

20 Years in Cosmology

Vladimir S. Netchitailo

netchitailov@gmail.com

Abstract

Hypersphere World-Universe Model (WUM) solves a number of physical problems in contemporary Cosmology and Astrophysics through Dark Matter Particles (DMPs) and their interactions: **Angular Momentum problem** in birth and subsequent evolution of Galaxies and Extrasolar systems – how do they obtain it; **Hubble Tension** – disagreement in the values of Hubble’s constant obtained by various teams; **Fermi Bubbles** – two large structures in gamma-rays and X-rays above and below Galactic Centre; **Coronal Heating problem** in solar physics – temperature of Sun's corona exceeding that of photosphere by millions of degrees; **Cores of Sun and Earth** rotating faster than their surfaces; **Diversity of Gravitationally-Rounded Objects** in Solar system and their **Internal Heat**; **Lightning Initiation problem** – electric fields observed inside thunderstorms are not sufficient to initiate sparks; **Terrestrial Gamma-Ray Flashes** – bursts of high energy X-rays and gamma rays emanating from the Earth. The Model solves **Missing Baryon problem** related to the fact that the observed amount of baryonic matter did not match theoretical predictions. WUM reveals **Inter-Connectivity** of Primary Cosmological Parameters and calculates their values, which are in good agreement with the latest results of their measurements. In 2013, Model predicted the values of the following Cosmological parameters: Gravitational, Hubble’s, Concentration of Intergalactic plasma, and the Minimum energy of photons, which were experimentally confirmed in 2015 – 2021. The Nobel Prize in Physics 2020 “*The Discovery of a Supermassive Compact Object at the Centre of Our Galaxy*” confirmed one of the most important predictions of WUM: “*Macroobjects of the World have cores made up of the discussed DM particles. Other particles, including DM and baryonic matter, form shells surrounding the cores*”. Hypersphere World-Universe Model is, in fact, a Paradigm Shift in Cosmology. According to WUM, Superclusters are the principal objects of the World. Macroobjects form from the top (Superclusters) down to Galaxies and Extrasolar systems in parallel around different Cores made up of different DMPs. Formation of galaxies and stars is not a process that concluded ages ago; instead, it is ongoing.

1. Introduction

I am a Doctor of Sciences in Physics. I belong to the school of physicists established by Alexander Prokhorov–Nobel Prize Laureate in Physics. I am a Laser Physicist by education, having published over 150 papers. About 20 years ago, I developed an interest in Cosmology. I have been elaborating a model I dubbed [World-Universe Model](#) (WUM) for 11 years, and then in 2013, I uploaded my first papers on viXra and later published a series of articles in [Journal of High Energy Physics, Gravitation and Cosmology](#). A paper [New Cosmology – Third Revolution in Physics](#) is a synthesis of my approach to Cosmology. An article [Paradigm Shift in Cosmology](#) is an essence of my view of the World.

In my opinion, there is a principal difference between Physics and Mathematics. I am convinced that Physics cannot exist without Mathematics, but Mathematics must not replace Physics. It is exactly what has happened for the last 100 years. Between 1907 and 1912, Albert Einstein wrote: “*Since the mathematicians have invaded the theory of relativity, I do not understand it myself anymore*”.

I absolutely agree with John von Neumann who said: “ *The sciences do not try to explain, they hardly even try to interpret, they mainly make models. By a model is meant a mathematical construct, which, with addition of certain verbal interpretations describes observed phenomena. The justification of such a mathematical construct is solely and precisely that it is expected to work*”.

WUM is proposed as an alternative to the prevailing Big Bang Model (BBM) of Standard Cosmology that relies on General Relativity. In frames of BBM, the Beginning of the Universe is connected with **Initial Singularity (infinite energy density)** and **Cosmological Inflation**, which is a theory of an extremely rapid exponential expansion of space (with practically **infinite speed**) in the early universe up to 93 billion light-years in diameter of the observable universe. The size of the whole universe is unknown, and it might be infinite in extent.

The Initial Singularity is a gravitational singularity predicted by General Relativity to have existed before the Big Bang and thought to have contained all the energy and spacetime of the Universe. From a physical point of view, existence of a mathematical singularity is a drawback of any theory. It means that the theoretical model did not consider some significant physical phenomenon, which prevents an occurrence of the singularity.

In our view, there is no way to prevent an occurrence of the initial singularity in BBM. The World must have gotten started in a principally different way – a Fluctuation in the Eternal Universe with a **finite size and energy density**. The size of this Fluctuation can increase with a **finite speed**. Then, there is no need to introduce the cosmological inflation. However, a question about the mechanism of Continuous Creation of Matter in the World arises.

F. Hoyle and J. V. Narlikar in 1964 offered an explanation for the appearance of the new matter by postulating the existence of what they dubbed the "Creation field", or just the "C-field". P. Dirac in 1974 discussed a continuous creation of matter by an additive mechanism (uniformly throughout space) and a multiplicative mechanism (proportional to the amount of the existing matter).

WUM follows the idea of the continuous creation of matter by the additive mechanism, albeit introducing a different mechanism of matter creation. The Mechanism of continuous creation of matter was the main issue of WUM during its development for 20 years.

There were a few principal steps in the development of WUM:

- In **2013**: 3D World is a Black Hole. Residing inside of a black hole, we can conduct no observations of the outside Universe, and learn nothing about its characteristics. The World is expanding in the Universe without limit with the speed equal to the gravitodynamic constant c . The Universe serves as an unlimited source of energy that the World is consuming as it grows. Predicted values of cosmological parameters: Gravitational, Hubble's, Concentration of Intergalactic plasma, and Minimum energy of photons were confirmed experimentally in 2015 – 2021. The Nobel Prize in Physics 2020 “*The Discovery of a Supermassive Compact Object at the Centre of Our Galaxy*” confirmed one of the most important predictions of WUM: “*Macroobjects of the World have cores made up of the discussed DM particles. Other particles, including DM and baryonic matter, form shells surrounding the cores*” [1], [2], [17], [18], [24], [25].
- In **2015**: 5D Model is aligned with the theoretical framework developed by P. S. Wesson, albeit assigning a new physical meaning to the fifth coordinate. It is associated with the total energy of the Medium of the World [3]-[6].

- In **2016-2018**: The finite 3D World is a Hypersphere that is the surface of a 4D Nucleus. All points of the hypersphere are equivalent; there are no preferred centers or boundary of the World. In 1854, G. Riemann proposed a hypersphere as a model of a finite universe. WUM follows this idea, albeit proposing that the World is expanding and filled with the Medium of the World consisting of stable elementary particles. The surface of the hypersphere is created continuously in a process analogous to sublimation. The creation of matter is happening homogeneously in all points of the hypersphere World and is a direct consequence of expansion [7]-[12].
- In **2019-2020**: To be consistent with the Law of Conservation of Angular Momentum, the Model developed a New Physics of the World [13]-[16], [19], [20]:
 - Principal objects of the World are overspinning Dark Matter (DM) Cores of Superclusters, which were created during Dark Epoch. It started at the Beginning of the World and lasted for about 0.45 billion years;
 - Luminous Epoch spans from 0.45 billion years up to the present Epoch (during 13.77 billion years). The transition from Dark Epoch to Luminous Epoch was the result of the Rotational Fission of DM Cores of Superclusters and self-annihilation of Dark Matter Particles (DMPs);
 - Luminous Matter is a byproduct of DMPs self- annihilation.
- In **2021**: The synthesis of my approach to Cosmology and the essence of my view of the World are formulated in papers [21]-[25].

Below, I would like to share with you some Original Ideas, which I proposed and developed in 20 years of my scientific life in Cosmology.

2. Black Hole World-Universe Model

WUM is based on three primary assumptions:

- The World is finite and is expanding inside the Universe with speed equal to the gravitodynamic constant c . The Universe serves as an unlimited source of energy that continuously enters into the World from the boundary;
- Medium of the World, consisting of protons, electrons, photons, neutrinos, and DMPs, is an active agent in all physical phenomena in the World;
- Two fundamental parameters in various rational exponents define all macro- and micro- features of the World: Fine-Structure constant α , and dimensionless quantity Q . While α is constant, Q increases with time, and is, in fact, a measure of the Size and the Age of the World.

In 2013, WUM revealed a self-consistent set of time-varying values of Primary Cosmological Parameters of the World: Gravitation parameter, Hubble's parameter, Age of the World, Temperature of Microwave Background Radiation, and concentration of Intergalactic plasma. Based on the inter-connectivity of these parameters, WUM solved the Missing Baryon problem and predicted the values of the following Cosmological parameters: gravitation, Hubble's, concentration of Intergalactic plasma, and the minimum energy of photons, which were experimentally confirmed in 2015 – 2021. *"The Discovery of a Supermassive Compact Object at the Centre of Our Galaxy"* (Nobel Prize in Physics 2020) made by R. Genzel and A. Ghez confirms one of the most important predictions of WUM in 2013: *"Macroobjects of the World have cores made up of the discussed DM particles. Other particles, including DM and baryonic matter, form shells surrounding the cores"*.

Based on the Inter-connectivity of Primary Cosmological Parameters, WUM explains experimental data accumulated in the field of Cosmology over the last decades: the Age of the World; Critical energy density; Temperatures of the Cosmic microwave background radiation and Peak of the Far-infrared radiation of cosmic dust; Hubble’s parameter and Maximum stellar mass. Additionally, the Model explains “Pioneer Anomaly”; resolves paradoxes like “Matter – Antimatter Asymmetry” and “Faint Young Sun”. WUM makes predictions pertaining to rest energies of DMPs and neutrinos; proposes new types of particle interactions (Super Weak and Extremely Weak). The Model suggests introducing a new fundamental parameter Q in the CODATA internationally recommended values for calculating time-varying parameters of the World.

3. 5D World-Universe Model

5D Space-Time-Energy World–Universe Model is a unified model of the World built around the concept of the Medium. WUM utilizes the following principles:

- **Time-varying gravitational parameter.** This hypothesis was proposed by P. Dirac in 1937.
- **Continuous creation of matter.** F. Hoyle and J. V. Narlikar in 1964 offered an explanation for the appearance of new matter by postulating the existence of what they dubbed the “creation field”. P. Dirac in 1974 discussed continuous creation of matter by additive/multiplicative mechanisms.
- **The World is a 3-sphere** that is a surface of a 4-ball Nucleus of the World. The 4-ball is expanding in the fourth spatial dimension of the Nucleus and its surface, the 3-sphere, is likewise expanding. The total surface energy of the 4-ball is increasing as it expands, thus creating new matter in the 3-sphere World.
- **Supremacy of matter** was postulated by Albert Einstein: “*When forced to summarize the theory of relativity in one sentence: time and space and gravitation have no separate existence from matter*”.
- **The World consists** of the Medium (protons, electrons, photons, neutrinos, and DMPs) and Macroobjects (Superclusters, Galaxies, Extrasolar systems) made of these particles.
- **Mach’s principle.** A very general statement of Mach’s principle is: “*Local physical laws are determined by the large-scale structure of the universe*”.
- **Fifth dimension.** In 1983, P. S. Wesson suggested that a fifth dimension might be associated with rest mass via $x^4 = Gm/c^2 \propto t$.

5D WUM aligns with the theoretical framework developed by P. S. Wesson, albeit assigning a new physical meaning to the fifth coordinate. In WUM, the fifth dimension is associated with the total energy of the Medium of the World, and the gravitomagnetic parameter of the Medium that serves as the dimension-transposing parameter.

J. M. Overduin and P. S. Wesson postulated that “*Metrics which do not depend on $4x$ can give rise only to induced matter composed of **massless** photons; while those which depend on $4x$ give back equations of state for fluids composed of massive particles*”. WUM supplies the fluid that they have predicted: it is, in fact, the Medium of the World.

According to WUM, an empty space does not exist; instead, the World is filled with the Medium that consists of massive particles. The inter-galactic voids discussed by astronomers are, in fact, examples

of the Medium in its purest. Consequently, the Medium of the World as described by WUM can serve as further evidence in favor of the fifth-dimensional view of the World.

4. Hypersphere World-Universe Model

Hypersphere WUM is based on the following Principal Points:

- The World was started by a Fluctuation in the Eternal Universe, and the Nucleus of the World, which is a four dimensional 4-ball, was born.
- The 3D World is the Hypersphere that is the surface of a 4-ball Nucleus. Hence, the World is curved in the fourth spatial dimension of the Nucleus.
- The 4-ball is expanding in the Eternal Universe, and its surface, the hypersphere, is likewise expanding so that the radius of the 4-ball R is increasing with speed c that is the gravitodynamic constant.
- The World consists of the Medium and Macroobjects. The Medium consists of stable elementary particles with lifetimes longer than the Age of the World: protons, electrons, photons, neutrinos, and DMPs. The Medium is not Aether; it is a mixture of elementary particles. The energy density of the Medium is $2/3$ of the total energy density in all cosmological times.
- Superclusters, Galaxies, and Extrasolar systems are made of these particles. The energy density of Macroobjects is $1/3$ of the total energy density in all cosmological times. There are no empty space and dark energy in WUM.
- Time, Space and Gravitation are emergent phenomena and have no separate existence from Matter. In WUM, they are closely connected with the Impedance (wave resistance), the Gravitomagnetic parameter, and Energy density of the Medium, respectively.
- Two Fundamental parameters in various rational exponents define all macro- and micro-features of the World: Fine-structure constant α and dimensionless Quantity Q . While α is constant, Q increases in time, and is in fact a measure of the Worlds' curvature in the fourth spatial dimension of the Nucleus.
- WUM holds that there exist relations between all Q -dependent parameters: Newtonian parameter of gravitation and Hubble's parameter; Critical energy density and Fermi coupling parameter; Temperatures of the Microwave Background Radiation and Peak of Far-Infrared Background Radiation. The calculated values of these parameters are in good agreement with the latest results of their measurements.
- The black-body spectrum of a cosmic Microwave Background Radiation is due to thermodynamic equilibrium of photons with low density Intergalactic plasma.
- DM consists of 5 different particles: Neutralinos, WIMPs, DIRACs, ELOPs, and sterile neutrinos, and has the relative energy density of about 24%.
- All Macroobjects of the World (superclusters, galaxies, and extrasolar systems) possess the following properties: their Cores are made up of DMPs; they contain other particles, including DM and baryonic matter, in shells surrounding the Cores. Self-annihilation of DMPs can give rise to any combination of gamma-ray lines.
- Nucleosynthesis of all elements occurs inside stars during their evolution. Stellar nucleosynthesis theory should be enhanced to account for self-annihilation of heavy DMPs (WIMPs, Neutralinos) inside of the Stars' Cores.

- Macroobjects form from top (superclusters) down to galaxies and extrasolar systems in parallel around different Cores made of different DMPs. Formation of galaxies and stars is not a process that concluded ages ago; instead, it is ongoing.
- Assuming an Eternal Universe, the numbers of cosmological structures on all levels will increase – new superclusters will form; existing superclusters will obtain new galaxies; new stars will be born inside existing galaxies; sizes of individual stars will increase, etc. The temperature of the Medium of the World will asymptotically approach absolute zero.

5. Hypersphere World-Universe Model. New Physics

The angular momentum problem is one of the most critical problems in BBM. Standard Cosmology cannot explain how Galaxies and Extra Solar systems obtained their substantial orbital and rotational angular momenta, and why the orbital momentum of Jupiter is considerably larger than the rotational momentum of the Sun. WUM is the only cosmological model in existence that is consistent with the Law of Conservation of Angular Momentum. To be consistent with this Fundamental Law, WUM discusses in detail the Beginning of the World. The Model introduces Dark Epoch (spanning from the Beginning of the World for 0.45 billion years) when only DM Macroobjects existed, and Luminous Epoch (ever since for 13.77 billion years).

WUM solves a number of physical problems in Standard Cosmology and Astrophysics through DMPs and their interactions: Angular Momentum problem in birth and subsequent evolution of Galaxies and Extrasolar systems; Fermi Bubbles—two large structures in gamma-rays and X-rays above and below Galactic center; Coronal Heating problem in solar physics—temperature of Sun’s corona exceeding that of photosphere by millions of degrees; Cores of Sun and Earth rotating faster than their surfaces; Diversity of Gravitationally-Rounded objects in Solar system and their Internal Heating. Model makes predictions pertaining to rest energies of DMPs, proposes new type of their interactions. WUM reveals Inter-Connectivity of Primary Cosmological Parameters and calculates their values, which are in good agreement with the latest results of their measurements.

The main ideas of WUM are as follows:

- The Finite World is a 3D Hypersphere of the 4D Nucleus of the World, which is 4D ball expanding in the fourth spatial dimension of the Nucleus. All points of the Hypersphere are equivalent; there are no preferred centers or boundaries of the World;
- The Universe is responsible for the creation of DM in the 4D Nucleus of the World. DMPs carry new DM into the World. Luminous Matter is a byproduct of DMPs self-annihilation. DM plays a central role in creation and evolution of all Macroobjects;
- WUM introduces Dark Epoch (spanning from the Beginning of the World for 0.45 billion years) and Luminous Epoch (ever since, 13.77 billion years). Transition from Dark Epoch to Luminous Epoch is due to Rotational Fission of Overspinning DM Supercluster’s Cores and self-annihilation of DMPs;
- The Medium of the World, consisting of protons, electrons, photons, neutrinos, and DMPs, is an active agent in all physical phenomena in the World. Time, Space and Gravitation are closely connected with the Impedance, Gravitomagnetic parameter, and Energy density of the Medium, respectively. It follows that neither Time, Space nor Gravitation could be discussed in absence of the Medium. WUM confirms the Supremacy of Matter postulated by Albert Einstein: “*When*

forced to summarize the theory of relativity in one sentence: time and space and gravitation have no separate existence from matter”;

- Macroobjects of the World possess the following properties: their Cores are made up of DMPs; they contain other particles, including DMPs and Ordinary Particles, in shells surrounding the Cores. Macroobjects’ cores are essentially **Dark Matter Reactors** fueled by DMPs. All chemical elements, compositions, substances, rocks, etc. are produced by Macroobjects themselves as the result of DMPs self-annihilation;
- WUM is the only cosmological model in existence that is consistent with the Fundamental Law of Conservation of Angular Momentum;
- WUM revealed the Inter-Connectivity of all Primary Cosmological Parameters;
- Fermi Bubbles are DMPs’ clouds containing uniformly distributed Dark Matter Objects, in which DMPs self-annihilate and radiate X-rays and gamma rays;
- WUM is based on two parameters only: dimensionless Rydberg constant α (later named Fine-structure constant) and time-varying Quantity Q that is, in fact, the Dirac Large Number and a measure of the Worlds’ curvature in the fourth spatial dimension and the Age of the World.

6. New Cosmology – Third Revolution in Physics

Dirac’s themes were the unity and beauty of Nature. He identified three revolutions in modern physics – Relativity, Quantum Mechanics and Cosmology. In his opinion: *“The new cosmology will probably turn out to be philosophically even more revolutionary than relativity or the quantum theory, perhaps looking forward to the current bonanza in cosmology, where precise observations on some of the most distant objects in the universe are shedding light on the nature of reality, on the nature of matter and on the most advanced quantum theories”*. In 1937, P. Dirac proposed: the Large Number Hypothesis and the Hypothesis of the variable gravitational “constant”; and later added the notion of continuous creation of Matter in the World. The developed Hypersphere WUM follows these ideas, albeit introducing a different mechanism of matter creation.

WUM is based on the following Primary Points:

- **The Beginning.** The World was started by a fluctuation in the Eternal Universe, and the Nucleus of the World, which is a 4D ball, was born. An extrapolated Nucleus radius at the Beginning was equal to the basic unit of size a . The World is a finite 3D Hypersphere that is the surface of the 4D Nucleus. All points of the Hypersphere are equivalent; there are no preferred centers or boundaries of the World. The extrapolated energy density of the World at the Beginning was four orders of magnitude smaller than the nuclear energy density.
- **Expansion.** The 4D Nucleus is expanding along the fourth spatial dimension of the Nucleus and its surface, the 3D Hypersphere, is likewise expanding so that the radius of the Nucleus is increasing with speed c that is the gravitodynamic constant.
- **Creation of Matter.** The surface of the Nucleus is created in a process analogous to sublimation. DM is created by the Universe in the 4D Nucleus of the World. DMPs carry new DM into the 3D Hypersphere World. Ordinary Matter is a byproduct of DMPs self-annihilation. Consequently, the Matter-Antimatter asymmetry problem discussed in literature does not arise. Creation of Matter is a direct consequence of expansion.

- **Content of the World.** The World consists of the Medium and Macroobjects. Total energy density of the World equals to the critical energy density throughout the World's evolution. The energy density of the Medium is 2/3 of the total energy density and Macroobjects (Superclusters, Galaxies, and Extrasolar systems)– 1/3 in all cosmological times. The relative energy density of Dark Matter Fermion (DMF) particles DMF4 is about 68.8%, self-annihilating DMPs (DMF1, DMF2, DMF3, DIRACs, and ELOPs) – about 24%, and Ordinary Particles (protons, electrons, photons, and neutrinos) – about 7.2% .
- **Two Fundamental Parameters** in various rational exponents define all micro- and macro-features of the World: dimensionless Rydberg constant α and time-varying Quantity Q . The World's energy density is proportional to Q^{-1} in all cosmological times. Particles relative energy densities are proportional to $\alpha \cdot Q$ in the present epoch equals to: $Q = 0.759972 \times 10^{40}$.
- **Supremacy of Matter.** Time, Space and Gravitation have no separate existence from Matter. They are closely connected with the Impedance, Gravitomagnetic parameter, and Energy density of the Medium, respectively.
- **Inter-Connectivity of Primary Cosmological Parameters.** WUM reveals the Inter-Connectivity of them and calculates their values, which are in good agreement with the latest results of their measurements.
- WUM introduces **Dark Epoch** (spanning from the Beginning of the World for 0.45 billion years) and **Luminous Epoch** (ever since, 13.77 billion years). Transition from Dark Epoch to Luminous Epoch is due to the **Rotational Fission** of Overspinning DM Supercluster's Cores and self-annihilation of DMPs.
- **Macroobjects Shell Model.** Macroobjects of the World possess the following properties: their Cores are made up of DMPs; they contain other particles, including DMPs and Ordinary Particles, in shells surrounding the Cores. Introduced **Weak Interaction** between DMPs provides integrity of all shells. Self-annihilation of DMPs can give rise to any combination of gamma- and X-ray lines.
- **Macroobjects Formation and Evolution.** Macroobjects form from superclusters down to galaxies and extrasolar systems in parallel around different Cores made up of different DMPs. Formation of galaxies and stars is not a process that concluded ages ago; instead, it is ongoing. Assuming an Eternal Universe, the numbers of cosmological structures on all levels will increase – new superclusters will form; existing clusters will obtain new galaxies; new stars will be born inside existing galaxies; sizes of individual stars will increase, etc. The temperature of the Medium will asymptotically approach absolute zero.
- **Nucleosynthesis** of all elements occurs inside of Macroobjects during their evolution. Stellar nucleosynthesis theory should be enhanced to account for the self-annihilation of DMPs inside of Stars.
- **Black-body spectrum of the Cosmic Microwave Background Radiation** is due to thermodynamic equilibrium of photons with Intergalactic plasma.
- **Milky Way Galaxy** is a Disk Bubble whose boundary with Intergalactic Medium has a surface energy density σ_0 (a basic surface energy density σ_0 equals to: $\sigma_0 = hc/a^3$, where h is Planck constant). The Disk Bubble contains Intragalactic Medium and (100 – 400) billion Stars.
- **Dark Matter Fermi Bubbles** are stable clouds of DMPs containing uniformly distributed Dark Matter Objects, in which DMPs self-annihilate and radiate X-rays and gamma rays. Proposed **Weak interaction** between particles DMF3 (3.7 keV) provides integrity of Fermi Bubbles.

- **Extrasolar systems.** The boundary between Extrasolar systems and Intragalactic Medium has a surface energy density σ_0 . This bubble-like region of space, which surrounds the Sun, is named Heliosphere that is continuously inflated by Solar jets, known as the Solar wind.
- **Solar system.** A detailed analysis of the Solar system shows that the overspinning DM Core of the Sun can give birth to DM planetary cores, and they can generate DM cores of moons through the Rotational Fission mechanism.
- **Solar Corona, Geocorona and Planetary Coronas** made up of DMPs resemble honeycombs filled with plasma particles (electrons, protons, and multicharged ions), which are the result of DMPs self-annihilation.
- **Lightning Initiation problem** and **Terrestrial Gamma-Ray Flashes** are explained by the self-annihilation of DMPs in Geocorona.
- **Dark Matter Reactors.** Macroobjects' cores are essentially Dark Matter Reactors fueled by DMPs. All chemical elements, compositions, radiations are produced by Macroobjects themselves as the result of DMPs self-annihilation in their DM cores.

7. Paradigm Shift in Cosmology

The most important Concepts for any Cosmological model are as follows: universality of physical laws; cosmological principle (homogeneous and isotropic universe); Space, Time, and Gravitation; speed of light in vacuum; structure and content of the World; dark matter and ordinary matter; origin of matter (singularity or continuous creation); Law of Conservation of Angular Momentum; Primary Cosmological Parameters; Four Pillars of Standard Cosmology – expansion of Universe, nucleosynthesis of light elements, formation of large-scale structures, origin of cosmic background radiation. The performed analysis shows that Standard Cosmology fails to account for these concepts. The most intriguing result is that there was no **Initial Singularity**: all galaxies are gravitationally bound with their Superclusters.

Hypersphere WUM is, in fact, a Paradigm Shift in Cosmology. According to WUM, Superclusters are the principal objects of the World. Macroobjects form from the top (Superclusters) down to Galaxies and Extrasolar systems in parallel around different Cores made up of different DMPs. Formation of galaxies and stars is not a process that concluded ages ago; instead, it is ongoing.

The latest observations of the World [25]:

- *Galaxies congregate in clusters and along filaments, and are missing from large regions referred to as voids;*
- *Most cosmological structures in the universe spin. The generation of angular momentum across these scales is poorly understood;*
- *The discovery of a giant, almost symmetrical arc of galaxies – the Giant Arc – spanning 3.3 billion light years at a distance of more than 9.2 billion light years away that is difficult to explain in current models of the Universe.*

can be explained in frames of the developed WUM only:

- *“Galaxies do not congregate in clusters and along filaments”. On the contrary, Cosmic Web that is “networks of structure that are interconnected with no clear boundaries” is the result of the Rotational Fission of DM Cores of neighbor Superclusters;*

- “*Generation of angular momentum across these scales*” provide DM Cores of Superclusters through the Rotational Fission mechanism;
- “*Spinning cylindrical tendrils of matter hundreds of millions of light-years across*” are the result of spiral jets of galaxies generated by DM Cores of Superclusters with internal rotation;
- The Giant Arc is the result of the intersection of the Galaxies’ jets generated by the neighbor DM Cores of Superclusters;
- Cosmological Principal is valid for the Homogeneous and Isotropic Medium of the World with 2/3 of the total Matter. The distribution of Macroobjects with 1/3 of the total Matter is Inhomogeneous and Anisotropic, and therefore, the Cosmological Principal is not viable;
- The main conjecture of Standard Cosmology: “*Projecting galaxy trajectories backwards in time means that they converge to the **Initial Singularity** at $t=0$ that is an infinite energy density state*” is wrong because all Galaxies are gravitationally bound with their Superclusters.

Hubble Tension that is the disagreement in the values of the Hubble’s constant H_0 obtained by the various teams is due to the observations of Galaxies belonging to different Superclusters. According to WUM, the value of H depends on the cosmological time: $H = \tau^{-1}$. It means that the **value of H should be measured based on Cosmic Microwave Background only**. The calculated value of Hubble’s constant in 2013: $H_0 = 68.733 \text{ km/s Mpc}$ is in excellent agreement with the most recent measured value in 2021: $H_0 = 68.7 \pm 1.3 \text{ km/s Mpc}$ using only Cosmic Microwave Background data [25].

8. Conclusion

WUM does not attempt to explain all available cosmological data, as that is an impossible feat for any one article. Nor does WUM pretend to have built an all-encompassing theory that can be accepted as is. The Model needs significant further elaboration, but in its present shape, it can already serve as a basis for a new Physics proposed by Paul Dirac in 1937. The Model should be developed into the well-elaborated theory by the entire physical community. In our view, great experimental results and observations achieved by Astronomy in the last decades should be analyzed through the prism of a New Paradigm – Hypersphere World-Universe Model.

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Collected Articles

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