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Exploring Theoretical Modifications in Fabric of Spacetime

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Article

Exploring Theoretical Modifications in Fabric of Spacetime

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Abstract: In this paper, I present a possible explanation for the expansion of the universe, by introduced a unique nature of Space-time, this particular and marvelous nature of space shows us that space can shrink, expand, and stretch. This property of space is caused the size of the universe changing over time: growing or shrinking. The observed expansion of the universe, which relates the stretching of Shrunk space for the new theory, is derived. This model is based on the two principal long-range forces are the gravitational force and the repulsive force generated by shrunk space. They are the two most fundamental quantities in the universe that govern cosmic evolution. They may provide the clockwork mechanism that operates our eternal cyclic universe.

Keywords: big bang and big crunch; cosmology; dark energy; gravitational force; the cyclic universe

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1. Introduction

In physics, spacetime is a mathematical model that fuses the three dimensions of space and the one dimension of time into a single four-dimensional continuum. Spacetime diagrams are useful in visualizing and understanding relativistic effects such as how different observers perceive where and when events occur.

Until the turn of the 20th century, the assumption had been that the three-dimensional geometry of the universe (its description in terms of locations, shapes, distances, and directions) was distinct from time (the measurement of when events occur within the universe). However, space and time took on new meanings with the Lorentz transformation and special theory of relativity.

In 1908, Hermann Minkowski presented a geometric interpretation of special relativity that fused time and the three spatial dimensions of space into a single four-dimensional continuum now known as Minkowski space. This interpretation proved vital to the general theory of relativity, wherein spacetime is curved by mass and energy.

Right after Einstein formalized GTR, he devised a static model of the universe in which the universe has a finite size using his own equation known as Einstein equation. Einstein introduced what is known as the cosmological constant, in his equation which brought about a repulsive force rather than an attractive one, into his equation. This adjustment aimed to avoid the depiction of the universe contracting under the influence of gravity [1].

The recent discoveries of cosmic acceleration indicating self-repulsive dark energy [2–4] were not predicted and have no clear role in the standard model. Dark energy is just the name that astronomers gave to the mysterious "something" that is causing the universe to expand at an accelerated rate. [5,6] Furthermore, no explanation is offered for the 'beginning of space-time', the initial conditions of the universe, or the long-term future and ultimate fate of the universe. Most scientists adding in dark energy as a cosmological constant could nearly explain how space-time is being stretched apart. But that explanation still leaves scientists clueless as to why the strange force exists in the very beginning. However, the standard model has some cracks and gaps.

The author suggests that this repulsive force generated by shrunk space is the most fundamental quantities in the universe. This paper provides several philosophical and scientific arguments for understanding the unique nature of spacetime.

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By adopting a philosophical perspective, this article aims for a logical and simplified description of space-time. Some important achievements of the article are listed below.

1. In this paper, I present a cosmological model consisting of an endless sequence of cycles of expansion and contraction of the universe that repeat indefinitely.

2. This paper explain a more descriptive physical model and properties of Space-time.

3. This model provides a rational explanation for the accelerated expansion of the universe (Dark Energy).

4. We follow up on this approach to predict the future and the ultimate end of the cosmos.

5. This new theory is best understood by pictures rather than by a large number of equations.

2. Relativistic Cosmology and Realism of Spacetime

Scientific cosmology has rapidly evolved both experimentally and theoretically, seeking to unravel the origins and future of the universe. Approximately a century has elapsed since Albert Einstein introduced GTR, and it is within this span of time that significant advancements have taken place. These advances have been driven not only by classical GTR but also by quantum mechanics. Below, I will provide a rough overview of the significant advancements in cosmological research ([7], pp. 6-7).

1. Right after Einstein formalized GTR, he devised a static model of the universe in which the universe has a finite size using his own equation known as Einstein equation [1].

2. Einstein introduced what is known as the cosmological constant, which brought about a repulsive force rather than an attractive force, into his equation. This adjustment aimed to avoid the depiction of the universe contracting under the influence of gravity [1].

3. When evidence of the expansion of the universe was indicated by redshift through Edwin Hubble's observations [8], it led to the belief that the universe had a beginning. Based on the current elemental composition ratios, George Gamow and others proposed the Big Bang theory, suggesting that the early universe was in a state of high density and high temperature [9].

4. Observations of the cosmic microwave background radiation (CMB) confirmed the predicted elemental ratios proposed by the Big Bang theory, validating the accuracy of the theory [10].

5. With the development of elementary particle cosmology, the inflation theory became the standard model to address issues within Big Bang cosmology such as the horizon problem and the flatness problem, suggesting that the universe underwent rapid inflationary expansion from an initial microscopic quantum state to its present macroscopic state [11].

Einstein aimed to maintained a static model of the universe and adjusted his equation known as the cosmological constant, in (2). Despite observations confirming that the universe was not static but indeed expanding, as evidenced in (3), it is intriguing that his cosmological constant continued to exist in cosmology as a form of dark energy or vacuum energy without being discarded. Recent observations of supernovae reveal not only the universe's expansion but also its accelerated expansion [19], and so an enigmatic form of energy is responsible for explaining this phenomenon (I will take up this case in 3.2). In fact, the universe derived from (2) was not only solely static but also artificially closed and finite, deduced from various other presuppositions.

In the next subsection, I will focus on the notion of spacetime by introducing a unique nature of shrinking and expanding of Spacetime, in which shrunk space exerts the repulsive force which is responsible for stretching the Shrunk Space, or expansion of the space. In GTR, Λ represents the cosmological constant, serving as a repulsive force. But how did it come about? This negative pressure is believed to exert a repulsive force counteracting gravity throughout the entire universe. Furthermore, I will focus on the core concepts of expansion discussed above within the context of stretching the shrunk space. This notion significantly influences the modern cosmological worldview.

3. Unique Nature of Shrinking and Expanding of the Space-Time

In simple terms, an expanding universe literally means that the scale of the universe is increasing. The greater the distance between galaxies and clusters of galaxies distributed in the universe becomes, the larger the universe itself becomes. The key first evidence is the redshift-distance relationship that

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was discovered by Lemaître and then by Hubble [8]. Observations show that the redshift, which is the increase in wavelength of light reaching Earth, indicates how fast a star or galaxy from which the light was emitted is moving away. This information indirectly helps us determine the rate of expansion. This implies that these galaxies are moving away from us; the farther they are, the faster they move. The second key evidence is the cosmic microwave background radiation. This was, in fact, a prediction of the expanding universe model. Initially, I would like to accept the expansion of the universe as an empirical fact.

Well, now that the spacetime picture in GTR has been established, first I will explore the theory of an expanding universe using this structural perspective. In fact, the reason behind the universe's expansion, even if it holds true, still lacks a satisfactory explanation. One model that attempts to explain the expanding universe is based on the concept of space itself. Let me elaborate on this view, which ultimately leads to the fundamental question: How did spacetime come into existence?

The FLRW metric is often likened to a balloon model. It is the scale factor a(t) that drives the expansion of the universe. This factor, as its name implies, serves as a kind of ruler for measuring the scale of the spatial coordinate system. When the scale factor increases, the scale of the system also increases, regardless of whether the system or the universe itself is finite or infinite. The scale of the spatial coordinate system corresponds to the scale of the universe. Thus, this coordinate system is referred to as a co-moving coordinate system. Galaxies and clusters of galaxies move in accordance with this spatial coordinate system, their positions on the system remaining unchanged, much like the marks on a balloon moving apart as the balloon expands. This explanation of the universe's expansion is straightforward and easy to understand, but it does carry the potential for misunderstanding. The balloon model utilizing the FLRW metric does not inherently provide the explanation for the cause of this expansion, but just expresses the expansion itself.

However, the co-moving coordinate system might be more than just a convenient tool for describing the universe's system. Each spatial coordinate value in the comoving coordinate system corresponds to a physical position. It directly corresponds to the position of each galaxy. If the universe is isotropic and homogeneous, using this coordinate system is very natural and logical. In this sense, the co-moving coordinate system might be the most suitable model for representing spacetime itself. The co-moving coordinate system saves the cosmological principle. Hubble also demonstrated through observational data on redshift that the farther galaxies are from Earth, the faster they move away, with velocities proportional to their distance from Earth [24]. Intuitively, these results seem to suggest that all celestial bodies are moving away from the center of the universe, our Milky Way galaxy, considered seemingly a special place, which contradicts the cosmological principle. However, if the universe truly expands like a balloon, these data are consistent with the cosmological principle. Thus, if there is no expanding space behind matter, there is no explanation for why the universe is expanding in this manner.

The co-moving coordinate system could suggest the existence of expanding space behind matter. But this model does not provide an explanation for the fundamental reason behind the current expansion of the universe.

This is precisely the answer I aim to present to the fundamental question. In order to discuss the entire universe, we needs to establish a basic model of Spacetime for the global universe system. The observed expansion of the space, which relates the stretching of Shrunk space for the new theory, is derived and suggests that as the space shrinks it exerts the repulsive force which is responsible for stretching the Shrunk Space, or expansion of the space. This model exploring theoretical modifications in the fabric of Spacetime, by introducing a unique nature of shrinking and expanding of Spacetime, and suggest the existence of expanding space behind matter. When matter comes closer to each other, the space also shrinking between them. As space shrinks it exerts repulsive force, which stretches the Shrunk space. Space is all around us, it expands, it reacts to what it contains (matter, energy, radiation). It grows, and shrinks, it has a finite volume, it could shrink at Planck Length and it could grow at a cosmic scale. This is a new concept about structure of Spacetime, which shows us how the size of universe changed over time, (we will discuss the structure of Spacetime in the next section). Space-time is part of our universe and plays a very important role in it. Our model takes that

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space consists of unique properties of shrinking and expanding, in which participate in the evolution of the universe, we can follow and trace its progress and its ultimate fate.

It is worth elaborating on how an expanding space differs from a static space with objects moving through it. As we have discussed above that space having properties of its own, so we will use several analogies.

One way to imagine space is like a stretchy band with galaxies stuck onto it. As the band stretches, the galaxies all move away from each other, but they are moving due to the stretching of the space, they are not moving through the space. Furthermore, we see that the galaxies themselves are not stretching, they are not growing, only the shrunk space between them is stretching. That is because the internal (gravitational) forces within galaxies overwhelm the expansion of space. So our Universe is expanding, but our Galaxy and Solar System are not. On average, all galaxies are moving away from each other, but within a galaxy, the stars are not moving away from each other because gravity keeps them bound together.

The galaxies move away from each other as shrunk space stretches. The expansion follows the Hubble Law: the farther away a galaxy is from another, the faster its velocity. This is true from the perspective of any of the galaxies in the universe. This illustrates what is meant by saying that shrunk space is stretching and carrying objects along with it, in contrast with saying the objects are moving through space. It is not necessarily expanding into anything. So, for example, the Universe does not necessarily expand into previously existing empty space. The expansion is instead caused by stretching of shrunk space everywhere, constantly.

This model that attempts to explain the expanding universe is based on the concept of space itself. Let me elaborate on this view, as we discussed above the shrinking and expanding is a property of Spacetime itself. When the matter comes closer to each other, the space also shrinking between them. As space shrinks it exerts force, which stretches the Shrunk space. It means that increasing distance between galaxies and cluster of galaxies depends on how much space had shrunk between any two points. This implies that how much repulsive force produced between any two points. Let me example to explain the expansion of Spacetime by assuming that point A and B is moving away from each other, see **Figure 1**, now imagine that space had shrunk between point A and point B. When space exponentially shrunk it exerts the repulsive force, which force cause the stretching of shrink space. As shrunk space stretching, it leads to appearance of space, this phenomenon cause the distance increasing between two points. In fact space itself is not creating but shrunk space stretching. As force of gravity decreasing between these points, the shrunk space stretching accordingly. The point A and point B will move away from each other until all the shrunk space stretched or until cease of repulsive pushing force of shrunk space.

It does not matter which point you choose as a reference in the universe. You will always get the same linear expansion law. Here, an important thing to realize is that none of these galaxies exerted any effort to move away from each other. They were carried along with the expansion, or stretching of the shrunk space. For simplicity we have done this example in one dimension, but this sort of stretching of shrunk space happens in all three spatial dimensions simultaneously as the Universe expands.

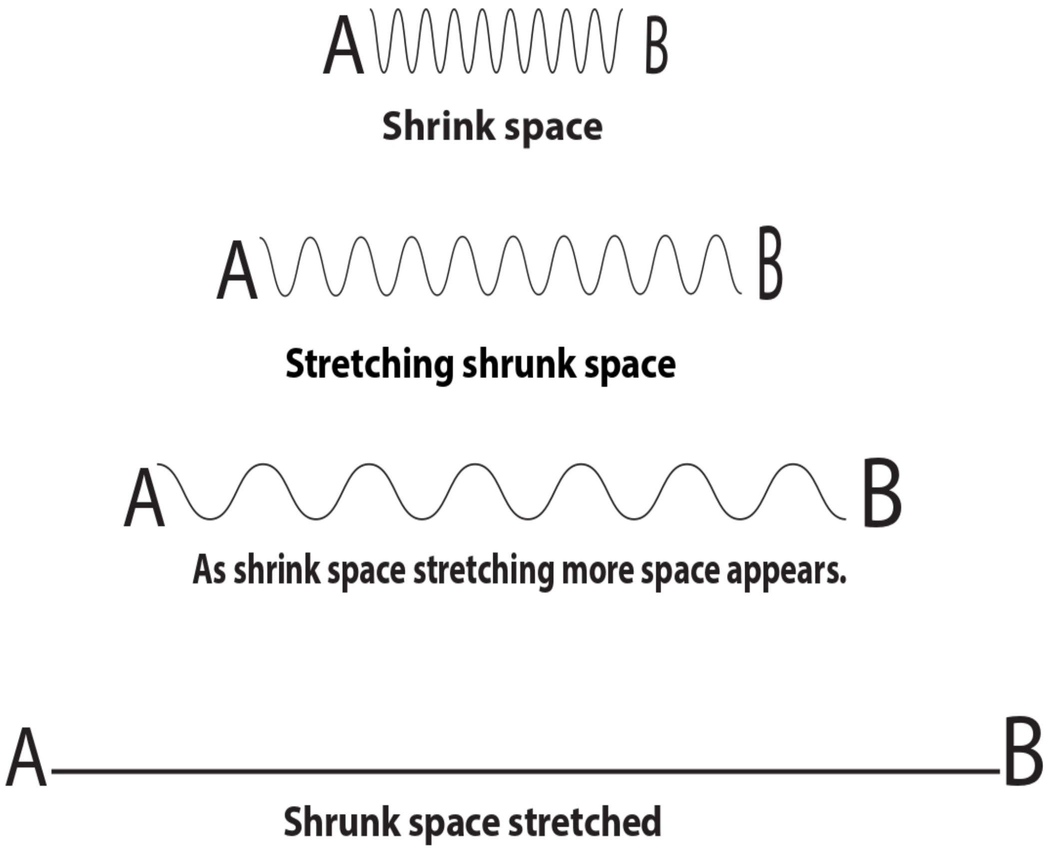

Fig:1 **This model takes that space consists of unique properties of shrinking and expanding, it could shrink at planck length and it could grow at a cosmic scale**

Our Space-time model suggests and embodies some properties of space:

1) Space-time itself is a finite and it consists of unique properties of shrinking and expanding. When space exponentially shrunk it exerts the repulsive force, which force cause the stretching of shrink space.

2) The force of shrink Space differs from gravity. Curved space exerts the inwards pulling force, we called gravitational force, and shrunk space exerts the outwards pushing force, the shrink space force is repulsive; it exerts a force opposite to that gravitational force, we can say antigravity. So the gravity and antigravity is not a force at all, but it is the influence of vacuum space.

3) Vacuum Space, might be the most fundamental entities in universe. There cannot be anything without space; without space there is “nothing”.

4) We might point out certain implications of our universe, It could be that our universe is cyclic and there is no beginning; there may have been Big Bangs before ours.

5) Finally, we also comment on the ultimate fate of the universe as this topic is also quite controversial in the scientific community. The ultimate fate of the Universe with any level of certainty that will depend on how much space had shrunk, which essentially determines how the repulsive force of the shrunk space responds to the stretching the shrunk space. The force of the shrunk space will cease, at universe reached its maximum volume of cosmic scale, and the expansion of the Universe will eventually stalls. After then the universe will begin to contract until all the matter and energy in the universe re-collapses to a final singularity (Big Crunch).

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Spacetime, which consists of three dimensions of space and one dimension of time, is such a large, abstract concept that scientists have a very difficult time understanding and defining it. Moreover, different theories offer different, contradictory insights on spacetime's structure. While general relativity describes spacetime as a continuous manifold, quantum field theories require spacetime to be made of discrete points. Unifying these two theories into one theory of quantum gravity is currently one of the biggest unsolved problems in physics.

Space-time, in physical science, single concept that recognizes the union of space and time, first proposed by the mathematician Hermann Minkowski in 1908 as a way to reformulate Albert Einstein's special theory of relativity (1905).

Einstein's general theory of relativity (1916) again makes use of a four-dimensional space-time, but incorporates gravitational effects. Gravity is no longer thought of as a force, as in the Newtonian system, but as a cause of a "warping" of space-time, an effect described explicitly by a set of equations formulated by Einstein. The result is a "curved" space-time, as opposed to the "flat" Minkowski space-time, where trajectories of particles are straight lines in an inertial coordinate system. In Einstein's curved space-time, a direct extension of Riemann's notion of curved space (1854), a particle follows a world line, or geodesic, somewhat analogous to the way a billiard ball on a warped surface would follow a path determined by the warping or curving of the surface. One of the basic tenets of general relativity is that inside a container following a geodesic of space-time, such as an elevator in free-fall, or a satellite orbiting the Earth, the effect would be the same as a total absence of gravity. The paths of light rays are also geodesics of space-time, of a special sort, called "null geodesics."

From the perspective of structure of Spacetime, this model proposed that space could shrink and stretch simultaneously. Space-time has a finite volume, but its scale changed overtime, it could shrink at Planck Length and it could grow at a cosmic scale. The shrinking and expanding is a unique nature of Space-time. This new possible structure of spacetime on Planck scale, as well as large scale, suggests that spacetime could be both shrunk and stretches at the same time, conceivably satisfying general relativity and quantum field theories simultaneously.

The space consists of a unique property of shrinking and expanding, this particular and marvellous nature of space shows us that space can stretch, expand, and shrink, it is like a spring. If we push the spring it shrinks, in the same way when the matter comes closer to each other, the space also shrinking between them. As space shrinks it exerts repulsive force, which stretches the Shrunk space. This property of space is causes the size of the Universe changed over time: growing or shrinking. As the particles get closer to each other, the vacuum space should also consequently get closer. In a way, we can say that space shrunk, and as shrunk space expands, it allows particles to move away from each other. The force of shrinking space produces an exponential change in the size of the Universe.

For instance, in GTR and from this model, space points are not the same across different times. In the co-moving coordinate system, let us consider a space point labeled p with spatial coordinates xp, yp, zp at time coordinate value t1 in the FLRW metric. This space point is not identical to another point labeled p at the same coordinate system but at a different time coordinate value t2 , as space points do not persist through time. Point p at t1 and point p at t2 coincidentally possess the same spatial coordinates within the framework of the co-moving coordinate system **(Figure 2)**. According to the principle of general covariance, even if a different coordinate system were applied to these two points, physical phenomena should be described in the same manner. Hence, there is no need to assert their identity since these two spacetime points labeled t1 (xp, yp, zp) and t2 (xp, yp, zp) in the co-moving system are assigned distinct spatial coordinates in the new coordinate system.

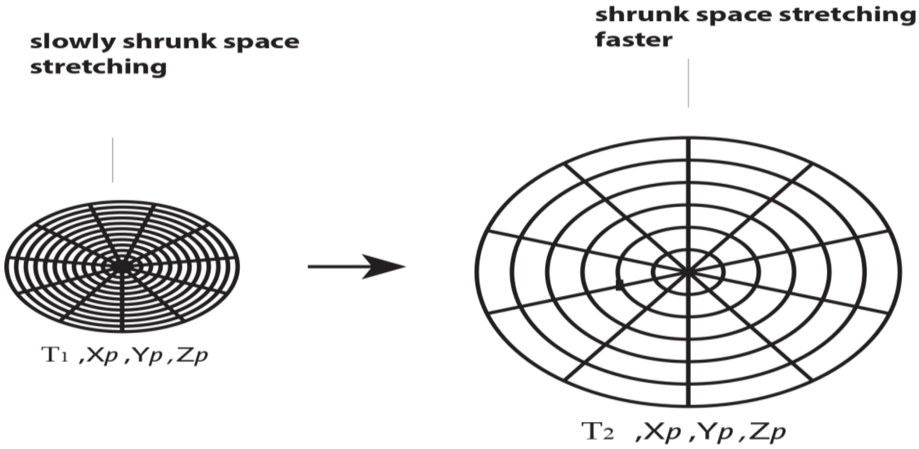

fig 2 the explanation of stretching of shrunk space with a co-moving coordinate system

See in Figure 2, how the size of the universe changed over time. In figure we can see the space itself is not creating, but shrunk space is stretching, which leads to the appearance of space, whereby the scale of space changes. The universe does not expand "into" anything and does not require space to exist "outside" it.

3.1. The Big Bang Was not the Beginning, but a Repeating Pattern of Expansion and Contraction of Spacetime

It is proposed that about 14 billion years ago the Universe started from the shortest meaningful length, Planck Length and the shortest meaningful measure of time, Planck Time. The nascent Universe passed through a phase of exponential expansion soon after the Big Bang, driven by a positive vacuum energy density [12]." The cyclic universe theory is a model of cosmic evolution according to which the universe undergoes endless cycles of expansion and cooling, each beginning with a "big bang" and ending in a "big crunch". Although the cyclic model differs radically from the conventional Big Bang–inflationary picture in terms of the physical processes that shape the universe and the whole outlook on cosmic history [13].

Our model has no zero-volume singularity because the size of space is finite, and limited, i.e., the volume of space cannot be zero at the quantum scale. This proposed theory depends upon the force generated by shrunk space, which force caused the exponential growth of space. We speculated that space-time, grows in concert very rapidly at first. About 14 billion years ago, there was an infinite repulsive force of infinite Shrunk space, we speculate that the infinite repulsive force of Shrunk space gave rise to the Big Bang, and caused the rapid growth of space. That process would appear to move very rapidly in the early universe, and was only readily observable by detectors of high-frequency gravitational waves such as the Li-Baker [14] [15] [16]. It then expanded and cooled undergoing phase transitions to radiation, fundamental particles, and matter. Matter grew into galaxies, and was further consolidated by gravity into superclusters. Thus, the Big Bang was not only an explosion of matter and radiation all over space, but it may just have been a silent burst of infinite force of infinite shrink space, that caused the simultaneous appearance of space everywhere. The force of shrunk space expands the universe until all the shrunk space expands at a certain large scale. The force of the shrunk space depends on how much space has shrunk, which essentially determines how the force of the shrunk space responds to the expansion of the universe. Eventually after trillions of years, the expansion stalls. And Gravitational force contracted the Universe until all the space shrunk and matter re-collapsed to a final singularity, and restarted the cycle, see **Figure 3**.

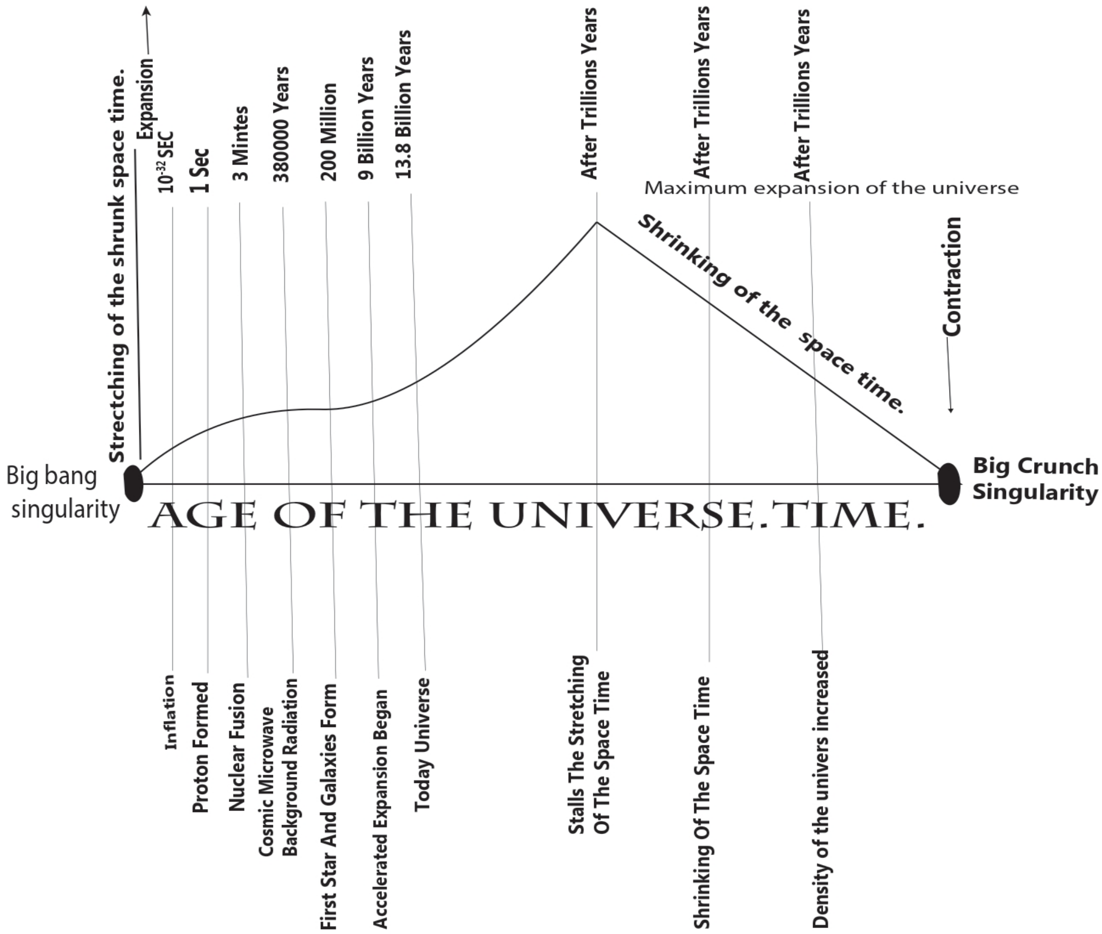

Figure 3. The Big Bang was not the beginning, but a repeating pattern of expansion and contraction of the spacetime.

The two principal long-range forces are the gravitational force and the force generated by the shrunk space play an important role in the reformation of the Universe. The force of shrink Space differs from gravity. Curved space exerts the inwards pulling force, we call gravitational force, and shrunk space exerts the outwards pushing force, the shrink space force is repulsive; it exerts a force opposite to that gravitational force, we can say antigravity. So gravity and antigravity is not a force at all, but it is the influence of vacuum space. The universe may have had no beginning — the Big Bang may have been just a particular moment in the evolution of this always-existing, not a true beginning. This new model of Space-time and its unique properties enables us to describe a sequence of events from the Big Bang to the Big Crunch.

3.2. Accelerated Expansion of the Universe

The recently observed accelerated expansion of the universe has put a challenge for its theoretical understanding. In the standard Big Bang and inflationary models, the recently discovered dark energy and cosmic acceleration [4,17] are an unexpected surprise with no clear explanation. A subsequent paper of Einstein (1917) applies the theory of general relativity to cosmology, and in fact represents the birth of modern cosmology. In it, Einstein looks for models of the entire universe that satisfy his equations under suitable assumptions about the large-scale structure of the universe, such as its "homogeneity," meaning that space-time looks the same in any part as any other part (the "cosmological principle").

Here I proposed a naturally phenomenon of uniform distribution throughout, I gave named homogeneity law. Homogeneity is the sameness of things, or it also mean that something is the same throughout or uniform in composition, or the state of having identical cumulative distribution.

Some effects of homogeneity law on cosmic scale :

The shrink space stretching uniformly. Universe expanding equally in all directions, Using the largest telescope of the time, physicists discovered that the more distant a galaxy is from us, the faster it appears to be receding into space. This means that the universe is expanding uniformly in all directions. A homogeneous Universe that stretches according to a Hubble Law remains homogeneous. This means the stretching looks the same (on average) at every location. This property, homogeneity, does not hold for other possible explanations for the Hubble Law. The stretching Universe also appears the same (on average) in all directions. We call this property isotropy, and we say that the Universe is isotropic.

Distribution of matter in the universe is uniformly, when viewed on a large enough scale. In modern physical cosmology, the universe is uniformly isotropic and homogeneous.

The temperature of the cosmic microwave background – the radiation is remarkably uniform across the sky. It varies by less than 0.001 degrees from a chilly 2.725 kelvin.

Some examples of homogeneity law:

Ripples in a pond, Just as a small disturbance in a pond can create ripples that spread outward in all directions, these ripples are often caused by an object falling into the water.

A sound wave, the pattern of the disturbance creates outward movement in a wave pattern, like sea water in the ocean. The wave carries the sound energy through the medium, equally in all directions.

Nuclear explosions, a nuclear explosion releases vast amounts of energy in the form of blast, heat and radiation equally in all directions.

First Einstein aimed to maintained a static model of the universe and adjusted his equation known as the cosmological constant. When observational evidence later revealed that the universe did in fact seem to be expanding, but not static Einstein withdrew that suggestion. However, closer analysis of the expansion of the universe during the late 1990s once more led astronomers to believe that a cosmological constant should indeed be included in Einstein's equations. It is quite intriguing that his cosmological constant continued to exist in cosmology as a form of dark energy or vacuum energy without being discarded. Recent observations of supernovae reveal not only the universe's expansion but also its accelerated expansion [19], and so an enigmatic form of energy is responsible for explaining this phenomenon.

However, dark energy is one of the most important mysteries in the modern day of cosmology, accordingly to this model the dark energy may not exist, but accelerated stretching of shrunk space is the cause of accelerated expansion of the universe. The overall scenario of this model and its implications explain, the expansion of space, and it's accelerated expansion. The expansion of space is the increases in distance between any two given gravitationally unbound parts of the universe with time. After the beginning of the universe, the Shrunk space continues to expand, but in the distant past, density of the universe should have been greater, so the universe must have been expanding more slowly than it is today. About 4 billion years ago the accelerated expansion of the universe began. Actually space itself is not creating, but shrunk space is stretching, which leads to appearance of space, whereby the scale of space changes. As density of the universe decreases, the repulsive force of shrunk space decrease, the decreasing repulsive force of shrunk space leads to stretches the shrunk space faster and faster, that is although in general, decelerates in the repulsive force of shrunk space leads to accelerating the stretching of space. In other words, stretching Shrunk Space is causing the expansion to accelerate by causing the deceleration in the repulsive force of Shrunk Space. This is the big key to understanding the accelerated expansion of the universe. The universe will not continue to expand forever, no need however, for dark energy. The universe does not expand "into" anything and does not require space to exist "outside" it. This model, however, not only is the source of the accelerated expansion of the universe explained, but it also predicts its ultimate fate.

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As the repulsive force of shrunk space decreases, as a consequence the shrunk space stretches, and as the stretched space shrinks, which leads to increasing the repulsive force (Figure 4). As much space shrunk, the greater repulsive force produced. The force of gravity and repulsive force of shrunk space remains constant. If the force of gravity increases the repulsive force of shrunk space increases, and as the force of gravity decrease, the repulsive force of shrunk space decrease.

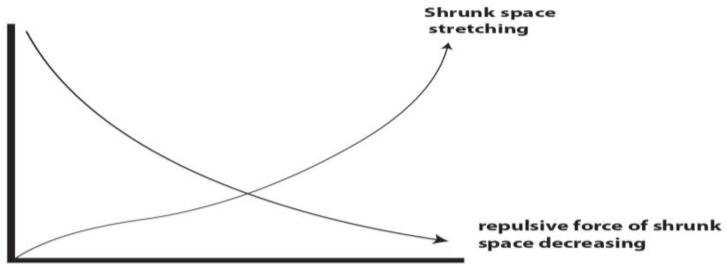

Figure 4. As the repulsive force of shrunk space decreases, as a consequence the shrunk space stretches

This model not only explains the way phenomena occur but also provides a clear worldview on the expanding space concept. The expansion of the universe is not a consequence of the space itself expanding, but rather it is caused by stretching of shrunk space. This explanation of the universe's expansion is straightforward and easy to understand.

See in **Figure 5**, how the size of the universe changed over time. In figure we can see the space itself is not creating, but shrunk space is stretching, which leads to the appearance of space, whereby the scale of space changes. At the very beginning there was an infinite shrunk space, this infinite shrunk space produced the infinite repulsive force in the singularity, which force gave rise to the Big Bang, and shrunk space began to stretch very rapidly. As the repulsive force of the shrunk space decreases, the stretching of shrunk space or expansion of space increases accordingly. Eventually after trillions of years, the universe reached its maximum size, and all the shrunk space stretched, the expansion stalls. After that Gravitational force contracted the Universe until all the space shrunk and matter re-collapsed to a final singularity.

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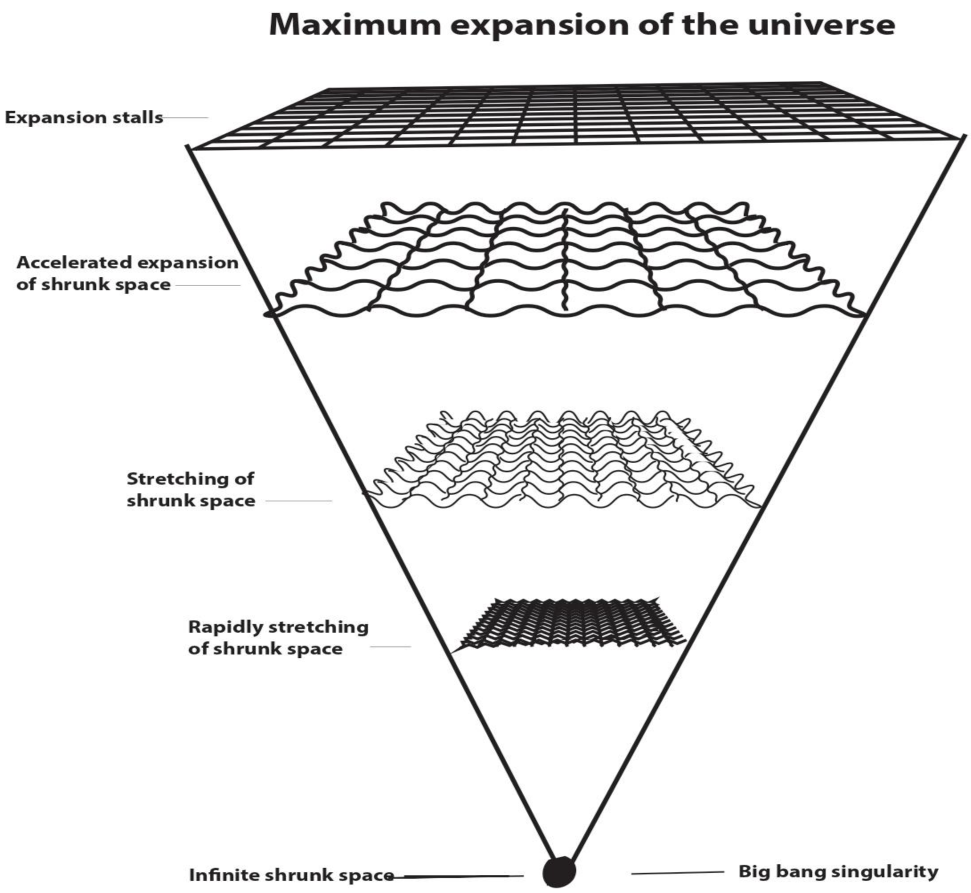

fig 5. the size of the universe changed over time

The repulsive force of shrunk space is directly proportional to the force of gravity and inversely proportional to the universe's expansion.

4. Summary and Conclusions

This model of the universe is designed to solve some of the seemingly unsolvable Problems of cosmology. "It allows us to go beyond the Big Bang, Eternal Cyclic Universe, and inflationary models. The new theory provides possible answers to several longstanding questions with the Big Bang model, which has dominated the field of cosmology for decades. It addresses, for example, the nagging question of what might have come before the beginning of Space-time, and how did spacetime come into existence?

Mathematically, the Big Bang looks like it came from an undefined state — something that isn't explained by the laws of physics under Einstein's theory of general relativity. This is called a "zero volume singularity". But our model has no zero-volume singularity. It suggests that the space would be Shrunk at Planck Length and it would be expanded at a certain cosmic scale. However, the Shrunk space (hence the volume) cannot be zero at the quantum scale. Our model deals directly with the cosmic singularity, explaining it as a transition from a contracting to an expanding phase. This model described that the Universe started from the shortest meaningful length, Planck Length, (the smallest measure of length because shorter than it becomes meaningless) and the shortest meaningful measure of time, Planck Time. Although inflation does not address the cosmic singularity problem directly, it does rely implicitly on the opposite assumption: that the big bang is the beginning of space and time, and that the universe emerges in a rapidly expanding state [18]. In our model the infinite force of infinite shrunk space gave rise to the big bang, and caused the rapidly expansion of space, it then cooled undergoing phase transitions to radiation, fundamental particles, and matter.

The Inflation theory also gets stuck at the point "before" the Big Bang, because according to it, there is nothing before it. "The fundamental philosophical problem with the Big Bang is, there's an after but there's not a before." "In a similar way, we don't know 'one time only' things that happened in history." But this model drives us to a deeper understanding of the universe and suggests that the future of the Universe with any level of certainty that will depend on how much space has shrunk, which essentially determines how the force of the shrunk space responds to the stretching of the shrunk space. Eventually, the accelerated expansion of space will cease because the shrunk space will expand until it reaches its maximum volume of cosmic space. And then the universe starts to contract until all the space shrinks at the Planck Length. This could fill some of the biggest gaps in our common understanding of the way space and time work. The space-time and its unique nature of shrinking and expanding are the most fundamental quantities, which govern cosmic evolution. Thus, bringing the universe back to contract to its initial state, ending in a Big Crunch. The universe will not continue to expand forever, no need however, for dark energy. This could account that the Big Bang was not the beginning of the Universe, there's always a universe before the Big Bang. The universe may have had no beginning — that it has simply always existed. What we perceive as the Big Bang may have been just a particular moment in the evolution of this always-existing, not a true beginning.

Researchers suggest that our expanding universe is now entering a new phase of exponential expansion, due to dark energy. Here again, we have no idea how long this inflationary phase will last. If it continues for more than 10 times the current age of the universe, our galaxy will be left alone, surrounded by darkness with no other source of light in sight. However Dark Energy is one of the most important mysteries in the modern day of astronomy [2]

Our explanation for dark energy is that it is a repulsive force of shrunk space, which is responsible for the stretching of shrunk space. We have elaborated on the mechanism by force emanates from the Shrink space and provides the repulsive force or antigravity, which stretches the Shrunk space. The stretching of Shrunk Space is causing the expansion to accelerate by causing the deceleration in the force of shrink space. As shrunk space stretches more space would appear, as a result, this appearance of space would cause the universe to expand faster and faster. But the interesting thing is that we cannot see which space is shrunk, and which space is stretched because this is invisible. But we can observe this phenomenon by seeing the receding velocity of an object, because according to our model shrunk space is stretching faster, this would cause the universe to expand faster and faster, and as a result, distances between two objects would keep increasing faster and faster.

This research's major breakthrough is that the problem of dark energy could be fully addressed by revising the structure of Spacetime and requiring further understanding of the properties of Spacetime instead of new material components that have not been found up to now.

Another advantage of this theory is that it automatically includes a prediction of the future of the universe because it goes through definite repeating cycles lasting perhaps trillions of years each. The Big Bang and inflation model has no built-in prediction about the long-term future; in the same way that inflation and dark energy arose unpredictably, another effect could emerge that would alter the current course of expansion.

Reviewing the overall scenario and its implications, what is most remarkable is that our model can differ so much from the standard picture in terms of the origin of space and time and the sequence of cosmic events that lead to our current universe. It appears that we now have two disparate possibilities: It could be that our universe is cyclic and has no beginning; there may have been Big Bangs before ours and a universe with a definite beginning. The ultimate arbiter will be Nature.

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