The Origin of the Universe as Interpreted by Model Mechanics

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In the past 100 years theoretical physics and cosmology development have been conducted almost exclusively on a mathematical basis, leading to abstract mathematical objects or processes such as fields, space-time, curvature in space-time, time dilation, length contraction, virtual particles, action at a distance, curled-up dimensions, Entanglement, Dark Energy, Dark Matter etc. It is assumed that these abstract mathematical objects do not physically exist in our physical universe. It is also assumed that there exists a physical model of our universe that can provide physical explanations for all our mathematic. This paper describes a unique physical model of our universe, called Model Mechanics. The provisions of Model Mechanics lead to a new theory on the origin of our universe.

I abandoned the conventional approach for doing physics and started using an approach called the *Pyramid Techniques*. As the name implies, the *Pyramid Techniques* assumes that there is only one physical description of the current state of the universe that is capable of explaining all the processes of nature. This description is at the apex of the pyramid.

The step by step procedure for the *Pyramid Techniques* is as follows:

1. There are three dimensions of space and one dimension of absolute time. No other abstract mathematical object is allowed.
2. Search the literatures and identify the major problems of current theories. The result of this search identified the following major problems of the current theories: The lack of a physical explanation of gravity; The observed accelerated expansion of the universe; The Horizon problem; The Flatness Problem; The Galactic rotational curve problem; Dark Energy and Dark Matter.
3. Formulate a physical model that can account for these problems. The formulator is free to assume any physical model of the current state of the universe. The assumed physical model must be capable of explaining all the forces and processes of nature. In addition, the mathematics of the current theories must be derivable from this physical model.
4. Use this physical model to develop a new theory of gravity that is compatible with the other forces of nature and derive a complete theory of relativity from this physical model that is compatible with quantum field theories.
5. Formulate a new theory of relativity that avoids all the paradoxes of the current Special Relativity Theory.

The *Pyramid Techniques* enabled me to go through a number of possible states of the current universe quickly. The final model adopted is called Model Mechanics. A description of Model Mechanics is as follows:

Model Mechanics supposes that a stationary substance, called the E-Matrix, occupies all of pure-space (void) in our Universe. Subsequently, we perceive the E-Matrix as space. The E-Matrix, in turn, is composed of E-Strings, which are very thin three-dimensional elastic objects, of diameter estimated at 10^{-33} cm. The length of an E-String is not defined. Away from matter, the E-Strings are oriented randomly in all directions. This means that a slice of the E-Matrix in any direction will look the same. Near matter, the E-Strings are more organized: some emanate from the matter, and the number of these passing through a unit area followed the well-known inverse square law of physics. The E-Strings repel each other. This means that there is an unknown outside force that is compacting them together to form the E-Matrix. The repulsive force and the compacting force are in equilibrium. This state of the E-Matrix allows massive matter particles to move freely within it. The motion of a matter particle or S-Particle system in the E-Matrix is called absolute motion. The absolute motion of matter in the E-Matrix will distort the local E-Strings. The E-Strings will recover to the non-distorted state after the passage of the matter particles. Light consists of wave-packets (photons) in neighboring E-Strings as shown in Fig 3.1. On its way toward its target, a wave-packet (photon) will follow the geometries of these neighboring E-Strings. This description of light embodies "duality" as proposed by current physics, *i.e*. light possessing properties of a mass-bearing particle as well as a wave packet. This description of a photon (wave-packet) provides a valid explanation for the peculiar predictions of Schrödinger's Equation—that the probability of finding a photon at a specific location is dependent

on the probability amplitude of that location. Model Mechanics interprets Schrödinger's equation as that the absolute motion of the detector determines the position or location of the photon.

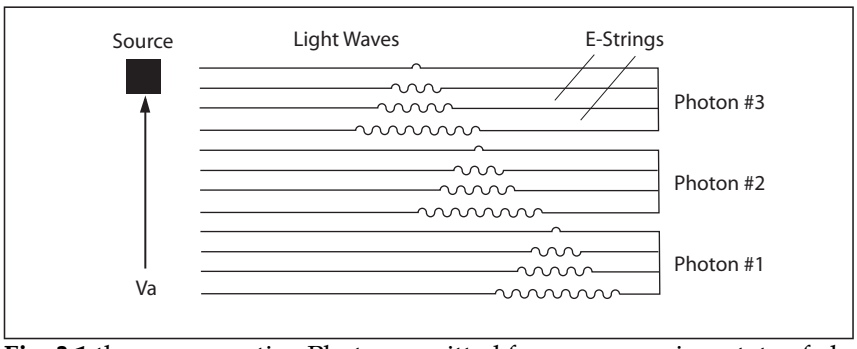

Fig. 3.1 three consecutive Photons emitted from a source in a state of absolute motion in the E-Matrix.

With this description of the E-Matrix (space), the next relevant question is: What is matter? All stable and visible matter is made from three Elementary Particles: the electrons, the up-quarks, and the down-quarks. The protons and neutrons in the nuclei of all the atoms are made from the up-quarks and the down-quarks. The electrons orbit around the nuclei to complete the picture of all the atoms. The three Elementary Particles are, in turn, made from one truly fundamental mass-bearing particle, called the S-Particle. An S-Particle is a three-dimensional spherical object. It is repulsive to the E-Strings surrounding it and therefore its motion in the E-Matrix is maintained. An S-Particle orbiting around an E-String in the helical counterclockwise direction is an electron. This motion of the S-Particle is the fastest in the E-Matrix, and it gives rise to one unit of negative electric charge. A down quark is also an S-Particle orbiting around an E-String in the helical counterclockwise direction. The speed of its orbiting motion is only 1/3 that of the electron, giving the down quark a negative 1/3 electric charge. An up quark is an S-Particle orbiting around an E-String in the helical clockwise direction at 2/3 the speed of the electron, resulting a 2/3 positive electric charge. There is one more stable Elementary Particle: the electron neutrino. An electron neutrino has no detectable electric charge, and therefore it does not interact with the other three charged basic particles. It is composed of an S-Particle orbiting around an E-String in the counterclockwise direction like the electron. However, it is moving in a corkscrew-like motion away from the charged Elementary Particles. This means that the distortion in the E-Matrix created by the absolute motion of the S-Particle of the electron neutrino will have already dissipated by the time the charged basic particles are ready to interact with it. This is the reason why the electron neutrino does not interact electromagnetically with the charged Elementary Particles.

This above simple description of all stable visible matter can answer the thorny question: What *is* the mass of an Elementary Particle? The answer is: the mass of an Elementary Particle is the evidence of the orbiting diameter of its S-Particle. Those S-Particles that are not in a state of orbiting motion do not possess any electric charge and therefore they will not interact with the Elementary charged particles electrically. They will, however, interact with them gravitationally. They become the dark matters predicted by the astronomers.

The next relevant question is: what are the processes that give rise to all the forces between matter particles? The proposed answers to this question are as follows:

1) All the processes of Nature are the result of matter particles reacting to the geometries of the E-Strings (*i.e.* distortions or waves) to which they are confined because of their orbiting motions around these E-Strings.

2) Absolute motions of two objects in the same direction in the E-Matrix will cause the objects to converge to each other--an attractive force. Absolute motions of two objects in the opposite directions in the E-Matrix will cause the objects to diverge from each other--a repulsive force.

This completes the Model Mechanical description of our current universe. All the particles, all the forces and all the processes of nature can be derived from this one description. Model Mechanics

replaces the math constructs of space-time of Relativity Theories and the fields/virtual particles of Quantum Field Theories with the E-Matrix and the distortions or waves in the E-Matrix. The combination of the physical model of Model Mechanics with the math of Quantum Field Theory (QFT) and the math of General Relativity Theory (GRT) eliminates the incompatibility problem exists between QFT and GRT. In addition, it provides a foundation for a valid Theory of Everything.

1. The E-Matrix is a stationary and structured light-conducting medium. It occupies all of pure space (pure void). It is comprised of very thin and elastic E-Strings and these E-Strings are repulsive to each other. There is an outside compacting force that compresses these E-Strings together to form the E-Matrix.
2. The S-Particle is the only truly fundamental particle existing in our universe. The different orbiting motions of the S-Particles around the E-String(s) give rise to all the visible and stable particles in our universe.
3. All the processes of nature are the results of different absolute motions of the S-Particles or S-Particle systems in the E-Matrix.
4. All the forces of nature are the results of the S-Particles or S-Particle systems reacting to the distortions or waves in the E-Strings to which they are confined. The distortions or waves in the E-Strings, in turn, are the results of the absolute motions of the interacting S-Particles or S-Particle systems in the E-Matrix.
5. All the stable and visible matters are the results of orbiting motions of the S-Particles around specific E-String(s). These postulates eliminate all the infinity problems that plagued both GRT and QM. Model Mechanics has the same mechanism for all the forces of nature and thus it unites all the forces of

nature naturally. It gives an explanation why the force of gravity is capable of acting at a distance. It explains the provisions of the Uncertainty Principle. It explains the weird results of all quantum experiments. It eliminates the need for the concept of force messengers in QM. It eliminates the need for the Higgs particles to impart mass to the massless point particles of quantum theories. It explains the mass of a particle. It explains the charge of a particle. It leads to the discovery of the CRE force, which, in turn leads to a new theory of gravity. In short, Model Mechanics gives us a unique way to achieve the elusive goal of unifying all of physics.

Forces Based on Absolute Motions

The idea that absolute motion of interacting particles in the same direction gives rise to an attractive force, while absolute motion of interacting particles in the opposite directions gives rise to a repulsive force, is derived from the familiar electric current experiments in parallel wires. These experiments show that when electric currents are flowing in the wires in the same direction, the wires are attracted to each other, and when the currents are flowing in the opposite direction, the wires repel each other. Figs. 3.2 and 3.3 illustrate these experiments graphically. The absolute motions of the electrons in the same direction cause distortions in the E-Matrix that pulls the wires together--an attractive force. Conversely, the directions of absolute motion of the electrons in the opposite directions will cause distortion in the E-Matrix that pulls the wires apart--a repulsive force.

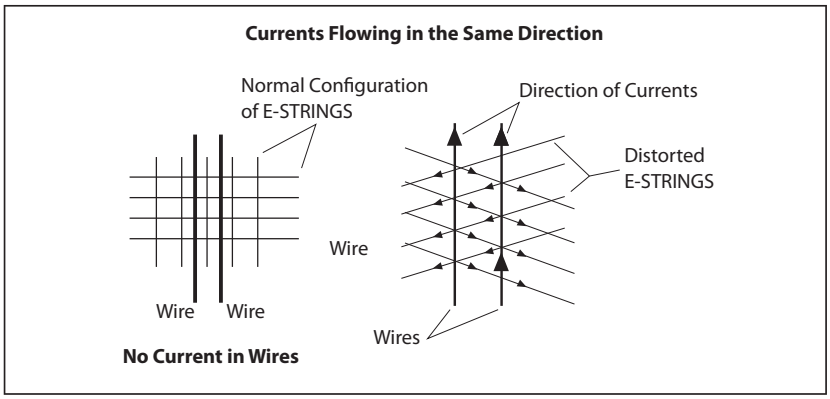

Fig. 3.2: Currents (electrons) in the wires are flowing in the same direction, and therefore the force between the electrons is attractive. The right diagram that shows that the tension created in the E-Strings by the absolute motions of the electrons is pulling the wires together.

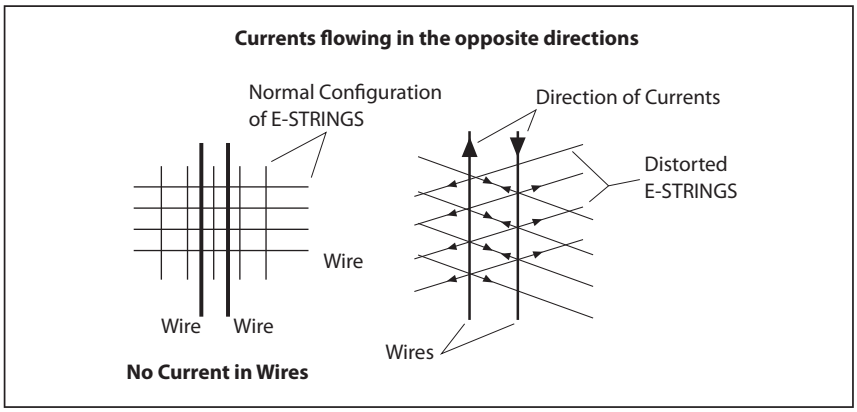

Fig. 3.3: Currents (electrons) in the wires are flowing in the opposite direction, and therefore the force between the electrons and thus the wires is repulsive. The right diagram shows that the tension created in the E-Strings by the absolute motions of the electrons is pulling the wires apart.

Extending the Model Mechanics interpretations of the results of the electric-current experiments to include the orbiting motions of the S-Particles around the E-Strings will enable us to explain all the nuclear forces between the interacting up quarks and down quarks. This interpretation becomes the most important concept of Model Mechanics and it enables Model Mechanics to unite all the forces of nature naturally.

Cosmological Repulsive Effect (CRE) Force

Current physics posits that there are four forces of Nature: the electromagnetic force, the nuclear weak and strong forces, and gravity. Model Mechanics posits that there is a fifth force of Nature; the new force being the CRE force (Cosmological Repulsive Effect Force). As the name implies, the CRE force between any two objects is repulsive. While the CRE force is new to physicists, it is not new to experiments; it is what we commonly refer to as inertia. In other words, the resistance between two objects to change their state of absolute motion is the CRE force between them. The CRE force between any two objects moving in the same direction in the E-Matrix is always repulsive, and it is derived from the confinement of the interacting objects to the diverging structure of the E-Matrix.

To understand the CRE force, recall the inverse square law of physics. This law states that the intensity of light, gravity and electromagnetic force decreases with increasing distance from the source is inversely proportional to $1/r^2$. The geometry of neighboring E-Strings emanating from any two objects also obeys the inverse square law. This means that each object will follow the diverging geometry of these neighboring E-Strings. Therefore, their path of motions in the E-Matrix will have a tendency to diverge from each other. This repulsive effect is identified as the CRE force. The CRE force between any two objects is not constant; it increases with the square of the distance between the objects. The CRE force is not the cosmological constant that Einstein inserted into his original GRT field equations. Although the cosmological constant is repulsive, it is not the CRE force predicted by Model Mechanics, for the simple reason that it is not constant.

The CRE force played an important role in the formation of our Universe, and is continuing to do so today. The repulsive CRE force, along with the attractive electromagnetic force between gravitating objects shaped the primeval Universe into the Universe that we see today. The CRE force also played an important role in the manifestation of the nuclear weak

force. Without the CRE force, there would be no nuclear weak force. It is the CRE force that initiates the radioactive decay of atoms. Perhaps, the most important function of the CRE force will be a role, in combination with the electromagnetic force, in the processes of life. Model Mechanics predicted the repulsive CRE force in 1993. However, it was not discovered until 1998 when two independent groups of astronomers discovered that the Universe at the far reached regions is in a state of accelerated expansion. This observation is in direct conflict with the prediction of GRT. In order to explain this observation, astronomers are now re-introducing the discarded repulsive Cosmological Constant to the GRT equation. The CRE force eliminates the need for this ad hoc approach.

The Force of Gravity (DTG)

Newton posited that gravity is a force, but he did not provide a mechanism for it. Newton's gravity model involved the unexplained phenomenon of action-at-a-distance, which was troublesome for the physicists of his time. Also, Newton's equation for gravity was eventually found to be slightly inconsistent with observations. Recognizing the deficiencies in Newton's theory, Einstein formulated GRT, which is not a theory of force, but rather a theory of space-time, amounting to an extension of SRT to include gravity. However, GRT also encounters problems with some current observations as outlined in the next section of this book.

As a mean to resolve the problematic observations encounter by GRT a new theory of gravity called Doppler Theory of Gravity (DTG) is formulated. DTG is based on the following provisions of Model Mechanics:

1. As the Universe expands, all neighboring objects (or neighboring galaxies) are expanding in the same directions and this causes an attractive force between them.

2. On the other hand, objects expanding in the same direction are confined to the divergent structure of the E-Matrix. This causes a repulsive effect between them.

Like Newton's theory of gravity, DTG also treats gravity as a force but with an identified mechanism. Based on the provisions of Model Mechanics, the mechanism of gravity between two objects A and B moving in the stationary E-Matrix is as follows:

1. If both A and B are moving absolutely in the same direction, this gives rise to an attractive force because A's absolute motion distorts the surrounding stationary E-Matrix and B's absolute motion is confined to follow the distortion created by A; conversely, B's absolute motion distorts the surrounding stationary E-Matrix and A's absolute motion is confined to follow the distortion in the E-Matrix created by B.

2. The global structure of the stationary E-Matrix is divergent. Both A and B are confined to this global divergent structure as they travel in the stationary E-Matrix. This gives rise to the repulsive CRE force between A and B globally.

3. The force of gravity between A and B is the combined result of items 1 and 2 above. It is noteworthy that gravity is the sum of an attractive and a repulsive force acting on both A and B. This explains why the force of gravity is so weak compared to the electromagnetic and nuclear forces.

4. The above description for gravity suggests that the Newtonian equation for gravity can be modified to make it consistent with observations as follows:

$$F_g = \left(\frac{F_{ab}}{F_{aa}}\right)\left(G\frac{M_a M_b (j_a)\cdot(\pm j_b)}{r^2}\right) \qquad (3.1)$$

$F_{aa} = f_{aa}$ = Frequency of a standard elementary light source in A's frame as measured by A.

F_{ab} =Transverse Doppler Frequency of an identical standard elementary light source in B's frame as measured by A.

The dot product $\left(j_a\right)\cdot\left(\pm j_b\right)$ in Eq. (3.1) expresses the concept that not all objects in the Universe attract each other gravitationally. A positive dot product represents an attractive force, but a negative dot product represents a repulsive force. Those objects that have the same direction of absolute motion are attracted to each other, but those objects that have absolute motions in the opposite direction exert a repulsive force on each other. Assuming the Big Bang model is correct then the dot product of the vectors for all local regions of the Universe is +1. This means that gravity in the local region is attractive. The dot product for a distant region, say beyond the radius of the observable Universe, is -1. Therefore, gravity for all those distant regions is repulsive. This is the reason why the far reached regions of the Universe are in a state of accelerated expansion.

The DTG description of the force of gravity uses the same mechanism as that for the electromagnetic and nuclear forces. This enables Model Mechanics to achieve the elusive goal of uniting gravity with the electromagnetic and nuclear forces naturally.

The Electromagnetic Force

This is the force observed between charged particles. It was determined that like-charged particles exert a repulsive force on each other while unlike charged particles exert an attractive force on each other. The reader will recall that a charged particle is the result of a clockwise or counterclockwise orbiting motion of its S-Particle around a specific E-String. A clockwise orbiting motion of the S-Particle gives rise to a positively charged particle. A counterclockwise orbiting motion of the S-Particle gives rise to a negatively charged particle. The charges between the interacting particles determine whether the force between them is attractive or repulsive. The following diagrams describe the electromagnetic force in Model Mechanical terms:

Interaction between Negatively Charged Particles

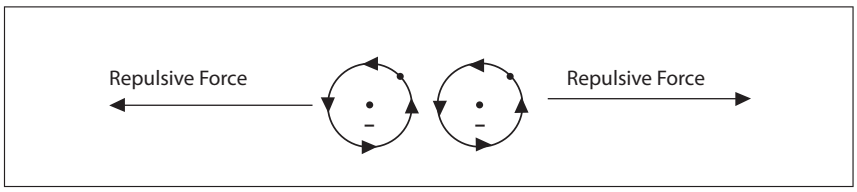

Fig. 3.4: The force exerted on each other by two negatively charged particles. In this case, the S-Particles are traveling in the opposite directions at the closest approach and therefore the force between them is repulsive.

Interaction between Positively Charged Particles

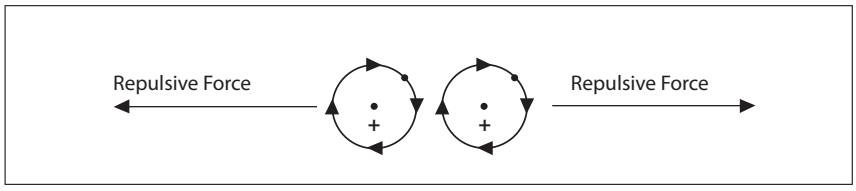

Fig. 3.5: The force exerted on each other by two positively charged particles. In this case, the S-Particles are traveling in the opposite directions and therefore the force between the resulting particles is repulsive.

Interaction between Negatively-Positively Charged Particles

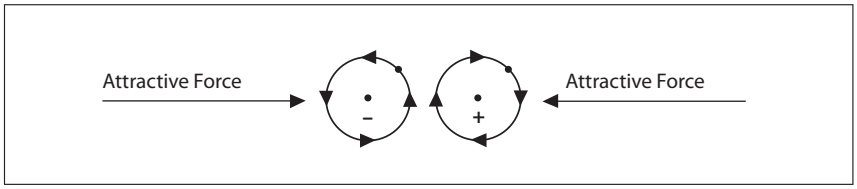

Fig. 3.6: The force exerted on each other by a negatively and a positively charged particle. At the nearest point of approach, the S-Particles are traveling in the same direction and therefore the force between them is attractive.

Note: The net attractive or repulsive force between any two interacting charged particles is not a constant force. The net force is determined by the direction of orbiting motions of their S-Particles at the closet point of approach. When the S-Particles are moving in the same direction at the closest point of approach then the net force between the charged particles is attractive. Conversely, when the S-Particles are moving in the opposite directions then the net force between the charged particles is repulsive. It is noteworthy to point out that the force between any two charged particles is alternating between attractive and repulsive for one complete orbit of their S-Particles. This property of the electromagnetic force is due to the fact that the direction of orbiting motions of the S-Particles is alternating between the same direction and opposite directions. This unique characteristic of the electromagnetic force agrees with Maxwell's equation that the propagation of the electromagnetic force is alternating between the electric field and magnetic field.

The above diagrams illustrate how the electromagnetic force is manifested between charged particles. This force is long range because the distortions created in the E-Strings are long range. This description of the electromagnetic force eliminates the need for the complicated and abstractive quantum mechanical explanation. In addition, this explanation has no infinities to contend with because the electric charge is not within the particle itself. Therefore, there is no need for the dubious renormalization procedure to get rid of the infinities as in the quantum mechanical description of this force.

The Nuclear Strong Force

This force is responsible for binding the protons and the neutrons in the nucleus. At a more fundamental level, this force is responsible for the binding of the quarks of the protons and neutrons to form the nucleus. According to quantum mechanics the nuclear strong force is manifested by the exchange of messenger particles known as gluons.

The Model Mechanical description of the nuclear strong force is very simple. It is caused by the absolute motion (V_{suq} and V_{sdq}) of the S-Particles of the quarks in the protons and neutrons. This description of the nuclear strong force raises the question: Since the quarks in the protons and neutrons are negatively and positively charged particles, how do they manage to stick to each other? The answer is stacked-interaction. When two particles of the same charge are stacked on top of each other, their S-Particles are traveling in the same direction. Therefore, they exert an attractive force on each other. The following diagrams illustrate the stack interaction concept.

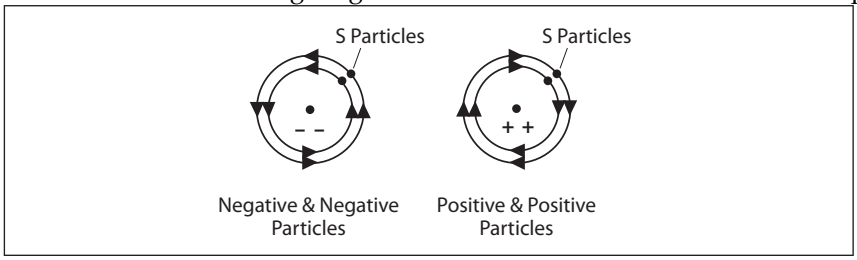

Fig. 3.7: The stacked interactions of two similarly charged particles. The negative particles would be the down-quarks and the positive particles would be the up-quarks.

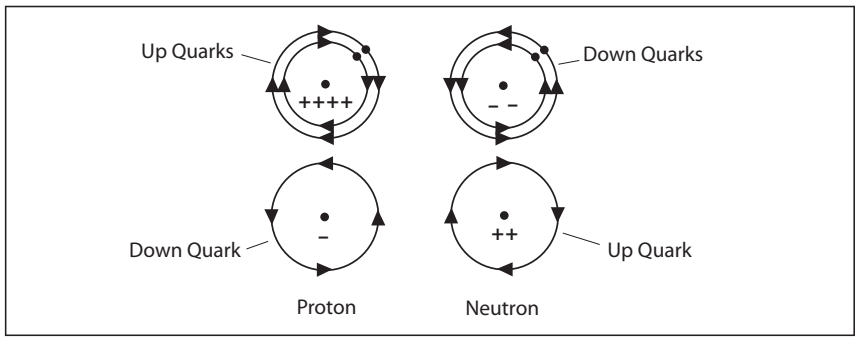

Fig. 3.8: The stacked and the electromagnetic interactions in a proton and a neutron.

Note: All quarks of the same family have the same orbital diameter and same direction of orbital motion. The different orbital diameters shown here serve to illustrate the stacked-interactions. The negative and negative particle interaction is the stacked-interaction of the down quarks. The positive and positive interaction is the stacked-interaction of the up quarks. The proton is formed by the stacked interaction of the up-quarks and the electromagnetic interaction between the stacked up-quarks and the down-quark. The neutron is formed by the stacked interaction of the down quarks and the electromagnetic interaction between the stacked down quarks and the up quark.

It is noteworthy to point out that the attractive stacked-interactions are effective only within a short distance of 10^{-13} cm. At a greater distance than that the stacked-quarks exert a repulsive force on each other. This is the exact behavior of the nuclear strong force that we observed in the laboratory. Another peculiar property of the nuclear strong force is that it becomes stronger when the interacting particles are being pulled apart. This peculiar property is also predicted by Model Mechanics as follows: When the stacked particles are pulled apart the E-Strings surrounding them becomes more distorted. Therefore, the energy required to pull them further apart will be increased accordingly.

The Nuclear Weak Force

Quantum Mechanics describes this force as the force that causes the decaying processes of all the unstable particles through time. The quantum mechanical process for the weak force involves a process called the spontaneous breaking of symmetry. This process gives rise to the weak force messengers W^+, W^- and Z^0. These are virtual particles whose brief existence is financed by the uncertainty of energy and time relationship. Also, this description of the nuclear weak force depends on the existence of yet another class of particles known as the Higgs Bosons. The Higgs Boson is necessary because it is the mechanism that imparts mass to all massless particles. Model Mechanics gives a much simpler description of the weak force. In the case of a heavy nucleus, such as a uranium nucleus, the decay is the result of the de-coupling of the stacked-interactions by a combination of neutron captures followed by the repulsive CRE force. The processes involved are as follows:

1. A free neutron is captured by a decaying nucleus
2. The stacked interactions at the site of neutron capture are weakened. This enables the repulsive CRE force to de-couple the weakened stacked-interactions and give rise to the nuclear weak force.

In the case of a subatomic particle, the decaying process is different. The best-known subatomic particle-decaying process is the neutron decay, also known as the beta decay. Quantum Mechanics does not specify when a free neutron will decay or why it will decay in about sixteen minutes. On the other hand, Model Mechanics is capable of describing the neutron decay process in detail. The following diagrams will help the reader to visualize the processes involved.

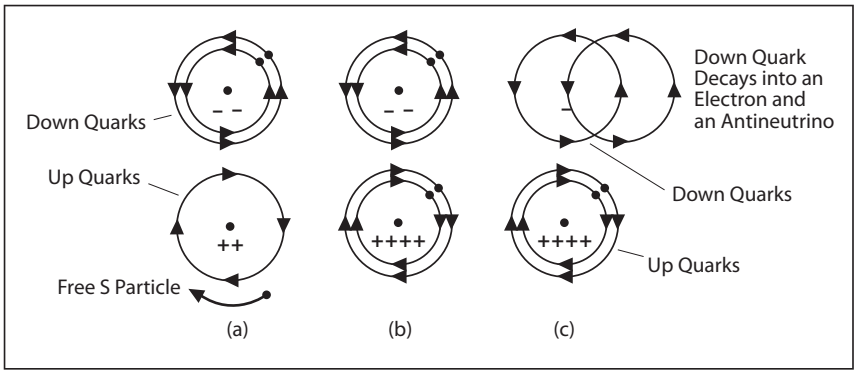

Fig. 3.9: Schematic diagrams for the neutron decay process.

a) The up-quark in an unbounded neutron exerts an attractive force on any free S-Particles that are traveling in the same direction as its S-Particle. When a free S-Particle follows the orbit of the orbiting S-Particle of the up quark, it becomes an up-quark. This new up-quark immediately forms a stacked interaction with the original up quark.

b) The down-quark between the two-stacked up-quarks is pulled closer to them because it feels the force from both of them.

c) This has the effect of moving the stacked down quarks laterally relative to each other. When the lateral movement is greater than the radius of the down quark, the force between the stacked down-quarks becomes repulsive. This causes the down-quark that feels less attractive force from the two stacked up-quarks to peel away. The peeled away down-quark will then interact with a free S-Particle to give an electron and an antineutrino.

The decaying process for a subatomic particle such as a muon is different from that for a neutron. It was found that a muon at a speed close to that of light would have a much longer decay length than that of a muon at the rest frame of the laboratory. When these decay lengths are converted to decay times they agree with the SRT time dilation equation. This led physicists to claim that the muon decaying process is a proof of the time dilation concept of SRT. The Model Mechanical explanation of the muon decay process is as follows:

1. The orbit of the muon's S-Particle is unstable and it will decay into a stable orbit of the electron.
2. In the rest frame of the Lab, a muon decays in 2.2 microseconds. However, a muon moving with respect to the Lab will have a longer decay time of $(2.2*10^{-6})(F_{aa}/F_{ab})$ seconds.
3. Therefore from the Lab point of view the decay length for a traveling muon is: $v(2.2*10^{-6})(F_{aa}/F_{ab})$ meters v is the relative velocity between the Lab and the traveling muon. This Model Mechanical prediction for the decay length of a traveling muon agrees with experimental observations.

The Origin of the Universe as Interpreted by Model Mechanics

The Model Mechanical description of the current universe leads us to a new interpretation on the origin of the universe. The following is a summary of the relevant provisions of Model Mechanics as related to the origin of the universe and its subsequent evolution.

1. According to Model Mechanics, all of space is occupied by a substance called the E-Matrix. Conversely, the E-Matrix is space. The E-Matrix is, in turn, composed of E-Strings. Away from matter, the E-Strings exist randomly in all directions. However, near matter, the E-Strings are more organized. Some emanate from the matter, and the number of these passing through a unit area at a distance r from the matter is inversely proportional to r^2. This means that any waves that are emitted from matter and that are being transmitted by the E-Strings will obey the inverse square law. It also means that any particles or particle systems that are confined to the E-Strings

will follow the geometry of these E-Strings as they move in the E-Matrix. In other words, two neighboring objects traveling in the same direction will have the natural tendency to converge toward each other as they travel in the E-Matrix. This will be perceived as an attractive effect existing between the two objects.

2. The E-Strings exert a repulsive force on each other and at the same time, there is an unknown compacting force that compacts them together. This gives rise to a delicate equilibrium between the E-Strings. This equilibrium is self-restoring when it is disturbed by the motions of particles or particle systems in the E-Matrix. The S-particle is the only truly fundamental particle existing in the E-Matrix. The orbital motions of the S-particles in the E-Matrix give rise to all the Elementary Particles and all the forces of nature.

3. There are five forces of nature and they are: the CRE force, gravity, electromagnetic force and nuclear strong and weak forces. All these forces are the results of absolute motions of the interacting particles or particle systems in the E-Matrix. Absolute motions in the same direction give rise to an attractive force and absolute motions in the opposite directions give rise to a repulsive force.

4. An Elementary Particle with its S-Particle in a counterclockwise orbiting motion is a negatively charged particle. Similarly, an Elementary Particle with its S-Particle in a clockwise orbiting motion is a positively charged particle. The intensity of the charge of an Elementary Particle is determined by the speed of the orbiting motion of its S-Particle.

5. An S-Particle feels a repulsive force from the E-Strings surrounding it. This enables an S-Particle to move unimpeded in the E-Matrix. This also enables an S-Particle to retain its original motion in the E-Matrix.

6. A photon is a wave packet in neighboring E-Strings. It will follow the geometry of these E-Strings to the target. A Basic Particle is formed by the orbiting motion of its S-Particle around a specific E-String. Therefore, the motion of this Basic Particle will follow the geometry of this specific E-String.

7. Absolute Time is the only time that exists. Clock time (a clock second) at the rest frame of the clock is known as proper time. A clock second does not represent the same amount of Absolute Time in different frames (different states of Absolute Motion). This is the cause that clocks in different frames accumulate clock seconds at different rates. The flow of Absolute Time is constant in all frames of reference. That's why the GPS uses Absolute Time to synchronize the GPS with the ground clock by redefining the GPS second to have 4.4647 more periods of the Cesium 133 radiation than the ground clock second.

The above provisions of Model Mechanics allowed me to formulate a model of the origin of the universe. According to this model, the sequence of events that led to the Big Bang[1] explosion is as follows:

The E-Matrix is infinite in all directions and thus, the number of S-Particles in it is also infinite. Our universe is just one small region of the infinite E-Matrix. The S-Particles in the E-Matrix are in constant motions in all directions. As time evolved, those neighboring S-Particles that were traveling in the same general direction would have exerted an attractive force on each other. This caused these S-Particles to clump together and form a loosely packed S-Particle clump. This was the initial seed of our universe. As time evolved, more S-Particles from all directions were attracted and added to the clump. This caused the clump to have a rotation motion. The rotating motion shaped the clump into a ball of S-Particles. At this point, the S-Particle Ball would have had an expanding motion as well as

[1]The standard Big Bang model describes the initial explosion as the expansion (swelling) of the space around us. The Model Mechanical description of this event was an actual explosion that spewed S-Particles into the E-Matrix. However, the E-Matrix did expand for a brief period during the Big Bang and this was the result of the E-Strings releasing their internal distortions.

a rotating motion in the E-Matrix. These motions of the S-Particle Ball would have severely curved the local E-Strings and at the same time compacted the S-Particle Ball into a very hot dense mass. It turned out that our universe was born from an S-Particle Ball that had a counterclockwise[2] rotating motion. As time evolved further, more S-Particles were attracted to the S-Particle Ball. This process continued until the S-Particles were so tightly packed that they began to collide with each other. At this point, the E-Strings would have reached their maximum curvature. The collisions of the S-Particles gave rise to an immense increase in temperature, which in turn gave rise to the explosive force that initiated the Big Bang. Fig. 6.1 depicts the above processes graphically.

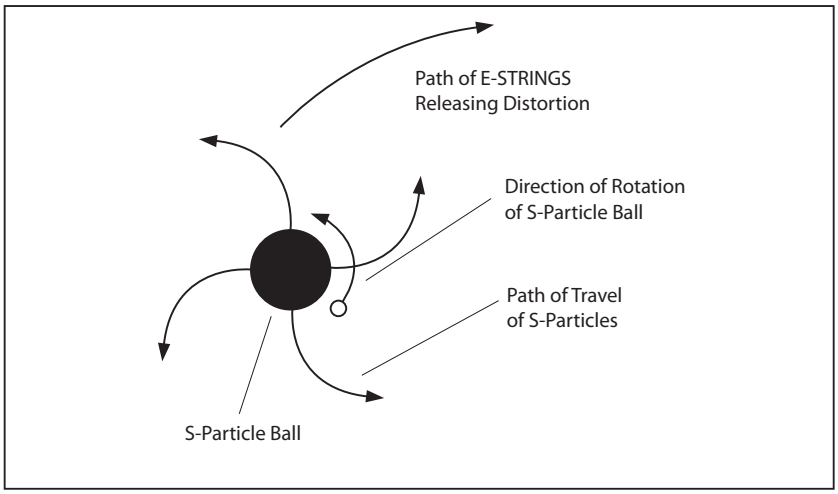

Fig. 6.1: At a critical temperature, the S-Particle ball exploded and spewed out S-Particles in a counterclockwise direction as indicated in the diagram. This effectively released the E-Strings (not shown) and enabled them to unwind to restore to their normal configuration in a clockwise direction.

The relative counterclockwise and clockwise motions of the S-Particles and the E-Strings lasted for a brief period--this is the inflationary period posited by current cosmology. It was during this period that all the stable Elementary and Basic particles of the universe were created. To understand this process, the reader needs to visualize that these relative rotating motions effectively gave rise to the orbiting motions of all Elementary Particles. When an S-Particle entered into orbit around a specific E-String from the right hand side, the resulting Elementary Particle became negatively charged and it became an electron. When an S-Particle entered into orbit around a specific E-String from the left hand side, the resulting Elementary Particle became positively charged and it became an up-quark. The reader will recall that the intensity of the charge of a Elementary Particle is related to the speed of the orbiting motion of its S-Particle. Why then does an electron have a charge of -1 and an up-quark a charge of +2/3? To understand the answer to this question, the reader will need to recall that all the S-Particles originally had a counterclockwise motion. Therefore, when an S-Particle entered into orbit in this direction, it retained all of its original intensity (speed). This gave rise to one unit of electric charge. On the other hand, the S-Particle of an up-quark is in a clockwise orbiting motion. This means that it had to change the direction of motion in order to acquire this motion. This change in the direction of motion caused it to lose 1/3 of its original intensity. That is why an up-quark has 2/3 units of electric charge. Fig. 6.2 and 6.3 describe the processes that took place for the production of electrons and up quarks at the moment of the Big Bang. However, the first type of Elementary Particle produced was not the electron or the up-quark. It was the electron neutrino. The processes to produce an electron neutrino were exactly the same as those for an electron. To understand why this is the case, the readers will recall that an electron neutrino is actually an electron traveling away from us in a left-handed corkscrew-like motion. At the time when the first batches of electron neutrinos were produced, they were the only detectable particles in the universe. The reason was that the first batch of up-quarks was still in the process of formation. The time lag was due to the slower speed of the S-Particle of the up-quark entering into an orbit.

[2] The S-Particle ball could have easily been on a clockwise rotating motion. In that case the universe formed would have been made entirely of antimatter.

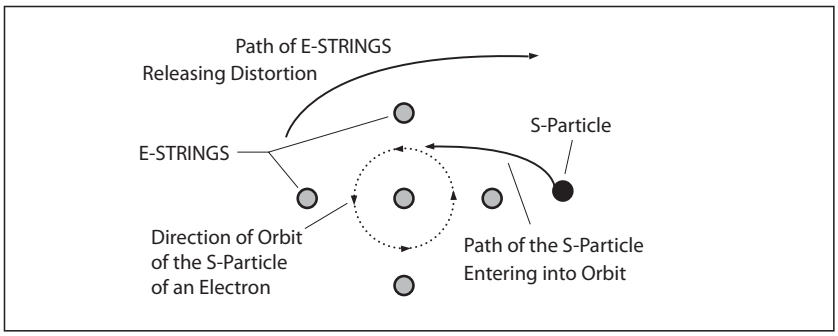

***Fig. 6.2*:** Schematic diagram of the process that produced an electron from an S-Particle at the moment of the Big Bang explosion

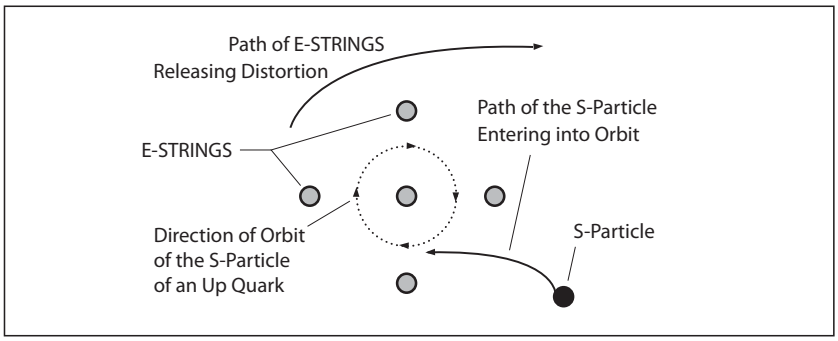

Fig. *6.3*: Schematic diagram of the processes that produces an Up-Quark from an S-Particle at the moment of the Big Bang explosion.

The first batch of electrons and up-quarks produced were very close to each other and they began to annihilate each other immediately. This process gave rise to the down-quarks and the free S-Particles. There were more up-quarks than electrons available because the first electrons that were produced were electron neutrinos. A close pair of these extra up-quarks would form a stacked interaction with each other. The stacked up-quarks then attracted a newly formed down quark to form a proton. Also, a close pair of the newly formed down quarks would form a stacked interaction with each other that, in turn, attracted a newly formed up-quark to produce a neutron. At a later point, the E-Matrix would have expanded and the up-quark production process ceased. However, the electron production process continued. The extra electrons produced became the electrons of our universe.

After the above particle production processes, the universe consisted of a mixture of the following particles: Up-quarks and down-quarks that are in protons and neutrons, electrons, electron neutrinos and free S-Particles. Except for the S-Particles, all the other particles have been detected in the laboratory, and therefore, collectively they are identified as Basic Particles. The free S-Particles are not in any sort of orbiting motion. Therefore, they cannot be detected directly by our instruments. However, they are involved in all nuclear processes as well as high energy accelerator experiments. Also, they would have observable astronomical consequences on all Basic Particles as they move along with them. Indeed, astronomers have detected strange motions of galaxies in galaxy clusters that cannot be accounted for by the general theory of relativity; they attributed these strange motions to an unseen dark matter.

The law of conservation of charge posits that the ratio of up-quark to electron in our universe is one and one-half to one. However, it is not possible to confirm this ratio by counting the number of up-quarks and electrons in an atom. On the other hand, the Model Mechanical process of particle production described above is capable of confirming this ratio numerically because a down-quark and a free S-Particle are the products of annihilation of an up-quark and an electron. Therefore, if we count a down-quark in any atom as the annihilation product of an up-quark and an electron, the ratio of up-quark to electron is one and one-half to one for all the atoms in our universe.

The distortion in the E-Strings was released in the clockwise direction. This process lasted for a very brief period and this is perceived by current physics as the inflationary period. However, it was during this brief period that all the Elemantary Particles of the universe were formed. In addition, these motions of the E-Strings would have observable astronomical consequences and these would be the huge galaxy clusters of today's observable universe. To visualize this concept, the reader will recall that all the forces of nature are the results of absolute motions of particles in the E-Matrix. Also, all particles will exert an attractive force on each other when they are traveling in the same direction. The Big Bang explosion imparted an outward counterclockwise motion to all the particles (see Fig. 3.1). Those particles that were in a same general *neighboring* area would have been traveling in the same direction in the E-Matrix. This would have caused an attractive force among them and this force would have compressed them into a clump. This brief motion of the E-Strings would have an additional attractive effect among the Elementary Particles that were in the various clumps. These primordial clumps of Elementary Particles were the seeds of the galaxy clusters that we see today. This concept of galaxy cluster formation by Model Mechanics predicts that these clusters should be regularly spaced and indeed recent astronomical observations have confirmed these predictions.

After the Big Bang Explosion the protons and neutrons were very close to each other and therefore, they were able to enter into stacked interactions. This process gave rise to the deuterium nuclei, each of which consists of a proton and a neutron. The deuterium nuclei, in turn, entered into stacked interactions with each other. This process produced the helium nuclei. At the end of the helium production process, all the particles would have been driven apart sufficiently to halt almost all of the stacked interactions. However, before it was halted completely, a trace of lithium nuclei was produced. At the end of this period, the universe was 10^{-12} seconds old. It was composed of free S-Particles, electron neutrinos, electrons, protons, helium nuclei, a small amount of deuterium nuclei and a trace of lithium nuclei.

As the universe continued to expand and cooled, the electrons became less energetic and thus, were able to combine with the various nuclei to form the various atoms. These primordial atoms were the stuff that formed the first generation of stars and galaxies. How were the galaxies and stars formed from the primordial clumps? To understand the processes, the reader will recall that all the *neighboring* particles of the universe maintained a counterclockwise and outward absolute motion (V_{bb}) in the E-Matrix. This absolute motion gave rise to an attractive force among them. Also, all the Elementary Particles are confined to the diverging geometry of the E-Strings. Therefore, they are continuously subjected to the repulsive CRE force as they travel in the E-Matrix. Under these dynamics, each primordial clump would break into smaller clumps and these smaller clumps would become the galaxies of our universe. As this process continued, the smaller clumps would break into mini-clumps and provide the basis for future stars. The process of a star formation is as follows. The attractive electromagnetic force between the gas particles within a mini-clump was able to overcome the repulsive CRE force. This compressed the hydrogen atoms to ever closer together and enabled them to form stacked interactions and thus the birth of a new star. The stacked interactions that took place in the ancient stars forged the heavy elements of our universe and distributed them throughout the universe by way of a cataclysmic super nova explosion. These heavy elements were then picked up by the newly forming star systems as planets. This means that, we are made of the stuff that was forged in the ancient stars and therefore, the phrase that *we are the children of the stars* certainly rings true.

The Model Mechanical theory, described above, provides us with a realistic beginning of the origin of the universe. Also, it explains: the origins of all matters; why there is a preponderance of matter over antimatter and what the universe was like before it was expanding. This is a significant improvement over the Standard Big Bang model that can only describe the origin of the universe up to 10^{-12} seconds. Any time before that, the equations of General Relativity will yield meaningless results. This is also a significant improvement over the Inflationary Model on the origin of the universe. The Inflationary Model is based on the abstractive theory of GUT, which can describe the origin of the universe up to 10^{-35} seconds. Any time before that, the equations of GUT will also yield meaningless results.
The Model Mechanical theory also provides a realistic explanation of the flatness and the horizon problems of the Standard Big Bang model. Although the inflationary theory can explain these problems, it gives rise to a new problem related to the process of the formation of the huge galaxy

clusters that are observed in our universe. A more detail discussion of these problems is included in Chapter 2 of this book.

What about God?

The self-initiating universe described above raises the question: is there a role for a Creator? The answer is a resounding *yes*. This becomes apparent when we try to go through the process of answering the fundamental questions of nature. In the case of the self-initiating universe, we would have no answer for the fundamental questions such as: How did the S-Particles come into being? How did the E-Matrix come into being? What do we mean by an infinite E-Matrix? What is the composition of the S-Particle? What is the composition of the E-String? Obviously, with this method of questioning, there would be an infinite number of questions to each fundamental assumption of nature. In other words, we are not capable of arriving at the final answer to any fundamental question of nature. The only way to end the endless questioning would be to invoke the answer that "God made it that way."

The need for a Creator is overwhelming if ours is the only universe that exists, or if there are only a finite number of universes that exist. In these cases, the continuous self-creation scenario is no longer valid because the E-Matrix and the number of S-Particles in it would be finite. Therefore, our universe must be "put in place" by a Creator. Perhaps the S-Particle Ball of our universe was a "seed" of sort. The E-Matrix is the "ground" in which the Creator planted this "seed" and the current state of evolution of our universe is the fruit of His labor. Although I have described the self-creating universe in detail, I favor the view that our universe was the creation of a God. God is infinite and all-encompassing thus, His real purpose for our creation will forever be unknowable to us.
The self-initiating universe and the Creator "put in place" universe would have evolved the same. In both cases, all the Elementary Particles would have been produced and interacted the same way as described above. However, there is one major difference between these two universes. In the case of the self-initiating universe, the E-Matrix and the E-Strings are infinite in all directions. The microwave background radiation is posited as a property of the E-Matrix detected by our instruments. In the "put in place" universe by God both the E-Matrix and the E-Strings are finite. Also, it is likely that each E-String in this universe would be as a loop similar to that of an ordinary rubber band. In this case, the universe is self-contained. The microwave background radiation would be the remnant of the Big Bang explosion, as posited in the Standard Big Bang cosmology.

Conclusions

The Model Mechanical description of the current Universe leads to a new interpretation on the origin of our Universe. This new interpretation provides valid answers to the following unanswered questions of the current cosmological theories:

1) The current theory of gravity (GRT) does not provide a valid explanation for the formation of the observed huge galactic clusters. GRT predicts that these huge galactic clusters do not have sufficient time, since the Big Bang, for their formation. The Model Mechanical theory of gravity (DTG) and the posited repulsive CRE force provide the logical physical processes for the formation of these huge galactic clusters.
2) Model Mechanics posits that our Universe is an open Universe. Current theories do not have a valid answer to this question.
3) Model Mechanics provides the physical processes for the origin of all Matter Particles.
4) Model Mechanics provides natural solutions to the observed horizon and flatness problems of the current theories without the ad hoc Inflationary hypothesis.
5) Model Mechanics provides a link between the origin of our Universe and a Creator.
Model Mechanics provides valid solutions to all the problematic cosmological observations of the current theories. It is recommended that the established Cosmologists take an interest to further develop Model Mechanics into a full fledge scientific theory.