories propose that the standard redshift model, as a distance–scale factor relation, might be incomplete [201, 202]. Addressing these observations supports modifications to some foundations of cosmology based on the cosmological principle [203]. Modifying the standard redshift relation may offer a plausible explanation for investigating recent Hubble tensions [204].

Some other models propose cosmic acceleration as an emergent phenomenon [205]. The fundamental effect of cosmic evolution on photon propagation is cosmological redshift. In the standard model, cosmological redshift is a theoretical function of the scale factor derived from the Friedmann metric. However, researchers are now reconstructing this scale factor–redshift relation from observations rather than relying on its theoretical form [206, 207]. One drawback of remapping cosmological models is the unknown function of the observed redshift, increasing the degree of freedom of the equation. This issue has been addressed by introducing function parameterization through Taylor expansion before adopting a parametric approach. Related work includes a cosmological model proposed to explain the accelerated expansion of the universe by modifying the standard redshift relation [208, 209]. It has been demonstrated that combining Friedmann equations with a modification of redshift remapping may lead to a self-consistent framework under the assumption of the inadequacy of the Friedmann model [210, 211]. The parametric,non-parametric, [212] and modified standard redshift models, are expected to address the cosmological constant problem [213, 214].

However, all these ambitious objectives hinge upon an indispensable prerequisite—an abundance of accurate and expansive cosmological data. Despite the growing body of observational data, persistent limitations require a careful interpretation of the current cosmological models' completeness and accuracy [215, 216, 217]. The upcoming Vera

Rubin Observatory holds the potential for a transformative ten-year exploration, armed with a 3.6 Gigapixel camera, [218] ready to survey the entire visible night sky and delve into cosmic intricacies [219]. Again,the parametric model proposed by Bassett et al [220] in 2015 introduces modifications to the traditional redshift paradigm, seeking to refine our understanding of cosmic dynamics. This model involves the introduction of parameters that capture modifications in the redshift space, allowing for a more nuanced interpretation of observational data. The model addresses subtle aspects of cosmic phenomena by incorporating specific parameters, providing a more detailed and accurate representation of redshift-related observations. On the other hand, the non-parametric model, as formulated by Wojtak and Prada in 2017, takes a distinct approach by avoiding predefined parameters, allowing for greater flexibility in modeling cosmic phenomena [220].Unlike parametric models, the non-parametric model refrains from imposing fixed parameters, enabling a more adaptive and data-driven analysis of redshift-related phenomena. This model is precious in scenarios where the underlying dynamics are complex and not easily encapsulated by predefined parameters. It provides a more versatile tool for interpreting observational data.

There are a wide variety of evolved stellar systems in the nearby universe (Norris et al. 2014), [221] from globular clusters (Brodie & Strader 2006; Kruijssen 2014; Renzini et al. 2015) [222, 223, 224] to compact elliptical galaxies (e.g., Faber 1973), ultrafaint dwarfs (e.g., Simon & Geha 2007), and ultra-diffuse spheroids (e.g., van Dokkum et al. 2017), each of which presumably has its own characteristic formation pathway [225, 226]. The high stellar densities in many of these systems in combination with their old ages (e.g., Forbes & Bridges 2010) [227] suggest that the majority of their star formation occurred at $z \gtrsim 1.5$ when the gas densities in the universe were in general much higher. One potentially promising way forward for investigating the formation of these local systems is by obtaining a sensitive, high-resolution view of the distant universe. Fortunately, such observations can be obtained by combining the power of long exposures with the Hubble Space Telescope with the magnifying effect of gravitational lensing, as recently implemented in the ambitious Hubble Frontier Fields (HFF) program (Coe et al. 2015; Lotz et al. 2017)[228, 229]. Such sensitive observations allow us to probe to very low luminosities, as is likely necessary to detect many of the progenitors of local systems. The high lensing magnifications from massive galaxy clusters stretch many galaxies by substantial factors, allowing them to be studied at very high spatial resolution. As we discussed in Bouwens et al. (2021b) [230], this stretching can reliably be estimated up to linear magnifications of $\sim 30\times$ (or total magnification factors of $\sim 50\times$; see also Bouwens et al. 2017a, c where similar though smaller limits were presented with the then-current models, and Meneghetti et al. 2017) [231, 232, 233]. Given the small inferred sizes of the fainter lensed sources identified by Kawamata et al. (2018)and Bouwens et al. (2021b), it is interesting to place these sources in the context of various stellar systems that they may evolve into today, as well as other small star-forming systems like star clusters or cluster complexes [234, 235]. An initial look at such comparisons was already executed in an earlier unpublished study by our group (Bouwens et al. 2017b) and also by Kikuchihara et al. (2020) [236, 237]. An important early inference from these studies was that lensed $z = 6$–8 galaxies have sizes and masses that appear to lie in the range of $\sim$50–500 pc and 10^7 to $10^8\ M_\odot$, lying somewhere between ultracompact dwarfs/globular clusters and compact elliptical galaxies in size/mass space.

There has been enormous progress over the past decade in discovering galaxies which existed early in the history of the Universe (within a billion years of the Big Bang, at $z > 6$), thanks in large part to images from the Hubble Space Telescope, and confirming spectroscopy from large telescopes on the ground. The next few years will see the “high redshift frontier” pushed even further with the James Webb Space Telescope (JWST) and ground-based Extremely Large Telescopes (ELTs) [238].The Nancy Grace Roman Space Telescope (shortened as the Roman Space Telescope, Roman, or RST) is a NASA infrared space telescope in development and scheduled to launch to a Sun–Earth L_2 orbit by May 2027 [239]. The limited field of view of these facilities (especially JWST), and sensitivity only out to the near-infrared (near-IR, $\lambda < 2\mu m$) for the Roman Space Telescope (formerly WFIRST) and EUCLID wide-field imaging space missions, mean that a crucial piece of the jigsaw remains missing: a wide-field imaging survey, working at near and mid-IR wavelengths (necessarily from space) is needed to find the very rare most massive and luminous galaxies at the highest redshifts, the progenitors of which are likely to be the first galactic structures to form [240, 241]. NIR spectroscopy at $\lambda > 2\mu m$ (corresponding to the rest-frame optical frame) is also mandatory to get complete information (metallicity, stellar mass) for galaxies at $z > 10$ [242].

The landscape of astrophysics in the timeframe from 2035-2050 is expected to be very rich: the JWST mission will have been completed, presumably finding a wealth of faint galaxies at high redshift and addressing the role of these early galaxies in the reionization of the inter-galactic medium. Millimeter/submillimeter Array (ALMA), currently the most powerful radio telescope on Earth. The Square Kilometer Array (SKA) isan intergovernmental international radio telescope project being built in Australia (low-frequency) and South Africa (mid-frequency). ALMA will be a very mature facility by then and SKA will have explored the molecular emission and dust re-emission from some of these objects [243].The re-ionization of the Universe was achieved by low luminosity sources [244, 245, 246]. These low luminosity sources would only be visible if they are in groups or proto clusters. This is likely so for the first galaxies, which were of very low luminosity. Thus, detecting proto clusters from z~6 to z~15 would unveil the history of the Universe's re-ionization [247].Rare and bright sources at high redshift (as well as transients such as distant supernovae) will be explored by the Rubin Observatory (previously LSST) on the ground, and EUCLID and the Roman Space Telescope in space, at wavelengths below 2 microns [248]. In the X-ray, after a hiatus of many decades new facilities such as Athena will see AGN out to unprecedented distances. But there is a key gap in the parameter space that remains unexploited - a wide-field IR survey mission with spectroscopy and imaging working beyond 2 microns that need to address in future [249].

The physical nature of the cosmological constant Λ that was introduced by Albert Einstein a century ago has remained an enigma. It was unexpectedly found necessary to reintroduce Λ in 1998 as a fitting parameter to allow for modeling of redshift z versus distance r in terms of the FLRW (Friedmann–Lemaître–Robertson–Walker) framework for observations of supernovae type Ia as standard candles [248, 249]. If the Λ term is placed on the right-hand side of the Einstein field equation and considered as a physical field that is a component $\rho\Lambda$ (commonly referred to as "dark energy") of the energy-momentum tensor, then the observed sign and magnitude of this field represent a repulsive gravity force that permeates all of space without any significant spatial structuring, driving an accelerated cosmic expansion [250, 251]. Furthermore, as the magnitude of $\rho\Lambda$ is found to be of the same order as the matter density ρM, although ρM varies with redshift as $(1+z)^3$ while $\rho\Lambda$ is independent of z, the present epoch seems to be singled out as special. Such a "cosmic coincidence" violates the Copernican principle, which states that we are not privileged observers. While the supernovae observations that were reported in 1998 represented the remarkable discovery of an unexpected property of the redshift–distance relation $z\ (r)$, the interpretation of the redshift data in terms of an accelerated cosmic expansion as driven by some "dark energy" depends on a theoretical model for the relation between the observable $z\ (r)$ function and the $a\ (t)$ function that describes the dynamics and evolution of the universe in terms of scale factor a versus time t. As the time dependence of the scale factor is not directly observable, it is inferred from a static historical record of a sequence of past discrete events like in archaeology [252, 253]. In the case of cosmology, the static timeline of past historical events is accessed by looking out in space. Due to the finite speed of light, distance from the observer and look-back time are equivalent coordinates. When cosmic distances are measured with the help of the astrophysical "distance ladder" and that makes use of "standard candles" and in particular supernovae, the corresponding look-back times are also obtained [254].If one makes use of arguments from quantum physics that the universe should be in the mode with the lowest allowed energy state, then a unique value for the constant Λ-type boundary term is obtained. It is found to agree with the observationally determined value for the cosmological constant, without the use of any free parameters in the theory [255].

The cosmological constant is not treated as a new physical field like dark energy or an arbitrary fitting parameter. Instead, it is interpreted as a covariant integration constant arising from a boundary condition on the spacetime metric, tied specifically to the conformal age of the universe [256]. However, it is important to note that standard cosmology still largely relies on treating the cosmological constant as an empirical parameter or a vacuum energy density within the ΛCDM model, where the "smallness" of its value remains a major theoretical challenge. Again, Recent developments in string theory have revealed a remarkable and radical new picture about gravity. In particular, the AdS/CFT duality illustrates a typical example of emergent gravity and developing space because gravity in higher dimensions is defined by a gravity less field theory in lower dimensions [257, 258]. Now we have many examples from string theory in which spacetime is not funda-mental but only emerges as a large distance, classical approximation [259]. Therefore, the rule of the game in quantum gravity is that space and time are an emergent concept. Since the emergent space-time is a new fundamental paradigm for quantum gravity and it is exclusive and irreconcilable with the conventional spacetime picture in general relativity, it is necessary to reexamine all the bases to introduce the multiverse hypothesis from the standpoint of emergent spacetime [260]. The emergent spacetime will certainly open a new prospect that may cripple all the rationales to introduce the multiverse picture [261, 262].

17.Conclusion

Cosmologists can still be able to do their jobs a trillion or 10^{12} years from now and even after the universe's expansion has pushed nearly all galaxies out of sight. That's the conclusion of an astronomer in the US and other nations like China, who argues that the giant black hole at the center of our galaxy will eject stars into the void beyond, providing objects that future cosmologists can use to trace the universe's expansion. Again, since the late 1990s, when astronomers used supernova explosions in distant galaxies to discover that the universe's expansion is accelerating, the far future of cosmology has seemed bleak. Within roughly 100 billion years, nearly all other galaxies will be so distant that their light won't reach us. So, future observers won't know that the universe is expanding. Furthermore, the cosmic microwave background and that is the Big Bang's afterglow and a key clue to the universe's origin and will be attenuated below the threshold at which it can be detected. In 21st century, the most prominent current uncertainty is the "Hubble Tension," and that a significant discrepancy between two different methods of measuring the universe's current expansion rate. The enduring 5-sigma discrepancy suggests "something has been found" that is not yet understood, potentially requiring new physics beyond the standard model as we know so far. The exact nature of dark energy remains uncertain. Whether it is a constant energy density like cosmological constant or something that evolves over time is an open question that future missions like the Roman Space Telescope aim to answer.

The boundedness of the speed of light ensures humans can only ever observe a finite portion of the cosmos in the visible universe, placing a fundamental limit on our complete knowledge of the entire universe, including whether it is infinite or finite, or how it will ultimately end.The universe is often viewed by some scientists as an intricate tapestry, with every individual element like stars, galaxies, etc. representing a thread. Understanding the cosmos is like appreciating the immense and complex pattern of the whole, recognizing how all the threads interweave to form a masterpiece. Again, the universe is often viewed as an intricate tapestry, with every individual element like stars, galaxies, etc. representing a thread. However, understanding the cosmos is like appreciating the immense and complex pattern of the whole, recognizing how all the threads interweave to form a masterpiece. Metaphors for cosmic understanding often compare the vast and abstract nature of the universe to more familiar, tangible human experiences or objects. These comparisons help to conceptualize complex scientific and philosophical ideas. So, this discussion accentuates a profound truth that the cosmos is far more intricate and mysterious than once believed. By addressing open questions about dark matter, magnetic fields, time, neutrinos, inflation, and even the possibility of a simulated reality, this collection illustrates how modern astrophysics and cosmology are increasingly interwoven with cutting-edge physics, speculative ideas, and technological innovation. Ultimately, the evaluation suggests that the astonishing nature of the universe is inseparably linked to its uncertainties. New discovery provides answers to old questions while simultaneously flagging the way for deeper, more challenging mysteries, embodying the dynamic nature of scientific exploration. Anynew findings not only challenge existing paradigms but also offer foretastes into deeper layers of physical law, potentially reshaping our understanding of existence itself. However, with contemporary development of cosmology and advanced technologies along with ideas may unlock utterly new dimensions both literally and metaphorically of cosmic understanding and which may clear many confusions of universe and we will the mystery of universe better way in future.

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