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Primordial Matter Structure and Revised Big Bang Theory

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Abstract

We present the structure of primordial matter of the universe and the main stages of universe origination, formation and evolution. The form of first and single force, formation of small particles and small systems (protons, neutrons, nuclei, atoms, molecules), formation of large objects and large systems (moons, planets, stars, galaxies) are interpreted. The primordial matter consists of particles (electrons & quarks) and anti – particles (positrons & anti quarks) without distance between them. In a very small fraction of a second the interaction between them occurs with resultant enormous energy leading to the first very small expansion with very short distance (10^{-18} - 10^{-15} m) and the formation of protons, neutrons, nuclei, hydrogen atoms and most atoms at the first moments of universe age. The formation of atoms associated with tremendous pressure as a result of their much larger volumes will lead to the second huge expansion (inflation) and the stage of universe as a huge cloud of smoke and the formation of planets, moons, stars and galaxies. The distribution of celestial objects in the universe is uniform in terms of their masses and areas and have constant value. The square root of the number of stars of any galaxy is proportional to its circumference and give constant value. At present all particles, objects and systems in the universe are governed by one equation with two faces containing four main physical parameters (mass, distance, force, velocity) with calculations and results for all objects of solar system identical with known determined values. Two faces fundamental force is responsible for construction and destruction of the universe.

Keywords: Particles, Mass, Energy, Force, Time, Big Bang, Universe

Introduction

Quarks and electrons are two types of elementary particles and a fundamental constituent of matter. Quarks combine together by strong nuclear force to form composite particles called hadrons, the most stable of them are protons and neutrons. All commonly observable matter in the universe is composed of up quarks, down quarks and electrons.

According to the big bang theory, nearly 13.5 billion years ago the universe began with a very small atom with infinite density and temperature then a great bang occurred [1-2]. In a fraction of a second a single fundamental force separated into the four known fundamental forces, electromagnetic force, weak nuclear force, strong nuclear force and gravitational force, and the very small ball started to expand.

After this first expansion, the big bang theory suggests that the universe cooled to permit the formation of elementary particles and consequently the formation of simple atoms. After some time, huge clouds of these simple atoms were collected by the gravity force to form stars and galaxies and the universe we know.

The universe contains all space and time and their constituents. It consists of all fundamental interaction and physical processes and consequently all forms of energy and matter and all the structures from smallest sub atomic particles to the largest galactic filaments. Now the universe has expanded into age and size known as observable universe with diameter of 93 billion light years, while the remaining entire universe is unknown [3].

As the universe expands, the energy density of electromagnetic radiation decreases than does that of matter because the energy of each photon decreases as it cosmologically redshifted [4]. The great part of ordinary matter in the universe is unseen, because visible stars and gas inside galaxies and clusters account for less than ten percent of the ordinary matter contribution to the mass energy density of the universe [5].

According to the cosmological principle and all models that use the Friedman-Lamaitre-Robertson-Walker metric (FLRW), including the current version of the Lambda Cold Dark Matter (Λ CDM) model, the distribution of matter in the universe is homogeneous and isotropic [6,7]. This means that the universe is the same in all locations and all directions respectively.

The distribution of particles in the nuclei is uniform for their masses and diameters and calculations confirmed that the mass and diameter of any nucleus give constant value [8]. All atoms have a certain uniform distribution of their constituents (electrons & nuclei) and have a certain constant connecting atomic area, number of electrons and atomic mass [9]. The homogenous distribution of diatomic homonuclear molecules as the number of shared electrons and their circumference have a molecular constant [10].

Physical Foundations

The primordial matter of the universe has a spherical shape and consists of electrons, quarks, positrons and anti – quarks at boundaries of the sphere with different masses (electrons & quarks are greater than positrons & anti - quarks) with certain arrangement and certain ratios. The bulk of primordial matter consists only of electrons and quarks which represents the universe center [11]. All constituents are confined in a region with spherical shape without distance between them. Zero distance between all particles and anti - particles producing the first or single primordial force bound all constituents without motion of particles with the following equation.

$$F = \frac{C \times m}{t_1 \times t_2} = \frac{2\pi \times r \times m}{t_1 \times t_2} \quad (1)$$

where

m is the mass of all constituents of universe in kg

C is the circumference of sphere

r is the radius of sphere in m

t_1 is the time before interaction between particles and anti - particles in sec

t_2 is the time after interaction between particles and anti - particles in sec

The single force will be terminated after certain time and will be replaced by four fundamental forces (Strong Nuclear Force – Weak Nuclear Force – Electromagnetic Force – Gravitational Force). The remaining primordial mass after interaction will form all particles, objects, small systems and large systems in the universe (Protons, Neutrons, Nuclei – Atoms – Molecules – Planets – Stars – Galaxies). The first radius or diameter of the sphere of primordial matter will form all distances in the universe. The primordial time of initiating interaction between particles and anti - particles will be replaced by all times in the universe.

Universe Origination

The primordial matter of the universe at boundaries of the sphere is unstable and consequently in a very small fraction of a second the interaction between (electrons & positron) and (quarks & anti – quarks) will occurs this will lead to the annihilation of the same corresponding masses with resultant enormous energy with the first very small expansion because the annihilation process of particles permits very short distance between all constituents in the range (10^{-18} - 10^{-10} m).

It is known that the amount of energy (E) produced by annihilation of particles and anti - particles is equal to the mass (m) that disappears multiplied by the square of the velocity of light c [12]

$$E = mc^2 \quad (2)$$

With the first expansion and the distance between quarks is less than femtometer, the first fundamental force, strong force will produce and be very effective and bound each three quarks to form protons and neutrons [13].

When the distance between protons and neutrons exceeds femtometer the residual strong force will bound protons and neutrons together to form most nuclei (light & heavy). For heavy nuclei with increasing density of protons and neutrons and at distance $\sim 10^{-18}$ m, the second fundamental force, weak nuclear force will appear [14,15].

When the distance approaching one angstrom $\sim 10^{-10}$ m, the third fundamental force, electromagnetic force will produce and be very effective and each proton will capture electron forming the simplest atom, hydrogen atoms (~ 99 % of total mass of the boundary of sphere) and each formed nucleus will capture the corresponding number of electrons as the same number of its protons forming most remaining atoms (~ 1 % of total mass).

The strong nuclear force and electromagnetic force will produce as a result of existing certain masses at certain distances with velocities comparable to the velocity of light and can be determined by the following equations [8,9].

$$F = \frac{4c^2 \times m}{d} \quad (3)$$

$$F = \frac{4c^2 \times (m_1 + m_2)}{d} \quad (4)$$

where

m is the sum of two particles

m_1 is the mass of the first particle

m_2 is the mass of the second particle

c is the velocity of light

d is the distance between particles.

The formation of protons, neutrons, nuclei and atoms associated with tremendous pressure as a result of their much larger volumes will lead to the explosion and disappearance of primordial force and second huge expansion, inflation and the universe in this stage is a huge cloud of smoke.

Most mass of the primordial matter of the universe in the center is in the form of quarks and electrons with spherical shape will remain without interaction or expansion consequently this center is unseen and can't be detected directly, because it has no emission. The main role of this center is to collect the particles and formed atoms after second expansion (Inflation) and maintain the spherical shape of all matter and consequently the universe.

With the second huge expansion and cooling certain number of hydrogen atoms will collect together under the influence of the mass in the center (non - interacted matter) with increasing pressure, density and temperature and this will lead to the nuclear fusion to form helium atoms and liberating tremendous energy [16-17] and the formation of stars with different masses and larger systems as galaxies, while the collections of mixture of all types of atoms will lead to the formation of planets and moons.

After the formation of celestial bodies, the large masses (planets, moons, stars, galaxies) at certain distances will lead to the existence of fourth fundamental force, gravitational force [18-22]. The main role of gravitational force is to bound the formed certain celestial objects to form the universe. The gravitational force can be formulated in the following new mathematical form connecting mass, distance, rotational and orbital velocity of formed celestial objects.

$$F = \frac{m \times v_{rot} \times v_{orb}}{d} \quad (5)$$

$$F = \frac{(m_1 + m_2) \times (v_{r1} + v_{r2}) \times (v_{o1} + v_{o2})}{d} \quad (6)$$

where

m is the sum of two masses of celestial objects or galaxies $m_1 + m_2$

v_{rot} is the sum of two rotational velocities $v_{r1} + v_{r2}$

v_{orb} is the sum of two orbital velocities $v_{o1} + v_{o2}$

m_1 is the mass of the first celestial object or galaxy

m_2 is the mass of the second celestial object or galaxy

v_{r1} is the rotational velocity of the first celestial object or galaxy

v_{r2} is the rotational velocity of the second celestial object or galaxy

v_{o1} is the orbital velocity of the first celestial object or galaxy

v_{o2} is the orbital velocity of the second celestial object or galaxy

d is the distance between two celestial objects or two galaxies

c is the velocity of light

Confirming Validity of Fundamental Force of Celestial Objects Mass, Distance, Rotational and Orbital Velocity of Celestial Objects

According to the above equation (6) of gravitational force between celestial objects the mass, distance, rotational and orbital velocities of two celestial objects can be determined by the following equations [23].

$$m_1 = \frac{F \times d}{(v_{r1} + v_{r2}) \times (v_{o1} + v_{o2})} - m_2 \quad (7)$$

$$m_2 = \frac{F \times d}{(v_{r1} + v_{r2}) \times (v_{o1} + v_{o2})} - m_1 \quad (8)$$

$$d = \frac{(m_1 + m_2) \times (v_{r1} + v_{r2}) \times (v_{o1} + v_{o2})}{F} \quad (9)$$

$$v_{r1} = \frac{F \times d}{(m_1 + m_2) \times (v_{o1} + v_{o2})} - v_{r2} \quad (10)$$

$$v_{r2} = \frac{F \times d}{(m_1 + m_2) \times (v_{o1} + v_{o2})} - v_{r1} \quad (11)$$

$$v_{o1} = \frac{F \times d}{(m_1 + m_2) \times (v_{r1} + v_{r2})} - v_{o2} \quad (12)$$

$$v_{o2} = \frac{F \times d}{(m_1 + m_2) \times (v_{r1} + v_{r2})} - v_{o1} \quad (13)$$

It is found that the calculated value of mass, distance, rotational velocity and orbital velocity of any object of the solar system by using equations (7 - 13) is identical with known determined values as indicated in table (1).

Table (1) lists the values of mass, rotational and orbital velocity of the objects of solar system

Object	Mass	Distance from Sun	rotational velocity	orbital velocity
Sun	1.9×10^{30} kg		2000 m/s	225000 m/s
Mercury	3.2×10^{23} kg	58×10^9 m	3 m/s	48000 m/s
Venus	4.8×10^{24} kg	109×10^9 m	1.8 m/s	35000 m/s
Earth	5.9×10^{24} kg	150×10^9 m	263 m/s	30000 m/s
Moon	7.3×10^{22} kg	150×10^9 m	4.5 m/s	1000 m/s
Mars	6.4×10^{23} kg	228×10^9 m	241 m/s	24000 m/s
Jupiter	1.8×10^{27} kg	779×10^9 m	12600 m/s	13000 m/s
Saturn	5.6×10^{26} kg	1434×10^9 m	9860 m/s	9000 m/s
Uranus	8.6×10^{25} kg	2873×10^9 m	2580 m/s	6900 m/s
Neptune	1.02×10^{26} kg	4495×10^9 m	2670 m/s	5000 m/s
Pluto	1.3×10^{22} kg	5995×10^9 m	13 m/s	4000 m/s

Constant of Celestial Objects (Moons, Planets, Stars)

As a result of the homogeneity and isotropy of the universe, the area of any celestial object and its acceleration is proportional to its mass.

$$a \times g \propto m \quad (14)$$

$$a \times g = cons \times m \quad (15)$$

$$4\pi \times r^2 \times g = cons \times m \quad (16)$$

$$cons = \frac{4\pi \times r^2 \times g}{m} \quad m^3 kg^{-1} s^{-2} \quad (17)$$

$$m = \frac{4\pi \times r^2 \times g}{cons} \quad (18)$$

$$g = \frac{m \times cons}{4\pi \times r^2} \quad (19)$$

where

a is the area of any celestial object

m is the mass of any celestial object

cons is the constant value for any celestial object

r is the radius of any celestial object

g is the acceleration of any celestial object

Confirming Constant of Celestial Objects ((Moons, Planets, Stars)

By using equation (17), the calculations confirmed that there is constant value for celestial objects (Moons, Planets, Stars) relating their area, acceleration and mass as indicated in table (2).

Table (2) lists the constant of 22 stars, planets and moons of the solar system.

Stars	Planets	Moons of planets of the solar system	Constant ($m^3 kg^{-1}s^{-2}$)
Sun	Mercury	IO (Jupiter I)	8.5×10^{-10}
Proxima Centauri	Venus	Europa (Jupiter II)	8.5×10^{-10}
Sirius	Earth	Ganymede (Jupiter III)	8.5×10^{-10}
Epsilon Eridani	Mars	Callisto (Jupiter IV)	8.5×10^{-10}
Tau Ceti	Jupiter	Phobos (Mars I)	8.5×10^{-10}
HR 7703 A	Saturn	Deimos (Mars II)	8.5×10^{-10}
GL Virginis	Uranus	Titan	8.5×10^{-10}
Beta Hydri	Neptune	Titania (Uranus III)	8.5×10^{-10}
Gliese 514	Pluto	Oberon (Uranus IV)	8.5×10^{-10}
Mu Cassiopeiae Aa		Ariel	8.5×10^{-10}
61 Virginis		Umbriel	8.5×10^{-10}
Alpha Mensae			8.5×10^{-10}
Iota Persi			8.5×10^{-10}
HIP 57050			8.5×10^{-10}
Gamma Serpentis			8.5×10^{-10}
Eta Boötis			8.5×10^{-10}
HD 125072			8.5×10^{-10}
TRAPPIST-1			8.5×10^{-10}
V538 Aurigae			8.5×10^{-10}
Barnard's Star			8.5×10^{-10}
YZ Ceti			8.5×10^{-10}
Sigma Draconis			8.5×10^{-10}

Table (2) shows that all bodies of the solar system and another 22 stars have the same constant value ($8.5 \times 10^{-10} m^3 kg^{-1}s^{-2}$). This leads to conclude that all celestial objects have the same constant value relating the area, acceleration and mass of any celestial object.

Constant of Galaxies

Approximating galaxies to spherical shapes and as a result of the homogeneity and isotropy of the universe, the square root of the number of stars of any galaxy is proportional to its circumference

$$\sqrt{n} \propto 2 \times \pi \times r \quad (20)$$

$$\sqrt{n} = cons \times 2 \times \pi \times r \quad (21)$$

$$cons = \frac{\sqrt{n}}{2 \times \pi \times r} \quad m^{-1} \quad (22)$$

where n is the number of stars of any galaxy
 cons is the constant value for any galaxy
 r is the radius of any galaxy

Confirming Constant of Galaxies

By using equation (22), the calculations confirmed that there is constant value ($1.7 \times 10^{-16} m^{-1}$) for many galaxies relating their number of stars and circumference as indicated in Table (3). This leads to conclude that all galaxies have the same constant value.

Table (3) lists the physical parameters of 12 galaxies and their constant.

Galaxy	Number of Stars	Radius ly	Radius meter	Constant m^{-1}
Milky Way	2.5×10^{11}	5×10^4	4.7×10^{20}	1.7×10^{-16}
Andromeda	1×10^{12}	1×10^5	9.5×10^{20}	1.7×10^{-16}
Messier 101	9×10^{11}	92×10^3	8.7×10^{20}	1.7×10^{-16}
UGC 2885	2.1×10^{12}	14×10^4	1.3×10^{20}	1.7×10^{-16}
Large Magellanic Cloud	22×10^{11}	15×10^3	1.4×10^{20}	1.7×10^{-16}
Small Magellanic Cloud	4×10^9	6500	6.1×10^{19}	1.7×10^{-16}
Messier 33	6×10^{10}	24×10^3	2.3×10^{20}	1.7×10^{-16}
NGC 5128	7.5×10^{10}	28×10^3	2.6×10^{20}	1.7×10^{-16}
Messier 81	2.4×10^{11}	48×10^3	4.5×10^{20}	1.7×10^{-16}
Sculptor	3.2×10^{11}	57×10^3	5.4×10^{20}	1.7×10^{-16}
Messier 51a	1.5×10^{11}	38×10^3	3.6×10^{20}	1.7×10^{-16}
Messier 77	2.1×10^{11}	44×10^3	4.2×10^{20}	1.7×10^{-16}

Six Main Stages of Universe Origination

- Existence of primordial matter of the universe as spherical shape with its main constituents (electrons, quarks, positrons and anti – quarks) at boundaries of sphere and the center consists of quarks and electrons.
- Interaction between particles and anti - particles.
- First expansion and formation of protons, neutrons, nuclei, hydrogen atoms and remaining atoms.
- Second huge expansion (huge cloud of smoke) and cooling.
- Nuclear fusion of hydrogen atoms and formation of stars and galaxies.
- Collections of mixture of all atoms and the formation of planets and moons.

Two Faces Fundamental Force and Universe Fate

The significant and greatest part of the primordial matter of the universe remained without expansion or explosion which represents the center of the universe and consists of fundamental constituents of the matter (quarks & electrons) [6]. This huge mass act as a fundamental force with two faces, the first one of them (Constructing Force) responsible for collecting the particles, atoms and gas after the second inflation and forming all celestial objects and consequently the universe.

The constructing force can be formulated in the following mathematical form connecting mass, distance and time

$$F = \frac{(m_1 + m_2) \times d}{t^2} \quad (23)$$

where

F is constructing force in N

m_1 is the mass of universe center in kg

m_2 is the mass of collected particles in kg

d is the distance between two masses in m

t is the time of forming certain celestial object

The second face of the force (Destructing Force) will act when the evolution of most stars specially stars with large masses terminate and reach to critical situation, then this force will overcome all constituents of the universe and starts to contract until all matter in the universe collapse and return as its beginning state.

Conclusions

The universe is originated from unstable primordial matter consisting of electrons, quarks, positrons and anti – quarks and they are holding together by the first and single force produced as a result of zero distance between its constituents.

The interaction between particles and anti - particles leading to the appearance of five effective fundamental forces and consequently the formation of particles and small systems (Protons, Neutrons, Nuclei, Atoms, Molecules) and large systems (Planets, Stars, Galaxies) in the universe.

All systems in the universe from smallest (nuclei & atoms & molecules) to largest bodies and systems (moons & planets & stars & galaxies) have certain constant value.

At present all systems in the universe with known building fundamental forces (Strong Nuclear Force, Electromagnetic Force, Gravitational Force) are governed by one equation with two faces containing four main physical parameters

(Force, Mass, Distance and Velocity), one of them is expressed by velocity of light for small systems (Nuclei, Atoms, Molecules) and the other is expressed by rotational and orbital velocity of large bodies (Planets, Stars).

The beginning and ending of the universe are controlled by fundamental force with two faces, the first face is responsible for constructing the universe, while the second face leads to its destruction.

References

1. Lemaitre. G. (1931), *Nature*, 127, 709.
2. Gamow, G. (1946). Expanding universe and the origin of elements. *Physical review*, 70(7-8), 572.
3. Planck 2018 results, VI. (2018), *Cosmological parameters*, A&A, A6, 641.
4. Steane, A. M. (2021). *Relativity Made Relatively Easy Volume 2: General Relativity and Cosmology*. Oxford University Press.
5. Macquart, J. P., Prochaska, J. X., McQuinn, M., Bannister, K. W., Bhandari, S., Day, C. K., ... & Tejos, N. (2020). A census of baryons in the Universe from localized fast radio bursts. *Nature*, 581(7809), 391-395.
6. Abdalla, E., Abellán, G. F., Aboubrahim, A., Agnello, A., Akarsu, Ö., Akrami, Y., ... & Pettorino, V. (2022). Cosmology intertwined: A review of the particle physics, astrophysics, and cosmology associated with the cosmological tensions and anomalies. *Journal of High Energy Astrophysics*, 34, 49-211.
7. Migkas, K., Schellenberger, G., Reiprich, T. H., Pacaud, F., Ramos-Ceja, M. E., & Lovisari, L. (2020). Probing cosmic isotropy with a new X-ray galaxy cluster sample through the LX-T scaling relation. *Astronomy & Astrophysics*, 636, A15.
8. Sanad, M.R. (2025), *New Equations of Atomic Nuclei*, *Journal Material Science*, 9(5), 1-10.
9. Sanad, M. R. (2024). Constant of Atoms and New Equation of Electromagnetic Force. *PROCEEDINGS OF THE ROMANIAN ACADEMY SERIES A-MATHEMATICS PHYSICS TECHNICAL SCIENCES INFORMATION SCIENCE*, 25(4), 301-306.
10. Sanad, M R. (2025), *Investigating Diatomic Homonuclear Molecules*, *United Journal of Chemistry*, 8(3), 136-144.
11. Sanad, M R. (2024). *Open Access Journal of Astronomy*, 2 (2), 1-4.
12. Einstein, A. (1905). Does the inertia of a body depend upon its energy-content. *Annalen der physik*, 18(13), 639-641.
13. Wilczek, F. (1982). Quantum chromodynamics: The modern theory of the strong interaction. *Annual Review of Nuclear and Particle Science*, 32(1), 177-209.
14. Guralnik, Gerald S. (2009). *International Journal of Modern Physics*. A24 (14).
15. SANAD, M. (2025). *Oriental Journal of Physical Sciences*. interactions, 14, 15.
16. Eddington, A.S. (1920). *Nature*. 106 (2653): 14–20.
17. International Atomic Energy Agency (IAEA). (2022).
18. Long, D. R. (1976). Experimental examination of the gravitational inverse square law. *Nature*, 260(5550), 417-418.
19. Bagley, C. H., & Luther, G. G. (1997). Preliminary results of a determination of the Newtonian constant of gravitation: a test of the Kuroda hypothesis. *Physical Review Letters*, 78(16), 3047.
20. Iorio, L. (2007). A model-independent test of the spatial variations of the Newtonian gravitational constant in some extrasolar planetary systems. *Monthly Notices of the Royal Astronomical Society*, 376(4), 1727-1730.
21. Persic, M., Salucci, P., & Stel, F. (1996). The universal rotation curve of spiral galaxies—I. The dark matter connection. *Monthly Notices of the Royal Astronomical Society*, 281(1), 27-47.
22. Disney, M. J., Romano, J. D., Garcia-Appadoo, D. A., West, A. A., Dalcanton, J. J., & Cortese, L. (2008). Galaxies appear simpler than expected. *Nature*, 455(7216), 1082-1084.
23. Sanad, M. R. (2025). *Equation of Constructing the Universe*. *Explors Astron Astrophys*, 1(1), 1-4.

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