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Omniom Vacuum Framework: Unifying Vacuum States from Pre-Big Bang to Dark Energy

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Abstract

The concept of vacuum has undergone profound evolution in physics and cosmology, transitioning from ancient philosophical interpretations to contemporary scientific understandings. This article delves into the nature and essence of the vacuum, focusing on three key stages: the pre-Big Bang vacuum, referred to as "Omniom", the Big Bang vacuum (quantum vacuum) with its extremely high density, and the dark energy vacuum, which represents an expansive phase of the Omniom vacuum, with slightly less density. For the first time, we delve into the fundamental composition of the void itself, introducing the concept of the Omnicle—a particle without spin, resembling a massless, timeless entity akin to a soap bubble. The Omnicle, as the building block of the pre-Big Bang vacuum, embodies infinite potential and provides a framework for understanding the origin of the universe's structure and energy. The article distinguishes between these three types of vacuums. In the Omniom vacuum, there is no movement or energy—it is a state of perfect stillness and potential. The quantum vacuum, by contrast, is filled with fluctuations of electromagnetic waves, radiation, and virtual particles. Finally, the dark energy vacuum resembles the Omniom vacuum in its structure, but unlike the static nature of the Omniom, the dark energy vacuum is dynamic, fuelling the accelerated expansion of the universe. This study offers a fresh perspective on how the vacuum is not merely an empty void but a complex entity that plays a crucial role in the fabric of space-time. By distinguishing between the Omniom vacuum, the quantum vacuum, and the dark energy vacuum, the article explores how each contributes to the universe's structure, expansion, and evolution. Understanding these distinctions provides new insights into the unification of forces and the ultimate fate of the universe, bridging early metaphysical interpretations with contemporary scientific models.

Keywords

Vacuum, Space-Time, Superfluid, Granular Space, Foam Structure, Omniom

Vacuum, Omnicle

1. Introduction

Traditionally, the vacuum has been thought of as a completely empty space, a void, or "nothingness". In classical physics, it was simply defined as a region devoid of matter. However, our modern understanding of the vacuum has evolved significantly, revealing it to be far more complex than previously thought. It is well accepted today that the vacuum can transmit light and all other wavelengths of the electromagnetic spectrum, from the very short gamma rays to radio waves and beyond. This demonstrates that the vacuum can contain energy in the form of electromagnetic radiation, challenging the notion of "nothingness."

In the past, different terms such as ether (aether), primordial field, Higgs field, zero-point energy (ZPE), quantum field, and space-time were used to describe the vacuum or concepts associated with it. The historical Aether theory, for example, proposed that the vacuum was filled with a substance through which light waves travel. This idea was eventually discarded after experiments, such as the Michelson-Morley experiment in 1887, failed to detect the presence of an "aether wind" [1].

This led to the rise of Einstein's Special Relativity in 1905, which showed that light could propagate through space without the need for a material medium [2].

The vacuum can be described in two key ways today: the real vacuum and the quantum vacuum.

The real vacuum is considered the absolute lowest state of energy, where no physical particles exist, and in this context, its energy density is regarded as zero or negligible. This aligns with the classical view of the vacuum as an empty space.

In contrast, the quantum vacuum presents a far more intricate picture. According to quantum field theory, the quantum vacuum is not empty at all. It is filled with fluctuating energy and virtual particles that constantly pop in and out of existence. These quantum fluctuations are allowed by the Heisenberg uncertainty principle, which permits temporary violations of energy conservation on small scales. As a result, the quantum vacuum is characterized by a non-zero energy density, which can have observable effects, such as the Casimir effect and the cosmological constant, which is linked to dark energy in the universe [3] [4].

The distinction between the real vacuum and the quantum vacuum has significant implications in fields like cosmology. For instance, the energy density of the dark energy is thought to be responsible for the accelerated expansion of the universe, contributing to the cosmological constant [5].

This expansion, driven by dark energy, contradicts the classical notion of a static universe and suggests that the vacuum plays a central role in shaping the universe's fate.

In particle physics, the behavior of the vacuum, especially the quantum vacuum, becomes even more critical in high-energy environments, such as those created in particle accelerators. Quantum effects in the vacuum also play a role near black holes, giving rise to phenomena like Hawking radiation, where particles are emitted due to quantum fluctuations near the event horizon [6].

A significant challenge in modern physics, often referred to as the cosmological constant problem, arises from the discrepancies between the predicted and observed values of the vacuum's energy density. According to quantum field theory, the energy density of the quantum vacuum should be extremely high, about 10^{96} kg/m^3 yet observations of the universe's expansion suggest that the actual energy density, associated with the cosmological constant, is much smaller, about 9.5×10^{-27}, by a factor of approximately 120 orders of magnitude [4].

This vast difference is known as the "cosmological catastrophe," which remains one of the greatest unsolved problems in theoretical physics and cosmology.

One approach to resolving this discrepancy is to distinguish between different types of vacuums, including the Omniom vacuum, which may have existed prior to the Big Bang. Unlike the quantum vacuum, which is filled with virtual particles and energy fluctuations, the Omniom vacuum is proposed to be a state of "real vacuum" with no energy. This distinction could help clarify the discrepancies between theory and observation and provide a deeper understanding of the vacuum's role in the universe's evolution.

The purpose of this work is to present a cohesive framework for understanding the nature of the vacuum at different stages of the universe's evolution. Specifically, it introduces three distinct types of vacuums:

1) Omniom, the pre-Big Bang vacuum characterized by a defined density but lacking movement or energy.

2) the quantum vacuum, which emerged during the Big Bang with quantum fluctuations that fuelled the rapid expansion and creation of matter; and

3) dark energy, a post-Big Bang vacuum with a diluted density that drives the universe's accelerated expansion. By clarifying these different forms of vacuum and their roles in cosmic evolution, this article seeks to provide a more unified perspective on how the concept of the vacuum has shaped our understanding of the universe.

This framework not only bridges the gaps in our understanding of the vacuum across different stages of the universe's evolution but also addresses key questions in cosmology and particle physics. By differentiating between the Omniom vacuum, the quantum vacuum, and dark energy, this work aims to offer a unified explanation of their roles in shaping the universe. It also explores their implications for solving long-standing challenges, such as the cosmological constant problem, and their potential to revolutionize our understanding of the interplay between energy, matter, and the vacuum itself. This study is a step toward reconciling theoretical predictions with observational data, fostering new insights into the fundamental nature of the cosmos.

2. Omniom Definition

The only concept that could logically exist before the Big Bang is a medium that has no beginning, no end, no energy, no space or time, and no movement, except for small fluctuations. This medium, distinct from any other concept related to the vacuum (such as vacuum energy, zero-point energy, or dark energy), represents the pre-Big Bang state of the universe.

To avoid confusion when discussing specific theories, we propose the term Omniom to describe this primordial medium. Omniom consists of an immense quantity of inert, non-rotating "vesicles" or entities with extremely long wavelengths we call these vesicles Omnicles. These Omnicles follow infinite statistics, meaning that all possible arrangements of particle permutations can occur. For every boson or fermion in our observable universe today, there could be approximately 10^{31} of these Omnicles.

The name Omniom combines the prefix "omni-" meaning "all" or "everywhere," with "Om," a sacred sound representing divinity in Eastern philosophies. "Om" symbolizes the seed of creation, encompassing the past, present, and future—everything that was, is, and will be.

In this context, Omniom extends this notion of divinity, emphasizing its all-encompassing nature. It suggests a medium that is not only present everywhere but is also the very fabric of existence. It has no boundaries, exists universally, and holds the cosmos together through its fundamental properties.

Attributes of Omniom:

- **Primordial and Omnipresent:** Omniom existed before space-time and is present everywhere, without any boundaries.
- **Has a Density:** Omniom has a measurable density, though it lacks kinetic energy, movement, or the typical properties of space and time.
- **Standstill with Minimal Fluctuations:** Omniom is primarily motionless, with basic, minimal fluctuations that provide an absolute system of rest, against which all other motion can be measured.
- **Superfluidity:** Omniom behaves like a superfluid, meaning it flows without friction or energy loss. This superfluidity allows it to transmit waves, such as electromagnetic or gravitational waves, without resistance [7]-[11].
- **Mobility:** Although motionless at large scales, Omniom can create vortices and flow in localized areas due to small fluctuations.
- **Deformability:** Omniom can deform to form waves (electromagnetic and gravitational) while maintaining its superfluid properties.
- **Mechanical Properties:** Omniom has the mechanical capacity to transmit forces such as gravity and inertia, suggesting it plays a role in the transmission of fundamental forces.
- **Expansibility:** At high temperatures, Omniom behaves like an ideal gas, leading to universal expansion. This could have been the driving mechanism behind cosmic inflation after the Big Bang.
- **Contractility:** At low temperatures and pressures, Omniom can contract, as seen in black holes or during a potential Big Crunch scenario.
- **Compressibility:** Omniom can be compressed into a smaller volume under

high pressure, leading to the formation of highly dense matter's particles.

Transparency to Light: Omniom is transparent to electromagnetic waves, allowing them to pass through it with minimal impedance. It provides small electric permittivity and magnetic permeability constants, along with gravitational constant G [12]-[14].

Non-Immunity: Omniom interacts with material objects, influencing phenomena such as inertia, the speed of light, and redshift. When Omniom rotates, it can also create lensing effects, affecting the path of light.

3. The Omniom as Pre-Big-Bang Vacuum

The concept of Omniom refers to a hypothetical medium that existed before the Big Bang, which serves as a foundational framework for understanding the origins of the universe. Unlike the familiar vacuums of quantum physics or relativity, Omniom is characterized by its static nature. It has a defined density but lacks any movement, energy, or matter, standing in contrast to the dynamic vacuums of post-Big Bang cosmology.

The average density of the universe is approximately 9.5 - 9.9 × 10^{-27} kg/m^3, a value that aligns closely with the critical density required for a flat universe.

This density encompasses all forms of matter and energy, including ordinary (baryonic) matter, dark matter, and dark energy. Specifically, ordinary matter constitutes about 4.6% of this total density, equating to roughly 1 proton per 4 cubic meters. Dark matter accounts for approximately 24%, and dark energy makes up about 71.4%. These proportions are derived from observations and measurements, such as those conducted by the Wilkinson Microwave Anisotropy Probe (WMAP) [15].

This density should be the same density of the Omniom before the Big Bang, because the density is constant. Omniom is envisioned as a primordial medium, omnipresent, and lacking space-time as we understand it. It acts as the "void" that predated the creation of the universe, and the transition from Omniom to the quantum vacuum during the Big Bang is what initiated the formation of matter and energy. Omniom remains entirely inert, serving as the cosmic "stage" upon which the universe was set to form, without itself contributing to the mechanics of the universe's creation.

In contrast to modern scientific concepts that associate vacuums with fluctuating energies and virtual particles, Omniom's primary distinction lies in its absence of movement except a minimal oscillation. Omniom does not participate in the quantum fluctuations that define the quantum vacuum, nor does it contain electromagnetic waves, radiation, or even gravity. In Omniom, time does not exist, and space is undefined. As a result, there is no energy within the Omniom vacuum, leading to a complete absence of forces or interactions that could disturb its static nature.

Omniom serves as the ultimate container and cohesive force that gave rise to the universe. It is, in essence, the seed of all existence, containing within it the potential for every force and law that governs the cosmos. Unlike mathematical or physical constructs like the perfect sphere, Omniom is not bound by any theoretical limit. It is both the beginning and the culmination of all that was, is, and will be.

Omniom's characteristics present a theoretical framework that allows for the existence of a pre-Big Bang medium that is fundamentally different from what is currently observable in the universe. It avoids the issues presented by quantum vacuums or zero-point energy by existing without the instability caused by fluctuating particles. Omniom may be seen as the primordial medium that facilitated the conditions necessary for the Big Bang but did not itself directly initiate the event.

The introduction of Omniom into cosmological theory attempts to address one of the most profound and debated questions in theoretical physics: what existed before the Big Bang? At present, the concept of "before" the Big Bang is not clearly defined, with many scientists acknowledging that our current models do not provide adequate tools for understanding pre-Big Bang conditions. The Big Bang theory suggests that space, time, and the laws of physics as we know them began at the moment of the Big Bang, leaving the state before this event largely unexplained.

By introducing the concept of Omniom, we create a framework in which the universe's pre-Big Bang state can be more thoroughly explored. Omniom provides a "place" for the universe to emerge from, free from the constraints of movement, energy, and time. It offers a stable, static medium from which the dynamics of the Big Bang could have emerged.

Moreover, Omniom is not subject to the cosmological constant problem or the "cosmological catastrophe," as its density remains constant without contributing to the accelerated expansion of the universe post-Big Bang. Omniom, instead, served as the precursor to the universe, from which the quantum vacuum and dark energy could emerge as the universe expanded and matter began to form.

Omniom is more than just a philosophical or mystical notion. It embodies the principles of unity and interconnectedness. If we consider Omniom as the medium from which the Big Bang arose, it could potentially offer insights into the forces that govern the early universe. From the smallest quantum fluctuations to the largest galactic formations, Omniom serves as the underlying fabric that holds the universe together.

4. Omniom Vacuum Density

The density of the Omniom can be calculated using a variety of methods, all of which yield consistent results that align with known fundamental constants. The vacuum, or "Omniom," is theorized as a primordial medium that existed before the Big Bang, influencing the universe's expansion and current structure. This introduction will briefly explore the different approaches to calculate the density of the dark energy, each derived from fundamental physical and cosmological constants. These methods will be elaborated upon in a future article, where they will be applied to address the cosmological catastrophe, providing a detailed exploration of the connection between the vacuum density and the universe's expansion.

Using the Hubble constant H_0 and the observed expansion of the universe, we calculate the universe's mass and volume. From this, we derive the cosmological density of the universe, which closely matches but little bit smaller than the density of the Omniom vacuum.

The universe is expanding, as shown by Hubble's Law, which correlates the velocity of galaxies with their distance. Based on recent estimates, the Hubble constant [16] $H_0 \approx 71.9$ km/s/Mpc allows us to calculate the universe's mass M_U and volume V_U:

$$M_u = \frac{c^3}{2H_0 G} \approx 8.66 \times 10^{52}\ \text{kg},$$

where c is the speed of light constant, and G is the gravitational constant and H_0 is Hubble constant.

$$V_u = \frac{4}{3}\pi R_u^3 = \frac{4}{3}\pi\left(\frac{c}{H_0}\right)^3 \approx 8.92 \times 10^{78}\ \text{m}^3$$

where R_u is the radius of the universe, the radius of the observable universe is:

$$R_U = c \cdot t_U$$

where c is the speed of light ($\approx 3 \times 10^8$ m/s) and t_U is the age of the universe ($\approx$13.8 billion years).

This gives a cosmological density of:

$$\rho_u = M_U / V_U \approx 9.71 \times 10^{-27}\ \text{kg/m}^3$$

This is the density of the Omniom vacuum in expansion and becomes more diluted over time, some of its components are hypothesized to condense, forming dark matter and standard matter particles with high density. Thus, the sum of all densities (dark energy, dark matter, and baryonic matter) maintains the universal density constant, ensuring a balance in the cosmological evolution of the universe.

5. The Speed of Light as an Expression of Omniom Vacuum Density

The speed of light (c), a universal constant, has long been recognized as a fundamental feature of our physical universe. While it is most commonly associated with the propagation of light and electromagnetic waves, its significance extends much deeper into the fabric of space-time. The speed of light directly relates to the properties of the vacuum, specifically its density and elasticity. This article explores how c embodies the density of the vacuum, providing a pathway to understanding the fundamental structure of the universe.

The speed of light is intimately connected to the vacuum's elasticity (E) and density (ρ) through the equation:

$$c = (E/\rho)^{1/2}$$

Here, E represents the vacuum's elasticity, a measure of its resistance to deformation, and ρ denotes the vacuum's density. This relationship is analogous to the speed of sound in a medium, where the propagation velocity depends on the material's density and its elastic properties.

The value of E, the vacuum's elasticity, is calculated to be approximately:

$$E = 8.87337441 \times 10^{-10}\ \mathrm{kg} \cdot \mathrm{m/s^2} \cdot \mathrm{m^2}$$

This value, derived from electric permittivity and magnetic permeability, highlights that the vacuum is not "empty space" but a structured medium with physical properties.

By rearranging the equation $c = (E/\rho)^{1/2}$, we can calculate the vacuum's density as:

$$\rho = E/c^2$$

Substituting the known values:

- $E = 8.87337441 \times 10^{-10}\ \mathrm{kg} \cdot \mathrm{m/s^2} \cdot \mathrm{m^2}$,
- $c = 3 \times 10^8\ \mathrm{m/s}$.

The density of the vacuum becomes:

$$\rho \approx 9.86 \times 10^{-27}\ \mathrm{kg/m^3}$$

This result aligns with cosmological observations, indicating the density of the vacuum itself.

The speed of light is far more than a numerical constant in physics; it encapsulates the essence of the vacuum's properties. By linking c to the vacuum's density and elasticity, we gain insights into the structured nature of space-time and its role in shaping the universe. The derivation of vacuum density from c underscores the fundamental interdependence of physical constants, offering a pathway to unify our understanding of electromagnetism, quantum field theory, and cosmology. Understanding c as an expression of vacuum density provides a compelling framework for exploring the fabric of the cosmos, bridging the gap between theoretical and observational physics.

6. Electric Permittivity as an Expression of Omniom Vacuum Density

Electric permittivity (ϵ_0) measures the vacuum's ability to "permit" electric field lines. It determines how electric charges interact and how electromagnetic waves propagate. Alongside magnetic permeability (μ_0), ϵ_0 plays a central role in defining the speed of light (c) in a vacuum through the relation:

$$c = 1/\left(\epsilon_0 \mu_0\right)^{1/2}$$

This equation highlights that c, a universal constant, depends directly on the vacuum's capacity to support electric and magnetic fields. It implies that ϵ_0 and μ_0 are intrinsic properties of the vacuum, shaping the behavior of light and electromagnetic waves.

The vacuum is not merely an electromagnetic medium but also a mechanical system with elasticity and density [12].

The elasticity of the vacuum, measured by its bulk modulus (K), describes its resistance to compression. In classical mechanics, the speed of sound in a material depends on its density (ρ) and elasticity (K):

$$v = \left(K/\rho\right)^{1/2}$$

In the context of the vacuum, the speed of light (c) can be seen as analogous to the speed of sound. This analogy allows us to relate the vacuum's elasticity to its density:

$$K = \rho c^2$$

Substituting the expression for c in terms of ϵ_0 and μ_0, the equation becomes:

$$K = \rho/\epsilon_0\mu_0$$

Rearranging this equation gives:

$$\rho = \epsilon_0\mu_0 K$$

This formula reveals that the density of the vacuum is directly proportional to its electric permittivity (ϵ_0), magnetic permeability (μ_0), and bulk modulus (K). Each of these constants captures a different aspect of the vacuum's physical properties.

Using the known values:
- $\epsilon_0 = 8.854 \times 10^{-12}\ \mathrm{F/m}$,
- $\mu_0 = 4\pi \times 10^{-7}\ \mathrm{N/A^2}$,
- $K = 8.55 \times 10^{-10}\ \mathrm{Pa}$.

The vacuum's density can be calculated as:

$$\rho = \epsilon_0\mu_0 K$$

Substituting these values:

$$\rho \approx 9.51 \times 10^{-27}\ \mathrm{kg/m^3}$$

This density aligns with cosmological estimates, reinforcing the validity of this approach.

Therefore, Electric permittivity (ϵ_0) is far more than a parameter in Maxwell's equations; it encapsulates the vacuum's ability to support electromagnetic waves and serves as a measure of its density. Through its relationship with the speed of light, magnetic permeability, and bulk modulus, ϵ_0 provides a comprehensive framework for understanding the vacuum as a structured, dynamic medium. By linking mechanical and electromagnetic properties, the study of ϵ_0 offers a pathway to unifying diverse aspects of physics, shedding light on the fundamental nature of the universe.

7. Magnetic Permeability as an Expression of the Omniom Vacuum's Viscosity

Magnetic permeability (μ_0) is a fundamental property of the vacuum that governs its interaction with magnetic fields. While traditionally understood in the context of classical electromagnetism, μ_0 can also be interpreted as an expression of the viscosity of the Omniom vacuum [13].

This perspective arises from examining the interplay between magnetic fields, the motion of particles, and the vacuum's density and resistance to shear stress. By understanding magnetic permeability in this way, we gain deeper insights into the vacuum as a dynamic medium with measurable physical properties.

In classical electromagnetism, magnetic permeability measures the degree to which a material or vacuum can support the formation of a magnetic field. For a vacuum, this is denoted as:

$$\mu_0 = 1.206572 \times 10^{-6}\ \mathrm{N} \cdot \mathrm{s} / \mathrm{A}^2$$

This value reflects the vacuum's inherent resistance to the propagation of magnetic fields, analogous to how viscosity describes a fluid's resistance to deformation or motion.

The Omniom vacuum, conceptualized as a superfluid-like medium, exhibits properties such as density (ρ), elasticity, and viscosity. When particles like electrons move through this vacuum, their momentum is influenced by the vacuum's shear stress and density. The magnetic permeability (μ_0) encapsulates this interaction, representing the vacuum's ability to resist changes in momentum due to the presence of magnetic fields.

The relationship between momentum (P), the vacuum's density (ρ), and other constants is expressed as:

$$P = \rho c / \lambda$$

where:

- P is the momentum affected by Omniom vacuum,
- ρ is the density of the Omniom vacuum,
- c is the speed of light ($c \approx 3 \times 10^8$ m/s,
- λ is the Compton wavelength of the electron ($\lambda = 2.426310235 \times 10^{-12}$ m).

The calculated value for P is approximately:

$$P = 1.206572 \times 10^{-6}\ \mathrm{kg} / \mathrm{m}^2 \cdot \mathrm{s}$$

This value corresponds to the momentum of the magnetic field as it interacts with the vacuum, linking magnetic permeability to the vacuum's density and viscosity.

When electrons move through the vacuum, their motion generates magnetic fields. These fields, in turn, interact with the vacuum, creating a feedback loop that diminishes the electrons' momentum. This process is governed by the vacuum's magnetic permeability (μ_0), which determines the rate at which the magnetic field influences the electron's motion.

The rate of change of momentum (P) due to the magnetic field is expressed as:

$$\mu_0 = P / tI^2$$

where:

- t is time,

- I is the current generating the magnetic field.

This relationship shows that μ_0 is directly proportional to the vacuum's ability to resist changes in magnetic momentum, a characteristic analogous to viscosity in fluids.

By substituting the expression for P into the equation for density, we can calculate the vacuum's density as:

$$\rho = P\lambda/c$$

Substituting the known values:

- $P = 1.206572 \times 10^{-6}\ \text{kg}/\text{m}^2 \cdot \text{s}$
- $\lambda = 2.426310235 \times 10^{-12}\ \text{m}$
- $c = 3 \times 10^{8}\ \text{m}/\text{s}$

The density (ρ) is calculated to be approximately:

$$\rho \approx 9.76 \times 10^{-27}\ \text{kg}/\text{m}^3$$

This result aligns with the theoretical predictions for the Omniom vacuum's density, further reinforcing the connection between μ_0 and the vacuum's physical properties.

In conclusion, magnetic permeability (μ_0) serves as more than a parameter in electromagnetic theory, it represents the Omniom vacuum's resistance to shear stress and its interaction with magnetic fields. By interpreting μ_0 as an expression of viscosity, we bridge the gap between the vacuum's mechanical and electromagnetic properties. This perspective deepens our understanding of the vacuum as a structured, dynamic medium and offers a framework for unifying classical electromagnetism with the emerging physics of the Omniom vacuum.

8. The Gravitational Constant (G) as an Expression of the Omniom Vacuum Drag Force

The gravitational constant, G, is one of the most fundamental constants in physics, governing the strength of gravitational interactions between masses. Traditionally, G has been treated as a fixed quantity with little connection to the properties of the vacuum. However, the Omniom vacuum hypothesis provides a new perspective, interpreting G as an expression of the vacuum's resistance to the displacement of density, akin to a drag force [14].

The vacuum, as a structured medium, exhibits characteristics akin to a fluid, such as density (ρ), elasticity, and resistance to motion. In this framework, the gravitational constant can be expressed in terms of a drag force that acts on a mass moving through the vacuum. The pressure gradient generated by this drag can be described using the equation:

$$P = 1/2\,\rho c^2 C_D \quad [14]$$

where:

- P is the pressure gradient generated by drag = $6.67383255 \times 10^{-11}$ kg/m·s^2,
- C_D = between 0.1 and 0.2 ≈ 0.156 (drag coefficient),

- $c = 3 \times 10^8$ m/s.

In this model, the drag force per unit volume of the vacuum is directly proportional to the gravitational constant G. The relationship reflects the vacuum's resistance to the movement of mass, where G encapsulates the rate at which the vacuum density is displaced under gravitational interactions.

The constant G, with units of $m^3 \cdot kg^{-1} \cdot s^{-2}$, represents the proportionality factor in Newton's law of gravitation. By interpreting G through the lens of the Omniom vacuum, it can be seen as arising from the interplay of the vacuum's density, the speed of light, and the drag coefficient. Rearranging the drag pressure equation to solve for ρ, we get:

$$\rho = 2P/c^2 C_D$$

Substituting the known values:

- $P = 6.67383255 \times 10^{-11}\ \mathrm{kg/m \cdot s^2}$,
- $c = 3 \times 10^8\ \mathrm{m/s}$,
- $C_D = 0.156$.

The calculated density of the vacuum is:

$$\rho \approx 9.51 \times 10^{-27}\ \mathrm{kg/m^3}$$

This value matches cosmological estimates for the density of dark energy, suggesting that G inherently encapsulates the vacuum's resistance properties.

In the context of the Omniom vacuum, G can be reinterpreted as a measure of the vacuum's capacity to resist gravitational displacement. This resistance is analogous to the drag force experienced by an object moving through a fluid. The drag pressure of the vacuum, being constant, reflects a fundamental property of space-time, derived through the conservation of momentum using density and velocity.

The relationship between G and the vacuum's density (ρ) also implies that variations in vacuum density could influence the gravitational constant. Such variations might arise in extreme environments, such as near black holes or during the early universe, potentially offering new insights into the nature of gravity and space-time.

Understanding G as an expression of the Omniom vacuum unifies gravity with the vacuum's mechanical properties, bridging the gap between classical and quantum descriptions of gravity. It suggests that gravity is not an isolated phenomenon but an emergent property of a structured vacuum. By tying G to the vacuum's density and elasticity, this perspective opens the door to exploring how the vacuum shapes gravitational interactions on both cosmic and quantum scales.

9. Granular Structure of Dark Energy

Dark energy, a hypothetical energy form, is proposed to cause the observed acceleration of the universe's expansion. Unlike Omniom vacuum, dark energy is considered to be an intrinsic property of space itself [15].

In cosmology, the mystery of dark energy and dark matter is yet to be unveiled. While it's thought that these elements contribute to the supposed accelerated expansion of the Universe, their nature remains elusive.

The cosmological constant, interpreted as the energy density of vacuum energy emerging from quantum mechanics, is often linked to dark energy in empty space, contributing to the accelerating expansion of space against gravity's attractive effects [16].

This dark energy vacuum or cosmological constant exerts a negative pressure, $p = -\rho c^2$, which adds to the stress-energy tensor, a factor that, in accordance with the general theory of relativity, facilitates the accelerating expansion. The vacuum appears uniform and featureless at a macroscopic level, yet on an atomic scale, it may exhibit turbulence.

The universe's space, often likened to a "container" holding all objects and events, possesses properties such as size, shape, and dimensionality, which presumably came into existence after the Big Bang [17].

Dark matter, another hypothetical entity, is believed to constitute approximately 85% of the universe's matter. Differing from normal matter, it is invisible and only interacts via gravitational effects. Various theoretical models have attempted to explain dark matter's nature, some proposing it to be composed of unobservable virtual particles arising from quantum fluctuations, but no model has been definitively proven [18].

The vacuum's microscopic structure is still largely undiscovered. Quantum field theory proposes that even devoid of real particles, the vacuum is inhabited by pairs of created and annihilated virtual particles. These elusive particles may materialize temporarily and exert a measurable force [3].

In a pioneering quantum theory of gravity, John Wheeler suggested that spacetime could be a fluid of small, constantly changing regions where space and time are not stable but fluctuate in a foam-like manner. He argued that on the very smallest scales, the ability to define length, time, and energy would become subject to the uncertainty principle [19] [20].

He further speculated that these fluctuations could lead to significant deviations from the smooth spacetime observed at macroscopic scales, thereby endowing spacetime with a "foamy" character. The foam would exist on the so-called Planck scale, the regime where lengths are 10^{-35} meters, times are 10^{-44} seconds, and energies are 10^{19} GeV. These scales are characteristic of the initial moments of the Big Bang [21].

Considering our understanding of Quantum Field Theory, we could surmise that dark energy is quantized, which could then depict space as a superfluid sea of quantized dark energy. At the Planck length, the smoothness of space disintegrates, and space acquires a granular structure [22].

This "granular structure" could be the essence of superfluid quantum space, dark energy, and zero-point energy. At this length, the turbulence of zero-point energy influences matter [23].

According to quantum gravitation theory, spacetime is expected to have a "foamlike" structure on scales of the Planck length or less with high curvatures and complicated topology [24].

10. The Omnium Vacuum: A Foam-Like Structure Defining the Fabric of Space-Time

Modern physics has revolutionized our understanding of the cosmos, suggesting that the universe could have emerged from a quantum vacuum through natural processes such as quantum tunneling or fluctuations. The proposed Omnium vacuum hypothesizes a structured medium at scales smaller than the Planck size, providing a novel perspective on the fabric of space-time.

The Omnium vacuum is a groundbreaking concept in cosmology and physics, proposing that space-time is not a void but a fundamental medium filled with elementary units called Omnicles. These Omnicles are the theoretical building blocks of the vacuum, and their interactions are hypothesized to define the very fabric of the universe. Unlike traditional particles, Omnicles possess unique properties that differentiate them from known entities like photons or electrons.

Omnicles are characterized by the absence of spin, a quantum property that describes the intrinsic angular momentum of particles. For example, photons are spin-1 particles, while electrons are spin-1/2. In contrast, Omnicles are hypothesized to have zero spin, making them fundamentally non-rotating entities. This lack of spin is posited as critical to their role in forming the Omnium vacuum. Unlike conventional particles, Omnicles do not generate electromagnetic fields or interact through traditional forces such as electromagnetism or gravity. Instead, they are bound by fundamental forces intrinsic to the structure of space-time itself.

The Omnium vacuum is envisioned as a foam-like structure, where countless Omnicles arrange themselves into a pattern resembling soap bubbles. Each Omnicle acts as an individual "bubble" within this cosmic foam. This structural analogy aligns with principles of energy minimization and mechanical stability, central tenets in physics and material science [25].

Individual Omnicle bubbles are hypothesized to form spherical shapes, as spheres minimize surface area for a given volume. This property reduces surface tension within the vacuum structure, achieving a state of mechanical equilibrium. When many such bubbles come together, they form a complex foam where the interfaces between Omnicles minimize energy across the entire system (**Figure 1**).

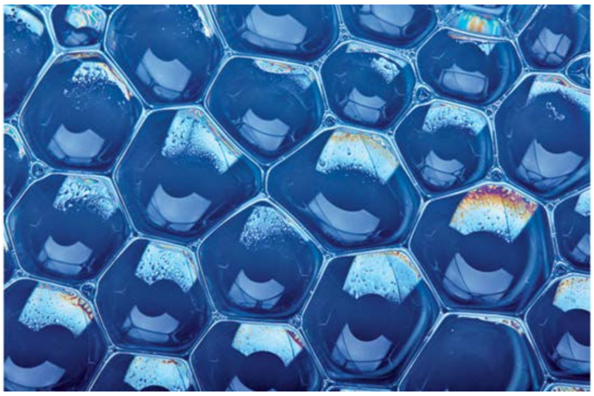

Figure 1. Formation of omnicle bubble foam structure minimizing surface tension.

Figure 1, a soap bubble foam arrangement reduces surface tension across the entire system, minimizing the energy required to maintain the structure. The interaction between Omnicles allows for the formation of junctions where multiple bubbles meet.

A notable feature of the Omnium vacuum's foam-like structure is the formation of four-way junctions, where the walls of multiple Omnicle bubbles meet. These junctions are theorized to form angles close to 109.5 degrees, characteristic of tetrahedral geometry. This geometric arrangement is significant because it minimizes surface area and provides mechanical stability, similar to the principles governing soap bubble foams [26].

In natural soap bubble foams, four-way junctions form as a result of surface tension forces finding a configuration that minimizes energy. Similarly, the Omnium vacuum's foam structure achieves equilibrium through this arrangement, balancing the forces acting on the Omnicle bubbles. Despite the overall stability of the structure, slight imperfections may arise, leading to variations in the shapes and sizes of individual facets. Nonetheless, the interplay of forces ensures that the system remains mechanically stable.

The hypothesis of the Omnium vacuum introduces a novel framework for understanding space-time as an emergent property of a more fundamental medium. The foam-like structure of Omnicles provides an intriguing model that could bridge concepts from quantum field theory and general relativity. For example, the concept of a discrete vacuum structure resonates with approaches like loop quantum gravity, which posits a granular structure to space-time at the Planck scale.

Further exploration of this hypothesis could lead to new insights into the nature of space-time, the unification of fundamental forces, and the origins of the universe. While the Omnium vacuum remains speculative, its conceptual foundation invites innovative research and experimentation in theoretical physics.

In the Omnium vacuum's foam-like structure, the points where Omnicle "bubbles" meet are called four-way junctions. These are regions where the walls of the bubbles intersect, always forming angles close to 109 degrees—a geometric arrangement related to the shape of a tetrahedron. This angle is important because it represents the configuration with the least surface area and the most stable mechanical state.

The four-way junctions in the foam structure are reminiscent of the geometric stability found in tetrahedrons. This arrangement ensures that the surface tension pulling on the Omnicle bubbles is minimized, maintaining a balance between the various forces acting on the structure.

Although the overall structure is stable, subtle variations and imperfections arise. Not all facets are perfectly uniform; some may have five sides, others six, or even just three or four. Despite these differences, the system achieves mechanical equilibrium through the interplay of forces, maintaining overall stability across the cosmic foam.

11. Dimensional Properties of Omnicle

Let us assume that the Omnicle bubbles have an unknown minimum size. These particles are trapped in a 3D box with three lengths:

L_x, L_y, and L_z.

As in other systems, there is no potential acting on the particles inside the box. The total potential energy E of the particles is the sum of their energies in the x, y, and z directions. So, we can express the total energy as:

$$\varepsilon_x + \varepsilon_y + \varepsilon_z = E$$

Now the equations are very similar to a 1-D box quantum number n and the boundary conditions are identical, *i.e.*,

$$n = 1, 2, \cdots, \infty$$

The quantum numbers n_x, n_y, and n_z are used to define the energy levels, where:

- $n_x = 1, 2, 3, \cdots, \infty$
- $n_y = 1, 2, 3, \cdots, \infty$
- $n_z = 1, 2, 3, \cdots, \infty$

For each quantum number, we can apply the de Broglie energy equation, which expresses the energy as a function of the mass m, the Planck constant h, and the box length L:

$$\varepsilon_x = n_x h^2 / 8mL^2$$

Quantum mechanics tells us that the translational energy levels for a particle in a three-dimensional box are given by the Schrödinger equation. This gives us the following expression for the energy of a particle in periodic motion in a cubic box with edge length L:

$$E\left(n_x, n_y, n_z\right) = h^2 / 8mL^2 \left(n_x^2, n_y^2, n_z^2\right) \quad n = 1, 2, 3, \cdots$$

From the Schrödinger equation, we can then derive the well-known expression for the energy of a particle in periodic motion in a cubic box with edge length L [27].

The value of energy levels with the corresponding combinations and sum of squares of the quantum numbers:

$$n^2 = n_x^2 + n_y^2 + n_z^2$$

The result now is

$$E_n = n^2 h^2 / 8mL^2 \quad n = 1, 2, 3, \cdots$$

This means that the energy of a particle is quantized and the lowest possible energy is not zero, even though it is minimal, it can never be at rest because it always has some kinetic energy.

From this equation, we can deduce that the energy of a particle is quantized, meaning that it can only take on discrete values. The lowest possible energy is not zero, even though it is minimal, because the particle always has some kinetic energy. The term $h^2/8mL^2$ will be minimized for $L = L_{\max}$ where $L_{\max}$ is the maximum edge length of the cubic box, whose maximum diameter $d_{\max}$ is given by:

$$d_{\max} = L_{\max}\sqrt{3}$$

The minimum energy of an Omnicle corresponds to its inertial energy at rest. Therefore, we can write the equation as:

$$\frac{n^2h^2}{8m_{om}L^2} = m_{om}c^2$$

where:

- n is the quantum number,
- h is Planck's constant,
- m_{Om} is the mass of the Omnicle,
- L is the box's characteristic length,
- c is the speed of light.

Solving for m_{Om}, we get:

$$m_{om} = \frac{nh}{cL_{\max}\sqrt{8}}$$

The value of m_{Om} can be calculated if we know the maximum diameter $d_{\max}$ that the universe can reach.

$$m_{om} = \frac{nh}{cL_{\max}\sqrt{8}} = \frac{h}{cd_{\max}}\sqrt{\frac{3}{8}}$$

where $d_{\max} = L_{\max}\sqrt{3}$.

To calculate the radius of the observable universe using the Hubble constant (H_0), we can use the relationship between the radius and the Hubble constant. The formula is:

$$R_{\text{universe}} = \frac{c}{H_0}$$

where:

- R_{universe} is the radius of the observable universe,
- c is the speed of light, approximately 3×10^8 m/s.

H_0 is the Hubble constant, which typically ranges from about 67 to 74 km/s/Mpc, but we'll use the commonly accepted value of

$$H_0 \approx 71.9 \text{ km/s/Mpc} \approx 2.33\times10^{-18}\text{ s}^{-1}$$

or this calculation.

$$R_{\text{universe}} \approx 1.286\times10^{26}\text{ meters}$$

The diameter of the visible universe is approximately:

$$2L_{\max} = \frac{2c}{H_0} = 2.57\times10^{26}\text{ m}$$

Thus, to find $d_{\max}$:

$$d_{\max} = 2L_{\max}\sqrt{3} \approx 4.46\times10^{26}\text{ m}$$

The value of m_{om} can be calculated once we know the maximum diameter $d_{\max}$

that the universe can reach.

Substituting the value of $d_{\max}$ from previous calculations:

$$m_{om} = \frac{h}{cd_{\max}}\sqrt{\frac{3}{8}} = 3.04\times10^{-69}\ \text{kg}$$

Although the Omnicle has no mass because it has no rotation movement, however the small oscillation of the Omnicle contributes to a very small mass equivalence.

To calculate the number of Omnicle in the universe we divide the mass of the universe by the mass of the Omnicle.

To calculate the mass of the observable universe without relying on density, we can use a formula that relates mass to the properties of the universe's expansion. Specifically, we use the inertial mass formula based on the Hubble constant (H_0), the speed of light (c), and Newton's gravitational constant (G):

$$M_u = \frac{c^3}{2H_0G}$$

where:

- M_u is the total mass of the observable universe,
- c is he speed of light ($c = 3 \times 10^8$ m/s),
- H_0 is the Hubble constant (we'll use $H_0 = 71.9$ km/s $= 2.33 \times 10^{-18}$ s^{-1}),
- G is Newton's gravitational constant ($G = 6.674 \times 10^{-11}$ m^3/kg/s^2).

Substituting the values, we calculate:

$$M_u \approx 8.66\times10^{52}\ \text{kg}$$

If the total volume of the observable universe, calculated using:

$$V_u = \frac{4}{3}\pi R_u^3 = \frac{4}{3}\pi\left(\frac{c}{H_0}\right)^3$$

is approximately $\approx 8.92 \times 10^{78}$ m^3.

Then the density of the universe is calculated to be:

$$M_u/V_u = 8.66\times10^{52}\ \text{kg}/8.92\times10^{78}\ \text{m}^3 = 9.71\times10^{-27}\ \text{kg}/\text{m}^3$$

If we assume that the density of an Omnicle is the same as the density of the Omniom vacuum, which is:

$$9.71 \times 10^{-27}\ \text{kg/m}^3$$

then the volume of the single Omnicle (V_{om}) can be calculated to be

$$V_{om} = m_{om}/\rho = 3.13\times10^{-43}\ \text{m}^3$$

The total volume occupied by all the Omnicles is:

$$n_{om}\times V_{om} = 6.07\times10^{78}\ \text{m}^3$$

However, the total volume of the observable universe, calculated using:

$$V_u = \frac{4}{3}\pi R_u^3 = \frac{4}{3}\pi\left(\frac{c}{H_0}\right)^3$$

is approximately ≈ 8.92×10^{78} m^3

If the sum of the Omnicle volumes in the universe is 6.07×10^{78} m^3 and the total volume of the observable universe is 8.92×10^{78} m^3, it suggests that the Omnicles (the fundamental units or objects occupying space) do not completely fill the universe. Instead, there are significant free spaces or voids between these Omnicles.

Fraction of the Universe's Volume Occupied by Omnicles (f_{om}):

$$f_{om} = tot\, m_{om} / M_u = 6.07 \times 10^{78}\ \text{m}^3 / 8.92 \times 10^{78}\ \text{m}^3 \approx 0.68$$

and this is the effect fraction occupied by the dark energy.

The empty regions (voids) in the observable universe can span hundreds of millions of light-years, making the universe appear like a cosmic web, with matter concentrated in filaments and nodes and vast empty regions in between.

The presence of so much free space is a direct consequence of the universe's expansion. As space itself expands, the distance between these Omnicles increases, creating more voids over time.

12. Superfluid Vacuum

The concept of the vacuum, in general, as a superfluid offers a novel perspective on the nature of space-time and has several profound implications for our understanding of fundamental physics. If the vacuum behaves like a superfluid, it means that it can be described using the principles of hydrodynamics, allowing us to apply the laws of fluid mechanics to the formation and dynamics of particles and fields.

A superfluid is a fluid that flows with quiet zero viscosity and exhibits unique quantum mechanical properties, such as the ability to flow without friction. If the vacuum behaves like a superfluid, this implies it has a low-viscosity, high-coherence state.

Superfluidity would allow the vacuum to transmit waves and particles in a manner analogous to a fluid, potentially offering insights into how particles form and propagate.

The vacuum superfluid could support vortex structures or quasi-particles, which may correspond to known particles such as electrons, quarks, photons, or even more exotic states [27]-[30].

In quantum electrodynamics, the vacuum is a state with no real matter particles or photons, but it is not devoid of energy. Instead, it contains vacuum fluctuations, and a finite energy called vacuum energy. The vacuum is the state with the lowest possible energy and exhibits superfluid behavior. This superfluidity is foundational to Maxwell's equations, special relativity, and general relativity.

Dirac's theories suggest that the vacuum behaves like a non-trivial medium, potentially comprising a quantum-scale substrate like an elastic solid, a fluid, or a Higgs condensate [8] [9] [31].

Thus, the physical vacuum behaves like a superfluid with extremely low viscosity and high thermal conductivity. This energy has real physical effects, which can be observed and measured [1] [32].

The superfluid vacuum theory describes the vacuum as a quantum superfluid, which behaves like a perfect fluid with minimal viscosity and no structural memory. If perturbed, it does not revert to a former state. This theory suggests a mass generation mechanism that could replace or supplement the electroweak Higgs mechanism, similar to gap generation in superconductors [10].

However, the idea of a superfluid vacuum is controversial due to the historical rejection of the ether concept. The Michelson-Morley experiment (1887) famously demonstrated no detectable ether, leading to the development of special relativity [1].

Despite this, there are indications that the vacuum may behave like a fluid. Maxwell's equations, which underpin special and general relativity, suggest that light moves through a medium with properties like transverse elasticity and density, supporting the idea that photons propagate through a fluid-like space.

13. The Vacuum as an Ideal Gas

The concept of the Omniom vacuum behaving as an ideal gas draws an analogy between the behavior of particles in an ideal gas and certain properties of the vacuum. In an ideal gas, particles are considered to be point-like entities that move freely and randomly in all directions. They undergo elastic collisions with each other and with the walls of the container. These particles have no interactions except for brief collisions, and there are no intermolecular forces at play. Similarly, in the vacuum, there is an absence of matter, and the space is considered empty. Analogous to the random motion of particles in an ideal gas, omnicles in the vacuum as with the particles in an ideal gas undergo oscillations and elastic collisions.

The oscillation speed can be calculated as follows:

Given that the kinetic energy E is related to the velocity v by:

$$E = \frac{1}{2}\rho v^2$$

where ρ is the density and v is the speed of oscillation. Equating this expression to another equation for energy $\rho v = \frac{1}{2}\rho v^2$, we can cancel out ρ from both sides:

$$v = \frac{1}{2}v^2$$

Multiplying through by 2 to eliminate the fraction:

$$v^2 = 2v$$

Rearranging terms:

$$v^2 - 2v = 0$$

Factoring:

$$v(v-2) = 0$$

This equation gives two solutions: $v = 0$ (which is trivial and indicates no motion), and $v = 2$ m/s.

Thus, the speed v of the Omnicle oscillation is 2 m/s.

The Omnicle has no spin thus does not rotate, therefore its oscillation is not related to its rotation like physical particles, but it is related to the expansion and contraction. The frequency of oscillation can be further analysed by determining the oscillation's wavelength or period. For now, based on the given speed, we estimate the oscillation frequency as:

$$f = 0.5\ \text{Hz}$$

This indicates a low-frequency oscillation, meaning the particle slowly expands and contracts over time.

The low frequency of oscillation further supports the idea that the Omnicle operates at a fundamental level, influencing the fabric of the vacuum or space-time and creating a fundamental oscillation of the Omniom vacuum. The low-frequency oscillation suggests the Omnicle's interaction with other Omnicles implies a slow but significant influence on the structure of the vacuum, potentially in line with theories related to zero-point energy or quantum field fluctuations.

The Boltzmann constant, $k_B = 1.38 \times 10^{-23}$ J/K, links temperature to the kinetic energy of particles. As the temperature increases, the energy associated with particle movement also rises proportionally. This means that at extremely high temperatures that was at the moment of the Big Bang, the particles would have extremely high kinetic energy.

As temperature increases, the oscillation intensifies, leading to larger displacements. This could mean that Omnicles would oscillate so rapidly and with such high energy that they cause a massive destabilization in the vacuum structure and expansion of the vacuum.

Given that the speed v of the Omnicle oscillation is 2 m/s, the majority of the oscillation energy is cancelled due to elastic collision between the Omnicles. The Boltzmann constant, approximately 1.38×10^{-23} J/K, indicates that for every 1 Kelvin increase in temperature, the average kinetic energy of each Omnicle increases by 1.38×10^{-23} J.

However, the Browning movement cancels each other and reduces it to the range of 10^{19} GeV, corresponding to the energy scale where all known forces of nature (gravity, electromagnetic, strong nuclear, and weak nuclear forces) were possibly unified.

The resulting energy would influence the vacuum, potentially causing an outward pressure, contributing to the rapid expansion of the universe, converting the standstill Omniom vacuum to dark energy.

The outward pressure created by this oscillatory motion would overcome gravitational attraction at small scales, leading to the inflationary phase of the universe where the universe expanded exponentially due to the release of high-energy particles. At such high temperatures, their collective energy would essentially "stretch" space-time. The rapid expansion of the universe would cool down these particles, slowing their oscillations, and leading to a more stable universe at lower temperatures.

14. Modelling Omniom Vacuum Density Using the Ideal Gas Law

While the analogy between the vacuum and an ideal gas is not perfect, it provides a useful framework for understanding certain phenomena. For example, the ideal gas law relates the pressure, volume, and temperature of an ideal gas. In a similar vein, theoretical frameworks like quantum field theory provide descriptions of the vacuum state and its properties.

During the early stages of the universe, mere fractions of a second after the Big Bang, a period of rapid expansion known as inflation occurred. This expansion resulted in cooling, leading to the formation of both small "overdensities" and "underdensities" within the universe. At points of very low vacuum density, negative pressure emerged, drawing in surrounding vacuum and fostering the creation of high-density structures such as vortices and elementary particles like electrons and quarks [29].

The transition from the initial vacuum state to the high-density quark state during the inflationary epoch is elucidated by a complex framework of equations termed the inflationary equations. These equations, rooted in the principles of general relativity and quantum field theory, delineate how the energy density of the universe evolves over time. The transformation process from Omniom vacuum to photon, electron and quark and to mass formation was discussed in previous articles.

The vacuum as an ideal gas, with its behavior exhibits compressibility akin to gases and described by principles akin to the ideal gas law. This law, applicable to gases behaving ideally, finds relevance when applied to the vacuum. Expressed as:

$$PV = nRT$$

where:

P denotes the pressure of the gas,

V signifies the volume of the gas,

n represents the number of moles of the gas,

R is the ideal gas constant, and

T denotes the temperature of the gas.

The number of moles n can be rewritten as:

$$n = \frac{m}{M}$$

Substitute n into the ideal gas law:

$$PV = \frac{m}{M}RT$$

Solve for the mass/volume ratio, which is density.

Density is defined as mass per unit volume,

$$\rho = \frac{m}{V}.$$

Rearranging the equation above to solve for density ρ:

$$\rho = \frac{PM}{RT}$$

where:

- P is the pressure,
- M is the molar mass, 2.16×10^{-15} kg,
- R is the ideal gas constant, $R = 8.314 \text{J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$,
- T is the temperature = 2.73 K.

In this equation, R stands for the ideal gas constant, equating to the product of the Boltzmann constant (denoted as k) and Avogadro's number (abbreviated as N_A).

The relationship between the ideal gas constant (R), the Boltzmann constant (k), and Avogadro's number (N_A) is given by the formula:

$$R = k \times N_A$$

where:

- R is the ideal gas constant, which is approximately 8.314J/(mol·K).
- k is the Boltzmann constant, which has a value of approximately 1.380649×10^{-23} J/K.
- N_A is Avogadro's number, which is approximately 6.022×10^{23} mol^{-1}.

The molar mass used here is extremely small, indicating that it corresponds to a hypothetical particle or field-like component of dark energy. The reasoning behind such a low molar mass is due to the extremely low density and pressure values associated with dark energy, making it a unique "ideal gas" model in cosmological terms.

The pressure related to dark energy, which drives the expansion of the universe, is negative. This pressure is related to the density using

$$P = w \cdot \rho \cdot c^2$$

where:

P is the pressure,

w is a dimensionless equation-of-state parameter for dark energy,

ρ is the energy density of dark energy,

c is the speed of light.

For dark energy:

- Observations suggest $w \approx -1$ w, which is characteristic of a cosmological constant (Λ).
- The cosmological constant is equivalent to dark energy in the simplest models, where it represents a constant vacuum energy density that fills space.

The energy density associated with Λ is given by:

$$\rho\Lambda = \Lambda c^2 / 8\pi G$$

Using the known values of constants:

$$\rho\Lambda \approx 6 \times 10^{-27} \text{ kg/m}^3 .$$

This yields a pressure of:

$$P \approx -8.74 \times 10^{-10}\ \text{Pa}.$$

This negative pressure leads to the accelerated expansion of the universe. The estimated pressure associated with dark energy is approximately -10^{-9} Pa, which is extremely small and negative.

In the near-vacuum of intergalactic space, the pressure is even lower, typically in the range of 10^{-14} Pa. The Cosmic Microwave Ground (CMB) radiation pressure is also extremely low, with estimates typically below 10^{-10} Pa [32]-[34].

The calculated density of the Omniom vacuum:

$$\rho = \frac{PM}{RT} \approx 9.71 \times 10^{-27}\ \text{kg/m}^3$$

The Omnium vacuum holds a density of 9.71×10^{-27} kg/m^3, while the density of dark energy is measured at 6×10^{-27} kg/m^3. This subtle difference whispers a profound truth—dark energy is but the Omnium in expansion, stretching ever outward, its essence diffusing into the vast cosmic fabric. As it unfolds through the boundless reaches of space, its density diminishes, echoing the silent symphony of an accelerating universe.

This observation aligns seamlessly with modern cosmological models, reinforcing the notion that dark energy and Omniom vacuum behave like an ideal cosmic medium, permeating the universe and governing its expansion with an unseen yet profound influence.

15. Conclusions

This study offers a transformative perspective on the nature of vacuums, redefining them as dynamic, structured entities that shape the fabric of the cosmos. By introducing the concept of the Omniom vacuum—a primordial, static medium existing before the Big Bang—this work bridges the gap between metaphysical and scientific interpretations of the universe's origin. The transition from Omniom to the quantum vacuum and finally to the dark energy vacuum highlights the evolving role of vacuums in cosmic evolution, from the creation of matter and energy to the accelerated expansion of the universe.

The analysis establishes the Omniom vacuum as a foundational medium with measurable density, elasticity, and viscosity, unifying the properties of electric permittivity, magnetic permeability, and the gravitational constant. By tying physical constants such as ccc, ϵ_0, μ_0, and G to the vacuum's density, the study reveals the vacuum as a superfluid-like medium that governs the propagation of forces and particles. Furthermore, the foam-like structure of the Omnium vacuum, composed of Omnicles, offers a compelling model for understanding space-time's granular nature at much less than Planck scales.

This framework not only resolves the cosmological constant problem by differentiating between vacuums but also advances our understanding of dark energy and gravity as emergent phenomena tied to the vacuum's properties. The Omniom vacuum hypothesis provides a cohesive model for unifying quantum field theory, general relativity, and cosmology, laying the groundwork for future research into the fundamental nature of the universe. This paradigm shift invites us to reconsider the vacuum not as empty space but as the underlying fabric of existence, holding the key to the cosmos' past, present, and future.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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