Basics of World-Universe Cosmology

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"If I have seen further, it is by standing on the shoulders of giants."
— Isaac Newton

Abstract

This paper summarizes key results of Classical Physics obtained prior to the advent of Quantum Mechanics, together with hypotheses proposed by some of the physicists whose ideas contributed to Hypersphere World-Universe Cosmology (WUC) from the seventeenth through the twentieth centuries. These results and ideas are then unified into a single coherent framework within the developed WUC.

1. Introduction

Hypersphere World-Universe Cosmology (WUC) is founded on Classical Physics and incorporates a number of hypotheses and results proposed by eminent physicists—both renowned and largely forgotten by the mainstream scientific community.

Historical Foundations

Robert Boyle (1627–1691). Boyle was a proponent of the aether hypothesis. According to Boyle, the aether consists of subtle particles. One class explains the absence of a vacuum and the mechanical interactions between bodies (ordinary particles in WUC), while another class accounts for phenomena such as magnetism and possibly gravitation (Universe-Created Particles, or UCPs, in WUC).

Isaac Newton (1642–1727). Newton introduced the concepts of absolute space and absolute time as independent aspects of objective reality. These concepts are retained in WUC.

Nicolas Fatio de Duillier (1664–1753). Fatio is known for proposing a "push" or "shadow" theory of gravitation, a concept incorporated into WUC.

Georges-Louis Le Sage (1724–1803). Le Sage developed a kinetic theory of gravitation based on ultramundane particles—entities extending beyond ordinary physical experience. This idea forms the basis of the UCPs framework in WUC.

John Michell (1724–1793). Michell proposed the existence of "dark stars" and suggested their detection through gravitational effects in binary systems. In WUC, dark matter objects are composed of UCPs.

Wilhelm Weber (1804–1891) and Rudolf Kohlrausch (1809–1858). They demonstrated that the ratio of the electrostatic unit of charge to the electromagnetic unit of charge yielded a value equal to the speed of light, (c). In WUC, an analogous gravitodynamic constant (c) is defined as the ratio of the gravitostatic unit of charge (E_0) to the gravitomagnetic unit of charge (p_0) (see Section 2).

James MacCullagh (1809–1847). McCullagh developed the theory of a rotationally elastic aether capable of transmitting transverse waves. This concept resembles the Cosmic Medium of WUC.

Bernhard Riemann (1826–1866). Riemann proposed a hypersphere as a model of a finite universe. WUC follows this hyperspherical concept while proposing a stretching World filled with a Cosmic Medium consisting of stable UCPs and ordinary particles.

Ludwig Boltzmann(1844–1906). Boltzmann played a central role in the development of statistical mechanics and the statistical interpretation of thermodynamics. In 1877, he formulated the entropy relation $S = k_{\mathrm{B}}\ln W$, where W is the number of accessible microstates. Boltzmann's constant k_{B} is extensively used in WUC.

George Darwin (1845–1912). Darwin formulated the lunar-origin fission hypothesis. **Louis Jacot** later proposed a solar-fission theory (1951), and **Tom Van Flandern** extended related ideas in 1993. Rotational fission is a key mechanism in WUC.

Oliver Heaviside (1850–1925). Heaviside reformulated Maxwell's equations into their modern vector form and extended them to gravitoelectromagnetism, providing a mathematical foundation relevant to WUC.

Johannes Robert Rydberg (1854–1919). Rydberg derived the empirical formula relating atomic spectral lines. In WUC, the Sommerfeld constant α is interpreted as a dimensionless Rydberg constant.

Joseph John Thomson (1856–1940). Thomson demonstrated that cathode rays consist of negatively charged particles, later named electrons. His experimentally determined charge-to-mass ratio is used in WUC.

Nikola Tesla (1856–1943). Tesla developed original ideas concerning matter and energy, stating that "*there is no energy in matter other than that received from the environment*." This concept plays an important role in WUC.

Max Planck (1858–1947). Planck derived the black-body radiation law using statistical thermodynamics and Boltzmann's entropy relation. The Planck constant h is a fundamental parameter in WUC.

Paul Dirac (1902–1984). In 1937, Dirac envisioned a future synthesis of physics and cosmology through his Large Number Hypothesis and the possibility of a time-varying gravitational constant. WUC follows a similar line of thought.

2. Classical Physics [1]

In this section, we review principal milestones of Classical Physics. Based on an analysis of experimentally measured physical constants, we argue that several of the most important fundamental constants could, in principle, have been calculated before the development of Quantum Mechanics.

Kinetic Theory of Gases

The kinetic theory of gases explains macroscopic properties such as pressure, temperature, viscosity, thermal conductivity, and volume in terms of molecular motion. In 1859, James Clerk Maxwell formulated the Maxwell velocity distribution, describing the fraction of molecules possessing velocities within a specified range. This was the first statistical law in physics and demonstrated that macroscopic properties emerge from microscopic dynamics.

Maxwell's Equations

Maxwell's equations were published by James Clerk Maxwell in 1861. Using the electrodynamic constant (c) measured by Weber and Kohlrausch in 1857, Maxwell calculated the velocity of electromagnetic waves and found it to be remarkably close to the measured speed of light. This observation led him to propose that light itself is an electromagnetic phenomenon.

Rydberg Constant

The Rydberg constant (R_∞) is a fundamental physical constant associated with atomic spectra. It first appeared in 1888 as an empirical parameter in Rydberg's formula describing the spectral series of hydrogen.

Electron Charge-to-Mass Ratio

The electron charge-to-mass ratio, (e/m_e), is a fundamental quantity in experimental physics because the electron mass cannot be measured directly. J. J. Thomson successfully determined this ratio in 1897. Following Thomson, we define $R_T \equiv e/m_e$.

Planck Constant

The Planck constant emerged from Planck's investigation of black-body radiation. He employed Boltzmann's entropy relation $S = k_B \ln W$, which relates entropy (S) to the number of possible microscopic configurations

(W). Planck found that the entropy of a resonator depends simultaneously on the ratios (U/ν and U/E), where (U) is the resonator's vibrational energy. He reconciled these requirements through the relation $E = h\nu$, where (h) converts frequency into energy.
From black-body radiation data, Planck obtained in 1901 $h = 6.55 \times 10^{-34}\ J \cdot s$ within 1.2% of the currently accepted value. He also determined $k_B = 1.346 \times 10^{-23}\ J/K$ approximately 2.5% below the modern value. We emphasize that the Planck constant, now regarded as a cornerstone of Quantum Mechanics, was introduced through statistical thermodynamics before the development of quantum theory itself.

Classical Fundamental Physical Constants.

Using the experimentally measured values of R_∞ , R_T , c, h and the magnetic constant: $\mu_0 = 4\pi \times 10^{-7}\ H/m$ we calculate the following fundamental constants:

Basic length unit	$a = 0.5[(2\,\mu_0 h/c)^3 R_\infty R_T^6]^{1/5} = 1.7705641\ \times\ 10^{-14}$ m
Dimensionless Rydberg constant	$\alpha = (2aR_\infty)^{1/3}$ $\qquad$ $\alpha^{-1} =\ 137.036303776$
Electron mass	$m_e = \alpha h/ac$
Electron charge	$e = m_e R_T$
Gravitostatic unit of charge	$E_0 = hc/a$
Gravitomagnetic unit of charge	$p_0 = h/a$

All of these fundamental constants were experimentally measurable and, according to WUC, could have been calculated prior to the development of Quantum Mechanics.

3. Hypersphere World–Universe Cosmology [2]

3.1 Assumptions

World–Universe Cosmology (WUC) is founded on the following primary assumptions:

1. **Hyperspherical World.** The World is a finite, boundless three-dimensional hypersphere whose four-dimensional Nucleus expands along a fourth spatial dimension at a speed equal to the gravitodynamic constant (c).
2. **Continuous Creation of Matter.** The Eternal Universe continuously generates Universe-Created Matter (UCM) within the Nucleus. Ordinary Matter is a byproduct of the self-annihilation of Universe-Created Particles (UCPs).
3. **Cosmic Medium.** The Cosmic Medium is an active agent in all physical phenomena and serves as the fundamental constituent of the World.
4. **Fundamental Parameters.** All macro- and microphysical properties of the World are governed by two fundamental parameters: the dimensionless Rydberg constant (α), later termed the fine-structure constant, and the dimensionless, time-dependent quantity (Q) (Dirac's Large Number).

3.2 Principal Features

Beginning

The World originated from a fluctuation in the Eternal Universe that gave rise to a four-dimensional Nucleus. Its initial radius was equal to the fundamental length scale $a = 1.7705645 \times 10^{-14}\ m$. The three-dimensional hypersphere constituting the World possesses neither a preferred center nor a boundary.

Expansion

The Nucleus expands along the fourth spatial dimension, increasing its radius (R) at the speed (c), while its hyperspherical surface stretches uniformly. In this framework, cosmic expansion occurs naturally and does not require dark energy.

Creation of Matter

Matter is generated through a process analogous to sublimation, in which surface formation is energetically favored. Universe-Created Matter is produced within the four-dimensional Nucleus and transported into the World by UCPs. The self-annihilation of UCPs gives rise to Ordinary Matter.

This process drives cosmic expansion, matter creation, and the arrow of time. It proceeds homogeneously throughout the hypersphere and is independent of the Cosmic Medium.

Content of the World

The World consists of the Cosmic Medium and macroobjects (MOs), with the total energy density always equal to the critical density.

Throughout cosmic evolution:

- The Cosmic Medium contributes two-thirds of the total energy density.
- Macroobjects contribute one-third.
- UCPs account for 92.8% of the total energy density.
- Ordinary particles contribute 4.8% within the Medium and 2.4% within macroobjects.

Rotational Fission

The angular momentum of macroobjects originates from the rotational fission of overspinning prime objects. During fission, part of the rotational momentum is transferred to satellites, implying that the rotational momentum of the parent object exceeds the orbital momentum of its satellites.

In WUC, the prime objects are UCM cores of superclusters. These cores accumulate substantial angular momentum before luminous structures emerge, giving rise to a prolonged Dark Epoch.

Dark Epoch

The Dark Epoch extends from 14.22 Byr to approximately 0.45 Byr ago (for the Laniakea Supercluster). During this period, only UCM macroobjects existed.

Luminous Epoch

The Luminous Epoch began approximately 13.77 Byr ago with the explosive rotational fission of overspinning supercluster cores. This process resembles a cosmic “firework” in which satellites are formed while conserving total angular momentum.

No preferred direction of rotation exists at any scale.

Macroobject Shell Model

Macroobjects consist of UCPs-based cores surrounded by shells containing both UCPs and Ordinary Matter. Weak interactions between these components provide structural stability.

UCM Reactors

The cores of macroobjects act as UCM reactors fueled by UCPs. Through self-annihilation processes, they produce all chemical elements, radiation, and matter compositions. Nucleosynthesis therefore occurs continuously throughout the evolution of macroobjects.

Formation of Cosmic Structure

Superclusters are the primary structures in the World.

Macroobjects form independently around distinct UCM cores, producing a finite and boundless “patchwork” of luminous superclusters ($\gtrsim 10^3$) that emerge at different locations and epochs. The resulting distribution

of matter is inhomogeneous, anisotropic, and non-simultaneous. Structure formation proceeds in a top-down sequence: Superclusters → Galaxies → Extrasolar Systems → Smaller Bodies.

Evolution

Structure formation remains an ongoing process. New superclusters, galaxies, and stars continue to emerge, while stellar dimensions increase with time. Meanwhile, the temperature of the Cosmic Medium asymptotically approaches absolute zero.

3.3 Predictions of WUC

WUC provides a self-consistent, time-dependent set of cosmological parameters, including:

- The gravitational parameter;
- The Hubble parameter;
- The age of the World;
- The microwave background radiation (MBR) temperature;
- The concentration of intergalactic plasma.

The interdependence of these quantities enables predictive calculations, many of which were reported between 2015 and 2018.

In particular, WUC permits the precise determination of quantities that are conventionally obtained only through measurement, such as the MBR temperature.

The discovery of a supermassive compact object at the center of the Milky Way (recognized by the 2020 Nobel Prize in Physics awarded to Reinhard Genzel and Andrea Ghez) is consistent with a key WUC prediction: *macroobjects possess dark-matter cores surrounded by shells composed of both dark and baryonic matter.*

3.4 Problems Addressed by WUC

WUC offers explanations for a number of outstanding astrophysical and cosmological problems:

- The origin of angular momentum in galaxies and extrasolar systems through rotational fission;
- The Hubble tension as a consequence of observations made across different superclusters, implying that the Hubble parameter should be derived from MBR data;
- The missing-baryon problem through the existence of intergalactic plasma;
- Fermi bubbles as clouds of UCPs emitting gamma radiation;
- The morphology of galaxies, with elliptical and spiral structures arising from rotational fission;
- Coronal heating through the UCPs-based structure of plasma;
- Internal heating of Solar System bodies through UCPs self-annihilation in their cores;
- Matter–antimatter asymmetry through the absence of antimatter production;
- The black-body spectrum of the MBR through thermodynamic equilibrium with intergalactic plasma;
- Wave–particle duality, where wavelength is interpreted as an ensemble property rather than an intrinsic property of individual particles.

3.5 Supporting Observations

Several observations are consistent with the principal concepts of WUC:

- Microwave background radiation and intergalactic plasma support the existence of the Cosmic Medium;
- The Laniakea Supercluster ($\sim 10^{17}\ M_{\odot}$), which contains the Milky Way and approximately 100,000 galaxies, exists without requiring an initial singularity;
- The orbital angular momentum of the Milky Way exceeds its rotational angular momentum;

- The high mass-to-light ratios observed in superclusters indicate the presence of substantial amounts of UCM;
- The discovery of the distant galaxy JADES-GS-z14-0, located approximately 13.5 billion light-years away, is consistent with WUC predictions that galaxies may be observed out to distances of approximately 13.8 billion light-years.

The Cosmic Medium, Universe-Created Matter, and Angular Momentum constitute the three central pillars of WUC, representing a change in the foundational assumptions of cosmology and classical physics.

4. Conclusion

Hypersphere World–Universe Cosmology is consistent with the fundamental concepts proposed for the structure and evolution of the World. The model provides a unified description of the principal cosmological parameters and their interrelationships. WUC enables the calculation of quantities that have traditionally been determined only through experiment and yields testable predictions.

In light of recent discoveries made by the James Webb Space Telescope, the results achieved by WUC, and the continuing relevance of Dirac's cosmological ideas nearly nine decades after their introduction, it may be timely to reexamine some of the foundational assumptions of astronomy, cosmology, and classical physics.

References

[1] Netchitailo, V. (2018) Hypersphere World-Universe Model. Tribute to Classical Physics. *Journal of High Energy Physics, Gravitation and Cosmology*, **4**, 441-470. doi: 10.4236/jhepgc.2018.43024.

[2] Netchitailo, V. S. (2026) Fifty-Five Years in Physics: From Classical Foundations to Modern Cosmology. A Personal Journey Through Questions, Doubts, and the Search for a Coherent World. https://ai.vixra.org/abs/2604.0105.