

From Four Spatial Dimensions to Three: The Physical Origin of Time, Energy, and Angular Momentum in World–Universe Cosmology

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Abstract

World–Universe Cosmology (WUC) proposes that the physical World is a finite, boundless three-dimensional Hypersphere forming the surface of an expanding four-dimensional Nucleus embedded in the Eternal Universe. The Nucleus expands at the fundamental speed c , and the radius of curvature of the Hypersphere is determined by the evolving World Parameter Q .

Within this framework, the Eternal Universe continuously generates Universe-Created Matter (UCM) through the formation of Universe-Created Particles (UCPs) within the expanding Nucleus. These particles possess four spatial coordinates and four spatial momentum components.

The present paper advances a hypothesis concerning the physical origin of three fundamental quantities: Time, Energy, and Angular Momentum. Time is interpreted as our three-dimensional description of the evolution of the fourth spatial position, identified with the radius of the expanding Nucleus. Energy represents the fourth spatial momentum component transformed by the fundamental expansion speed c . Angular Momentum is proposed to manifest as a collective property of organized UCP ensembles whose circulation already exists within the four-dimensional Nucleus immediately before their entry into the three-dimensional Hypersphere.

The paper also summarizes the proposed interconnectivity of primary cosmological parameters through the evolving World Parameter Q . These ideas suggest a common four-spatial foundation for fundamental physical quantities and cosmological parameters. The proposed interpretation is presented as a physical hypothesis intended to stimulate further theoretical investigation and observational testing.

1. Introduction

Time, Energy, and Angular Momentum are among the most fundamental concepts in physics. Their mathematical descriptions are well established, but questions concerning their underlying physical nature continue to motivate theoretical investigation.

World–Universe Cosmology offers a different perspective based on the existence of four spatial dimensions.

According to WUC, our physical World is a three-dimensional Hypersphere forming the surface of an expanding four-dimensional Nucleus. The Eternal Universe continuously generates Universe-Created Particles within the Nucleus. These particles enter the Hypersphere and participate in the formation and evolution of the World.

The central question addressed in this paper is:

Can Time, Energy, and Angular Momentum be understood as different manifestations of the transition from four spatial dimensions to three?

We propose that they can and present a physical interpretation of each quantity.

The discussion emphasizes the physical meaning of the proposed transformation rather than attempting a complete mathematical description of its dynamics.

2. From Four-Dimensional Nucleus to Three-Dimensional Hypersphere

Imagine the surface of an expanding sphere. Creatures confined to its two-dimensional surface can move in two spatial directions but cannot directly explore the third spatial dimension in which the sphere expands.

World-Universe Cosmology (WUC) proposes an analogous geometrical picture with one additional spatial dimension.

Our physical World is a finite, boundless three-dimensional Hypersphere forming the surface of an expanding four-dimensional Nucleus embedded in the Eternal Universe. The Nucleus expands in the fourth spatial dimension at the fundamental speed c .

Within WUC, Universe-Created Particles (UCPs) possess four spatial coordinates:

$$(x, y, z, w)$$

where w denotes the radial fourth spatial coordinate. Its value can vary throughout the interior of the four-dimensional Nucleus.

At the three-dimensional Hypersphere (H), the fourth spatial coordinate reaches the value w_H , equal to the radius R of the Nucleus:

$$w_H = R = aQ = c\tau$$

where a is the fundamental length, Q is the evolving World Parameter, and τ is Absolute Cosmological Time.

Thus, the fourth spatial coordinate w of a UCP within the Nucleus must be distinguished from its value w_H at the expanding Hypersphere.

The Eternal Universe continuously generates Universe-Created Matter (UCM) through the formation of UCPs within the four-dimensional Nucleus. These particles enter the Hypersphere and participate in the continuing physical evolution of the World.

As the Nucleus expands, the radius of curvature of the Hypersphere increases, while its curvature decreases.

Within this framework, we propose that Time, Energy, and Angular Momentum are different three-dimensional manifestations of physical properties associated with the fourth spatial dimension.

3. The Physical Origin of Time

In WUC, Time is not introduced as an independent fourth coordinate of spacetime.

Time is our three-dimensional description of the evolution of the fourth spatial position, expressed through the fundamental expansion speed c .

Within the four-dimensional Nucleus, Universe-Created Particles possess four spatial coordinates:

$$(x, y, z, w)$$

The fourth spatial coordinate w can take different values within the Nucleus.

At the expanding three-dimensional Hypersphere, its value is

$$w_H = R = c\tau$$

Consequently, Absolute Cosmological Time is expressed as

$$\tau = w_H/c$$

The continuous expansion of the Nucleus determines the evolution of the Hypersphere and the corresponding progression of Absolute Cosmological Time.

Within WUC, Time is therefore associated with the evolution of the fourth spatial dimension rather than introduced as an independent spacetime coordinate.

4. The Physical Origin of Energy [1]

Within WUC, Universe-Created Particles possess four spatial momentum components:

$$\mathbf{P}_4 = (p_x, p_y, p_z, p_4)$$

The first three components describe momentum associated with motion in the three-dimensional World:

$$\mathbf{P}_3 = (p_x, p_y, p_z)$$

The fourth component, p_4 , is associated with the radial fourth-spatial direction of the Nucleus.

WUC proposes that Energy is our three-dimensional description of the fourth spatial momentum component, transformed by the fundamental expansion speed c .

This relationship is expressed as

$$E = cp_4$$

or equivalently,

$$p_4 = E/c$$

For a particle at rest in the three-dimensional World, the three-dimensional momentum components vanish, while the fourth spatial momentum component determines its rest energy.

Within WUC, the speed c has a fundamental geometrical meaning: it is the expansion speed of the four-dimensional Nucleus.

The same fundamental quantity therefore connects the evolution of the fourth spatial position with Time and the fourth spatial momentum with Energy.

The corresponding relationships are

$$\tau = w_H/c \quad E = cp_4$$

Within WUC, Time and Energy thus have a common four-spatial foundation.

5. The Physical Origin of Angular Momentum

Within World–Universe Cosmology (WUC), Angular Momentum is proposed to originate from the organized collective motion of Universe-Created Particles (UCPs) within the four-dimensional Nucleus.

UCPs possess four spatial coordinates:

$$(x, y, z, w)$$

and four spatial momentum components:

$$\mathbf{P}_4 = (p_x, p_y, p_z, p_4)$$

Consider an ensemble of UCPs moving within the Nucleus toward the expanding three-dimensional Hypersphere. The particles have different spatial positions and momentum components, but their collective motion is not necessarily random.

WUC proposes that organized circulation of UCP ensembles already exists within the four-dimensional Nucleus, immediately before their entry into the Hypersphere.

This circulation arises from correlated positions and momenta of the particles, forming a collective rotational structure. A useful physical analogy is a microscopic air vortex: individual molecules possess different positions and momenta, while their organized motion produces a rotating ensemble.

As UCPs approach the Hypersphere, their fourth spatial coordinate w approaches its boundary value:

$$w_H = R = c\tau$$

At the Hypersphere, the particles enter the three-dimensional World, where their pre-existing organized circulation manifests itself as collective three-dimensional Angular Momentum.

For an ensemble of particles, the total three-dimensional Angular Momentum is determined by the collective distribution of their positions and momentum components:

$$L = \sum_i (\mathbf{r}_i \times \mathbf{p}_i)$$

where $\mathbf{r}_i$ and $\mathbf{p}_i$ are the three-dimensional position and momentum of the i -th particle, measured relative to a common reference axis along the radial fourth spatial dimension.

The essential physical distinction is that Angular Momentum is not generated by the transition itself. The organized circulation exists before the transition and becomes manifested as three-dimensional Angular Momentum when UCPs enter the Hypersphere.

Within WUC, ensembles of UCPs carrying intrinsic collective Angular Momentum may accumulate in the Cores of gravitationally rounded macroobjects. Their collective rotation provides a proposed physical basis for the accumulation of Angular Momentum and the subsequent Rotational Fission of overspinning Cores.

This mechanism is proposed to play an important role in the formation of galaxies, Extrasolar Systems, and other gravitationally rounded structures.

Thus, WUC connects the origin of macroscopic Angular Momentum with the organized collective motion of Universe-Created Particles in the four-dimensional Nucleus.

The proposed interpretation requires further theoretical development to establish the dynamics of the transition and demonstrate the conservation of Angular Momentum.

6. Inter-Connectivity of Primary Cosmological Parameters [2]

The constancy of fundamental physical constants, including the Newtonian gravitational parameter G , is generally accepted in contemporary physics and is strongly supported by experimental observations. Nevertheless, their absolute constancy over cosmological timescales has not been established conclusively.

In conventional physics, gravitation has no established unification with the other fundamental interactions. Consequently, G is treated as an independently measured parameter rather than a quantity calculated from other more accurately determined fundamental constants.

World–Universe Cosmology proposes a different approach.

WUC holds that there indeed exist relations between all Cosmological parameters that depend on dimensionless time-varying quantity Q that is a measure of the Size R and Age A_τ of the World according to

$$Q = \frac{R}{a} = \frac{A_\tau}{t_0}$$

where t_0 is the fundamental time unit: $t_0 = a/c$. At the present cosmological epoch, the World Parameter Q has the value

$$Q = 0.759972 \times 10^{40}.$$

According to WUC, the following primary cosmological parameters depend on Q :

1. Newtonian parameter of gravitation G : $G = \frac{a^2 c^4}{8\pi h c} \times Q^{-1}$
2. Hubble's parameter H : $H = \frac{c}{a} \times Q^{-1}$
3. Age of the World A_τ : $A_\tau = \frac{a}{c} \times Q$
4. The Worlds' Radius of curvature R : $R = a \times Q$
5. Critical energy density ρ_{cr} : $\rho_{cr} = 3 \frac{h c}{a^4} \times Q^{-1}$
6. Concentration of Intergalactic plasma n_{IGP} : $n_{IGP} = \frac{2\pi^2}{a^3} \frac{m_e}{m_p} \times Q^{-1}$
7. Minimum energy of photons E_{ph} : $E_{ph} = \left(\frac{m_e}{m_p}\right)^{1/2} E_0 \times Q^{-1/2}$
8. Temperature of Microwave Background Radiation T_{MBR} : $T_{MBR} = \frac{E_0}{k_B} \left(\frac{15 K_U}{2\pi^3} \frac{m_e}{m_p}\right)^{1/4} \times Q^{-1/4}$
9. Temperature of Far-Infrared Background Radiation peak T_{FIRB} : $T_{FIRB} = \frac{E_0}{k_B} \left(\frac{15}{4\pi^5}\right)^{1/4} \times Q^{-1/4}$

Here, h is Planck's constant, k_B is Boltzmann's constant, E_0 is the fundamental rest-energy scale, and K_U is the dimensionless Universe Constant. The ratio (m_e/m_p) denotes the electron-to-proton mass ratio appearing in the Model's quantitative relationships.

Within WUC, these cosmological parameters are interconnected through their dependence on Q . Their evolution is interpreted as a manifestation of the changing curvature of the World in the fourth spatial dimension.

The present-day values of these parameters can be calculated using Equations (2)–(9), together with the experimentally measured gravitational parameter G_{av} and the corresponding present-day World Parameter Q_{av} determined from Equation (1).

These relationships provide a quantitative foundation for WUC and offer opportunities to compare its predictions with astronomical observations.

Within WUC, all these cosmological parameters are manifestations of the Worlds' curvature in the fourth spatial dimension.

7. Discussion and Conclusion

The present paper proposes that Time, Energy, and Angular Momentum may have a common physical origin associated with the transition from the four-dimensional Nucleus to the three-dimensional Hypersphere.

Within WUC, three fundamental interpretations are proposed.

Time represents our three-dimensional description of the evolution of the fourth spatial position, identified with the radius of the expanding Nucleus.

Energy represents the fourth spatial momentum component transformed by the fundamental expansion speed c .

Angular Momentum is proposed to manifest as a collective property of organized UCP ensembles whose circulation already exists within the four-dimensional Nucleus immediately before their entry into the Hypersphere.

These interpretations are connected by the fundamental geometry of the expanding four-dimensional Nucleus.

The evolving World Parameter Q determines the radius of curvature of the Hypersphere and, within WUC, governs the evolution of primary cosmological parameters.

The proposed interpretations of Time and Energy follow from the fundamental four-spatial assumptions of WUC. The proposed origin of Angular Momentum additionally requires an explanation of how pre-existing organized circulation is transferred into the three-dimensional Hypersphere.

We present these ideas as a physical hypothesis rather than a completed theory.

The principal suggestion is that the four-dimensional structure of the World may provide a common physical explanation for Time, Energy, and Angular Momentum—three fundamental quantities that appear distinct within our three-dimensional experience.

Further theoretical investigation is needed to establish the dynamics of the proposed transition, its consistency with conservation laws, and its possible observational consequences.

We invite theoretical physicists and astrophysicists to examine this hypothesis and contribute to its further development.

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