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The Stages of the Universe Formation: A Matter/ Energy Interaction Function

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Abstract- This paper endeavors to explain the Universe creation stages and aims to complement the model proposed in 'A Single System Universe: A Cognitive Approach' adopting the same cognitive approach. The stages are the initial pre-compression era from the infinite realm, compression era, and the finite Universe era. The explanation is a function of the matter/energy interaction modes. Matter changed in the three processes from particles with an essence of mass into 'massable' particles of Dark Matter. Energy transformed from crude into functional energy, referred to as Dark Energy, responsible for matter integration and universal expansion. Matter and Energy are different in essence and non reciprocal. Finally, the paper calls for empirical evaluation of the proposed model.

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I. Introduction

This paper comes in an endeavor to present a new perspective to the human understanding of the Universe and its formation stages. It complements the ideas presented in 'A Single System Universe: A Cognitive Approach' [1]. It follows the same cognitive approach and intends to shed light on the ideas related to the relation of matter and energy. Comprehending the Universe and its formation stages requires much more than the most advanced tools humans can build. The reason is simple; the Universe is expanding and advancing at a much faster pace than man's advance.

Modern science relies heavily on empirical approaches and ignores human's greatest asset, the cognitive approach. Man's deficiency in his approaches has rendered cosmology and the understanding of the Universe into sets of contradicting theories [1]. The human mind remains the only tool that can roam among huge structures such as galaxies and planets; and at the same time, it can roam among the smallest particles of matter. It can also venture safely, efficiently, iteratively, and in a timely manner among the furthest structures and within the most extreme universal objects.

It is not intended to reiterate the reasoning introduced in the previous study but to complement it. The Universe is a complex system of interacting subsystems. To comprehend the main system, one should decipher the subsystems and their contribution in the big picture. The subsystems are numerous and each requires its dedicated analysis. This study explores the Universe formation dynamics as a function of energy and matter interactions.

The creation of the Universe has passed through different stages. These stages may be divided into 3 eras depending on the energy/matter interaction processes. The first stage is the pre-compression era, the second is the compression era, and the third is the post compression era.

Before venturing deeper into these eras, it is essential to set some guidelines for this study. Whether one believes that the creation of the Universe is the product of a deliberate or a random endeavor, one is expected to abide to simple logical interpretations that avoid emotional intercepts. If some people relate, for example, human existence to some alien seed from outer space, this implies that, in order to understand human existence, one has first to discover alien life, if it exists; then, one has to identify the alien that comprises the origin of the humans' seed; then, one has to search for the origin of that alien that itself maybe another alien from another place in the Universe… This obviously defies the purpose of the initial enquiry.

If, on the other hand, one believes that everything is the blunt endeavor of a 'Creator', then there is no reason to enquire further. A more inquisitive perception leads the inquisitor to the rule of natural laws according to which all universal objects behave. The dynamo that manipulates the universal resources with respect to these natural laws in order to achieve a goal is referred to as 'Nature'. Whether behind nature there exists a Creator or not is a discussion that remains beyond the scope of this paper.

Nature 'owns' resources that consist of matter and energy. It manipulates its resources, in order to maintain and develop itself. However, the interaction between matter and energy, at that stage, can only happen under the governance of natural laws. These interactive resources are finite within the Universal boundary. Nature, as defined in this paper, essentially exists in the post compression era.

The Universal macro dynamics are more elaborated in 'A Single System Universe: A Cognitive Approach' [1]. The micro systems are the subject of this study that commences with an argumentative model. Then a theoretical model condenses the argument into a hypothesized foundation of the study.

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II. Literature Review

The origin or starting point of the Universe has long been a controversial issue. Some scientists tried to avoid it by claiming that the Universe is eternal, without a beginning or end, where matter was created out of nothing [2] [3]. This, steady state theory, was later refuted by empirical science [3] [4] [5].

The 'ylem', or cosmic egg, idea was adopted [6] as a representation of the Big Bang theory. This theory claims that the ylem contained the entire Universe [7] [8] before reaching explosion conditions. After the explosion the Universe expanded and cooled until atoms clumped together to form planets and stars [6]. Scientists adopted the idea and theorized about the Big Bang theory [9] [10]. Some believe that this theory lost momentum because it is short of answering many questions [11] [12] [13] [14] [15] [16]. Other theories claimed that the Universe could have started from within a black hole [17].

Physicists can claim whatever they want as long as there are no bounding criteria [18]. There remain many details that can be reviewed in this section, such as the red shift, Einstein's cosmic constant, and Hubble's constant among others. However, since this paper is proposing a new model and approach, the review remains on the guideline level without venturing into the details of mathematics and empirical interpretations at the present stage.

Dark matter, in the present literature, though still unidentified, is assumed to be the source of the prime gravitationally attractive force of the Universe [19]. Cosmic microwave studies imply that dark matter is abundant [20] [21] [22] [23]. It comprises 23% of the Universe, 74% of dark energy, and 4% of baryons [19] [24]. Experiments imply that dark matter should have electromagnetic neutrality [19] [25] [26], self-interaction constraints [19] [26] [27] [28] [29] [30], and clumping on small scale [19] [26] [31].

There are also a number of guisses among the scientific community on the identity of dark matter. The candidates may be weakly-interacting massive particles (WIMPs) [19] [26] [32], axions [19] [26] [33], gravitinos [19] [26] [34], and sterile neutrinos [19] [26] [35] among other numerous objects. Different detection means were applied to confirm the existence of dark matter. Gravitational lensing [37], hot gas in galaxy clusters, and motion of galaxies in galaxy clusters are among other means that try to detect the gravitational influence of dark matter [38] [39] [40] [41] [42].

Newtonian gravitation theory fails to explain the universal expansion. This expansion has been attributed to a mysterious energy referred to as dark energy [43] [44]. There are lots of speculations about the real existence of dark energy. Till date, dark energy remains elusive to trace or define [34]. Some theories claim that dark energy is a property of space; others claim that it is a dynamical energy fluid or field [26]. Quantum theory claims that space is filled with temporary matter that forms and disappears [26].

III. The Model

Argumentative ideas follow in order to found a construct for the theoretical model. The proposed cognitive construct tries to present a coherent mechanism for the different creation phases. Energy/matter interaction systems are proposed as the basis for the discussion.

a) The Phases of Universal Creation

At the first era, the pre-compression era, time and space are not identified [1]. It is referred to as a time era though it is an existing geographical infinite area (universe, with a small u) in which the Universe floats. The coordinates and age of the Universe in universe are irrelevant unless other Universes exist [1]. The existence of other Universes is beyond the scope of this paper. In universe, with a small u, two possibilities exist. The first possibility is that matter only existed until energy was introduced to compress matter into the compression era. The second possibility is that both matter and energy coexisted without any 'constructive' interaction between them.

Whichever possibility one considers, matter, at that stage, consists of its simplest form. At its simplest form, matter cannot display any properties, nor is it expected to interact with itself or with any other thing, if this other thing existed. Matter, in that realm, may have possessed the essence of mass, but not mass as is known in the Universe.

A finite sum of this matter was then contoured by an energy field and the second era commenced. During this stage matter was compressed to form the basic masses through which energy could manifest itself. Matter was compressed and molded into particles that could interact with other forms of existence, or be utilized by other essences (energy), in order to form together the basic building constituents of the Universe. In other words, matter was subdued to energy.

This necessarily implies that matter has been compressed to form a finite lump of particles with 'identity' and 'constructability'. This process should have consumed large quantities of energy. It seems difficult to comprehend the reason behind persisting compression beyond this stage. The initial reason of compression has been to convert matter into usable particles. It defies logic that compression persists beyond this stage that it consumes more energy to destroy the essential particles that were created. Whatever exists within the contour of compression is finite and is supposed to be invested efficiently. This poses serious doubts, to say the least, on the Big Bang theory.

At this stage two questions may arise: How did the compression process initiate (and stop)? And where

did the energy come from? The compression process is the effect of an exerted directional energy towards a center, for a sphere, or two centers, for an ellipsoid. Whatever matter trapped within the energy contracting contour becomes finite. Matter at that stage is like pieces of a broken cup that need to be glued together (by energy) in order to be filled and utilized for a role. Just enough energy is introduced to transform matter into the simplest usable building blocks. If more energy is exerted, then it will either destroy the formed building blocks or it will be wasted as it exceeds the capacity of building blocks created.

i. *The Compression Process*

Matter and energy are two distinct non-interchangeable and non equivalent entities in essence. Matter cannot be changed into energy and vice versa. Else one entity would have been sufficient to interact and develop itself irrespective of the other entity. Therefore one would expect to find an area where sole matter develops itself, other area where sole energy develops itself, and other areas where different combinations of both energy and matter would develop themselves. It is logically impossible for systems to develop themselves into more complex systems without external input. As such, the only possible alternative would be a combination of both mutually exclusive matter and energy for development.

This, however, does not contradict the results of Einstein's general relativity equation ($E=mc^2$). This contradicts the explanation. Mass has returned into one of its less energy content structures, that remain undetectable on the present measure scales. The Energy released is the integrating energy required to upgrade the mass structure as is explained further hereafter.

Energy cannot manifest itself without mass. The manifestation of energy can only be exhibited through the development of mass that can then be colonized by more energy. The colonization capacity per unit of mass is finite. As such, energy compressed initial matter comprising the essence of mass into "massable" Matter, with a capital M, referred to as the Dark Matter. The compression process stopped when this stage was realized. It is a stage where the maximum possible energy has colonized the created Universe as dark energy.

At the early stage of the compression process, energy created a "massable" contour first then tightened it, through its "attract" function, and dissipated into the bounded area to create a "massable" circumferential grid that expanded towards the center. This rendered all particles within the contour to acquire mass. At this stage the shape of the universe may have been spherical in order it optimizes the energy required for compression.

b) The Compression Energy

The energy before compression could not have existed within the 'sea' of matter. Energy colonizes massable Matter for it to exist. It also requires massable Matter for it to travel and develop. The initial energy should have come from a source, a source with abundant crude energy. The interaction of this energy with matter seems to have created a sole 'attract' function in order to transfer matter with mass essence into massable Matter. Energy tends to act, and should be thought of, like a living creature that thrives to keep and develop its kind, or potential.

So when the contraction process stopped, the created space was completely packed with energy saturated particles of Matter. The compressed space has its initial volume. Crude energy stops from being dissipated into the new saturated space as it cannot be further absorbed or stored. The crude energy may have been directed to create other similar space/spaces somewhere else in the realm of infinity.

The potential energy, at this stage is what is referred to as Dark Energy. Matter, at this stage, is what is referred to as Dark Matter. They are both finite in the compressed space; therefore, no infinite activity can take place; and, no singularity points can exist. If a singularity point is formed, the new space will consume itself and disintegrates into its initial state. However, an energy absorbing singularity requires 'matter' with storage potential that resembles the crude energy storage source. This contradicts the logic of the matter/energy interaction process. The formed Matter lacks the potential of having such storage capacity. Infinite mass cannot be formed also as this requires infinite energy. This contradicts the assumption that Energy and Matter are finite in the formed Space.

At this exact moment, t=@, when energy could not be absorbed anymore and the compression process ended, the Universe was created. It comprised of totally packed volume of dark matter which was totally colonized by dark energy. This energy charged and turbulent volume that existed within a contour in a null resistive medium can only expand. The Universal expansion started but under the control of natural laws.

c) Dark Matter and Dark Energy

Matter has been transferred to the minimum structural threshold, which is dark matter, below which dark energy cannot colonize. Dark matter is the simplest structure of matter that can react to dark energy. The subsystem that held the Universe packed together and protected it from explosion and scatter could not be a gravitational force among the particles, if it existed, but the contour itself [1]. The contour during expansion differs in role, essence and structure from the contour of compression. The reason is the difference of the matter acted upon during compression from the Matter acting on the contour during expansion.

When the expansion process started, the shape of the Universe should have transformed into ellipsoidal by an array of expansion ripples [1]. The additional energy stored in the ripples, and that was released during the clash of the ripples, transformed dark matter into more complex forms of structured matter. The structured matter required much more space than what was consumed by the same mass before the transformation. Though an atom is a gigantic complex structure compared to a particle of dark matter, an atom's mass, for example, is concentrated in its nucleus; however, its volume is dictated by its orbiting electrons. Such spacious structuring of matter may further fuel the Universal expansion by acting as mass/energy storages that maybe processed at some stages [1]. Dark matter is expected to flow freely through most formations of massable structures due to its small structures.

As expansion ripples clash together, dark matter concentrations are created. Part of this concentration gets transformed by the extra boost of energy into more complex forms of Matter. Formations of nutrinos, baryons, and other forms of Matter constituents start to appear among more complex structures, such as atoms. The extent of Matter formation relies on the energy of the ripple clash.

The formation of different particles from the integrated dark matter/ dark energy interaction may propose one of two possibilities. The first possibility is that dark energy may be composed of different energies, with different strengths and different effects on the dark matter. The second possibility is that dark matter composes of different shapes, for example, that produces different structures when exposed to the same energy. The second possibility seems to be much more favorable because same structures of Matter that require the same energies to be formed, may exhibit different behaviors, such as the quarks that build the protons and neutrons. This implies that dark matter may have a differentiating agent within, such as shape, or may be something similar to a DNA.

Dark energy manifests itself through the Matter structures it builds. It may appear as a 'repel' force, 'attract' force, or energy packets. The repel force can be exhibited in the universal expansion or, for example, when two particles of the like charge meet. The attract force, which is a very essential function of energy, can be exhibited in building the particles and the objects of the Universe, such as the bonding energy of a nucleus. Energy packets are, for example, in photons and gamma rays. In all these three functions, energy manifests itself through massable matter. Even energy radiation, through photon-based particles, involves carriage mass particles. Energy cannot travel bare without a carrying and wrapping structure of dark matter. The carrying media can be a relatively condensed structure of dark matter particles that can carry the photon energy. When this structure is compromised through impact, it disintegrates into scattering dark matter particles each carrying its share of energy.

As the Universe expands it sends energy infested ripples towards its interior. This energy is carried by dark matter particles that build up into more complex structures with each clash of ripples. The clash area, in which universal objects are created, becomes rich with accumulated dark matter. The dark matter particles, under the massive pressure of the clash, integrate into more complex particles. The dark energy within builds up until it reveals itself as a specific form of energy through the function of the built particle. The function of the built particle may be defined by the shapes of the initial building dark matter particles.

Energy cannot exist stand-alone and requires a massable carrier. So as these particles build up, and two or more particles come together and merge, they share their energy content. The energy causing the merger of the building particles may have essentially modified their shape in the process. The new shared energy resists any disintegration of the new built up particle because it requires preserving its carrier. The initial carriers may also have been subjected to a change of shape in the fierce interactions caused by the clash. Because of the changes in shape, and eventually, changes in energy absorbing capacity or containment ability of the geometry, some of the initial particles, if released, might not be able to carry their initial capacity of energy. Since energy cannot stand alone, it will resist the disintegration of the new built up particles that integrated into a new cluster of Matter (of 'A' particles), above dark matter (in complexity).

The A particles interact, for example, and build up into more complex forms of Matter, B and C. Suppose that C particles, for instance, were made up of combinations of three B particles. Suppose also that a B particle consists of one A particle and of slightly deformed packed dark matter particles such that they can retain their initial load of energy. Under certain conditions, one can expect the C particle to disintegrate, for example, into two B particles, one A particle, and one photon or gamma particle.

The integration of particles continues to form different Matter constituents, such as neutrons, protons and electrons. Electrons are similar to photons in the structural sense. Neutrons and protons are bound together by energy. The bigger the nucleus, the greater the binding energy required, the stronger the ripple clash should be. The formation of particles is expected to be a very turbulent nuclear process into which dark matter particles are absorbed and processed to form more complex structures of Matter. These structures can be as complex as planets, black holes, galaxies…etc. The absorption of Matter from the surrounding triggered by the ripple clash reactions can be referred to as

'streaming' [1]. The streaming effect mobilizes dramatic quantities of Matter towards the reaction center, the 'sink'. Any particle crossing the area, such as photons, can be absorbed towards the sink. If the sink is as severe as a black hole, the passing photons, among other particles will be absorbed with the streaming particles into the sink and processed [1].

IV. Theoretical Model

1. The Universe is a finite subset of an infinite universe that consists of matter only. Matter in the infinite universe consists of particles with the essence of mass.
2. Energy dissipated from a source and compressed the particles with essence of mass to form massable particles. Energy and matter are different in essence and strictly mutually exclusive.
3. The compression process halted when all bounded matter was transformed into Matter and got fully charged with energy. Singularity was never achieved.
4. The first formed massable Matter is what is referred to as Dark Matter. It is fully colonized with energy referred to as Dark Energy. Dark matter particles have a finite capacity of dark energy absorption. The amount of dark energy in the Universe is directly proportional to the absorption capacity of dark matter.
5. The Universe is a finite closed system of interacting Matter and Energy. Dark matter and dark energy cannot dissipate to the initial universe. Dark matter particles may exchange dark energy; however, they have no other mutual interaction.
6. Dark matter cannot exert a gravitational force, if it exists, against Universal expansion. Dark matter is the carriage charged by dark energy to fuel the expansion.
7. The compression phase energy and the dark energy are the same in essence but different in function.
8. The compression contour and the expansion contour are different in structure and function.
9. Dark matter charged with dark energy acts like a compressed spring, that once and since released, has been expanding in a non restrictive environment. This causes the bounded Universe to accelerate in expansion.
10. Dark energy manifests itself through the integration of dark matter into complex structures. Dark matter structure is the minimum threshold for building more complex structures.
11. Dark matter particles may differ in shape; thus, dark energy may exhibit different functions through the integrated structures. Dark energy transforms its identity into detectable energy in integrated massable matter.
12. Dark energy is converting into other forms of Universal energies. As such, the relative amount of dark energy should be decreasing.
13. Energy cannot exist effectively without massable matter. Photon based particles comprise dense dark matter structures with a concentrated energy load. Electrons resemble photons in structure.
14. Universal ripples initiated by the Universal expansion process clash into each other transforming dense dark matter into universal objects.
15. Nature and natural laws started strict application at the instant the Universe started to expand.

V. Hypothesis

1. Dark energy exists as a constructive agent of the Universe. It is directly proportional to the absorption capacity of dark matter.
2. Dark matter particles are the simplest massable particles of the Universe. They exist in different shapes that allow energy to manifest itself in different functionalities.
3. Photons are concentrated forms of dark matter colonized with concentrated forms of energy.
4. The contraction of the initial matter never reached a singularity. It stopped when all matter became massable and fully energized. Infinities do not exist in nature.
5. Matter and Energy are not equivalent.

VI. Discussion

The presented ideas refute a good sum of ideas that are adopted in present sciences of the Universe. The division of universal constituents among different percentages of dark matter, dark energy, and baryons does not fit well with the proposed model. Dark energy is not believed to exist independent of dark matter. 'From astronomical observations, we know that dark matter exists, makes up 23% of the mass budget of the Universe, clusters strongly to form the load-bearing frame of structure for galaxy formation, and hardly interacts with ordinary matter except gravitationally' [19]. The proposed model agrees, however, with the idea that dark matter is the founding basis for galaxy formation; and, it explains the mechanism.

This model claims that dark matter is the simplest massable indivisible particle that exists in the Universe. It is the simplest building block existing. Present scientific ideas claim that WIMPs, for example, with masses close to the mass of a silver atom [19] [33], are dark matter candidates. The model agrees with some ideas that propose different 'identities' of dark matter [19] [40] [41] [42], but it claims that the difference may be in the shape of the particles.

This study claims that energy cannot exist as an independent entity that occupies its own space. It

requires massable matter in order that it functions. Photons are forms of energy particles that necessarily colonize and utilize massable condensed structures of dark matter [45] [46]. This contradicts the outcomes of the special relativity theory [47].

Nature is an efficient 'investor' of resources that cannot afford to waste finite sources of energy and matter within a finite Universe. As such, this study considers that the compression of matter beyond a certain point defies the reason of efficient matter formation. Since massable matter was formed at a certain stage, there could be no logical reasoning for a continuation of the compression process. This, if it is assumed that the aftermath of the Big Bang would be the Universe, is refuted in this model. This agrees with the doubts of many scientists [11] [12] [13] [14] [15] [16].

Following the above logic, infinities cannot exist within a finite Universe with finite resources. Otherwise the Universe would consume itself and disintegrate to a scatter of particles into the initial universe. Since the Universe exists, then infinity cannot exist.

This model claims that matter and energy are distinct in essence. Matter cannot be transformed into energy, and vice versa. Einstein's equation of Energy relates its value to the transformation of mass. The difference in mass has been proven empirically; however, the interpretation of the phenomenon was not accurate. According to this model, the mass disintegrates into one of its less complex structures, maybe to dark matter, and releases the energy associated with its former integration into its degradable structure. This does not agree with Einstein's interpretatin of the phenomenon [48] [49].

VII. Conclusion

Human capabilities are still modest when it comes to detection of particles or objects beyond certain thresholds. The volume of the Universe humans perceive is extremely small and cannot in any way be a prototype of what exists in the vast corners of the Universe. Added to this, scientific assumptions in the last century created glass ceilings for the advance in cosmology. Certain taboos were created around certain figures whose ideas can never be refuted.

This study calls for releasing the human mind from constraints. This led to the proposition of a logical perspective that perceives the Universe as a single system of interactive subsystems. Dark matter and dark energy have to be the building blocks of the Universe. The role of dark energy exceeds that of Universal expansion to matter integration.

The finite Universe cannot tolerate infinities within its borders. Mathematical equations can never lead cosmology but the other way round. Mathematics and observations are the modern sources of theories in cosmology [34]. Matter and energy are non-reciprocal in essence. Thus this paper calls to revisit many ideas and interpretations adopted in cosmology.

The limitations of the study are the difficulties associated with testing some of the ideas empirically in order to set firm ground for the model. The data available of some phenomena remain minimal for proper interpretation. The sources and references include lots of speculations that can be misleading.

The cognitive approach is an open call for more cognitive input to expand or properly direct certain ideas. Empirical scientists can confirm or negate the model building ideas in order to refine it further. The subject is as wide as the Universe and requires researchers from different backgrounds to expand on the model.

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