Pillars in Cosmology: Big Bang Model vs. World–Universe Model

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Abstract

Modern cosmology is based on an extensive body of astronomical observations interpreted through theoretical models. The expansion of the Universe, Cosmic Microwave Background Radiation (MBR), primordial abundances of light elements, and large-scale structure are commonly regarded as principal **observational pillars** of the Big Bang Model (BBM) and its modern ΛCDM formulation. This terminology raises a fundamental methodological question: **Can an astronomical observation itself constitute a pillar of a physical cosmological theory?**

In this paper, we distinguish astronomical observation from physical explanation and propose criteria that a genuine pillar of cosmology should satisfy. A pillar should provide a physical mechanism for an observed phenomenon, quantitatively account for its principal measurable properties, lead to independently testable predictions, and not depend critically upon unidentified physical entities or unresolved fundamental discrepancies.

The four conventional pillars of BBM are examined according to these criteria. Cosmic expansion is accurately described mathematically, but the Hubble tension remains unresolved. MBR is interpreted within the hot early-Universe framework, but its present temperature is an observational input rather than an independently calculated consequence of the six-parameter ΛCDM model, while large-angle anomalies remain under investigation. Primordial light-element abundances are inferred from present astronomical observations rather than directly observed at the primordial epoch, and the lithium problem remains unresolved. Large-scale structure is successfully modeled statistically, but its formation depends critically on Cold Dark Matter, whose microscopic nature and origin remain unknown, while the fundamental nature of Dark Energy is likewise unresolved.

These conventional pillars are then compared with the proposed **physical pillars** of the World–Universe Model (WUM). Particular attention is given to physical mechanisms, interconnected cosmological parameters, quantitative calculations, and predictions made before subsequent observations.

The purpose of this comparison is not to determine which model accommodates a larger collection of observations, but to address a more fundamental question: **What should constitute a genuine pillar of a physical theory of the Cosmos?**

1. Introduction

Astronomy and cosmology are inseparable but should not be regarded as identical.

Astronomy observes the Cosmos. Cosmology must physically explain it.

Astronomical observations provide measurements of redshifts, distances, radiation spectra, elemental abundances, motions of astronomical objects, distributions of matter, and numerous other properties of the Cosmos. These observations constitute the experimental foundation upon which cosmological theories must be constructed and tested.

A cosmological theory has a different task. It should identify physical mechanisms responsible for observed phenomena, establish quantitative relationships among them, calculate measurable quantities, and make predictions capable of independent observational or experimental verification.

This distinction becomes particularly important when the word **pillar** is used.

The expansion of the Universe, Cosmic Microwave Background Radiation, primordial abundances of light elements, and large-scale structure are frequently described as pillars of Big Bang Cosmology (BBC). They are unquestionably among the most important bodies of observational evidence considered in modern cosmology.

However, observational importance alone does not necessarily make a phenomenon a pillar of a **physical theory**.

We therefore begin with a definition.

2. What Is a Pillar of Cosmology?

In this paper, we propose that a **pillar of a physical cosmological theory** should satisfy the following principal requirements:

1. **Physical Explanation.**
   The theory should provide a physical mechanism or causal account of the phenomenon rather than only a mathematical description or phenomenological parameterization.
2. **Quantitative Calculation.**
   The theory should calculate the principal measurable characteristics of the phenomenon from its fundamental parameters and physical laws rather than merely introduce measured quantities as inputs.
3. **Independent Prediction.**
   Wherever possible, the theory should predict quantities or phenomena before their observational determination. Successful prior quantitative predictions provide a particularly strong test of a physical theory.
4. **Identified Physical Constituents.**
   A proposed explanation should not depend critically upon physical components whose fundamental nature remains unspecified within the theory.
5. **Absence of a Fundamental Internal Discrepancy.**
   A phenomenon presented as a pillar should not simultaneously contain a major persistent discrepancy that the theory cannot presently explain.

These requirements are intentionally stronger than the conventional meaning of an **observational pillar**.

An observation can provide powerful evidence supporting a theory even when its complete physical explanation is unknown. We do not dispute the importance of such evidence. Instead, we distinguish between two concepts:

Observational support for a cosmological model
and
A physical pillar of a cosmological theory.

This distinction provides a common standard by which both BBM and WUM can be evaluated.

3. Conventional Pillars of the Big Bang Model

3.1. Expansion of the Universe

The expansion of the Universe is one of the fundamental discoveries of observational astronomy. Measurements of distances and redshifts demonstrate a systematic cosmic expansion.

In the standard cosmological framework, this expansion is described by the Friedmann equations derived from General Relativity. They provide a mathematically successful description of the evolution of the cosmological scale factor.

A mathematical description of evolution, however, is not necessarily equivalent to identifying the underlying physical cause of the phenomenon. The Friedmann equations describe how the scale factor evolves for specified matter-energy content and initial conditions; they do not by themselves identify a deeper physical mechanism responsible for the existence and origin of cosmic expansion.

An additional difficulty is the **Hubble tension**. Values of the present expansion rate inferred from early-Universe observations within ΛCDM differ from values obtained using several late-Universe approaches. Considerable theoretical and observational effort has been devoted to this discrepancy, but no universally accepted physical resolution has yet emerged.

Consequently, expansion is an established astronomical observation and is successfully described within relativistic cosmology. Whether it qualifies as a **physical pillar** under the stronger definition adopted in this paper is a separate question.

3.2. Microwave Background Radiation

The Microwave Background Radiation (MBR) is among the most precisely characterized phenomena in observational cosmology. Its spectrum is extraordinarily close to an ideal black-body spectrum, with a present temperature

$$T_{MBR} \cong 2.7255\ K$$

In the standard cosmological interpretation, MBR consists of relic photons from an early hot and dense epoch. Before recombination, photons repeatedly interacted with charged particles. As the Universe expanded and cooled, neutral atoms formed and photons subsequently propagated through the transparent Universe while their wavelengths increased with cosmic expansion.

This framework provides a thermal history for the radiation and explains many of its observed characteristics. Nevertheless, an important distinction should be made between explaining the evolution of a radiation field and independently calculating its present temperature.

The numerical value of the present MBR temperature is observationally determined. In the standard six-parameter ΛCDM framework it is supplied as an observational quantity rather than independently derived from the six cosmological parameters. Once the present temperature is specified, its evolution with redshift follows from the standard framework.

Furthermore, several unusual features have been identified at large angular scales, including low large-scale correlations, alignments of low multipoles, hemispherical asymmetry, and the phenomenon popularly known as the **Axis of Evil**. Their statistical significance and physical interpretation continue to be investigated.

Thus, the extraordinary observational success associated with MBR should be distinguished from the question of whether every essential property of MBR is independently derived and physically explained by BBM.

3.3. Primordial Abundances of Light Elements

Big Bang Nucleosynthesis (BBN) is conventionally regarded as another major success of hot BBC.

Here again, however, observation and theoretical inference should be clearly distinguished.

Astronomers measure elemental abundances in astronomical systems that exist **today**. The abundances present during the hypothesized primordial nucleosynthesis epoch are not directly observed. Primordial values are inferred from carefully selected astrophysical environments and models describing subsequent stellar and chemical evolution.

Standard BBN calculations successfully account for important features of the inferred abundances of deuterium and helium. This agreement represents a significant quantitative achievement.

At the same time, the predicted abundance of lithium-7 does not agree satisfactorily with the abundance inferred from observations of old, metal-poor stars. This discrepancy is widely known as the **cosmological lithium problem** and remains unresolved.

The proper question is therefore not whether BBN has achieved important successes—it clearly has—but whether an observationally inferred primordial abundance containing a persistent discrepancy satisfies all the requirements of a **physical pillar** defined in Section 2.

3.4. Formation and Large-Scale Structure of the Universe

The Universe contains galaxies, galaxy groups and clusters, filaments, walls, and enormous voids. Their distribution constitutes the observed large-scale structure of the Cosmos.

ΛCDM has achieved impressive success in reproducing many statistical properties of large-scale structure. Starting from an assumed spectrum of primordial perturbations, gravitational evolution dominated by Cold Dark Matter produces a cosmic web broadly consistent with astronomical observations.

Nevertheless, this explanation depends critically upon Cold Dark Matter. Its gravitational behavior is specified by the model, but its microscopic physical identity and cosmological origin remain unknown.

Dark Energy presents a related fundamental issue. In ΛCDM it is represented by the cosmological constant and provides an economical mathematical description of accelerated expansion. Its underlying physical nature, however, remains unknown.

There is also the fundamental phenomenon of **angular momentum**. Galaxies, stellar systems, planets, and many other astronomical structures rotate. Standard structure-formation theory includes tidal torques, accretion, mergers, and nonlinear evolution as mechanisms for acquiring and redistributing angular momentum. Nevertheless, the quantitative origin and evolution of angular momentum across the hierarchy of astronomical systems remain active areas of research.

Large-scale structure therefore illustrates the distinction central to this paper particularly clearly: a model may achieve substantial phenomenological and numerical success while still depending upon fundamental physical ingredients whose nature has not been established.

4. Interim Assessment

The preceding discussion does not challenge the reality or importance of the four astronomical phenomena traditionally called pillars of Big Bang Cosmology.

Instead, it challenges the terminology.

Expansion, MBR, elemental abundances, and large-scale structure are **observations of the Cosmos**. They constitute essential empirical tests that every viable cosmological theory must confront.

But observations themselves are not physical mechanisms.

According to the definition proposed in this paper, none of the four conventional pillars unambiguously satisfies all five requirements of a physical pillar.

This leads naturally to the second part of our investigation:

Does the World–Universe Model possess pillars that satisfy these requirements?

That question must be answered using exactly the same standards applied to BBM.

5. Physical Pillars of the World–Universe Model

The World–Universe Model (WUM) should be evaluated according to exactly the same criteria applied to the Big Bang Model in the preceding sections. Its validity cannot follow from unresolved problems in BBM or from shortcomings of any other cosmological theory. WUM must stand on its own physical foundations and be judged by its internal consistency, explanatory power, quantitative results, and independently testable predictions.

We identify four principal physical pillars of WUM.

5.1. First Pillar: Physical Structure and Expansion of the World

WUM distinguishes between the **World**, which is finite and expanding, and the **Universe**, which is eternal and encompasses the World.

According to WUM, the World is a finite, boundless three-dimensional Hypersphere that is the surface of an expanding four-dimensional Nucleus. The Nucleus expands in the fourth spatial dimension with the speed of (c) that equals to a gravitodynamic constant (c).

The radius of curvature of the World is

$$R = a \times Q$$

where (a) is the basic unit of size and (Q) is the dimensionless, time-dependent quantity characterizing the evolution of the World.

The cosmological age is

$$\tau = a/c \times Q$$

and consequently

$$R = c \times \tau$$

The Hubble parameter follows directly:

$$H = c/R$$

Thus, in WUM, the radius of the World, its age, and the Hubble parameter are not independent quantities. They are interconnected consequences of the physical geometry and evolution of the World.

This constitutes an important methodological distinction. Expansion is not introduced solely as an empirical redshift–distance relation. It is incorporated into the physical construction of the World itself.

The first proposed pillar of WUM can therefore be summarized as:

The World is a finite, boundless three-dimensional Hypersphere whose radius increases in the fourth spatial dimension at the speed (c). Its radius, age, and expansion rate are physically and quantitatively interconnected.

5.2. Second Pillar: Continuous Creation of Matter

The second pillar concerns one of the most fundamental questions in cosmology:

Where does matter come from?

WUM proposes that matter creation is not confined to a unique event in the distant past. Matter is continuously created throughout the evolution of the World.

In the framework of WUM, the expanding four-dimensional Nucleus is the source of **Universe-Created Particles (UCPs)**. These particles are continuously created in the Nucleus by the Eternal Universe. They enter the World and participate in its ongoing physical evolution.

Consequently, the amount of matter in the World is not assumed to have been fixed at an initial epoch. Matter creation is an ongoing cosmological process associated with the evolution of the World itself.

UCPs are not introduced merely to reproduce gravitational effects conventionally attributed to unseen matter. They are assigned specific roles in WUM in the formation, internal structure, energy balance, and evolution of astronomical objects.

This proposed pillar therefore provides a common physical basis for phenomena that otherwise might appear unrelated.

It can be summarized as:

Matter is continuously created during the evolution of the World in the form of Universe-Created Particles, which participate in the formation and evolution of physical structures.

This hypothesis is fundamental and therefore places a strong burden on WUM: the existence and consequences of UCPs must ultimately be subjected to quantitative observational and experimental tests.

5.3. Third Pillar: Fundamental Parameters and Quantitative Cosmology

A physical cosmological theory should do more than describe observed phenomena. It should establish quantitative relationships among measurable properties of the Cosmos.

WUM is constructed around two fundamental dimensionless parameters:

- a dimensionless Rydberg constant ($\alpha = a \times R_\infty$), where (R_∞) is the Rydberg constant;
- the time-dependent dimensionless quantity (Q).

The parameter (Q) determines the cosmological evolution of the World. Through it, quantities that are normally treated as independent cosmological parameters become interconnected.

Among the Primary Cosmological Parameters considered in WUM are:

- Newtonian parameter of gravitation (G);
- Hubble parameter (H);
- age of the World (τ);
- radius of curvature (R);
- Microwave Background Radiation temperature (T_{MBR});
- concentration of intergalactic plasma;
- characteristic temperature of the Far-Infrared Background Radiation;
- minimum photon energy.

The essential claim of WUM is not merely that values can be assigned to these quantities, but that they follow from a common system of physical relationships controlled principally by (Q).

For example,

$$H = c/a \times Q^{-1}$$

while other Primary Cosmological Parameters possess their corresponding dependencies on (Q).

This interconnected structure makes quantitative prediction particularly important for evaluating WUM.

In 2013, WUM published numerical values for several cosmological quantities that the model regards as predictions or precise calculations. These included the Newtonian gravitational parameter, Hubble parameter, concentration of intergalactic plasma, minimum photon energy, and MBR temperature. Subsequent measurements can therefore be compared with the previously published values rather than with values fitted after the observations became available.

This distinction is fundamental:

agreement obtained after parameter adjustment is not logically equivalent to a successful quantitative prediction published before the corresponding observation.

The third pillar of WUM can therefore be stated as:

The principal cosmological parameters of the World form an interconnected quantitative system governed by a small number of fundamental parameters, enabling measurable quantities to be calculated and, where possible, predicted before observation.

5.4. Fourth Pillar: Formation and Evolution of Macroobjects

A cosmological theory must ultimately connect the global properties of the Cosmos with the physical formation and evolution of astronomical structures.

In WUM, Universe-Created Particles participate directly in the formation of macroobjects. The model proposes that astronomical objects can contain cores composed principally of UCPs surrounded by shells containing ordinary matter and other components.

The internal structure of these macroobjects is therefore connected to the same continuing matter-creation process that operates on cosmological scales.

This approach is intended to provide a common physical framework for the formation and evolution of structures across a broad hierarchy of scales.

An important consequence concerns **angular momentum**.

Rotation is ubiquitous in the Cosmos. Planets rotate, stars rotate, planetary systems possess orbital angular momentum, galaxies rotate, and larger structures exhibit organized motions. A complete theory of structure formation should therefore address not only how concentrations of matter form but also how their angular momentum originates and evolves.

Within WUM, angular momentum is treated as a natural consequence of the formation and evolution of macroobjects containing UCP components rather than as an isolated secondary phenomenon. Luminous Galaxies and Extrasolar Systems arise through the rotational fission of overspinning supercluster cores composed of UCPs, accompanied by UCPs self-annihilation.

Other proposed applications of the same physical framework include the internal heat and activity of gravitationally rounded objects, properties of stellar and planetary cores, and energetic phenomena associated with interactions involving UCPs.

The fourth pillar can therefore be summarized as:

The continuous creation and interaction of UCPs provide a common physical mechanism for the formation, internal structure, rotation, and evolution of macroobjects throughout the World.

6. Comparison of the Proposed Pillars

The purpose of comparing BBM and WUM is not simply to count the number of phenomena addressed by each model. The relevant question is whether the proposed pillars satisfy the physical criteria introduced in Section 2. The same criteria should be applied consistently to both models.

Criterion	Conventional BBM Pillars	Proposed WUM Pillars
Physical mechanism	Important phenomena are described within a successful relativistic framework, but several fundamental ingredients remain unexplained	WUM proposes explicit mechanisms based on hyperspherical expansion and continuous creation and interaction of UCPs
Quantitative calculation	Extensive quantitative calculations and high-precision fits to observations	Primary Cosmological Parameters are proposed to follow from interconnected relations involving (α) and (Q)
Prior prediction	The framework has made numerous successful predictions, although several quantities are observational inputs or fitted parameters	WUM emphasizes numerical results published before later measurements as a central test of the model
Physical constituents	Baryonic matter is known; the microscopic nature of Cold Dark Matter and the physical interpretation of Dark Energy remain unresolved	WUM proposes UCPs with definite rest energies and specific physical roles. Importantly, a number of independent gamma-ray observations and analyses have reported characteristic energies consistent with the rest energies of UCPs proposed in WUM. Cosmic expansion in WUM follows from the hyperspherical stretching of the World and does not require Dark Energy.
Unresolved discrepancies	Hubble tension, lithium problem, and other anomalies remain subjects of active research	WUM demonstrates that its proposed solutions remain quantitatively consistent across independent observations. Further independent observational and experimental tests provide continuing tests of the model.

The comparison of physical constituents deserves particular attention.

Observational Evidence for Universe-Created Particles

An important feature of WUM is that Universe-Created Particles (UCPs) are not introduced merely as unspecified invisible matter required to reproduce gravitational effects. Instead, WUM proposes particles with definite rest energies and specific physical roles. Their predicted properties can therefore be compared quantitatively with independent astronomical observations.

For the purposes of the present paper, we consider four representative Universe-Created Fermions—UCF1, UCF2, UCF3, and UCF4—which span an energy range from TeV to eV, together with Universe-Created Bosons – XIONs at much lower energies(μeV).

Particle	Rest Energy	Observational Connection Discussed in WUM
UCF1	1.315 TeV	Very-high-energy gamma radiation, including the high-energy emission associated with the Fermi Bubbles
UCF2	9.596 GeV	Gamma-ray excesses associated with the Galactic Center and Fermi Bubbles; independently inferred dark-matter particle masses of approximately 10–11 GeV, including observations of the Andromeda galaxy (M31)
UCF3	3.729 keV	X-ray emission associated in WUM with UCP-containing structures, including the Fermi Bubbles and Solar Corona
UCF4	0.1986 eV	Unidentified Infrared Discrete Emission Bands with peaks at 3.3, 6.2, 7.7, 8.6, 11.2, and 12.7 μm

The UCF2 case provides a particularly direct quantitative comparison. Gamma-ray excesses associated with the Galactic Center and the Fermi Bubbles have been interpreted in terms of annihilating dark-matter particles with masses of approximately 10 GeV [1, 2], while an analysis of the Andromeda galaxy (M31) yielded a best-fitting dark-matter particle mass of approximately 11 GeV [3]. These independently inferred values are consistent with the rest energy predicted for UCF2 in WUM.

$$E_{UCF2} = 9.5959823\ GeV$$

At higher energies, WUM proposes UCF1 with rest energy

$$E_{UCF1} = 1.3149950\ TeV$$

WUM associates annihilation of UCF1 with very-high-energy gamma radiation and, together with UCF2, with the high-energy emission of the Fermi Bubbles.

At substantially lower energies, WUM proposes UCF3 with rest energy

$$E_{UCF3} = 3.7289402\ keV$$

WUM associates UCF3 annihilation with X-ray emission from UCP-containing structures, including the Fermi Bubbles and the Solar Corona.

WUM also proposes UCF4, previously referred to as DIONs, with rest energy

$$E_{UCF4} = 0.19857111\ eV$$

Unidentified Infrared Discrete Emission Bands

WUM associates UCF4 annihilation with the Unidentified Infrared Discrete Emission Bands (UIBs), whose principal peaks occur at wavelengths of 3.3, 6.2, 7.7, 8.6, 11.2, and 12.7 μm. The corresponding photon energies are approximately 0.376, 0.200, 0.161, 0.144, 0.111, and 0.098 eV, respectively. These bands are observed in the Interstellar Medium (ISM) of both nearby and distant galaxies and may be regarded as characteristic infrared "fingerprints" of galaxies.

The UIB phenomenon has been studied for approximately 50 years. The prevailing interpretation attributes these emission bands to polycyclic aromatic hydrocarbon (PAH) molecules, which are thought to constitute an important form of carbonaceous material in space. However, despite extensive study, the precise carriers responsible for the astronomical UIB spectrum remain a subject of investigation.

In the article *Unidentified Infrared Discrete Emission Bands* [4], we proposed an alternative explanation based on the self-annihilation of DIONs and biDIONs—bound pairs of DIONs—with characteristic energies near 0.38 eV, depending on their binding energy. Within WUM, the observed sequence of infrared emission bands is therefore interpreted as a consequence of the properties and annihilation processes of these particles. To the best of our knowledge, WUM provides a distinctive particle-based cosmological interpretation of the UIB phenomenon.

Fundamental 21-cm Radio Spectral Line

In 2005, R. Minchin *et al.* reported the system VIRGOHI 21 in association with NGC 4254, characterized by 21-cm emission with a broad line width [5]. The neutral-hydrogen 21-cm line is a fundamental radio spectral line at a frequency of approximately 1420.4 MHz, corresponding to a wavelength of about 21.1 cm and a photon energy of 5.87 μeV. In the conventional interpretation, it arises from the hyperfine spin-flip transition in ground-state neutral hydrogen, in which the relative orientations of the electron and proton spins change. The spontaneous transition probability for an individual hydrogen atom is **extremely small**, corresponding to a characteristic lifetime of roughly 10 million years.

WUM proposes another class of UCPs, called XIONs, with rest energy

$$E_{XION} = 5.2870895\ \mu eV$$

Within WUM, the 21-cm emission and broad line width observed in VIRGOHI 21 are interpreted as arising from the self-annihilation of ultra-relativistic XIONs that constitute the dark component of VIRGOHI 21.

The significance of these examples lies not in any single energy correspondence, but in the broader WUM prediction of a **multicomponent spectrum of seven UCP species with predetermined characteristic rest energies**. In WUM, these rest energies are determined by the constant (α) and a basic energy unit according to the relations

$$E_{UCP} = \alpha^n \times E_0$$

The basic energy unit is

$$E_0 = 70.025252\ MeV$$

and the relevant integer parameter assumes the discrete values specified by WUM:

$$\text{from } n = -2 \text{ to } n = 6$$

The complete UCP spectrum spans approximately **18 orders of magnitude in rest energy**. The representative particles discussed here occupy widely separated regions of this spectrum, ranging from very-low-energy radio phenomena through infrared and X-ray emission to GeV–TeV gamma radiation:

$$E_{UCF1} = \alpha^{-2} \times E_0 = 1.315\ TeV$$

$$E_{UCF2} = \alpha^{-1} \times E_0 = 9.596\ GeV$$

$$E_{UCF3} = \alpha^{2} \times E_0 = 3.729\ keV$$

$$E_{UCF4} = \alpha^{4} \times E_0 = 0.1986\ eV$$

$$E_{XION} = 1/2\,\alpha^{6} \times E_0 = 5.287\ \mu eV$$

WUM regards the correspondence between these predetermined UCP rest energies and independently observed astronomical phenomena—including high-energy gamma-ray emission, X-ray emission, unidentified infrared bands, and the 21-cm radio line—as **observational evidence supporting the physical existence of UCPs**.

Among the examples considered here, UCF2 provides a particularly direct quantitative comparison because independent analyses of gamma-ray observations have inferred dark-matter particle masses close to the WUM value. UCF4 provides a second distinctive comparison through the correspondence between its predicted energy scale and the observed UIB spectrum. The UCF1, UCF3, and XION cases extend the comparison across widely separated energy domains, from TeV gamma rays and keV X-rays to radio-frequency emission.

Thus, UCPs constitute a quantitatively testable component of WUM. Their predetermined rest energies identify specific energy scales at which their observational consequences can be sought. The underlying logic may be summarized as

$$UCP\ with\ Predetermined\ Rest\ Energy \rightarrow Characteristic\ High - Energy\ Radiation \\ \rightarrow Independent\ Astronomicsl\ Observation$$

A comprehensive analysis of all UCP species and their associated astronomical observations lies beyond the scope of the present paper. Interested readers are referred to the published article **"Dark Matter Cosmology and Astrophysics"** [6] for a detailed discussion of UCP properties, their astrophysical roles, and the corresponding observational evidence.

7. Quantitative Predictions as a Test of WUM Pillars

The quantitative prediction record of WUM has been examined in detail in the author's paper *"Quantitative Predictions of the World–Universe Model Confirmed by Subsequent Observations"* [7]. The present paper does not repeat that analysis. Instead, we summarize its principal results because they provide an essential test of the definition of a **physical pillar** proposed here.

In 2013, WUM presented an interconnected set of Primary Cosmological Parameters and published numerical values for several quantities that could subsequently be compared with independent observations and measurements. These included the Newtonian parameter of gravitation, Hubble parameter, concentration of intergalactic plasma, and minimum photon energy. WUM also calculated values for the

Microwave Background Radiation temperature and the characteristic temperature of the Far-Infrared Background Radiation—quantities whose numerical values had previously been determined observationally.

The distinction between these two categories is important:

Predictions are numerical results published before the corresponding observational or experimental determination.

Calculations of previously measured quantities demonstrate the quantitative structure of the model but should not be described as prior predictions.

A concise summary of the WUM results is presented in Table 1.

Table 1. Selected Quantitative Results of WUM

Parameter	WUM result (2013)	Measured	Year	Ref
Gravitational	$6.67420 \times 10^{-11} m^3 kg^{-1} s^{-2}$	$6.674184 \times 10^{-11} m^3 kg^{-1} s^{-2}$	2018	[8]
Hubble	$68.733\ km\ s^{-1} Mpc^{-1}$	$68.7 \pm 1.3\ km\ s^{-1} Mpc^{-1}$	2021	[9]
Intergalactic Plasma Concentration	4.8 % of overall matter	4.9 ± 1.3 %	2016	[10]
Minimum Photon Energy	$1.87433 \times 10^{-14}\ eV$	$\lesssim\ 2.2 \times 10^{-14}\ eV$	2017	[11]
MBR Temperature	$2.725245\ K$	$2.72548 \pm 0.00057\ K$	2009	[12]
FIRB Temperature Peak	$28.955\ K$	$29\ K$	1998	[13]

The significance of Table 1 for the present discussion is methodological rather than merely numerical. WUM proposes that apparently different cosmological quantities belong to a single interconnected physical system governed by a small number of fundamental parameters.

Consequently, the principal test of the proposed WUM pillars is not whether they provide an appealing qualitative picture of the Cosmos. It is whether their quantitative consequences agree with independent measurements.

This leads to the central criterion adopted in this paper:

$$Physical\ Principal\ \rightarrow Quantative\ Calculation\ or\ Prediction\ \rightarrow Independent\ Test$$

The previously published prediction record provides a direct means of applying this criterion to WUM.

8. Discussion

The comparison presented in this paper reveals two different meanings of the word **pillar**.

In observational cosmology, a pillar commonly denotes a major body of empirical evidence supporting a cosmological framework.

In the stronger physical sense proposed here, a pillar is a fundamental physical principle that explains phenomena, establishes quantitative relationships, and produces independently testable consequences.

Under the first definition, expansion, MBR, light-element abundances, and large-scale structure are legitimately described as observational pillars supporting the standard cosmological framework.

Under the second definition, their status is less straightforward because unresolved physical ingredients and discrepancies remain.

WUM approaches the concept from the opposite direction. Its proposed pillars begin with physical hypotheses: the hyperspherical structure of the World, continuous creation of matter, interconnected Primary Cosmological Parameters, and a common mechanism for macroobject formation and evolution.

But this creates an equally demanding challenge for WUM.

A physical hypothesis is not a physical pillar merely because it provides an explanation.

It becomes a pillar only when its quantitative consequences survive independent observational and experimental tests.

9. Conclusion

Astronomy provides observations of the Cosmos. Cosmology must transform those observations into a coherent physical understanding.

The phenomena conventionally called the four pillars of Big Bang cosmology—expansion, Microwave Background Radiation, primordial light-element abundances, and large-scale structure—constitute major bodies of astronomical evidence. The standard cosmological framework has achieved substantial quantitative success in connecting these observations.

Nevertheless, if a **physical pillar** is required to provide an underlying mechanism, quantitative derivation, independently testable prediction, identified physical constituents, and freedom from a fundamental unresolved discrepancy, the conventional observational pillars do not automatically satisfy this stronger definition.

WUM proposes a different set of physical foundations:

1. the hyperspherical structure and continuous expansion of the World;
2. continuous creation of matter in the form of Universe-Created Particles;
3. an interconnected system of Primary Cosmological Parameters governed by fundamental parameters;
4. a common physical framework for the formation and evolution of macroobjects.

These proposals should not be accepted merely because they offer physical explanations. Their validity must be established quantitatively.

We therefore propose that the ultimate pillars of any physical cosmological theory should be constructed upon the sequence

$$Physical\ Explanation\ \rightarrow Quantative\ Prediction\ \rightarrow Independent\ Experimental\ or\ Observational\ Confirmation$$

A cosmological model that repeatedly completes this sequence transforms astronomical observations from empirical facts into physically understood phenomena.

That, we propose, is what a **pillar in cosmology** should mean.

The strength of a cosmological theory should not be measured by the number of observations it can accommodate, but by its ability to transform observations into physically explained, quantitatively predicted, and independently confirmed phenomena.

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