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Four Spatial Dimension World-Universe Cosmology

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Abstract

This article represents the culmination of a decade-long effort to develop the World-Universe Cosmology (WUC), building upon a series of published works. These include the first one, "*5D World-Universe Model. Space-Time-Energy*" [1] and the last one, "*JWST Discoveries and the Hypersphere World-Universe Model. Transformative New Cosmology*" [2], both featured in the *Journal of High Energy Physics, Gravitation and Cosmology*. WUC is a unified model of the World built around the concept of the Cosmic Medium, composed of particles (protons, electrons, photons, neutrinos, and universe-created particles). WUC provides a mathematical framework that enables precise calculation of Medium-bound physical parameters: Gravitational parameter, Hubble's parameter, Absolute age of the World, Intergalactic plasma parameters, Temperature of microwave background radiation and the Minimum energy of photons. This paper aligns WUC with the theoretical framework developed by P. Wesson and J. Overduin [3] [4], albeit assigning a new physical meaning to the fourth spatial coordinate associated with the total energy of the Observable World.

Keywords

World-Universe Model, Universe-Created Particles, Gravity, Cosmic Medium, Fourth Spatial Coordinate, Observable World

1. Introduction

In 1937, P. Dirac proposed a new basis for cosmology: the hypothesis of a variable gravitational "constant" G [5]; and later (1974) added the notion of continuous creation of matter in the World [6].

In 1983, P. Wesson developed 5D Space-Time-Mass theory that associates the fourth spatial coordinate $x^4 = Gm/c^2 \propto t$ with the rest mass of particles. The

gravitational constant serves as the dimension-transposing parameter [3].

According to J. Overduin and P. Wesson (1994): "*a fifth dimension might be associated with rest mass via* $x^4 = Gm/c^2 \propto t$. *The chief effect of this new coordinate on four-dimensional physics was that particle rest mass, usually assumed to be constant, varied with time*" [4]. It is worth noting that in WUC, the gravitational parameter $G \propto \tau^{-1}$ and this "chief effect" do not arise.

J. Overduin and P. Wesson postulated [4] that "*Metrics which do not depend on* x^4 *can give rise only to induced matter composed of* (massless) *photons* (this is the case of the Big Bang Model); *while those which depend on* x^4 *give back equations of state for fluids composed of massive particles*" (this is the case of WUC).

WUC supplies this "fluid" that J. Overduin and P. Wesson have predicted: it is, in fact, the Cosmic Medium (CM) of the Observable World (OW). According to WUC, empty space does not exist; instead, OW is filled with CM that consists of particles with rest energy: protons, electrons, photons, neutrinos, and Universe-Created Particles (UCPs). The Intergalactic voids discussed by astronomers are, in fact, examples of CM in its purest. Consequently, the Cosmic Medium of OW as described by WUC can serve as further evidence in favor of the four spatial dimension views of WUC.

WUC follows these ideas, albeit introducing a different mechanism of matter creation and the fourth spatial coordinate associated with the total energy of OW, which is a 3D Hubble Bubble.

2. Fundamental Issues in Cosmology

It is well-known that any theory is based on certain hypotheses. WUC and Big Bang Model (BBM) are principally different models with fundamentally different hypotheses [2]:

Initial Conditions:

• **BBM**: Proposes an "Initial Singularity" with infinite energy density of the total Matter of the universe, which was created from absolutely Nothing. The need for the universe to begin at $t = 0$, avoids a temporal singularity. Extremely rapid expansion of spacetime (inflation). There is no center of expansion in the 3D universe.

• **WUC:** Suggests a fluctuation in the Eternal Universe that created a four spatial dimension Nucleus of the World with an extrapolated radius equal to a basic size unit: $a = 1.7705641 \times 10^{-14}$ m. The World is a Hypersphere of the Nucleus and has a finite extrapolated energy density (about 10^4 times less than nuclear density). The Nucleus expands in Its fourth spatial dimension at the speed c (a gravitodynamic constant that is identical to the electrodynamic constant c in Maxwell's equations), resulting in the even stretching of the World. There is no need for dark energy!

Structure of Observable World:

• **BBM:** Assumes an almost infinite homogeneous and isotropic universe

around the initial singularity with the age 13.787 ± 0.020 Byr. The observable universe is a spherical region of the universe consisting of all matter that can be observed from the Earth with the diameter of 93 Bly.

• **WUC:** Describes the Finite Boundless World that is the Hypersphere of the 4D Nucleus with the 3-dimensional surface volume of $V_H = 2\pi^2 R^3$. The absolute age of OW is 14.226 Byr. OW is the 3D Hubble Bubble with the radius $R = 14.226$ Bly, the volume $V_{OW} = 4\pi R^3/3$, and the total volume $V_{OWT} = 2\pi R^3$. It is a Patchwork Quilt of various main luminous superclusters ($\gtrsim 10^3$). The ratio of V_H to V_{OWT} is: $V_H/V_{OW} = \pi$. It means that in the Hypersphere World could exist three "Parallel Worlds" with the same laws of physics because all points of the Hypersphere are equivalent and there are no preferred centers in it.

The Microwave Background Radiation (MBR) "Cold Spot" is an anomalous region in the cosmic MBR that appears significantly larger and colder than expected. This region is approximately 70 μK colder than the average MBR temperature of 2.725 K, whereas typical temperature fluctuations have a root mean square of only 18 μK. At certain points, the "cold spot" reaches a temperature deficit of 140 μK below the average.

A controversial hypothesis proposed by L. Mersini-Houghton suggests that the "cold spot" is "*the unmistakable imprint of another universe beyond the edge of our own*" [7]. If validated, this would provide the first empirical evidence supporting the existence of a parallel universe, a concept that had previously been explored only in theoretical models. Within the framework of WUC, this anomaly can be interpreted as a consequence of interactions with "Parallel Worlds."

Cosmic Medium of Observable World:

• **BBM:** Often implies a vacuum state in the universe.

• **WUC:** Proposes that CM, which is both homogeneous and isotropic, while the distribution of Macroobjects (MOs) is spatially inhomogeneous, anisotropic, and temporally non-simultaneous. CM consists of protons, electrons, photons, neutrinos, and UCPs, previously referred to as "Dark Matter Particles." The rejection of the luminiferous aether in 1905 was a critical moment for Classical Physics; however, CM proposed by WUC could be considered a revival of this concept, acting as a savior for Classical Physics.

Conservation Laws:

• **BBM:** Does not explicitly emphasize the creation and conservation of angular momentum in its foundational principles.

• **WUC:** Stands out as the only cosmological model that provides a mechanism for angular momentum creation and is consistent with the fundamental law of its conservation.

Macroobject Formation:

• **BBM:** MOs form from the bottom, extrasolar systems (ESS) up to galaxies and superclusters.

• **WUC:** MOs form from the top, superclusters down to galaxies and ESS due to an Explosive Volcanic Rotational Fission of Superclusters' Overspinning Cores

(made up of UCPs), which were created by the Universe during the "Dark (invisible) Epoch" for 0.44 Byr. The formation of galaxies and ESS is not a process that concluded ages ago; instead, it is ongoing.

In conclusion. WUC presents a radically different approach to understanding OW compared to BBM, challenging long-held assumptions, and offering new perspectives on the fundamental nature of Cosmology and Classical Physics. The hypotheses of BBM are mathematical, while those of WUC are more physical in nature. Both models may seem incredible, but there is a key difference: BBM fails to explain many of experimental results observed by contemporary Astronomy, whereas WUC does!

3. Why Four Spatial Dimension Observable World?

1) WUC introduced a concept of the Hypersphere World to address the absence of the center of expansion in 3D universe, associated with "Initial Singularity." In frames of WUC, the center of expansion resides in the center of the 4D Nucleus.

2) The expansion of the Nucleus causes the stretching of Its surface, which constitutes the Hypersphere World. There is no need for dark energy.

3) Creation of Matter is a direct consequence of the Nucleus expansion in the fourth spatial dimension associated with the total energy of OW. Creation of UCPs occurs homogeneously in all points of the Hypersphere World.

4) J. Overduin and P. Wesson postulated that "*Metrics which depend on* x^4 *give back equations of state for fluids composed of massive particles*." WUC supplies this "fluid," which consists of "massive" particles with rest energy: protons, electrons, photons, neutrinos, and UCPs.

5) According to WUC, all parameters of OW depending on dimensionless time-varying quantity Q, which is a ratio of radius R to a basic size unit a ($Q = R/a$), are a manifestation of the Worlds' curvature in the fourth spatial dimension.

6) Leveraging the Inter-Connectivity of primary cosmological parameters revealed by WUC, we demonstrate that the gravitational parameter G_{exp}, which can be measured directly, enables the determination of all other cosmological parameters that are not directly measurable. Using G_{exp}, we calculate the radius of the curvature R as follows: $G_{exp} \to Q_{exp} \to R = a \times Q_{exp} = 1.3459 \times 10^{26}$ m.

4. Energy Density of Observable World

In WUC, OW is the Hubble Bubble with the radius $R = c\tau$ (where c is a gravitodynamic constant that is identical to the electrodynamic constant c in Maxwell's equations and τ is a cosmological time) and an energy density of a spherical surface σ_0 that is a temperature invariant surface enthalpy [8]:

$$\sigma_0 = hc/a^3$$

where h is the Planck constant. With Nikola Tesla's principle at heart, *there is no energy in matter other than that received from the environment*, we calculate an energy of OW E_{OW}:

$$E_{OW} = 4\pi R^2 \sigma_0$$

and an average energy density of OW ρ_{OW}:

$$\rho_{OW} = 3\sigma_0 / R = 3\rho_0 \times Q^{-1}$$

that is inversely proportional to R. An energy density unit ρ_0 equals to: $\rho_0 = hc/a^4$ and the dimensionless time-varying quantity Q equals:

$$Q_{exp} = \frac{a^2 c^4}{8\pi hc} \times G_{exp}^{-1} = 0.7599440 \times 10^{40}$$

where G_{exp} is a value of the experimentally measured Gravitational parameter [9]:

$$G_{exp} = 6.674334 \times 10^{-11}\ \mathrm{m^3 \cdot kg^{-1} \cdot s^{-2}}$$

The quantity Q that is a measure of the Size R and Age A_τ of OW, is, in fact, the Dirac Large Number (t_0 is a basic time unit: $t_0 = a/c = 5.9059662 \times 10^{-23}$ s):

$$Q = R/a = A_\tau / t_0$$

WUC is based on two parameters only: dimensionless Rydberg constant $\alpha = (2aR_\infty)^{1/3}$ (that is named the fine-structure constant now and R_∞ is the Rydberg constant) and time-varying quantity Q. We stress that the best theory is the one which is based on the minimum number of dimensionless parameters.

5. Critical Energy Density

The principal idea of WUC is that the energy density of OW ρ_{OW} equals to a critical energy density ρ_{cr}, which can be found by considering a sphere of radius R_M and enclosed mass M that can be calculated by multiplication of critical mass density by the volume of the sphere. When OW has the critical density, the Hubble velocity $H \times R_M$ ($H = c/R$ is the Hubble parameter) equals the escape velocity v_{esc} [10]:

$$v_{esc}^2 = \frac{2GM}{R_M} = \frac{2G}{R_M} \times \frac{4\pi}{3} R_M^3 \times \frac{\rho_{cr}}{c^2} = (H \times R_M)^2$$

which gives an equation for ρ_{cr}:

$$\rho_{cr} = 3H^2 c^2 / 8\pi G$$

This equation can be rewritten as:

$$\frac{4\pi G}{c^2} \times \frac{2}{3} \rho_{cr} = \mu_g \times \rho_M = H^2 = \frac{c^2}{R^2}$$

where $\mu_g = \frac{4\pi G}{c^2}$ is a gravitomagnetic parameter and $\rho_M = \frac{2}{3}\rho_{cr}$ is an energy density of CM.

Considering that $H \propto R^{-1}$, it is easy to see the gravitational parameter $G \propto R^{-1}$. We emphasize that the values of the main cosmological parameters G and H depend on the value of ρ_M which is the characteristic of CM that is homogeneous and isotropic. The critical energy density of OW in the present Epoch equals to:

$$\rho_{cr} = 3\rho_0 \times Q_{exp}^{-1} = 4.980161\,\mathrm{GeV/m^3}$$

6. Cosmic Medium Composed of Particles

Intergalactic Plasma, Microwave Background Radiation (MBR), and Far-Infrared Background Radiation speak in favor of existence of CM:

• **Intergalactic plasma** parameters, consisting of protons with mass m_p and electrons with mass m_e, can be found by investigations of Fast Radio Bursts, which are millisecond duration radio signals originating from distant galaxies. These signals are dispersed according to precise physical law and this dispersion is a key observable quantity that in tandem with a redshift measurement, can be used for physical investigations. The dispersion measure and redshift, conducted by E. F. Keane, *et al.* in 2016 [11], provide the measurement of the cosmic density of ionized baryons in the intergalactic medium Ω_{IGM} that equals:

$$\Omega_{IGM} = 4.9 \pm 1.3\%$$

which is in excellent agreement with the predicted by WUC value of $\Omega_p = 4.8\%$.

• **Minimum Energy of Photons.** Analysis of the Intergalactic plasma shows that the value of the lowest plasma frequency ν_{min} is:

$$\nu_{min} = \nu_0 \left(\frac{m_e}{m_p}\right)^{1/2} \times Q^{-1/2} = 4.53228\ \mathrm{Hz}$$

where $\nu_0 = c/a$ and m_e/m_p is the electron-to-proton mass ratio. Photons with energy smaller than $E_{ph} = h\nu_{min}$ cannot propagate in the intergalactic plasma. Thus, $h\nu_{min}$ is the smallest amount of energy a photon may possess, which equals to the value:

$$E_{ph} = \left(\frac{m_e}{m_p}\right)^{1/2} E_0 \times Q^{-1/2} = 1.87433 \times 10^{-14}\ \mathrm{eV}$$

where a basic energy unit E_0 equals to:

$$E_0 = hc/a = 70.025252\ \mathrm{MeV}$$

This value of E_{ph} predicted by WUC in 2013 is in good agreement with the value obtained by L. Bonetti, *et al.* in 2017 [12]:

$$E_{ph} \lesssim 2.2 \times 10^{-14}\ \mathrm{eV}$$

• **Origin of Cosmic Microwave Background Radiation (MBR).** According to BBM, the photons that existed at the time of photon decoupling (380,000 years after the Big Bang) have been propagating ever since, though growing fainter and less energetic, since the expansion of space causes their wavelength to increase over time. These photons are the same photons that we see in MBR now. But then, why is MBR a perfect black-body? What is the mechanism of photons wavelength increasing over time and growing fainter and less energetic?

According to WUC, the concept of wavelength is classical, not quantum. Wavelength, in this view, is a property of an ensemble of quantum objects (such as pho-

tons or electrons), all of which possess four-momenta but no individual wavelength. By definition, *Black-body radiation is the thermal electromagnetic radiation within or surrounding a body in thermodynamic equilibrium with its environment*. In WUC, the black-body spectrum of MBR is due to thermodynamic equilibrium of photons with Intergalactic plasma. It explains why MBR is a perfect black-body radiation.

$\rho_e = \frac{m_e}{m_p}\rho_p$ is an energy density of electrons and $\rho_p = \frac{2\pi^2\alpha}{3}\rho_{cr}$ is an energy density of protons in CM. We assume that the energy density of MBR ρ_{MBR} equals to twice the value of ρ_e (due to two polarizations of photons) and consider the Stefan–Boltzmann law:

$$\rho_{MBR} = 2\rho_e = 4\pi^2\alpha\frac{m_e}{m_p}\rho_0 \times Q^{-1} = \frac{8\pi^5}{15}\frac{k_B^4}{(hc)^3}T_{MBR}^4$$

where k_B is the Boltzmann constant. The calculated value of T_{MBR} is:

$$T_{MBR} = \frac{E_0}{k_B}\left(\frac{15\alpha}{2\pi^3}\frac{m_e}{m_p}\right)^{1/4} \times Q^{-1/4} = 2.725245\ \text{K}$$

which is in excellent agreement with the measured value of 2.72548 ± 0.00057 K by D. J. Fixsen in 2009 [13].

• **Far-Infrared Background Radiation.** The cosmic Far-Infrared Background (FIRB), which was announced in 1998, is part of the Cosmic Infrared Background with wavelengths near one hundred microns, which is the peak power wavelength of the black-body radiation at temperature 29 K. We calculate the temperature of its peak T_{FIRB}:

$$T_{FIRB} = \left(15/4\pi^5\right)^{1/4} E_0/k_B \times Q^{-1/4} = 28.955\ \text{K}$$

that is in an excellent agreement with experimentally measured value of 29 K [14].

• **Mass-Varying Neutrinos.** It is established that there are three different types of neutrinos: electronic ν_e, muonic ν_μ, and tauonic ν_τ, and their antiparticles. Neutrino oscillations imply that neutrinos have non-zero masses. We analyzed this phenomenon and calculated the values of their masses [15]:

$$m_{\nu_\tau} \cong 45\ \text{meV}/c^2$$

$$m_{\nu_\mu} \cong 7.5\ \text{meV}/c^2$$

$$m_{\nu_e} \cong 0.31\ \text{meV}/c^2$$

which are in good agreement with experimental results obtained in [16]-[18].

• **Universe-Created Particles.** In our previous articles, we followed the standard paradigm "Dark Matter" that is not quite right for WUC, in which OW consists of particles of Ordinary Matter: protons, electrons, photons, and neutrinos. On the other hand, there are particles created by the Universe, UCPs of a new kind of "Universe-Created Matter" (UCM). In 2024, we introduced a new term, UCPs, which have the following characteristics: UC Fermions (UCF) or Bosons, Rest En-

ergies (see Table 1), Weak Interaction, and Self-annihilation, like Majorana fermions [2]. Ordinary particles are a byproduct of UCPs self-annihilation. It is easy to switch from Dark (**D**) Matter to Universe-Created (**UC**) Matter.

Table 1. Universe-Created particles.

Fermion			Boson		
Particle	**Rest Energy**	**Value**	**Particle**	**Rest Energy**	**Value**
UCF1	$\alpha^{-2}E_0$	1.3149948 TeV	DIRAC	$\alpha^{0}E_0$	70.025252 MeV
UCF2	$\alpha^{-1}E_0$	9.5959804 GeV	ELOP	$2/3\alpha^{1}E_0$	340.66596 keV
UCF3	$\alpha^{2}E_0$	3.7289394 keV	XION	$1/2\alpha^{6}E_0$	5.2870895 μeV
UCF4	$\alpha^{4}E_0$	0.19857107 eV			

These particles are "dark," **optically invisible** when astronomers observe OW with telescopes only. The contemporary Astronomy allows us to observe OW on wavelengths from radio waves up to gamma rays! Then, they are not "dark" at all. The first known binary star system was Cygnus X-1 (1971) that is typically the brightest persistent source of hard X-rays with energies up to sixty keV. In 2000, R. Minchin, *et al.* discovered binary galaxy system VIRGOHI 21 with NGC 4254, which has a 21-cm emission.

These two kinds of Matter have different origins of radiations [2]:

• Ordinary particles radiate **Electromagnetic waves** from Radio waves up to X-rays by electrons outside nuclei.

• UCPs radiate **Gamma rays,** which are emitted by nuclei, as a result of self-annihilation of UCPs with rest energies, covering eighteen orders of magnitude (see Table 1).

WUC proposes multicomponent UCM system consisting of two couples of co-annihilating UCPs: a heavy fermion UCF1 (1.3 TeV) and a light spin-0 boson, DIRAC (70 MeV) that is a dipole of Dirac's monopoles with charge $\mu = e/2\alpha$ (e is an elementary charge); a heavy fermion UCF2 (9.6 GeV) and a light spin-0 boson, ELOP (340 keV) that is a dipole of preons with electrical charge e/3; fermions UCF3 (3.7 keV) and UCF4 (0.2 eV), and boson XION (5.3 μeV).

The reason for this multicomponent UCM system was to explain:

• The diversity of Very High Energy gamma-ray sources in OW.

• The diversity of UCM Cores of Macroobjects of OW (Superclusters, Galaxies, and ESS), which are Fermion Compact Objects and UCM Reactors in WUC.

• **Content of Observable World.** OW consists of CM and MOs. Total energy density of OW equals to the critical energy density throughout the World's evolution. The energy density of CM is two-thirds of the total energy density and MOs (Superclusters, Galaxies, ESS, etc.), one-third in all cosmological times. The relative energy density of UCPs is about 92.8% and Ordinary particles (protons, electrons, photons, and neutrinos), about 4.8% in CM and 2.4% in MOs.

One of the principal ideas of WUC holds that relative energy densities of the World's particles in terms of the critical energy density ρ_{cr} are constants in all

times and proportional to the proton energy density in the World's CM ρ_p that in the present Epoch equals:

$$\rho_p = \frac{2\pi^2\alpha}{3}\rho_{cr} = 0.048014655\rho_{cr} = 239.1207 \text{ MeV/m}^3$$

WUC holds that the energy density of all types of self-annihilating UCPs is proportional to ρ_p. In all, there are six distinct types of self-annihilating UCPs: UCF1, UCF2, DIRAC, ELOP, UCF3, and UCF4. Then the total energy density of UCPs ρ_{UCP} is

$$\rho_{UCP} = 6\rho_p = 0.28808793\rho_{cr}$$

that is in good agreement with the results in [19]. The total XION energy density ρ_{XION} is:

$$\rho_{XION} = 1.35\pi^2\rho_p = 0.63974563\rho_{cr}$$

The total baryonic energy density ρ_B is:

$$\rho_B = 1.5\rho_p$$

The sum of electron and MBR energy densities ρ_{eMBR} equals to:

$$\rho_{eMBR} = 1.5\frac{m_e}{m_p}\rho_p + 2\frac{m_e}{m_p}\rho_p = 3.5\frac{m_e}{m_p}\rho_p$$

We take energy density of neutrinos ρ_ν to equal:

$$\rho_\nu = \rho_{MBR}$$

For Far-Infrared Background Radiation energy density ρ_{FIRB} we take

$$\rho_{FIRB} = \frac{1}{40}\frac{m_e}{m_p}\rho_p$$

Then the energy density of OW ρ_W equals to the theoretical critical energy density:

$$\rho_W = \left[1.35\pi^2 + 7.5 + (5.5 + 1/40)\frac{m_e}{m_p}\right]\rho_p = \rho_{cr}$$

From this equation we can calculate the value of $1/\alpha$ using electron-to-proton mass ratio m_e/m_p:

$$\frac{1}{\alpha} = \frac{\pi^2}{60}\left[54\pi^2 + 300 + (220+1)\frac{m_e}{m_p}\right] = 137.03600$$

which is in excellent agreement with the commonly adopted value of 137.035999. It follows that there is a direct correlation between constants α and m_e/m_p expressed by the obtained equation. As shown, m_e/m_p is not an independent constant but is instead derived from α.

As a conclusion:

• The World's energy density is inversely proportional to a dimensionless time-varying quantity, Q in all cosmological times.

• The particles relative energy densities are proportional to constant α.

7. There Is No Cosmic Medium, There Is Nothing!

In 1937, Nikola Tesla declared, "*All attempts to explain the workings of the universe without recognizing the existence of the aether and the indispensable function it plays in the phenomena are futile and destined to oblivion*." The concept of the Cosmic Medium plays a fundamental role in WUC.

WUC, being a classical model, introduces classical notions only from the moment the first ensemble of particles emerged, at a cosmological time $\tau \gtrsim 10^{-18}$ s, which defined by the value of $Q \gtrsim \alpha^{-2} \cong 18780$.

Time, Space, and Gravitation are intrinsically linked to the Impedance (characterized by the Hubble parameter $H = \tau^{-1}$), the Gravitomagnetic parameter, and the energy density of CM, respectively. Consequently, Time, Space, and Gravitation cannot be discussed independently of CM.

Gravity, under WUC, is not an interaction but rather a manifestation of CM. This perspective aligns with the Le Sage's theory of gravitation, which, in WUC, is based on UCPs, referred to as XIONs. Notably, the energy density of CM constitutes two-thirds of the total energy density of OW.

Unique properties of Aether were discussed by J. McCullagh in 1846 [20] who proposed a theory of a rotationally elastic medium. The potential energy of deformation in such a medium depends only on the rotation of the volume elements and not on their compression or general distortion. This theory produces equations analogous to Maxwell's equations. Aether with these properties can transmit transverse waves. WUC is based on Maxwell's equations, and McCullagh's theory is a good fit for description of CM.

Mach's principle. A very general statement of a Mach's principle is "*Local physical laws are determined by the large-scale structure of the universe*." In WUC, Local Physics is linked with the large-scale structure of OW through the dimensionless quantity Q. The proposed approach to the fourth spatial dimension agrees with Mach's principle. Applied to WUC, it follows that all parameters of the World depending on Q are a manifestation of the Worlds' curvature in the fourth spatial dimension.

All physical laws in OW are determined by CM, that is, both homogeneous and isotropic. We can use well-known equations considering time-varying physical parameters, depending on Q. Indeed, CM emerges as the cornerstone of Classical Physics, a savior of its principles. Let us not discard this profound concept with the tide of modernity: **we must not throw the baby out with the bathwater**!

8. Physical Meaning of the Fourth Spatial Coordinate

According to J. M. Overduin and P. S. Wesson: "*a fifth dimension might be associated with rest mass via* $x^4 = Gm/c^2$ " [4]. In WUC, there are the following parameters [2]:

$$G = \frac{a^2 c^4}{8\pi hc} \times \frac{a}{R}$$

$$\sigma_0 = \frac{hc}{a^3} = \frac{h}{a^2 t_0} = J_h$$

that is, in fact, an angular momentum flux density J_h. Then the total energy of the observable World E_{OW}:

$$E_{OW} = 4\pi R^2 \sigma_0 = 4\pi R^2 \times J_h = I_h$$

is a total angular momentum flux that is a vector along the fourth spatial dimension, which is associated with E_{OW} via

$$x^4 = \frac{2G}{c^2} \times \frac{E_{OW}}{c^2} = \frac{2}{c^2} \times \frac{a^2 c^4}{8\pi hc} \times \frac{a}{R} \times \frac{4\pi R^2}{c^2} \times \frac{hc}{a^3} = R = a \times Q = c\tau$$

The Eternal Universe continuously creates ensembles of "massive" UCPs with ensembles' angular momenta.

As a conclusion:

- The gravitational parameter functions as a dimension-transposing factor.
- The fourth spatial coordinate corresponds to the cosmological time τ, defined as $\tau = t_0 \times Q$.

9. Conclusions

Four Spatial Dimension World-Universe Cosmology presents a fresh approach to understanding the Observable World and the science of Cosmology. It builds on the foundations of Classical Physics and has the potential to challenge core assumptions in both Cosmology and Classical Physics. Rather than claiming to explain all existing cosmological data or presenting a fully developed theory, WUC serves as a starting point for a New Cosmology envisioned by Paul Dirac in 1937. While further refinement by the global physics community is essential, World-Universe Cosmology's insights, combined with the groundbreaking discoveries of the JWST and the legacy of Dirac's ideas over 87 years, underscore the need for a Paradigm Shift in Astronomy, Cosmology, and Classical Physics.

Four Spatial Dimension World-Universe Cosmology invites recognition.

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Conflicts of Interest

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

References

[1] Netchitailo, V.S. (2015) 5D World-Universe Model Space-Time-Energy. *Journal of High Energy Physics, Gravitation and Cosmology*, **1**, 25-34. https://doi.org/10.4236/jhepgc.2015.11003

[2] Netchitailo, V.S. (2024) JWST Discoveries and the Hypersphere World-Universe Model: Transformative New Cosmology. *Journal of High Energy Physics, Gravitation and Cosmology*, **10**, 1806-1834. https://doi.org/10.4236/jhepgc.2024.104102

[3] Wesson, P.S. (1983) A New Approach to Scale-Invariant Gravity. *Astronomy and Astrophysics*, **119**, 145-152.

[4] Overduin, J.M. and Wesson, P.S. (1998) Kaluza-Klein Gravity.

[5] DIRAC, P.A.M. (1937) The Cosmological Constants. *Nature*, **139**, 323-323. https://doi.org/10.1038/139323a0

[6] Dirac, P.A.M. (1974) Cosmological Models and the Large Numbers Hypothesis. *Proceedings of the Royal* Society *of London. Series A, Mathematical and Physical Sciences*, **338**, 439-446.

[7] Chown, M. (2007) The Void: Imprint of Another Universe? New Scientist. https://www.newscientist.com/article/mg19626311-400-the-void-imprint-of-another-universe/

[8] Netchitailo, V.S. (2013) World-Universe Model. https://vixra.org/abs/1303.0077

[9] Li, Q., Xue, C., Liu, J., Wu, J., Yang, S., Shao, C., *et al.* (2018) Measurements of the Gravitational Constant Using Two Independent Methods. *Nature*, **560**, 582-588. https://doi.org/10.1038/s41586-018-0431-5

[10] Zuckerman, B. and Malkan, M.A. (1996) The Origin and Evolution of the Universe. Jones and Bartlet Publishers. https://books.google.com/books?id=G0iR4jpWKN4C&pg=PA4&lpg=PA4&dq=%22critical+density+universe%22+%22escape+velocity%22&source=bl&ots=ym46gfQUpI&sig=ACfU3U0-2_bRxgpJU-RIP0Kj44xTq7JHK7w&hl=en&sa=X&ved=2ahUKEwiO-aK4lZXhA-hUDHDQIHW7_BmYQ6AEwBHoECAkQAQ#v=onepage&q=%22critical%20density%20universe%22%20%22escape%20velocity%22&f=false

[11] Keane, E.F., *et al.* (2016) The Host Galaxy of a Fast Radio Burst. *Nature*, **530**, 453-456.

[12] Bonetti, L., Ellis, J., Mavromatos, N.E., Sakharov, A.S., Sarkisyan-Grinbaum, E.K. and Spallicci, A.D.A.M. (2017) FRB 121102 Casts New Light on the Photon Mass. *Physics Letters B*, **768**, 326-329. https://doi.org/10.1016/j.physletb.2017.03.014

[13] Fixsen, D.J. (2009) The Temperature of the Cosmic Microwave Background. http://arxiv.org/abs/0911.1955

[14] Lagache, G., *et al.* (1999) First Detection of the Warm Ionized Medium Dust Emission. Implication for the Cosmic Far-Infrared Background. *Astronomy and Astrophysics*, **344**, 322-332.

[15] Netchitailo, V.S. (2016) 5D World-Universe Model. Neutrinos. The World. *Journal of High Energy Physics, Gravitation and Cosmology*, **2**, 1-18. https://doi.org/10.4236/jhepgc.2016.21001

[16] Sanchez, M. (2003) Oscillation Analysis of Atmospheric Neutrinos in Soudan 2.

Ph.D. Thesis, Tufts University. http://nu.physics.iastate.edu/Site/Bio_files/thesis.pdf

[17] Kaus, P. (2003). Neutrino Mass Matrix and Hierarchy. *AIP Conference Proceedings*, **672**, 117-125. https://doi.org/10.1063/1.1594399

[18] Dermíšek, R. (2004) Neutrino Masses and Mixing, Quark-Lepton Symmetry, and Strong Right-Handed Neutrino Hierarchy. *Physical Review D*, **70**, Article 073016. https://doi.org/10.1103/physrevd.70.073016

[19] Freese, K. (2017). Status of Dark Matter in the Universe. *The Fourteenth Marcel Grossmann Meeting*, Rome, 12-18 July 2015, 325-355. https://doi.org/10.1142/9789813226609_0018

[20] McCullagh, J. (1846) An Essay towards a Dynamical Theory of Crystalline Reflexion and Refraction. *Transactions of the Royal Irish Academy*, **21**, 17-50.