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The Formation of the Universe

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Abstract- Unity is defined as matter or a system with its maximum energy limit. Unity Force is matter's tendency of being unity, expressed as attracting while energy sharing in a unity or repelling while excess-energy releasing out of the unity. The universe was (and still is) formed of four base particles: proton, electron, neutrino, and photon, created from the Big Bang. Then, each electron bonded with a photon as an electron unity, so that light could not propagate; each proton bonded with a neutrino as a proton unity, and the two unities made the universe opaque. No gravity, nor gravitational collapse, is needed to draw these base particles together because they were dense and hot in the first place when created. The high density and temperature were perfect for nuclear fusions, and the force of nuclear fusion (unity force) would keep pulling particles together. Most nuclear fusion centres with excess-energy releasing, form stars and planets. The rest, extra-large nuclear fusion centres with inner cores unable to release excess-energy as a repelling force, form black holes with much stronger attracting unity forces of their respective galaxies. Nuclear fusion produced the first light, and then atom formation brought the dawn of the universe.

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The Formation of the Universe

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Abstract- Unity is defined as matter or a system with its maximum energy limit. Unity Force is matter's tendency of being unity, expressed as attracting while energy sharing in a unity or repelling while excess-energy releasing out of the unity. The universe was (and still is) formed of four base particles: proton, electron, neutrino, and photon, created from the Big Bang. Then, each electron bonded with a photon as an electron unity, so that light could not propagate; each proton bonded with a neutrino as a proton unity, and the two unities made the universe opaque. No gravity, nor gravitational collapse, is needed to draw these base particles together because they were dense and hot in the first place when created. The high density and temperature were perfect for nuclear fusions, and the force of nuclear fusion (unity force) would keep pulling particles together. Most nuclear fusion centres with excess-energy releasing, form stars and planets. The rest, extra-large nuclear fusion centres with inner cores unable to release excess-energy as a repelling force, form black holes with much stronger attracting unity forces of their respective galaxies. Nuclear fusion produced the first light, and then atom formation brought the dawn of the universe. The orbit of each planet was decided by its position on the disk edge of the star system and is fundamentally decided by unity force. As the third planet from the sun, Earth is not too far, not too close, in a right position to have water mostly in liquid state, to nurture biological organisms and raise our human beings. Unity force forms the hierarchical structure of each galaxy, making the black hole as the galaxy's unity centre. The observations of "accelerating expansion" of the universe needs larger sample size, randomization, repetition and better calculation.

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I. Introduction

The Big Bang model[1]describes how the universe began by expanding from a single point of infinite density and heat, known as singularity.

Physicist Edwin Hubble[2] in 1929 first discovered that the universe was expanding: galaxies were moving away from Earth at a rate that accelerates proportionally with distance. Physicist George Gamow and colleagues[1] in the 1940s developed the modern version of the Big Bang.

In 1965, the discovery of the cosmic microwave background radiation[3] caused by high temperatures and densities in the distant past, agreed with the Big Bang model's prediction. The beginning of the Big Bang was estimated to be 13.8 billion years ago by measuring the expansion rate of the universe[1,4].

The Big Bang model depicted how the universe went from there and then on[1,4]:

1. *Expansion and cooling:* this singularity went through a period of rapid expansion and cooling, known as cosmic inflation.
2. *Formation of particles and atoms:* as the universe expanded and cooled, subatomic particles (protons, neutrons, and electrons) formed, and eventually, these particles combined to form atoms, primarily hydrogen and helium.
3. *Formation of stars and galaxies:* over billions of years, gravity caused these atoms to clump together, forming clouds of gas and dust, which eventually collapsed under their own gravity to form stars and galaxies.
4. *Evolution of structures:* galaxies then clustered together to form groups, clusters, and super clusters, creating the large-scale structures we observe in the universe today.

But this paper will show that the current Big Bang model still has some flaws and misconceptions, by representing the universe from the Big Bang, based on the following observed phenomena[4]:

1. The uniformity of the universe,
2. the abundance of light elements,
3. the cosmic microwave background radiation, and
4. large-scale structure.

Before any scientific research, three simple scientific rules are required:

II. The Scientific Rules

1. Observations and inquiries. Science always begins with observations and inquiries.
2. Hypotheses with simplicity (The Simplicity Rule):
   1) Based on known facts and clearly defined concepts.
   2) By avoiding and excluding unnecessary factors and dimensions, assumptions or speculations.
3. Testing of the hypothesis through experiments and statistical analysis, with replications and peer reviews, then, circulating back to rule 1, hopefully with better understanding and predictive power.

Now, let us begin.

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III. Formation of base Particles and Nuclear Fusion

The observed uniformity of expansion[1,4] indicates that the universe had only one origin of expansion.

As the universe expanded and cooled, matter formed as free protons, electrons, neutrinos, and photons (base particles[5]), in descending order of mass.

Then, each proton (p) shares energy with a neutrino (ν) as a proton unity (pν), because their mass fit each other to be a unity (see the definition of energy sharing and unity later in this section):

$$p + \nu \rightarrow p\nu$$

Each electron (e) shares energy with a photon (γ) as an electron unity (eγ), also because their mass fit each other to be a unity:

$$e + \gamma \rightarrow e\gamma$$

Proton unities (pν) and electron unities (eγ) are called base unities[5].

The light could not propagate because each photon bonded with an electron as a unity. The base unities also made the universe opaque (Cosmic Dark Age).

Physicists have proposed neutrons or neutrons' components as newly formed particles[1,4]. But neutron = proton + electron (p + e), which also agrees with the Simplicity Rule, will be proved by:

1) The nuclear fusion process below.
2) The beta decays[5] of some heavy and unstable nuclei produced by the nuclear fusion.
3) The formation of neutron stars (in the Burnt-Out section).

By then, the universe had expanded into many big chunks of matter (base unities), one of them was our Milky Way. And the big chunks of matter had also expanded into many smaller chunks of matter, one of which was our solar system.

In the centre of each chunk of matter, those base unities were so dense and hot that they began to fuse (nuclear fusion in the fusion centre), mainly through proton-proton chain reaction[6], shown as the following simplified steps, updated from my original version[5]:

1. Two proton unities and two electron unities share energy to form a hydrogen-2 nucleus called deuterium, releasing a high-energy neutrino (ν^+), a high-energy electron (e^+ or positron) and a high-energy photon (γ^+ or gamma ray):

$$2\,p\nu + 2\,e\gamma \rightarrow {}^2p\nu e\gamma + \nu^+ + e^+ + \gamma^+$$

The energy sharing concept comes from this fusion process:

$\nu + e + \gamma \rightarrow \nu^+ + e^+ + \gamma^+$, so that the energy in the produced deuterium (${}^2p\nu e\gamma$) must have been reduced (shared) to produce the high-energy neutrino, electron, and photon.

That is, *Energy sharing* is the process of forming a system with less energy than provided, plus the excess-energy: A + B = AB + excess-energy, based on the law of conservation of energy.

So, the newly formed system has an energy limit, and it will release excess-energy until it reaches its energy limit. Therefore, more concepts and their definitions:

Energy limit is the maximum energy limit of matter or a system in its situation.

Excess-energy is the energy that is over the energy limit.

Unity is matter or a system with its energy limit, like the deuterium (${}^2p\nu e\gamma$).

Free particles are matter or systems with excess-energy, like ν^+, e^+ and γ^+.

Unity Force is matter or a system's tendency of being unity, expressed as attracting while energy sharing in a unity or repelling while excess-energy releasing out of the unity, for example, nuclear fusion is unity force in action.

These concepts form the main foundation of *The Laws of Unity*[5].

2. The deuterium (${}^2p\nu e\gamma$) shares energy with another proton unity to form a helium-3 nucleus, releasing another high-energy photon (γ^+ or gamma ray):

$$^2p\nu e\gamma + p\nu \rightarrow {}^3p^2\nu e + \gamma^+$$

3. Two helium-3 nuclei share energy to form one helium-4 nucleus and release two proton unities to continue the process:

$$^3p^2\nu e + {}^3p^2\nu e \rightarrow {}^4p^2\nu^2 e + 2\,(p\nu)^+$$

4. The helium-4 nucleus, ${}^4p^2\nu^2e = 2({}^2p\nu e)$, becomes repelling while releasing the excess-energy mentioned above and moves out of the fusion centre to the outer core as the new unity, and the product of the fusion.
5. Or the helium-4 nucleus $2({}^2p\nu e)$ shares more energy with other nuclei or proton unities to form a heavier nucleus unity $n({}^2p\nu e)$, where atomic number $n > 2$, if the situation permits.
6. Therefore, in a newly formed nucleus unity from nuclear fusion, every electron shares energy with two protons and one neutrino as $n({}^2p\nu e)$, where the atomic number $n >= 2$. Although isotopes happen, this is the main composition. Thus, unity force replaces strong force and quantum chromodynamics[7].

7. Absent from nuclear fusion, a hydrogen nucleus has only one proton unity (pν).
8. Most fusion centres release their excess-energy (nuclear decay) by releasing high-energy neutrinos, photons, and electrons, producing the cosmic microwave background radiation:
   1) The high-energy neutrinos and photons (ν^+ and γ^+) carry their energy away directly, as part of the first light (invisible due to high energy).
   2) The high-energy electrons (e^+) transfer their energy to normal electron unities ($e\gamma$) that in turn transfer the energy to their bonded photons (no "annihilation"), producing gamma rays (γ^+), as another part of the first light:

$$e^+ + e\gamma \rightarrow 2\,e + \gamma^+$$

   The first light would become visible after the high-energy photons release some energy.
9. The rest, extra-large fusion centres could not release their excess-energy in the inner core but use it instead for energy sharing of heavier nuclei. Without repelling by excess-energy releasing, these extra-large fusion centres would become black holes with much stronger attracting unity forces.

In the above nuclear fusion process, mass does not change into energy, nor vice versa.

Mass and energy are not physical entities, but properties of matter, and independent of each other. The concept of mass-energy equivalence ($E=mc^2$)[8] is deemed as a misconception.

At this point, the rotation started by the Big Bang and then intensified by the unity force of nuclear fusion (instead of gravity), made the chunks into disks.

IV. Formation of Star Systems

Around 380,000 years after the Big Bang, while still expanding, the position of our solar system in the Milky Way was relatively settled. The centre of each disk was still the fusion centre, pulling most of the base unities toward the centre to form the star, still producing the cosmic microwave background radiation.

At the edge of each disk, some much smaller fusion centres were also pulling base unities toward them that eventually formed the planets, so that most of them have moons. The products of the nuclear fusions would move to the outer cores and then, billions of years later, form mantles and crusts of the planets.

So, inside the cores of the stars and their planets, proton unities and electron unities are attracting to form nuclei, while the newly formed helium-4 nuclei are repelling to move out. The net force of each fusion centre (or unity centre, like the sun) shows attraction because nuclear fusion (energy sharing) is the primary process.

The orbit of each planet was decided by its position on the disk edge of the star system; the position was initially set by the Big Bang and fundamentally established by unity force; the further the position on the edge, the further the orbit from the unity centre[5]. Therefore, unity force and inertia (the same unity force[5]) decide the orbit of each planet.

That is how the unity forces of the stars and planets jointly form the star systems.

V. Formation of Atoms and the Dawn of the Universe

At about the same time, out of the fusion centres in the disks of the star systems, the temperatures were eventually cool enough for the nuclei to capture electron unities, forming the first atoms and making the cosmos transparent:

1. Absent from nuclear fusion, each free proton unity attracts and shares energy with an electron unity in its orbit, forming a hydrogen atom: $(p\nu) + (e\gamma)$, producing most of the light elements in the universe.
2. Each of the helium-4 nucleus created in the fusion centres and moved out, shares energy with two electron unities in its orbit, forming a helium atom: $2(^2p\nu e) + 2(e\gamma)$, producing the rest of the light elements in the universe.
3. The heavier nuclei form atom unities the same way, with the same numbers of protons and electrons: $n(^2p\nu e) + n(e\gamma)$, where atomic number $n > 2$.

When getting excess-energy from the environment, like nearby fusion centres, the outermost electron unity ($e\gamma$) of an atom will oscillate out of the atom[5], becoming a free electron unity again, and in turn oscillating free its bonded photon to release the excess-energy, as light:

$$(e\gamma)^+ \rightarrow e + \gamma^+$$

together with the first light from nuclear fusion, bringing the dawn of the universe.

VI. Formation of Galaxies

By then, those extra-large fusion centres that could not release their excess-energy as a repelling force, with only the attracting force of the nuclear fusion, had become full-fledged black holes, attracting all the star systems around them, forming their respective galaxies.

So, I propose and predict:

1. Every galaxy is a unity, the ultimate unity with its ultimate unity force, with at least one black hole as the unity centre.
2. If there were more than one black hole in one galaxy, those black holes would eventually merge

into one, because they would be close enough to attract each other.

3. Unity force (instead of gravity) forms the hierarchical structure of each galaxy, making the black hole as its unity centre. Under a galaxy, each star becomes the unity centre of the star system. Under a star system, each planet is the unity centre of its moons. Then, each atomic nucleus is the unity centre of the atom. Inside the nucleus, every proton is the unity centre. Outside the nucleus, each electron is the unity centre of the electron unity ($e\gamma$).
4. The large-scale structures - the groups or clusters of galaxies - originate from the expansion of the universe (instead of gravity): the distribution of matter was random and uneven, although the universe on larger scales is relatively uniform.

Physicists have added gravity and gravitational collapse to the process, which is unnecessary and against the Simplicity Rule. Why would the process need gravity and gravitational collapse to pull particles together, since the particles were dense and hot in the first place when created? The high density and high temperature were perfect for nuclear fusion. Then, the force of nuclear fusion (unity force) keeps pulling particles together.

Some physicists have also added dark matter and dark energy to the process, which is also unnecessary and against the Simplicity Rule. Our theory is doing just fine without them, until observations (scientific rule 1) prove to us otherwise.

VII. The Burnt-Out Stars and Planets

After billions of years, in their fusion centres, some stars and most of the planets run out of their main fuel - the proton unities and electron unities - after making them into helium-4 nuclei $2(^2pve)$. Then the helium-4 nuclei became their main fuel, sharing more energy with each other to form heavier nucleus unities $n(^2pve)$, where atomic number $n > 2$.

1. As a star continues nuclear fusion of heavier nuclei, the fuels deplete gradually, the force of its nuclear fusion, and the force of inward attraction, reduces gradually, while the outward excess-energy releasing always lags, so that the outward pressure expands the star larger gradually, making it a red giant.

Then the fate of the star depends on its mass[9], whether being "massive" (about 5 or more times the mass of our Sun) or being "low or medium" (about 0.4 to 3.4 times the mass of our Sun).

1) *The Sun-Sized Stars:*[9]

When a medium size star (such as our Sun) reaches the red giant phase, its outer layers continue to expand, while the core contracts inward because the helium nuclei in the core continue to fuse into carbon.

The star will shed its outer layers and only about 20% of the star's initial mass remains. Then the star cools and shrinks until it is only a few thousand miles in diameter, becoming a white dwarf. With no fuel left to burn, the hot star radiates its remaining heat into space for billions of years, eventually becoming a cold dark mass, also called a black dwarf.

2) *The Massive Stars:*[9]

For stars that are about 5 or more times as massive as our Sun, after the outer layers of the star have swollen into a very big red giant, the core continues nuclear fusion after the formation of carbon, until the core becomes mostly iron. Then the fusion becomes harder because of iron's nuclear structure. The core temperature rises to over 100 billion degrees as the iron nuclei are crushed together, eventually causing a tremendous explosion called a supernova.

The intense pressure inside the supergiant causes the electrons to combine with the protons, forming neutrons ($p + e$). As a dense ball of neutrons that most likely remain intact after the supernova, the whole core of the star becomes a neutron star.

2. As planets are much smaller, their main fuel has long gone, and the nuclear fusion of heavier nuclei would stop gradually, leading to the current much cooler planets that we mostly see: the heavier elements moved out of the cores and became mantles and crusts, the previous fusion centres are still hot, with some unstable nuclei from the nuclear fusion going through beta decays and nuclear fissions, causing planetary quakes and volcanoes, some of them on Earth are extraordinary.

As the third planet from the sun, Earth is not too far, not too close, in a right position to have water mostly in liquid state, to nurture biological organisms and raise our human beings.

There should be some other planets in all the star systems that are as lucky as Earth.

VIII. Accelerating Expansion?

In 1998, two independent projects, the Supernova Cosmology Project and the High-Z Supernova Search Team, using distant type Ia supernovae to measure the expansion of the universe, discovered that objects in the universe are moving away from one another at an accelerating rate[1,4,10], which is unexpected and unexplained by the gravitational attraction of the matter in the universe.

Some physicists attribute this accelerated expansion to "dark energy" and "dark matter". But I can think of many other reasons:

1. The observed objects happened to be on the opposite side of their orbits moving away from us, and would eventually circle back, unless the observation samples were random and large

enough, and the observation time were long enough.

2. The observed objects were in an energy recession, so that their luminosities were dimming gradually. Again, sample size, randomization and observing duration matter.
3. In their distance calculation, the speed of light *c* is assumed as a constant, but physically and theoretically, the speed (and oscillation frequency) of photons must reduce gradually over long astronomical distances due to friction (refraction and diffraction), just like any other particle. Using a constant speed to estimate the reducing speed of light will cause the calculation of astronomical distance to be erroneous. That is, any equation using the speed of light as a constant will result in a slightly longer distance. For astronomical distances, it causes error.
4. As the speed and oscillation frequency of photons reduce gradually over astronomical distances, their wavelengths increase gradually, causing red shifting. So, the observed redshift may just be caused by the fixed astronomical distances, not by increased distances. Hence, contrast and repeating experiments and observations are needed.

IX. Conclusion

1. The universe is formed of four base particles[5]: proton, electron, neutrino, and photon, created from the Big Bang[1]. Immediately, a proton and a neutrino form a proton unity; an electron and a photon form an electron unity (base unities). Then, the unity force produced more elements from the two base unities.
2. In the early universe, light could not propagate because each photon bonded with an electron as a unity. The two base unities also made the universe opaque (Cosmic Dark Age).
3. No gravity, nor gravitational collapse, is needed to draw these base particles together because they were dense and hot in the first place when created. The high density and temperature were perfect for nuclear fusions, and the force of nuclear fusion (unity force) would keep pulling particles together.
4. In a newly formed nucleus unity from nuclear fusion, every electron shares energy with two protons and one neutrino: $n(^2p\nu e)$, where the atomic number $n >= 2$. Thus, unity force replaces strong force and quantum chromodynamics[7].
5. Neutron = (pe). In some heavy and unstable nuclei produced by nuclear fusion, their beta decays (electron emission and electron capture), as well as the formation of neutron stars, all prove that a neutron = (p + e).
6. When the universe was cool enough, absent from nuclear fusion, each free proton unity attracts and shares energy with an electron unity in its orbit, forming a hydrogen atom: $(p\nu) + (e\gamma)$, producing most of the light elements in the universe.
7. Each of the helium-4 nuclei created in the fusion centres and moved out, share energy with two electron unities in its orbit, forming a helium atom: $2(^2p\nu e) + 2(e\gamma)$, producing the rest of the light elements in the universe.
8. An atom is formed of the same numbers of protons and electrons sharing energy together: $n(^2p\nu e) + n(e\gamma)$, $n >= 2$; the same way as a hydrogen atom: $(p\nu) + (e\gamma)$.
9. The released excess-energy from the nuclear fusion centres produces the cosmic microwave background radiation. Most fusion centres with excess-energy releasing form stars and planets. In each fusion centre, the energy generated from energy sharing is always greater than the excess-energy released, so that the fusion centre can keep attracting (pulling) base unities to the core for nuclear fusion, showing a net force of attraction.
10. The rest, extra-large fusion centres with inner cores unable to release excess-energy as a repelling force, form black holes with much stronger attracting unity forces of their respective galaxies.
11. The orbit of each planet was decided by its position on the disk edge of the star system; the position was initially set by the Big Bang and fundamentally established by unity force; the further the position on the edge, the further the orbit from the unity centre. Therefore, unity force and inertia (the same unity force[5]) decide the orbit of each planet. That is how the unity forces of the stars and planets jointly form the star systems.
12. As the third planet from the sun, Earth is not too far, not too close, in a right position to have water mostly in liquid state, to nurture biological organisms and raise our human beings.
13. Unity force (instead of gravity) forms the hierarchical structure of each galaxy, making the black hole as its unity centre. Under a galaxy, each star becomes the unity centre of the star system. Under a star system, each planet is the unity centre of its moons. Then, each atomic nucleus is the unity centre of the atom. Inside the nucleus, every proton is the unity centre. Outside the nucleus, each electron is the unity centre of the electron unity ($e\gamma$).
14. The large-scale structures - the groups or clusters of galaxies - originate from the expansion of the universe (instead of gravity): the distribution of matter was random and uneven, although the universe on larger scales is relatively uniform.
15. The observations of "accelerating expansion" of the universe needs larger sample size, randomization, repetition and better calculation.

16. "Positron" here is re-defined as high-energy electron, not the original meaning of "positively charged electron". Electrons are either attracting while energy sharing in an atom unity or kinetically repelling while excess-energy releasing out of the unity[5]. The concepts of "oppositely charged electrons and protons", "positively charged electrons" and "annihilation" are deemed as misconceptions.

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