PHYSICAL SCIENCES

APPRAISAL OF CONCEPT AND BETTER UNDERSTANDING OF THEORY OF EVERYTHING OR GOD EQUATION AND CONSEQUENCE OF UNIVERSE

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Abstract

The Theory of Everything (ToE), also known as God Equation, is physics' quest to unite general relativity or gravity and quantum mechanics or other forces into one framework, describing all forces and particles, with String Theory as a leading applicant. The development of ToE or God Equation is to unify the four fundamental forces (as gravity, electromagnetism, strong and weak nuclear forces) into a single, sophisticated equation, satisfying Einstein's dream. But the problem is general relativity (or smooth spacetime) clashes with quantum mechanics (or discrete particles). String Theory posits fundamental vibrations of one-dimensional strings, potentially unifying everything. It describes how these strings propagate through space and interact with each other. A successful ToE would explain fundamental constants, black holes, the Big Bang, and potentially time travel. The future of the universe, or the most accepted scenario where the universe expands forever, cooling until stars die out and no new energy can be generated, making life impossible (known as Big Freeze or Heat Death). A scenario where dark energy accelerates expansion so violently it tears apart galaxies, stars, planets, and even atoms (known as Big Rip). Another a cyclic model where the universe expands and contracts, potentially leading to a new Big Bang (known as Big Bounce). The ToE is explaining the universe's fundamental rules, would provide the ultimate physical basis for predicting its beginning (as describe in Big Bang) and its end (as explain in Big Freeze/Big Rip/Big Bounce). A successful ToE would explain the universe's ultimate origins and ultimate fate, potentially revealing how our universe emerged from quantum fluctuations. However, uncertainty and mystery remain as the secret story of the universe. This is a review article to appraise the concept of Theory of Everything or God Equation and explain the consequence of universe on the basis of existing theory and latest scientific development.

Keywords: NASA, Dark matter, galaxies, good equation, ToE, LHC

1. Introduction

There is simple explanation of the well-known theories about Bangs, black holes, dark matter, parallel cosmoses, antiparticles and teleportation's of man into the past. The universe is made up of countless galaxies. They arise and disappear in the same way, and differ in size and activity, which also depends on the age of the galaxy. The universe is completely filled with dark matter particles, except for the places where galaxies are designed and formed from these same particles. The basis of the galaxy is the nucleus. The core of the galaxy with its mass and proportional attractive force absorbs all dark matter particles, which in their flight towards the core cause gravity on all material objects. The size of the gravitational field depends on the mass of the nucleus. Since the nucleus is constantly losing mass, as Hawking resolved, its field is also constantly decreasing. For this space, Albert Einstein claimed that it is a 'curved space-time' into which, due to the curvature towards the core, all material objects fall and that this is gravity. Einstein's 'General Theory of Relativity' proposed that gravity isn't a force but a manifestation of the curvature of spacetime (as a unified concept combining the three dimensions of space and the single dimension of time) caused by mass and energy, meaning massive objects warp spacetime, and other objects follow these curves, explaining planetary orbits and light bending. So, heavy objects like stars and planets create dips or curves in this spacetime fabric, much like a bowling ball on a stretched rubber sheet. The thinking of scientist before was wrong.

The gravitational field is an ordinary space in the form of a real sphere that surrounds the nucleus. And logical human reason does not understand how space, and especially time, can be twisted. From this metafiction later developed the ridiculous theory of Warp Drive, in the sense of warping subspace and making a shortcut to distant space bodies. Always from a wrong theory, especially if the author is known and recognized, irresponsible theories are developed that do not help the development of the evolution of human civilization. On the contrary, when the core of a galaxy forms and explodes from itself a hydrogen star, then that star with its core marks its own gravitational field, within the gravitational field of the galaxy. From this field, all dark matter particles are absorbed into the core of the star. Particles outside this field continue to flow towards the galactic core. When a star forms its own star and later a planet, the same scenario occurs. Dark matter particles are absorbed from the Earth's gravitational field towards the Earth's core, while the remaining ones continue to flow towards the Sun's core. In this way, the 'Interpolation of gravity fields in space' was performed. Based on this knowledge, it becomes a logical explanation for the pioneer anomalies and the Moon that rotates like the Earth, contempt the fact that according to Zero Point calculations, the Moon should rotate around the Sun, because the Sun's gravity is stronger than the Earth's at the position of our satellite.

On the other side of the coin, there are about two thousand billion galaxies in the universe, if we divide them among every person on earth, then every child, old man and young man will have 250 galaxies. In which there are not billions but trillions of stars. Thus, there is no shortage of stars and planets in the universe, but there are also some places in the universe where there is nothing, that is, there is no name or sign of stars and planets there. This is very strange, isn't it? There are stars and planets everywhere in the universe. But this area is completely uninhabited, it is dark here. National Aeronautics and Space Administration (NASA) scientists saw a mysterious area about 700 million light years away in 1981, which was very strange. Because this strange and empty area was completely empty in the middle of the universe decorated with galaxies. This strange area is called Boötes void in the language of scientists. This area is completely empty, so there is intense darkness in this "area" because there is no solid body for the reflection of light. The universe is in a severe state of load shedding in this area. NASA scientists believe that the speed at which the universe is expanding. And the way it is expanding in every direction, there should be thousands of galaxies in this place, but there is nothing far away. Why has the matter of the universe not reached this area? This is a mystery. This seemingly empty area is so vast. Interestingly, if we leave fifty thousand space vehicles in the 'Boötes void' area without sensors, they will cover a distance of trillions of years. And more interestingly, they will not collide with anything in this area, because there is nothing in this area.

There are no elementary particles like electrons or quarks in string theory, rather pieces of vibrating strings. Each vibration mode corresponds to a different particle and determines its charge and its mass. In the current understanding of the theory, those strings are not "made of" anything: they are the fundamental constituent of matter. The consequences of replacing point-like particles by vibrating microscopic strings are enormous. The only consistent framework to describe those strings implies a 10 or even conceivably an 11-dimension world in which 6 or 7 dimensions are curled up. Those extra dimensions are the ones which determine the properties on the earth we live in. The larger dimensions are which we distinguish as the ordinary space and time. On the other hand, in superstring theory's 10-dimensional spacetime, we still see only a 4-dimensional spacetime. Besides, we need to link those two if superstrings are to describe our universe. To achieve this, we curl up the extra 6 dimensions into a small dense space. If the size of the dense space is of order the string scale (10^{-33} cm) we would not be able to perceive the presence of these extra dimensions directly and they are just too small. Ultimately, the end result is that we get back to our familiar (3+1 or 4)-dimensional world. But there is a tiny 'ball' of 6-dimensional space associated with every point in our 4-dimensional universe.

String theory considers as unified theory, and it takes efforts to explain all four forces experience in nature. Now, one of the solutions of the string equations is a force that founds like gravity. It is evidence to the power and the positive side of string theory and which physicists would rather give up the very notion of space and time as well as admit a 10-dimension world. Rather than question the path on which the quest for a unified theory has led them. String theory could successfully account for gravity and forecast super-symmetric particles. But until a few years ago it had little connection with puzzles in physics. There were no results or concrete predictions to show off. It could have been nothing more than a beautiful mathematical construction. But in 1996 situation has changed. Andrew Strominger, at the Institute for Theoretical Physics in Santa Barbara, and Cumrun Vafa from Harvard University, used string theory to construct a certain type of black hole. Which was similar way one can construct a hydrogen atom by jot down the equations, as derived from QM, which define an electron bound to a proton. Other approaches to quantum gravity like LQG exist, but string theory is the most popular candidate for a complete ToE.

In the late 1970's Strominger and Vafa established a result derived by Jacob Bekenstein and Stephen Hawking. Bekenstein and Hawking found that the amount of entropy in a special kind of black hole was very large. This was a astonishing result, as no one could understand and nor did the calculations give any insight. Question remains as how an object as simple as a black hole could have such a large amount of entropy or disorder within it. So, to building such special black hole using string theory, Strominger and Vafa were able to obtain the correct value for the disorder predicted by Bekenstein and Hawking. This result excited the physics community. It was the first time; a result derived with classical physics could be obtained from string theory. Even though the black holes for which the result was derived have very little in common with the black holes which are believed to sit in the middle of galaxies. This new computation illustrated the linking between strings and gravity. In addition, the computation provides insight into the physical reasons for the answer. No one knows yet if string theory is the ultimate theory or the ToE, if there is such a thing. But the theory's incredible sophistication and potential make it a strong front-runner to further explain the inner workings of the universe well into the next century. Edward Witten is an American theoretical physicist known for his contributions to string theory, topological quantum field theory, and as a pioneer or one of its leaders said, 'String theory is a part of twenty-first century physics that fell by chance into the twentieth century.'

With Webb, the science team can now see where stars formed and how they are distributed, in a similar way to how the Hubble Space Telescope is used to study local galaxies. Webb's view provides a unique opportunity to study star formation and the inner workings of infant galaxies at such an unprecedented distance. An international team of astronomers have used the NASA/ESA/CSA James Webb Space Telescope to discover gravitationally bound star clusters when the Universe was 460 million years old. This is the first discovery of star clusters in an infant galaxy less than 500 million years after the Big Bang. In the early Universe, young galaxies underwent momentous burst phases of star formation, and generating substantial amounts of ionizing radiation. However, because of their cosmological distances, direct studies of their stellar content have proven challenging. An international team of astronomers by using Webb, have now detected five young massive star clusters in the Cosmic Gems arc

(SPT0615-JD1), and a strongly-lensed galaxy emitting light when the universe was roughly 460 million years old, looking back across 97% of cosmic time. The Cosmic Gems arc was initially discovered in NASA/ESA by using Hubble Space Telescope images obtained by the RELICS (Reionization Lensing Cluster Survey) programmed of the lensing galaxy cluster SPT-CL J0615−5746. The science team can now see where stars formed and how they are distributed with Webb, in a similar way to how the Hubble Space Telescope is used to study local galaxies. Today Webb's view provides a unique opportunity to study star formation and the inner workings of infant galaxies at such an unprecedented distance. Now, James Webb Space Telescope (JWST) offers a supreme view into early galaxies, allowing scientists see star birth and galaxy evolution in the distant, infant universe like never before. Due to its infrared vision and gravitational lensing, we can see-through details about star clusters, dust, and gas in galaxies just moments after the Big Bang, like the Cosmic Gems arc.

String theory is among the most well-known concepts in modern physics, but it's also one of the most perplexing. The central idea is that the elementary particles we notice are not point-like dots, but instead tiny strings so small that even our best instruments cannot tell them apart. This also anticipates that there are additional dimensions to space in addition to the obvious length, breadth, and depth, but we do not perceive them because they are clustered in small spaces. Although these ideas are bizarre, the main issue for string theorists has been the difficulty in testing them. String theory is a broad and diverse subject that attempts to answer a number of fundamental physics questions. It has made noteworthy contributions to mathematical physics, which have been applied to a wide range of issues in black hole physics, early universe cosmology, nuclear physics, and condensed matter physics, including stimulating a number of major advances in pure mathematics. String theory is a candidate for such a theory of everything, a self-contained mathematical model that encompasses all fundamental forces and forms of matter, because it has the possibility to provide a inclusive description of gravity and particle physics. Einstein has tried to seek a unified field theory, a solitary model to explain the universe's fundamental interactions or mechanics. Today's search is for a quantized unified field theory which also explains the structure of matter. This is known as the search for an all-encompassing theory. String theory transferred into superstring theory, with its six higher dimensions in addition to its four common dimensions, is the most prominent contender as a ToE. In this investigative review article author will take an effort to appraise the concept of ToE or God Equation for better understanding to explain the consequence of universe with ultimate fate on the basis of existing theory of physics and the latest scientific development.

2. Literature Review and History Related to String Theory Explain by M Kaku

String theory is a leading candidate for a Theory of Everything (ToE), a hypothetical single framework that unifies all fundamental forces (like gravity, electromagnetism, strong and weak nuclear forces) and matter, bridging the gap between General Relativity (gravity) and Quantum Mechanics (other forces). While a ToE aims to be the ultimate unified theory, String Theory proposes how this unification might work by replacing point-like particles with tiny, vibrating strings, where different vibrations create different particles and forces, including gravity. The ToE is the ultimate goal (a complete, unified description of everything), and String Theory is a prominent, well-developed method or candidate for achieving that goal. String theory naturally incorporates gravity (via gravitons, which are closed strings) and quantum mechanics, solving a major conflict in physics. Instead of point particles, string theory suggests everything is made of one-dimensional vibrating "strings" in extra dimensions. Different vibration patterns of these strings correspond to different particles (electrons, quarks, etc.) and forces, offering a single description. String theory (and its extension, M-theory) is the most mathematically consistent framework developed so far for a ToE, but it remains theoretical, requiring extra dimensions and lacking direct experimental proof.

About the idea of Thomas H. Huxley, Kaku also said, "As the great biologist Thomas H. Huxley said in 1863, "The question of all questions for humanity, the problem which lies behind all others and is more interesting than any of them, is that of the determination of man's place in Nature and his relation to the Cosmos." On the other hand, about the idea of Planck, Kaku also said, "But Planck would always reassure Einstein. He would write, "A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because the opponents eventually die and a new generation grows up that is familiar with it." Kaku explain a situation/example by saying, "Schrödinger's Cat Schrödinger devised a simple thought experiment that exposed the essence of the problem. Place a cat in a sealed box. Put a piece of uranium in the box. When the uranium fires a subatomic particle, it triggers a Geiger counter that sets off a gun that fires a bullet at the cat. The question is: Is the cat dead or alive? Since the firing of a uranium atom is a purely quantum event, it means that you have to describe the cat in terms of quantum mechanics. To Heisenberg, before you open the box, the cat exists as a mixture of different quantum states—that is, the cat is the sum of two waves. One wave describes a dead cat. The other wave describes a live cat. The cat is neither dead nor alive but a mixture of both. The only way to tell if the cat is dead or alive is to open the box and make an observation; then the wave function collapses into a dead or live cat. In other words, observation (which requires consciousness) determines existence."

About another example Kaku saying, "To Einstein, this insight was monumental. Either Newton or Maxwell was correct. The other had to be wrong. But how could it be that you could never catch up to light? At the patent office, he had plenty of time to ponder this question. One day, in the spring of 1905, it struck him while riding the train in Bern. "A storm broke loose in my mind," he would recall. His brilliant insight was that since the speed of light is measured by clocks and metersticks, and since the speed of light is constant no matter how fast you move, space and time must be distorted in order to keep the speed of light constant!

It meant that if you are on fast-moving spaceship, then clocks inside the ship beat slower than clocks on the Earth. Time slows down the faster you move--this phenomenon is described by Einstein's special relativity." Abou Einstein Kaku said, "In one letter, he wrote despondently, "I am nothing but a burden to my relatives. It would surely be better if I did not live at all." He finally managed to get a job as a clerk, third class, at the patent office in Bern. It was humiliating but actually a blessing in disguise. In quiet of the patent office Einstein could return to the old question that had haunted him since he was a child. From there, he would launch a revolution that physics and the world upside down."

Kaku take us to ancient time by saying, "With the introduction of radio, we now had a superfast. convenient, and wireless way of communicating over long distances. Historically, the lack of a fast and reliable communication system was one of the great obstacles to the march of history. (In 490 BCE, after the Battle of Marathon between the Greeks and the Persians, a poor runner was ordered to spread the news of the Greek victory as fast as he could. Bravely, he ran 26 miles to Athens after previously running 147 miles to Sparta, and then, according to legend, dropped dead of sheer exhaustion. His heroism, in the age before telecommunication, is now celebrated in the modern marathon.) However, in present time, we take for granted that we can send messages and information effortlessly across the globe, utilizing the fact that energy can be transformed in many ways. For example, when speaking on a cell phone, the energy of the sound of your voice converts to mechanical energy in a vibrating diaphragm. The diaphragm is attached to a magnet that relies on the interchangeability of electricity and magnetism to create an electrical impulse, the kind that can be transported and read by a computer. This electrical impulse is then translated into electromagnetic waves that are picked up by a nearby microwave tower. There, the message is amplified and sent across the globe.

But Maxwell's equations not only gave us nearly instantaneous communication via radio, cell phone, and fiber-optic cables, they also opened up the entire electromagnetic spectrum, of which visible light and radio were just two members. In the 166os, Newton had shown that white light, when sent through a prism, can be broken up into the colors of the rainbow. In 1800, William Herschel had asked himself a simple question: What lies beyond the colors of the rainbow, which extend from red to violet? He took a prism, which created a rainbow in his lab, and placed a thermometer below the color red, where there was no color at all. Much to his surprise, the temperature of this blank area began to rise. In other words, there was a "color" below red that was invisible to the naked eye but contained energy. Which was known as infrared light. However, today, we realize that there is an entire spectrum of electromagnetic radiation, most of which is invisible, and each has a distinct wavelength. The wavelength of radio and TV, for example, is longer than that of visible light. The wavelength of the colors of the rainbow, in turn, is longer than that of ultraviolet and X-rays. This also meant that the reality we see all around us is only the tiniest sliver of the complete EM spectrum, the smallest approximation of a much larger universe" Kaku added, "So in the same way that Kepler and Galileo laid the foundation for Newtonian physics, Faraday paved the way for Maxwell's equations."

About great physicist Isaac Newton Kaku said, 'Isaac Newton is perhaps the greatest scientist who ever lived. In a world obsessed with witchcraft and sorcery, he dared to write down the universal laws of the heavens and apply a new mathematics he invented to study forces, called the calculus.' The American theoretical physicist and Nobel laureate in physics Steven Weinberg has written, 'It is with Isaac Newton that the modern dream of a final theory really begins. In its time, it was considered to be the theory of everything-that is, the theory that described all motion.' The story of Newton was fascination. When he was twenty-three years old and student of Cambridge University. Due to the black plague his university was closed. In 1666, one afternoon he was walking around his country estate, and he saw an apple fall from tree. Suddenly, he asked himself a question that would alter the course of human history. If an apple falls, then does the moon also fall? Before Newton, the church taught that there were two kinds of laws. The first were the laws found on Earth, which were corrupted by the sin of mortals. The second were the pure, perfect, and harmonious laws of the heavens. The essence of Newton's idea was to propose a unified theory that encompassed the heavens and the Earth. Kaku give an example from idea of Newton as "If a cannonball is fired from a mountaintop, it goes a certain distance before hitting the ground. But if you fire the cannonball at increasing velocities, it travels farther and farther before coming back to Earth, until it eventually completely circles the Earth and returns to the mountaintop. He concluded that the natural law that governs apples and cannonballs, gravity, also grips the moon in its orbit around the Earth. Terrestrial and heavenly physics were the same."

Kaku said about Johannes Kepler as, "Johannes Kepler, who was one of the first to apply mathematics to the motion of the planets, was an imperial adviser to Emperor Rudolf Il and perhaps escaped persecution by piously including religious elements in his scientific work. The former monk Giordano Bruno was not so lucky. In 1600, he was tried and sentenced to death for heresy. He was gagged, paraded naked in the streets of Rome, and finally burned at the stake. His chief crime? Declaring that life may exist on planets circling other stars. He wrote about Galilleo as, the great Galileo, the father of experimental science, almost met the same fate. But unlike Bruno, Galileo recanted his theories on pain of death. Nonetheless, he left a lasting legacy with his telescope, perhaps the most revolutionary and seditious invention in all of science. With a telescope, you could see with your own eyes that the moon was pockmarked with craters; that Venus had phases consistent with its orbiting the sun; that Jupiter had moons, all of which were heretical ideas. Sadly, he was placed under house arrest, isolated from visitors, and eventually went blind. (It was said because he once looked directly at the sun with his telescope.) Galileo died a broken man. But the very year that he died, a baby was born in England who would grow up to complete Galileo's and Kepler's unfinished theories, giving us a unified theory of the heavens." He also said, "Johannes Kepler, who was one of the first to apply mathematics to the motion of the planets, was an imperial adviser to Emperor Rudolf Il and perhaps escaped persecution by piously including religious elements in his scientific work. The former monk Giordano Bruno was not so lucky. In 1600, he was tried and sentenced to death for heresy. He was gagged, paraded naked in the streets of Rome, and finally burned at the stake. His chief crime? Declaring that life may exist on planets circling other stars."

Again, Johannes Kepler has applied mathematics to the motion of the planets. He was a majestic adviser to Emperor Rudolf Il and possibly escaped persecution by piously including religious elements in his scientific work. Pythagoras had the insight to apply a mathematical description to worldly phenomena like music. According to legend, he noticed similarities between the sound of plucking a lyre string and the resonances made by hammering a metal bar. Kaku relate mathematics with physics by the word of Pythagoras as "Pythagoras had the insight to apply a mathematical description to worldly phenomena like music. According to legend, he noticed similarities between the sound of plucking a lyre string and the resonances made by hammering a metal bar. He found that they created musical frequencies that vibrated with certain ratios. So, something as aesthetically pleasing as music has its origin in the mathematics of resonances. This, he thought, might show that the diversity of the objects we see around us must obey these same mathematical rules." So at least two great theories of our world emerged from ancient Greece: 'the idea that everything consists of invisible, indestructible atoms and that the diversity of nature can be described by the mathematics of vibrations.' Kaku said, 'Democritus believed that 'everything could be reduced to tiny, invisible, indestructible particles he called atoms which meaning invisible in Greek. The critics, however, pointed out that direct evidence for atoms was impossible to acquire because they were too small to be observed. But Democritus could point out compelling, indirect evidence.' Kaku claimed as 'when Erwin Schrödinger, Werner Heisenberg, and others unlocked the secrets of the quantum theory, they gave us the high-tech revolution of today, with supercomputers, lasers, the internet, and all of the fabulous gadgets in our living rooms.'

String theory has also created a tremendous amount of interest, as well as a backlash. Actually, there is no the proof, in the same way that Newton did not have the proof of his inverse square law back in 1666. Sometimes, the mathematics and the ideas are ahead of the concrete experimental data. Here the Large Hadron Collider (LHC) comes into play. The Standard Model is the theory of almost everything. It works spectacularly well but it's one of the ugliest theories proposed so far. In string theory, the Standard Model just pops right out. With just a few assumptions we may get the entire Standard Model. So, the point here is that we need experimental proof and the LHC may give us hints of a deviation in the Standard Model . The LHC's goal is to allow physicists to test the predictions of different theories of particle physics, including measuring the properties of the Higgs boson, searching for the large family of new particles predicted by supersymmetric theories, and studying other unresolved questions in particle physics. The LHC is the world's largest and highest-energy particle accelerator. It was built by the European Organization for Nuclear Research (CERN) from 1998 to 2008, in collaboration with over 10,000 scientists, and hundreds of universities and laboratories across more than 100 countries. LHC is the world's largest and most powerful particle accelerator, designed to smash protons together at nearly the speed of light to study the fundamental particles and forces that govern our universe. It is the primary tool used by physicists to test the predictions of the Standard Model of particle physics.

The Standard Model is often referred to as the theory of 'almost everything' because while highly successful, it does not incorporate gravity, nor does it explain phenomena like dark matter and dark energy. Experiments at the CERN, where the LHC is located, have been instrumental in confirming the Standard Model's existence, most notably through the 2012 discovery of the Higgs boson. The discovery of the Higgs boson at the LHC was announced in 2012. Between 2013 and 2015, the LHC was shut down and upgraded. At the end of 2018, it was shut down for maintenance and further upgrades, and reopened over three years later in April 2022. This discovery was crucial because the Higgs boson is the physical manifestation of the field that gives mass to other particles, a central component of the Standard Model's framework. By continuing to operate and gather data, the LHC helps scientists explore potential new physics that lies beyond the Standard Model, seeking answers to some of the biggest remaining mysteries in physics. Scientists turned the LHC back on after a three-year shutdown. The Large Hadron Collider is the world's largest particle accelerator. Physicists and people interested in becoming superheroes alike are electrified by the possibilities. Now, the particle accelerator needed upgrades, which the pandemic extended. If all goes well, the Large Hadron Collider will run through the end of 2025. Just getting everything booted up will take about three months. After that, scientists will continue their search for dark matter, neutrinos-Opens in a new tab, and other mysteries of particle physics-Opens in a new tab.

A theory of everything is what remains after they shuck the outer layers as a framework to describe all the objects and forces within the universe's core. The theory would not mean all that much to us on the larger, outer layers of the universe, the ones that make us cry. The theory would mean everything to the primordial bulb, the seedling from which the universe grew. A theory of everything should not only reveal the divine cultivation, it should also codify the physical laws that arise from the basic forces. Even now, these forces and those laws dictate how matter moves throughout the universe. They can, for example, explain the thrusts of inanimate objects, even though what impels animate matter and how it becomes animate they do not say. The enactment of these laws, most physicists believe, afforded God a lengthy sabbatical. Natural laws reign supreme, managing the tasks that worshippers once foisted upon God. The laws keep the planets rotating, the sun burning, the people moving. Only at the moment of creation, as Stephen Hawking wrote, might God have wielded her powers, when 'all the laws would have broken down, so God would still have complete freedom to choose what happened and how the universe began.' Afterwards, God was as superfluous to the universe as an architect is to a building once built. Stephen Hawking was unsatisfied even with ceding God the task of drafting a universe and embellishing space and time with laws. He preferred to imagine a design that was 'completely self-contained, with no singularities or boundaries.' And that was 'completely described by a unified theory.' He wanted, in other words, to unite the four known forces into one prime mover, so the universe could create itself.

Stephen Hawking believed only one set of laws could be consistent with the theory of everything. There was thus no choice when designing a universe, because only one universe was possible. He thought, God was neither a creator nor a designer. The universe was enough. To wonder what happened before the Big Bang. Hawking famously said, was as ridiculous as asking what lay north of the north pole. Hawking long insisted on the proximity of the final theory. In every insistence, he was right. Every second of every day, physicists are, repetitiously, nearer the moment when they will ascertain the final theory; should it exist. It is, however, impossible to know that such a theory exists until physicists reveal it. And it is impossible to know that they can reveal it until they do. The obtusity of modern physics hardly bodes well for anyone understanding the theory of everything, should it even exist. But this is just one problem with the idea of scientific progress; even if it is asymptotic, we never reach its limit. Hawking made a bolder claim, much as Einstein did, about the theory of everything. He insisted that everyone be able to understand the theory and argue its meaning once physicists discovered it. The universe and its math, ultimately, had to be simple enough for dullards. In fact, that was one of the primary reasons for writing books about physics and to inform the masses about the universe and prepare them for the theory of everything.

Mathematics is the mother tongue of physics. Every book about the subject is a translation, not only from another language but a different culture. Popular physics thus suffers from the same predicaments of transliteration and interpretation that all foreign works do as does the Bible. But such limitations have never stopped devotees from claims of inerrancy. Guido Tonelli is an Italian particle physicist who played a key role in the discovery of the Higgs boson, the so-called God particle, which earned François Englert and Peter Higgs the 2013 Nobel Prize in Physics. Guido Tonelli wrote his book, 'Genesis: The Story of How Everything Began, to inform il popolo about the universe.' That was not, however, the original impetus. As Tonelli explained, in a preface that appeared in the original Italian, one summer afternoon he was having lunch at a restaurant near the headquarters of Ferrari, and chatting with his hosts about 'Formula One' and electric cars. He received a phone call from Sergio Marchionne, the director of Ferrari, who inviting him to stop by Marchionne's office for a chat. Tonelli is a commander of the 'Order of Merit of the Italian Republic', owing to his leadership on one of the two teams of thousands of people that discovered the Higgs particle, yet he expected a perfunctory introduction to a harried businessman. Instead, Marchionne welcomed him to sit and asked, 'Professor, do you believe in God?' Tonelli spoke about the Big Bang while Marchionne smoked and asked so many giddy questions that Tonelli nearly missed his flight. A few months later, Marchionne invited Tonelli to the annual dinner for Ferrari executives. They spent the evening talking about black holes and Steven Hawking. Before dessert, Marchionne hushed his subordinates and asked Tonelli to speak.

Tonelli extemporized on the full life of the universe, from its birth to the discovery of the Higgs. He told, God is a fascinating question, but I doubt that God is an answer. When we answer our juvenile questions with God, we eliminate the other, harder solutions. The ones that are more humane. When I quit studying physics in graduate school, when I gave up on a theory of everything to become a writer, I coined an aphorism to comfort myself. Tonelli said, 'It is impossible to know all the answers because the question of what to do with them will always remain.' He also added, 'The universe is enough for some people. Religion is enough for others. For the rest of us, there is humanity. It, too, is enough. We all search for meaning. Some of us ordain this God. But no matter our beliefs, we must take comfort in each other, in the now, while we live and breathe, freely and unmasked, for however long we have. Since writing my first term paper in college, I had not pondered God and physics much, if at all.' Marchionne said, 'After I finished writing this essay, I reached out to the professor who had once encouraged me to write about those subjects. I planned to let her know that I did not yet know enough physics to write about God, but I was still learning about the world as I wrote.' Hawking viewed the universe as governed by natural laws, not divine intent, and saw consciousness as a product of the brain's physical processes, thus no afterlife. Hawking found meaning in life's finite nature, urging a focus on curiosity and discovery. We need to utilize the concept of Theory of Everything or God Equation to understand and explain the consequence and final fate of universe, principally based on existing theories and propositions of physics along with the latest scientific concept.

3. String Theory

Every decade or so, a stunning breakthrough in string theory sends shock waves racing through the theoretical physics community, generating a feverish outpouring of papers and activity. John Schwarz of Caltech has been speaking to conferences around the world proclaiming the 'second superstring revolution.' Edward Witten of the Institute for Advanced Study in Princeton gave a spell-binding 3-hour lecture describing it. The after-shocks of the breakthrough are even shaking other disciplines, like mathematics. The director of the Institute, mathematician Phillip Griffiths, says, the excitement I sense in the people in the field and the spin-offs into my own field of mathematics have really been quite extraordinary. Cumrun Vafa at Harvard has said, 'I may be biased on this one, but I think it is perhaps the most important development not only in string theory, but also in theoretical physics at least in the past two decades.' What is triggering all this excitement is the discovery of something called M-theory, a theory which may explain the origin of strings. In one dazzling stroke, this new M-theory has solved a series of long-standing puzzling mysteries about string theory which have dogged it from the beginning, leaving many theoretical physicists gasping for breath. M-theory, moreover, may even force string theory to change its name. Although many features of M-theory are still unknown, it does not seem to be a theory purely of strings. Michael Duff of Texas A & M is already giving speeches with the title 'The theory formerly known as strings!' String theorists are careful to point out that this does not prove the final correctness of the theory. But it marks a most significant breakthrough that is already reshaping the entire field.

Einstein once said, 'Nature shows us only the tail of the lion. But I do not doubt that the lion belongs to it even though he cannot at once reveal himself because of his enormous size.' Einstein spent the last 30 years of his life searching for the tail that would lead him to the lion, the fabled unified field theory or the 'theory of everything,' which would unite all the forces of the universe into a single equation. The four forces as gravity, electromagnetism, and the strong and weak nuclear forces would be unified by an equation perhaps one inch long. Capturing the lion would be the greatest scientific achievement in all of physics, the crowning achievement of 2,000 years of scientific investigation, ever since the Greeks first asked themselves what the world was made of. But although Einstein was the first one to set off on this noble hunt and track the footprints left by the lion, he ultimately lost the trail and wandered off into the wilderness. Other giants of 20th century physics, like Werner Heisenberg and Wolfgang Pauli, also joined in the hunt. But all the easy ideas were tried and shown to be wrong. When Niels Bohr once heard a lecture by Pauli explaining his version of the unified field theory, Bohr stood up and said, 'we in the back are all agreed that your theory is crazy. But what divides us is whether your theory is crazy enough!' The trail leading to the unified field theory, in fact, is littered with the wreckage of failed expeditions and dreams.

Presently, however, physicists are following a different trail which might be 'crazy enough' to lead to the lion. This new trail leads to superstring theory, which is the best (and in fact only) candidate for a theory of everything. Unlike its rivals, it has survived every blistering mathematical challenge ever hurled at it. Not surprisingly, the theory is a radical, 'crazy' departure from the past, being based on tiny strings vibrating in 10-dimensional space-time. Moreover, the theory easily swallows up Einstein's theory of gravity. Witten has said, 'Unlike conventional quantum field theory, string theory requires gravity. I regard this fact as one of the greatest in- sights in science ever made.' But until recently, there has been a glaring weak spot: string theorists have been unable to probe all solutions of the model, failing miserably to examine what is called the 'non-perturbative region,' which I will describe shortly. This is vitally important, since ultimately our universe (with its wonderfully diverse collection of galaxies, stars, planets, sub- atomic particles, and even people) may lie in this 'non-perturbative region.' Until this region can be probed, we don't know if string theory is a theory of everything or a theory of nothing! That's what today's excitement is all about. For the first time, using a powerful tool called 'duality,' physicists are now probing beyond just the tail, and finally seeing the outlines of a huge, unexpectedly beautiful lion at the other end. Not knowing what to call it, Witten has dubbed it 'M-theory.' In one stroke, M-theory has solved many of the embarrassing features of the theory, such as why we have 5 superstring theories. Ultimately, it may solve the nagging question of where strings come from.

Albert Einstein once asked himself if God had any choice in making the universe. Perhaps not, so it was embarrassing for string theorists to have five different self-consistent strings, all of which can unite the two fundamental theories in physics, the theory of gravity and the quantum theory. Each of these string theories looks completely different from the others. They are based on different symmetries, with exotic names like E(8)xE(8) and O(32). Not only this, but superstrings are in some sense not unique: there are other non-string theories which contain super- symmetry, the key mathematical symmetry underlying superstrings. (Changing light into electrons and then into gravity is one of the rather astonishing tricks performed by supersymmetry, which is the symmetry which can exchange particles with half-integral spin, like electrons and quarks, with particles of integral spin, like photons, gravitons, and W-particles. In 11 dimensions, in fact, there are alternate super theories based on membranes as well as point particles as known as super-gravity. In lower dimensions, there is moreover a whole zoo of super theories based on membranes in different dimensions. As example, point particles are 0-branes, strings are 1-branes, membranes are 2-branes, and so on. For the p-dimensional case, some wag dubbed them p-branes (as "pea brains"). But because p-branes are horribly difficult to work with, they were long considered just a historical curiosity, a trail that led to a dead-end.

Michael Duff, in fact, has collected a whole list of unflattering comments made by referees to his National Science Foundation grant concerning his work on p-branes. One of the more charitable comments from a referee was "He has a skewed view of the relative importance of various concepts in modern theoretical physics." So that was the mystery. Why should supersymmetry allow for 5 superstrings and this peculiar, motley collection of p-branes? Now we realize that strings, supergravity, and p-branes are just different aspects of the same theory. M-theory (M for "membrane" or the "mother of all strings," take your pick) unites the 5 superstrings into one theory and includes the p-branes as well. To see how this all fits together, let us update the famous parable of the blind wise men and the elephant. Think of the blind men on the trail of the lion. Hearing it races by; they chase after it and desperately grab onto its tail (a one-brane). Hanging onto the tail for dear life, they feel its one- dimensional form and loudly proclaim "It's a string! It's a string!" Then one blind man goes beyond the tail and grabs onto the ear of the lion. Feeling a two-dimensional surface (a membrane), the blind man proclaims, "No, it's really a two-brane!" Then another blind man is able to grab onto the leg of the lion. Sensing a three-dimensional solid, he shouts, "No, you're both wrong. It's really a three-brane!" Actually, they are all right. Just as the tail, ear, and leg are different parts of the same lion, the string and various p-branes appear to be different limits of the same theory (as M- theory). Paul Townsend of Cambridge University, one of the architects of this idea, calls it "p-brane democracy," i.e. all p-branes (including strings) are created equal. Schwarz puts a slightly different spin on this. He says, "we are in an Orwellian situation: all p-branes are equal, but some (namely strings) are more equal than others. The point is that they are the only ones on which we can base a perturbation theory." To understand unfamiliar concepts such as duality, perturbation theory, non-perturbative solutions, it is instructive to see where these concepts first entered into physics.

As we know that, the key tool to understanding this breakthrough is something 'duality.' Loosely speaking, two theories are 'dual' to each other if they can be shown to be equivalent under a certain interchange. The simplest example of duality is reversing the role of electricity and magnetism in the equations discovered by James Clerk Maxwell of Cambridge University, 130 years ago. These are the equations which govern light, TV, X-rays, radar, dynamos, motors, transformers, even the Internet and computers. The remarkable feature about these equations is that they remain the same if we interchange the magnetic B and electric fields E and also switch the electric charge e with the magnetic charge g of a magnetic 'monopole': E <–> B and e <–> g (In fact, the product eg is a constant). This has important implications. Often, when a theory cannot be solved exactly, we use an approximation scheme. In first year, calculus, for example, we can approximate certain functions by Taylor's expansion. Similarly, since $e^2 = 1/137$ in certain units and is hence a small number, we can always approximate the theory by power expanding in e^2 (known as fine-structure constant). So, we add contributions of order $e^2 + e^4 + e^6$ etc. in solving for, say, the collision of two particles. Notice that each contribution is getting smaller and smaller, so we can in principle add them all up. This generalization of Taylor's expansion is called 'perturbation theory,' where we perturb the system with terms containing e^2. For example, in archery, perturbation theory is how we aim our arrows. With every motion of our arms, our bow gets closer and closer to aligning with the bull's eye.) But now try expanding in g^2. This is much tougher; in fact, if we expand in g^2, which is large, then the sum $g^2 + g^4 + g^6$ etc. blows up and becomes meaningless. This is the reason why the 'non-perturbative' region is so difficult to probe, since the theory simply blows up if we try to naively use perturbation theory for large coupling constant g. So, at first it appears hopeless that we could ever penetrate into the non-perturbative region. For example, if every motion of our arms got bigger and bigger, we would never be able to zero in and hit the target with the arrow. But notice that because of duality, a theory of small e (which is easily solved) is identical to a theory of large g (which is difficult to solve). But since they are the same theory, we can use duality to solve for the non-perturbative region.

M. H. MacGregor has published his book 'Power of alpha (α)' in 2007 and has told 'the mystery about the fine-structure constant is actually a double mystery. The first mystery is the origin of its numerical value and has been recognized and discussed for decades. The second mystery is the range of its domain and is generally unrecognized.' His work from this time is often cited in subsequent theoretical physics and cosmology papers, particularly those discussing models of the universe and the nature of dark matter. Wolfgang Pauli was an Austrian–Swiss theoretical physicist and a pioneer of quantum mechanics has said, 'When I die my first question to the Devil will be: What is the meaning of the fine structure constant?' That's why British astronomer Sir James Jeans declared 'God is a pure mathematician!' Again, Paul Davies is an English physicist, and a professor in Arizona State University said, 'The physical universe does seem to be organized around elegant mathematical relationships. And one number above all others has exercised an enduring fascination for physicists: 137.0359991.... It is known as the fine-structure constant and is denoted by the Greek letter alpha (α).' While twentieth-century physicists were not able to identify any convincing mathematical constants underlying the fine structure, partly because such thinking has normally not been encouraged, a revolutionary suggestion was recently made by the Czech physicist Raji Heyrovska, who deduced that the fine structure constant, ...really is defined by the [golden] ratio. Carl Johan Calleman talked about the concept of 'The Purposeful Universe.'

The first suspicion that duality might apply in string theory was discovered by K. Kikkawa and M. Yamasaki of Osaka Univ. in 1984. They showed that if you 'curled up' one of the extra dimensions into a circle with radius R, the theory was the same if we curled up this dimension with radius 1/R. This is now called T-duality and which connects a string theory compactified on a circle of radius R to another string theory compactified on a circle of radius $1/R$ (in Planck units). A string moving on a small circle behaves like a string with different momentum/winding states on a large circle, and vice-versa. When applied to various superstrings, one could reduce 5 of the string theories down to 3. In 9 dimensions (with one dimension curled up) the Type IIa and IIb strings were identical, as were the E(8)xE(8) and O(32) strings. Unfortunately, T duality was still a perturbative duality. The next breakthrough came when it was shown that there was a second class of dualities, called S duality, which provided a duality between the perturbative and non-perturbative regions of string theory. It is a transformation that exchanges a string theory with a weak coupling constant (g) for another string theory with a strong coupling constant (1/g). Type IIB string theory at weak coupling is equivalent to Type IIB at strong coupling, which is related to F-theory. Another duality, called U duality, was even more powerful. It encompasses both S-duality and T-duality transformations. It reveals the interconnectedness of various string theories (Type IIA, IIB, Heterotic, etc.) and M-theory, showing they are different limits or compactifications of a single underlying theory. It used to find new black hole/brane solutions, understand BPS states (supersymmetric states), and map out the landscape of string theory vacua. Then Nathan Seiberg and Witten brilliantly showed how another form of duality could solve for the non-perturbative region in four dimensional supersymmetric theories. However, what finally convinced many physicists of the power of this technique was the work of Paul Townsend and Edward Wit- ten. They caught everyone by surprise by showing that there was a duality between 10-dimensional Type IIa strings and 11 dimension- al supergravity! The non-perturbative region of Type IIa strings, which was previously a forbidden region, was revealed to be governed by 11-dimensional supergravity theory, with one dimension curled up. At this point, many physicists were rubbing their eyes, not believing what they were seeing. All of a sudden, they realized that perhaps the real 'home' of string theory was not 10 dimensions, but possibly 11, and that the theory wasn't fundamentally a string theory at all! This revived tremendous interest in 11 dimensional theories and p-branes. Loitering in the 11th dimension was an entirely new theory which could reduce down to 11-dimensional supergravity as well as 10-dimensional string theory and p-brane theory.

However, these mathematical developments still don't answer the nagging question: how do you test it? Since string theory is really a theory of Creation, when all its beautiful symmetries were in their full glory, the only way to test it, the critics wail, is to re-create the Big Bang itself, which is impossible. Detractors of string theory are including renowned physicists like Peter Woit, Sheldon Glashow, and Sabine Hossenfelder, largely argue that the theory lacks experimental verification and testable predictions, making it more of a mathematical framework or hypothesis than a proper scientific theory. The most significant criticism is that the phenomena predicted by string theory (such as the existence of strings themselves or super-partner particles) occur at energy scales far beyond the reach of current or foreseeable technology, like the Large Hadron Collider (LHC). This makes the theory difficult, if not impossible, to verify or falsify in practice, a core tenet of the scientific method for critics. String theory does not predict a single, unique universe with specific properties. Instead, it allows for a vast number of possible solutions (estimated at around 100^{500} different "vacua"), each describing a universe with different physical laws. Critics argue this means the theory explains everything and nothing simultaneously, as it can be tuned to match almost any observation, which limits its predictive power for our specific universe. Dependence on unproven hypotheses, the theory requires the existence of extra dimensions and supersymmetry (SUSY) for mathematical consistency. However, there is currently no experimental evidence for either of these ideas in nature, and the lack of SUSY particle discovery at the LHC has been a major disappointment for many physicists.

Nobel Laureate Sheldon Glashow likes to ridicule superstring theory by comparing it with former Pres. Reagan's Star Wars plan, i.e. they are both untestable, soak up resources, and both siphon off the best scientific brains. Some detractors, notably Lee Smolin in 'The Trouble with Physics', criticize the academic dominance of string theory, arguing it has received a disproportionate amount of funding and research positions for decades, stifling research into alternative approaches to quantum gravity like Loop Quantum Gravity. This has led to accusations of a "cult" of personality around leading string theorists and a lack of open discourse. In point of mathematical abstraction vs. physics critics argue that string theory has become an exercise in abstract mathematics rather than physics, losing its connection to empirical reality. While the theory has produced useful mathematical tools applicable in other areas of physics (like the AdS/CFT correspondence for black hole physics), these spin-offs are seen as separate from the primary goal of unifying all forces. However, whether a mathematically elegant and consistent framework is sufficient justification for a physical theory in the absence of empirical testability. Actually, most string theorists think these criticisms are silly. They believe that the critics have missed the point. The key point is this: if the theory can be solved non- perturbatively using pure mathematics, then it should reduce down at low energies to a theory of ordinary protons, electrons, atoms, and molecules, for which there is ample experimental data. If we could completely solve the theory, we should be able to extract its low energy spectrum, which should match the familiar particles we see today in the Standard Model. Thus, the problem is not building atom smashers l,000 light years in diameter; the real problem is raw brain power: if only we were clever enough, we could write down M-theory, solve it, and settle everything.

The Standard Model of particle physics is the prevailing theoretical framework describing the elementary particles and the fundamental forces through which they interact. Developed throughout the latter half of the 20th century, it is a highly successful quantum field theory that has been confirmed by numerous experiments. The Standard Model provides a robust framework for understanding the microscopic world, successfully predicting the existence of many particles before they were experimentally discovered, including the Higgs boson, which was confirmed in 2012 by researchers at CERN's Large Hadron Collider. The model describes 17 types of elementary particles (12 fermions, 4-gauge bosons, and 1 scalar boson) and three of the four known fundamental forces: the electromagnetic, strong nuclear, and weak nuclear interactions. The fourth, gravity, is not currently incorporated into the Standard Model. Quarks are fundamental constituents of matter that participate in all three fundamental forces, including the strong interaction. They combine to form composite particles called hadrons, such as protons and neutrons. There are six types, or flavors and arranged in three generations. Leptons are another class of fundamental matter particles that do not participate in the strong interaction. There are six types, also arranged in three generations. Gluons are the carrier particles (gauge bosons) of the strong nuclear force, binding quarks together to form hadrons. Electrons are the most stable and familiar of the leptons, carrying a negative electric charge and orbiting atomic nuclei. Neutrinos are elusive, weakly interacting leptons with very small mass. They interact primarily via the weak nuclear force and are extremely abundant in the universe. Higgs Boson as scalar particle is the physical manifestation of the Higgs field, which permeates all of space.

The interaction of other particles with this field is what gives them mass, a mechanism central to the Standard Model.

Now, what is the solution of M-theory and stop all the speculation and back-biting? There need to derive the Standard Model of particle interactions, with its bizarre collection of quarks, gluons, electrons, neutrinos, Higgs bosons, and many more. This might be done by curling up 6 of the 10 dimensions, leaving us with a 4-dimensional theory that might resemble the Standard Model a bit. Then try to use duality and M-theory to probe its non-perturbative region, seeing if the symmetries break in the correct fashion, giving us the correct masses of the quarks and other particles in the Standard Model. Witten's philosophy, however, is a bit different. He feels that the key to solving string theory is to understand the under-lying principle behind the theory. Einstein's theory of general relativity, started from first principles. Einstein had the "happiest thought in his life" when he leaned back in his chair at the Bern patent office and realized that a person in a falling elevator would feel no gravity. Although physicists since Galileo knew this, Einstein was able to extract from this the Equivalence Principle. This deceptively simple statement that the laws of physics are indistinguishable locally in an accelerating or a gravitating frame and that led Einstein to introduce a new symmetry to physics, general co-ordinate transformations. This in turn gave birth to the action principle behind general relativity, the most beautiful and compelling theory of gravity. Only now are we trying to quantize the theory to make it compatible with the other forces. Witten said, we need to discover the analog of the Equivalence Principle for string theory. The fundamental problem has been that string theory has been evolving "backwards." Witten also added, "string theory is 21st century physics which fell into the 20th century by accident." We were never "meant" to see this theory until the next century.

In theoretical physics, F-theory (where F for father) is a branch of string theory developed by Iranian-American physicist Cumrun Vafa. He added a strange twist to this when he introduced yet another mega-theory, this time a 12-dimensional theory and that explains the self-duality of the IIb string. Unfortunately, this 12-dimensional theory is rather strange: it has two-timed co-ordinates, not one, and actually violates 12-dimensional relativity. Imagine trying to live in a world with two times! It would put an episode of Twilight Zone to shame. Now, the question is the final theory 10, 11, or 12 dimensional? Schwarz feels that the final version of M-theory may not even have any fixed dimension. He feels that the true theory may be independent of any dimensionality of space-time, and that 11 dimensions only emerges once one tries to solve it. He feels that the true theory may be independent of any dimensionality of space-time, and that 11 dimensions only emerges once one tries to solve it. Townsend seems to agree, saying 'the whole notion of dimensionality is an approximate one that only emerges in some semiclassical context.' Question is, does this means that the end is in sight, that we will someday soon derive the Standard Model from first principles? Today's physicists are enthusiastic supporters of this revolution, they are still cautious about predicting the future. Townsend believes that we are in a stage similar to the old quantum era of the Bohr atom, just before the full elucidation of quantum mechanics. He says, 'We have some fruitful pictures and some rules analogous to the Bohr-Sommerfeld quantization rules, but it's also clear that we don't have a complete theory.'

The large number of semirealistic solutions to string theory referred to as the string theory landscape, with 10^{272000} elements or so, is dominated by F-theory compactifications on Calabi–Yau four-folds. There are at least 10^{15} of those solutions consistent with the Standard Model of particle physics. Duff says, 'is M-theory merely a theory of super-membranes and super 5-branes requiring some as yet unknown non-perturbative quantization, or (as Witten believes) are the underlying degrees of freedom of M-theory yet to be discovered? I am personally agnostic on this point.' Witten certainly believes we are on the right track, but we need a few more 'revolutions' like this to finally solve the theory. Witten said, 'we still know very little about what string theory is, and this implies that it remains an excellent subject for young physicists to start to work on. I suspect he sees all too well that among physicists the tide has changed, with students turning to other subjects as jobs in string theory dry up and prospects for progress on string theory unification look increasingly dismal. He's trying to counter this by restating the arguments that have continued to keep him interested in the subject.' He also added, 'I think there are still a couple more superstring revolutions in our future, at least. If we can manage one more superstring revolution a decade, I think that we will do all right.' Vafa said, 'I hope this is the 'light at the end of the tunnel' but who knows how long the tunnel is!' Schwarz has written about M-theory as 'whether it is based on something geometrical (like super-membranes) or something completely different is still not known. In any case, finding it would be a landmark in human intellectual history.' He also added, 'personally, I am optimistic. For the first time, we can see the outline of the lion, and it is magnificent. One day, we will hear it roar.'

4. Warp Machine Physics

As we know that, the Warp Drive is a faster-than-light spacecraft propulsion system that is used in some of Science Fiction, such as Star Trek. Again, the spacecraft equipped with the WARP machine can move faster than light. In the study of the Warp machine, the researchers proposed many ideas in physics. Those concepts are dark energy, general relativity of Albert Einstein, which predicts strange but real phenomena in the world, such as the bending of space-time and gravitational waves, the theory of "M". Ultimately, the result is that nothing can move in the vacuum faster than light. The report, which claims the car could be possible, says in the report: "If the concept of interstellar exploration really has to be realized in the lifetime of a human being, then it needs to make a fundamental change in the traditional approach and move towards the spacecraft propulsion. Removal." In the study, a table of various purposes has been mentioned, and it is said when, by bending space-time for traveling at 100 times the speed of light to those purposes. This can be achieved by using a significant amount of dark energy to expand the extra dimension into a bubble. Such a bubble will be large enough to accommodate a spacecraft of 100 cubic meters, a space-time space in front of the spacecraft, plus an extension region behind it that propels the bubble, without violating the speed of light, creates a space-time pipe. "It's impossible to move beyond the speed of light, but it can be imagined that space-time bending is effective," Carroll said. For example, if you want to go to Alpha Centaurus, you can ask yourself: Well, can I bend the space-time to distance with Alpha Centauri in a short time? Can I do something with the bending of space-time so that such a thing can come true? Well, the answer is yes you can. But there are things called the caraper, extra dimensions, the effect of a casimir, dark energy, and so on. All this is true. But it's probably zero that someone in the present or a thousand years later can make something right to exploit these ideas, whether for defense or anything else. "

There are many difficulties and dangers of traveling faster than light. Carroll went on to say: "Warp machine was dropped out of probable reality, because nobody knows what negative energy it is, how it can be made, how it can be stored, or how it can be used. In addition, the amount of energy needed to reach a point such as Alpha Centauri, which is the closest stellar planet to Earth, is located at 4.3367 light years, with a truly astronomical 100-cubic spacecraft. Take the whole earth and turn it into energy. This is the amount of energy you need to make the trip possible, with the exception that you need a negative amount and nobody knows how to build it. It should save this energy and use it with 100% return. It's really crazy. It's not that easy to say with better transistors this can be done. There is nothing to be easily achieved." Of course, experimental achievements in a large Hadron Collider or advances in the theory of M can enhance our understanding of this strange kind of energy and lead us to lead to major technology innovations. The large Hadron Collider still does not find evidence of particles that could reveal the secret of dark energy, and experiments have not made progress in the theory of M so far. Intermediate stars may soon lose control of their spacecraft and destroy their spacecraft immediately after their journey began.

In August 2008, the Department of Defense gathered several scholars to examine some of the aerospace technologies, such as unprecedented propulsion, lift and camouflage techniques, according to the Big Bang report. The researchers produced a 34-page report entitled "Warp Machine, Dark Energy, and Manipulation of Additional Dimensions." Although this documentary dates back to April 2, 2010, the Defense Intelligence Agency recently released it. According to the researchers, we may not have much to do with the mysteries of unknown dimensions or dark energy. Researchers believe that dark energy is the force that makes the universe more rapidly expanded. In this report, we see: "Control of this multidimensional space may be the field for controlling the density of dark energy. And ultimately play a role in the development of propulsion technologies or the car of the car. The journey to the planets of the Solar System takes only a few hours, not years old. Also, traveling to the local star system is measured in the week, not hundreds of thousands of years. "However, Sean Carroll, a theoretical physicist at Caltech who follows and studied the issues related to this report, points out "In this report, we see works of theoretical physics that seem to relate to real world applications, but not so. This is not a strange thing, and it is far from the Maharish claim that it is supposed to use the energy of the soul to fly from the earth. This report refers to real physics. But so soon we should not see the connection with engineering." James T. Lakatsky, who contributed to the drafting of the report, did not respond to the questions posed by Business Insider.

The United States Air Force facility has known as Area 51 and which is located in Reid's home state of Nevada. In the 1970s, after revived interest in the '1947 Roswell UFO incident', Area 51 was rumoured by ufologists and conspiracy theorists to be the US government's storage location for the crashed alien craft for study. So, the US military may predict some hostile technologies. It includes a series of advanced technology reports entitled Advanced Aerospace Weapons Applications (AAWSAP). The program also included a major project called Advanced Aid Identification Program (AATIP), in which the military personnel were responsible for reviewing reports of UFOs. It was an unclassified but unpublicized investigatory effort funded by the United States Government to study unidentified flying objects (UFOs) or unexplained aerial phenomena (UAP). Scientists have a dubious view about anonymous bird objects, even after seeing the many videos that are being made available. In one case, a person with his camera has captured a scene in which a spacecraft that shines brightly at very high speeds. A senior astronomer Seth Shostak believes we will find ET in the next two decades. Seth at Sestie Institute, or 'Extraterrestrial Intelligence', had previously told Business Insider that after 50 years of various reports about observing extraterrestrial organisms, there was still strong evidence that really these creatures had visited us. He said, 'Finding life beyond Earth would be like giving neanderthals access to the British Museum; we could learn so much from a society that is more advanced than ours, and it would calibrate our own existence.' Work is never boring for Shostak, discoveries are being made all the time and technology advances every year, which keeps things exciting. It's odd that extraterrestrials do not have to do hundreds of light years to reach the ground. In an extensive program that looked at the possibility of paying for Machine Warp, Wormholes and Star Trek, expert experts performed careful inquiries.

5. Concept and Analysis of God Equation or Theory of Everything

Michio Kaku was a famous theoretical physicist and the concept of the 'God Equation' or the 'Theory of Everything' (ToE). Kaku is an Armenian theoretical scientist and co-founder of 'String Field Theory'. He told everything in the universe particles, forces, matter, energy as well as that it made up of tiny vibrating strings. This theory could be the God equation. It may explain the origin, design and fate of the universe. It is still not proven, but it is the leading theme and tidal framework. God Equation is not the religious term, rather it is metaphorical. As we know that, Great scientist

Einstein spent his life searching for a unified theory and reformed to it as discovering 'God's thought.' Futurist and physicist Michio Kaku is the author of the book 'The God Equation' which published in 2017. It was a popular science book. In this book he explores few interesting texts like, history of physics; the quest to unity all the fundamental forces of nature under one single theory: the idea that the universe runs on a mathematical code and that code may be described by what Einstein called the 'God Equation.' Kaku explores the history of unification theories of physics starting with Newton's law of universal gravitation which unified our experience of gravity on Earth and the motions of the celestial bodies to Einstein's general relativity and quantum mechanics and the standard model. He dubs the final Grand Unified Theory and quantum gravity the God Equation with an 11-dimensional string theory as the only self-consistent theory that seems to fit the bill. Again, hypothetical single, which encompass everything so all, coherent theoretical frameworks of physics and that is known as ToE.

The ToE invites all four fundamental forces of nature. Again, general relativity explains gravity and that is big things. On the other hand, QM explains atoms and that is small things and the ToE would unify them. String theory, which incorporates an 11-dimensional framework in one of its primary formulations or M-theory, is currently considered the most mathematically consistent candidate for this ultimate equation. A ToE is a hypothetical framework in physics that aims to unify all fundamental forces and elementary particles into a single, coherent model, explaining all known physical phenomena from the large-scale universe to the subatomic level. It would reconcile the two pillars of modern physics, general relativity and quantum mechanics, and explain the four fundamental forces like gravity, electromagnetism, the strong nuclear force, and the weak nuclear force. The ToE seeks to describe how gravity, electromagnetism, the strong nuclear force, and the weak nuclear force are all different aspects of a single underlying interaction. It is a central goal, as these two theories currently describe reality at different scales and are incompatible in their current forms. A complete theory would ideally explain phenomena like dark matter and dark energy, which make up the majority of the universe but are not accounted for by the Standard Model of particle physics. Some discussions extend the concept to a philosophical ToE that seeks to explain all aspects of reality, including consciousness, from a single principle. The search for a ToE is a long-standing, central goal in theoretical physics.

The existence of a singular 'final theory' is also debated, with some suggesting that the universe may not be describable by a single theory. GR and QM have been frequently validated in their separate fields of application. Since the usual areas of applicability of GR and QM are so different, most situations require that only one of the two theories can be used. The two theories are considered mismatched in regions of extremely small scale and the Planck scale; like those, which exist within a black hole or during the beginning stages of the universe or the moment immediately following the Big Bang. To resolve the incompatibility, a theoretical framework revealing a deeper underlying reality, unifying gravity with the other three interactions, and which must be discovered to harmoniously integrate the realms of GR and QM into a seamless whole. So, a theory of everything may be defined as a comprehensive theory that, in principle, would be capable of describing all physical phenomena in the universe. In pursuit of this goal, quantum gravity has become one area of active research. One example is string theory, which evolved into a candidate for the ToE, but not without drawbacks. Particularly, its deceptive lack of currently testable predictions and controversy. String theory posits that at the beginning of the universe up to 10^{-43} seconds after the Big Bang, the four fundamental forces were once a single fundamental force. According to string theory, every particle in the universe, at its most ultramicroscopic level (or Planck length), consists of varying combinations of vibrating strings (or strands) with preferred patterns of vibration. String theory further claims that it is through these specific oscillatory patterns of strings that a particle of unique mass and force charge is created. The electron is a type of string that vibrates one way, while the up quark is a type of string vibrating another way, and continue. String theory or M-theory proposes six or seven dimensions of spacetime in addition to the four common dimensions for a 10 or 11-dimensional spacetime.

The universe is governed by 'laws of physics. To truly understand what it is why it exists and how it works, physicists seek answers to questions such as: What is the universe made of? How did it begin? Why are the laws of physics so precise? Is there a deeper, unified law behind everything? Interestingly, a 'theory of everything' is a single framework that explains all physical aspects of the universe from galaxies to subatomic particles. Gravity mainly governs planets, stars, galaxies, etc. Electromagnetism mainly governs light, electricity. Again, strong force holds atomic nuclei and weak force radioactive decay. On the other hand, 'The God Equation' is a journey through physics history, aiming to answer the big question, 'Can we find a single mathematical formula that explains the universe and the mind of God'. Einstein called the search for unity 'knowing the mind of God'. Kaku honours this metaphor and it is not religious, but symbolic of the ultimate truth. Kaku brings the new idea as String theory. He told; all particles are made of tiny vibrating strings. So different vibration = different particles. Think of it like strings on a violin; so different notes = different particles. String theory naturally includes gravity and quantum mechanics. Kaku said, 'The universe is a symphony of strings. The mind of God is cosmic music resonating through 11-dimensional hyperspace. Science is the engine of prosperity. But it also answers the biggest philosophical questions.'

So, in the beginning, the universe was a formless quantum fog. Then came the Big Bang as space, time and matter exploded into being. Physicists like Newton, Maxwell, Einstein, and now Kaku, have tried to decode this reality. While Einstein unified some forces, he could not finish the job. Kaku picks up where he left off - believing that tiny vibrating strings, living in hidden dimensions, hold the key. If found, this 'God Equation,' would be the ultimate achievement in science as a single elegant truth that explains everything from black holes to atoms, time to consciousness. Timeline of the universe according to physics is really interesting. The universe began from a singularity and that is 13.8 billion years ago. The universe expanded faster than light. Atoms formed after 380,000 years. Star and galaxies formed gravity 1 billion years later. Lastly, humans appeared only in the last few seconds of cosmic time. Michio Kaku believes the future lies in mastering this timeline like space travel, longevity and consciousness. He thought 10-11 dimensions exist where 6+ are 'curled up'. Every particle has a 'super partner.' String Theory says, So, in simple word, 'Everything is made of vibrating strings.' Whereas 'Loop Quantum Gravity,' says, space-time itself is quantized. Again, 'Causal Dynamical Triangulations' says, universe is a growing network. On the other hand, 'Emergent Gravity' says, gravity is not fundamental, but emerges. Kaku links ToE to our future survival. He went to say that, ToE will help to solve climate change, pandemics, AI ethics in short-term. ToE is going to becoming a Type I civilization in mid-term. Again, ToE is & will going to becoming a Type II or III civilization and harnessing the power of stars and galaxies.

So, it may say that, the universe is mathematical. At its core, reality appears to be governed by elegant, mathematical rules. The 'God Equation' would be a single formula that expresses all of nature. Michio Kaku believes this equation already exists in string theory, but we have not fully solved it yet. So, we are made of vibrating strings and our consciousness may be a product of cosmic level design. Human life is not random; rather structured. On the other hand, in the multiverse model, countless universes exist. Only a few have the right physical laws for life. We exist because this universe is "tuned" to allow consciousness. Kaku said, "we observe a universe suited for life -- because we are here to observe it." Kaku believes our ultimate destiny is to understand the universe. And to become creators ourselves. And to become a multi-planetary (Type I or II) civilization. Again, modern theory suggests: The Big Bang may not have been the beginning. Time and space might emerge from deeper laws, like strings or branes colliding. The God Equation could reveal what existed before time began. Michio Kaku said, 'we have not yet figured out why there is more matter than antimatter in the universe. Only one ten-billionth of the original matter in the early universe survived this explosion, and we are part of it. The leading theory is that something violated the perfect symmetry between matter and antimatter at the Big Bang, but we don't know what it is. There is a Nobel Prize waiting for the enterprising individual who can solve this problem.'

Michio Kaku also said, 'there was only one period of time when energy on this enormous scale was readily available, and that was at the instant of creation. In fact, the hyperspace theory cannot be tested by our largest atom smashers because the theory is really a theory of creation. Only at the instant of the Big Bang do we see the full power of the hyperspace theory coming into play. This raises the exciting possibility that the hyperspace theory may unlock the secret of the origin of the universe.' He added an interesting fact as, 'David Eagleman describes how you can take a male stickleback fish and have a female fish trespass on its territory. The male gets confused, because it wants to mate with the female, but it also wants to defend its territory. As a result, the male stickleback fish will simultaneously attack the female while initiating courtship behaviour. The male is driven into a frenzy, trying to woo and kill the female at the same time. This works for mice as well. Put an electrode in front of a piece of cheese. If the mouse gets too close, the electrode will shock it. One feedback loop tells the mouse to eat the cheese, but another one tells the mouse to stay away and avoid being shocked. By adjusting the location of the electrode, you can get the mouse to oscillate, torn between two conflicting feedback loops.'

Kaku said, 'in fact, there is one theory that states that dark matter, an invisible form of matter that surrounds the galaxy, might be ordinary matter floating in a parallel universe. As in H.G. Wells's novel The Invisible Man, a person would become invisible if he floated just above us in the fourth dimension. Imagine two parallel sheets of paper, with someone floating on one sheet, just above the other. In the same way there is speculation that dark matter might be an ordinary galaxy hovering above us in another membrane universe. We could feel the gravity of this galaxy, since gravity can ooze its way between universes, but the other galaxy would be invisible to us because light moves underneath the galaxy. In this way, the galaxy would have gravity but would be invisible, which fits the description of dark matter. (Yet another possibility is that dark matter might consist of the next vibration of the superstring. Everything we see around us, such as atoms and light, is nothing but the lowest vibration of the superstring. Dark matter might be the next higher set of vibrations.)' He also said, 'In other words, positive matter and energy that we see in stars can warp space-time so that it perfectly describes the motion of heavenly bodies. But negative matter and energy warp space-time in bizarre ways, creating an antigravitational force that can stabilize wormholes and prevent them from collapsing and propel warp bubbles to faster-than-light velocities by compressing space-time in front of them.'

So, the universe needs observers to give it meaning. We are the ones trying to decode its blueprint. And that is the 'God Equation.' Once we do, we may answer the oldest questions like: Why do we exist? What is the purpose of life? Was this all by chance or design or structured? So, the universe, its creation, and its future are filled with astonishing mind-bending facts, both from science and philosophical reflection. Universe had a beginning, but not from nothing. Big Bang says, the universe began ~13.8 billion years ago. Space, time, energy and matter all came into existence in an instant. But modern theories like M-Theory (or Multi-Verse Theory) suggest, the Big Bang might have been a transition, not a beginning; possibly a collision of higher-dimensional 'branes' (membranes). The fundamental constants (gravity, electromagnetism, etc) are so precise that even a tiny variation would make life impossible. Kaku and others says, we live in a universe that must allow observers like us to exist. Again the multiverse theory says there could be infinite parallel universes, each with different physical laws. Ours just happens to support stars, chemistry, and life. New universes may be budding off from black holes or via quantum fluctuations. Time flows forward for us; but in relativity time is relative, bendable. In quantum physics, some processes are timeless. The future, past and present may be illusions of perception, not absolute truths.

Once Michio Kaku said, 'First, to create the violent distortions of space and time necessary to travel through a wormhole, one would need fabulous amounts of positive and negative matter, on the order of a huge star or a black hole.' Matthew Visser, a physicist at Washington University, evaluates that the amount of negative energy we would need to open up a 1-meter wormhole is comparable to the mass of Jupiter, except that it would need to be negative. He said, 'You need about minus one Jupiter mass to do the job. Just manipulating a positive Jupiter mass of energy is already pretty freaky, well beyond our capabilities into the foreseeable future.' Again, Kaku said, 'If we had a microscope powerful enough, we could see that electrons, quarks, neutrinos, etc. are nothing but vibrations on minuscule loops resembling rubber bands. If we pluck the rubber band enough times and in different ways, we eventually create all the known subatomic particles in the universe. This means that all the laws of physics can be reduced to the harmonies of these strings. Chemistry is the melodies one can play on them. The universe is a symphony. And the mind of God, which Einstein eloquently wrote about, is cosmic music resonating throughout space-time.'

The universe is conscious of itself. All atoms in your body came from stars. Consciousness may be a byproduct of brain evolution. Or possibly a fundamental part of the universe as some theories suggest. Another concept is 'Big Freeze' and it means, universe expands forever, stars die, cold and dark. 'Big Crunch' says, gravity reverses expansion, universe collapses. 'Heat Death' says, maximum entropy: no energy left to do work. 'Big Rip' says, expansion accelerates infinitely, tearing everything apart. 'Eternal Inflation' says new universes keep forming forever. So we are not alone. In our universe we have 2 trillion galaxies. Each galaxy has billions of stars; many stars have Earth-like planets. Statistically life should exist elsewhere and yet we have found none. And this is known as 'Fermi Paradox.' So, Human destiny is to become any or many types of civilization. That is the thinking of Michio Kaku.

- **Type zero** means we use fossil fuels. Michio Kaku uses the term 'Type Zero civilization' in the context of the Kardashev Scale to describe the current state of human civilization. He posits that humanity is a Type Zero civilization because we still primarily rely on dead or fossil fuels to power our society, drawing energy from sources outside our planet.

- **Type I Civilization** (Planetary): Type I means we use 100% of planet's energy. It is capable of harnessing and storing all the energy that reaches its home planet from the sun. Kaku suggests humanity may reach this stage within a century or two. So, it may come 100 to 200 years later. As per Michio Kaku, 'Future of Humanity - Planetary Civilization. In mythology, the gods lived in the divine splendour of heaven, far above the insignificant affairs of mere mortals. The Greek gods frolicked in the heavenly domain of Mount Olympus, while the Norse gods who fought for honour and eternal glory would feast in the hallowed halls of Valhalla with the spirits of fallen warriors. But if our destiny is to attain the power of the gods by the end of the century, what will our civilization look like in 2100? Where is all this technological innovation taking our civilization? All the technological revolutions described here are leading to a single point: the creation of a planetary civilization. This transition is perhaps the greatest in human history. In fact, the people living today are the most important ever to walk the surface of the planet, since they will determine whether we attain this goal or descend into chaos. Perhaps 5,000 generations of humans have walked the surface of the earth since we first emerged in Africa about 100,000 years ago, and of them, the ones living in this century will ultimately determine our fate. Unless there is a natural catastrophe or some calamitous act of folly, it is inevitable that we will enter this phase of our collective history. We can see this most clearly by analysing the history of energy.'

- **Type II Civilization** (Stellar): Type II civilization means, we may harness power of an entire star. It is capable of harnessing the total energy output of its home star, potentially using megastructures like a Dyson sphere. These civilizations operate on a stellar, not planetary, scale, possessing the ability to engineer planets, manipulate orbits, and achieve a post-scarcity abundance through mastery of stellar energy. A Type II civilization commands an immense power source, capturing the total energy output of its star, which is on the order of 10^{28} watts. The most iconic concept is the Dyson sphere, a hypothetical shell or swarm of structures that completely surrounds a star to capture its energy. Such a civilization would have the technology to manipulate planets, alter orbits using gravity, and potentially perform black hole engineering. They would have mastered advanced communication, possibly using quantum networks for instant thought sharing across their solar system. Reaching this stage requires planetary unification, long-term peace, and a high degree of ethical and risk management maturity to safely handle such immense power.

- **Type III Civilization** (Galactic): Type III civilization means we may use energy of the whole galaxy. It is capable of harnessing the energy output of its entire galaxy, likely through advanced technologies like self-replicating probes and colonization of star systems. A Type III Civilization, as described by the Kardashev Scale, represents the pinnacle of intelligent life in the universe. Unlike us, still at Type 0 (barely harnessing Earth's resources), or even a future Type I or II, a Type III civilization would command the full power of an entire galaxy. Imagine beings capable of extracting energy from billions of stars, controlling the immense power of black holes, and even bending spacetime itself to enable faster-than-light interstellar travel. Such a civilization would be beyond our comprehension — their technology appearing as magic to us. A Type 3 civilization could extract energy from a supermassive black hole. This captured energy could meet the extraordinary needs of a civilization that requires up to 10^{46} W/s. The energy would be captured in the form of radiation emitted by the matter rushing into the star, by means of collectors located within the accretion disk (similar to Dyson spheres). The overflow, as well as the waste of the civilization, would be redirected towards the black hole. A fraction of this energy, directed as a high-powered beam, could be useful for space travel. A galactic club of civilizations could transmit the energy through networks within the galaxy. Within the various central power stations that make up the network, power transmission is periodically switched between transmitter and receiver, according to the galactic rotation. To be efficient, this network should be located at the centre of the galaxy. They may also use black holes as computers.

So, the universe is not just a cold machine. It is a profound mystery and we are the mechanism by which it tries to understand itself. Kaku explores these concepts in detail in his books, such as 'The Future of Humanity' and 'Physics of the Future', suggesting that reaching these stages represents an "insurance policy" against extinction and our ultimate fate in the cosmos. He said, 'Of all the transitions, perhaps the most difficult is the transition from Type 0 to Type I, which we are undergoing at present. This is because a Type 0 civilization is the most uncivilized, both technologically and socially. It has risen only recently from the swamp of sectarianism, dictatorship, and religious strife, et cetera. It still has all the scars from its brutal past, which was full of inquisitions, persecutions, pogroms, and wars. Our own history books are full of horrid tales of massacres and genocide, much of it driven by superstition, ignorance, hysteria, and hatred.' He also added, 'Each of the genes of the human body is spelled out explicitly in this dictionary, but what each does is still largely a mystery.' Michio Kaku also said, 'Today the leading (and only) candidate for a theory of everything is string theory. But, again, a backlash has arisen. Opponents claim that to get a tenured position at a top university you have to work on string theory. If you don't you will be unemployed. It's the fad of the moment, and it's not good for physics. I smile when I hear this criticism, because physics, like all human endeavours, is subject to fads and fashions. The fortunes of great theories, especially on the cutting edge of human knowledge, can rise and fall like hemlines. In fact, years ago the tables were turned; string theory was historically an outcast, a renegade theory, the victim of the bandwagon effect.'

Michio Kaku said, 'Galileo believed that science and religion could coexist. He wrote that the purpose of science is to determine how the heavens go, while the purpose of religion is to determine how to go to heaven. In other words, science is about natural law, while religion is about ethics, and there is no conflict between them as long as one keeps this distinction in mind. But when the two collided during his trial, Galileo was forced to recant his theories under pain of death. His accusers reminded him that Giordano Bruno, who had been a monk, had been burned alive for making statements about cosmology far less elaborate than his. Two centuries would pass before most of the ban on his books was finally lifted.' He added, 'There are an estimated 100 billion neurons residing inside the skull with an exponential amount of neural connections.' He also said about himself as, 'to myself I seem to have been only like a boy playing on a seashore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me.' Physicist Alan Guth of MIT is known as one of the originators of the inflationary universe theory, has even computed the energy necessary to create a baby universe in the laboratory. Where, the temperature is 1,000 trillion degrees, which is within the range of these hypothetical civilizations. Again, until someone actually makes contact with an advanced civilization, all of this amounts as speculated and tempered with the laws of physics, no more than a useful guide in our search for extra-terrestrial intelligence. But one day, many of us may observed at the compendium, which will be containing with many coordinates, even it may be hundreds of earth-like planets in our sector of the galaxy.

6. Concept on the End of the Universe and Critical Challenges

Big Bang nucleosynthesis. Big Bang nucleosynthesis is considered as the theory of the formation of the elements in the early universe. It has ended when the universe was about three minutes old and its temperature has released below that at which nuclear fusion could occur. It had a brief period during which it could operate, so that the very lightest elements were produced. Starting from hydrogen ions or protons, it primarily produced deuterium, helium-4, and lithium and other elements were produced in only trace abundances. The elementary theory of nucleosynthesis was developed in 1948 by George Gamow, Ralph Asher Alpher, and Robert Herman. Interestingly, which was used for many years as a probe of physics at the time of the Big Bang, as the theory of Big Bang nucleosynthesis connects the abundances of primordial light elements with the features of the early universe. Precisely, it can be used to test the equivalence principle, to probe dark matter, and test neutrino physics. Some cosmologists have proposed that Big Bang nucleosynthesis proposes there is a fourth "sterile" species of neutrino. Understanding the formation and evolution of the largest and earliest structures, like quasars, galaxies, clusters and superclusters and which was one of the largest efforts in cosmology. Cosmologists study a model of hierarchical structure formation in which structures form, from the bottom up, with smaller objects forming first, while the largest objects, like superclusters, are still accumulating. One way to study structure in the universe is to survey the visible galaxies, in order to construct a 3-dimensional picture of the galaxies in the universe and measure the matter power spectrum. This is the approach of the Sloan Digital Sky Survey and the 2dF Galaxy Redshift Survey. Another tool for understanding structure formation is simulations, which cosmologists use to study the gravitational aggregation of matter in the universe, as it clusters into filaments, superclusters and voids. Most simulations contain only non-baryonic cold dark matter, which should suffice to understand the universe on the largest scales, as there is much more dark matter in the universe than visible baryonic matter. More advanced simulations are starting to include baryons and study the formation of individual galaxies. Cosmologists study these simulations to see if they agree with the galaxy surveys, and to understand any inconsistency.

The Big Bang nucleosynthesis indicate that, the cosmic microwave background, structure formation, and galaxy rotation curves suggests that about 23% of the mass of the universe consists of non-baryonic dark matter, whereas only 4% consists of visible, baryonic matter. Today the gravitational effects of dark matter are well understood, as it behaves like a cold, non-radiative fluid that forms haloes around galaxies. As we know that, dark matter has never been detected in the laboratory, as well as the particle physics nature of dark matter remains entirely unknown. However, without observational constraints, there are a number of candidates. Such as: a stable supersymmetric particle, a weakly interacting massive particle, a gravitationally-interacting massive particle, an axion, and a massive compact halo object. Alternatives to the dark matter hypothesis include a modification of gravity at small accelerations (MOND) or an effect from brane cosmology. TeVeS is a version of MOND that can explain gravitational lensing. Again, Modified Newtonian dynamics (MOND) is a theory that proposes a modification of Newton's laws to account for observed properties of galaxies. MOND was developed in 1982 and presented in 1983 by Israeli physicist Mordehai Milgrom. Modifying Newton's law of gravity results in modified gravity, while modifying Newton's second law results in modified inertia. The latter has received little attention compared to the modified gravity version. Its primary motivation is to explain galaxy rotation curves without invoking dark matter, and is one of the most well-known theories of this class.

If we consider the universe is flat, then there must be an additional component, which making up 73% of the energy density of the universe in addition to the 23% dark matter and 4% baryons. And which is known as dark energy. In order not to interfere with Big Bang nucleosynthesis and the cosmic microwave background, it must not cluster in haloes like baryons and dark matter. There is strong observational indication for dark energy, as the total energy density of the universe is known through constraints on the flatness of the universe. However, the amount of clustering matter is tightly measured, and is much less than this. The case for dark energy was strengthened in 1999, and measurements demonstrated that the expansion of the universe has begun to gradually accelerate. Apart from its density and its clustering properties, nothing is known about dark energy. Quantum field theory predicts a cosmological constant (CC) and that is similar to dark energy, but 120 orders of magnitude larger than that observed. Steven Weinberg and a number of string theorists have appealed the 'weak anthropic principle.' Here, the reason that physicists observe a universe with such a small cosmological constant is that 'no physicists or life could exist in a universe with a larger cosmological constant. However, many cosmologists find this an unsettled explanation, as the weak anthropic principle is self-evident- it does not attempt to explain the context of that universe. As we know that where living observers exist, there must be at least one universe with a cosmological constant (CC) which allows for life to exist. A better understanding of dark energy is likely to solve the problem of the ultimate fate of the universe. Again, in the current cosmological epoch, the accelerated expansion due to dark energy is avoiding structures larger than superclusters from forming. It is not known whether the acceleration will continue forever, perhaps even increasing until a Big Rip, or whether it will eventually reverse, lead to a Big Freeze, or may follow something else.

Still today physics has no satisfactory answer, whether primordial black holes were formed in our universe, and what happened to them. So, cosmologists need to perceive cosmic rays with energies above the GZK cutoff, and whether it signals a failure of special relativity at high energies. Again, the Greisen–Zatsepin–Kuzmin (GZK) limit or cutoff is a theoretical upper limit on the energy of cosmic ray protons traveling from other galaxies through the intergalactic medium to our galaxy. They need to find out the equivalence principle, whether or not Einstein's general theory of relativity is the accurate theory of gravitation, and if the fundamental laws of physics are the same everywhere in the universe. Additionally, cosmologists need to clear the explanation of Biophysical cosmology and which is a type of physical cosmology that studies and understands life as part as well as an inherent part of physical cosmology. It stresses that life is inherent to the universe and therefore frequent. , Several possible futures have been predicted by different scientific hypotheses, including that the universe might have existed for a finite or infinite duration, or towards explaining the manner and circumstances of its beginning. The fate of the universe may be determined by its density. The preponderance of evidence to date, based on measurements of the rate of expansion and the mass density, favors a universe that will continue to expand indefinitely, resulting in the "Big Freeze" scenario below. So, the observations are not conclusive, and alternative models are still possible. Choosing among these challenging scenarios is done by 'weighing' the universe, for example, measuring the relative contributions of matter, radiation, dark matter, and dark energy to the critical density. More precisely, contending scenarios are evaluated against data on galaxy clustering and distant supernovas, and on the anisotropies in the cosmic microwave background.

Big Freeze or Heat Death. The creation or formation of the universe may be determined by a struggle between the momentum of expansion and the pull or push of gravity. The current rate of expansion can be measured by the Hubble Constant, while the strength of gravity depends on the density and pressure of the matter in the universe. If the pressure of the matter is low, as is the case with most forms of matter as we know, then the fate of the universe is governed by the density. On the other hand, if the density of the universe is less than the critical density, then the universe will expand forever, like the different curves. Gravity might slow the expansion rate down over time, but for densities below the critical density, there isn't enough gravitational pull from the material to ever stop or reverse the outward expansion. This is known as the Big Chill or Big Freeze; because the universe will slowly cool as it expands until eventually it is unable to sustain any life. It is a scenario under which continued expansion results in a universe that asymptotically approaches absolute zero temperature. In such scenario, the universe eventually reaches a state of maximum entropy, in which everything is evenly distributed and there are no energy gradients and which are needed to sustain information processing, and that is one form of life. In this scenario, stars are expected to form normally for 10^{12} to 10^{14} (1 to 100 trillion) years, but eventually the supply of gas needed for star formation will be exhausted. As existing stars run out of fuel and cease to shine, the universe will slowly and inexorably grow darker. Eventually black holes will dominate the universe, but they will disappear over time as they emit Hawking radiation. Over infinite time, there could be a spontaneous entropy decrease by the Poincaré recurrence theorem, thermal fluctuations, and the fluctuation theorem.

The heat death scenario is compatible with any of the three spatial models, but it requires that the universe reaches an eventual temperature minimum. Without dark energy, it could occur only under a flat or hyperbolic geometry. It could also occur in a closed universe with a positive cosmological constant. Physicist Freeman Dyson has proposed a scenario for the far future in which intelligent life could achieve a form of immortality by processing an infinite number of thoughts in his 1979 paper 'Time Without End: Physics and Biology in an Open Universe'. This concept, known as 'Dyson's eternal intelligence,' and was originally predicated on an open universe, and a cosmological model that expands forever. In the context of a zero cosmological constant (as a flat or open universe without dark energy), the universe would continue to cool as it expands, but at a decelerating rate. Dyson's idea was that intelligent beings could store a finite amount of energy and expend it in increasingly smaller fractions. After each expenditure of energy for thought processes, these beings would enter a state of hibernation for immense periods, allowing the universe to cool further. As the ambient temperature of the universe drops, the minimum energy required for a computation also decreases, theoretically allowing for an infinite number of thoughts to be processed over an infinite subjective time, even with a finite energy reserve. However, this scenario faces challenges, as the discovery of an accelerating expansion, driven by a positive cosmological constant, suggests that the universe will not continue to cool indefinitely and distant regions will become causally disconnected, which would prevent the indefinite survival envisioned by Dyson.

Big Rip. It may be explained as a future where the universe, all too soon, tears itself apart. First come the clusters, with their galaxies pulled away from each other. Subsequently the galaxies dissolve and then the star systems as well as the planets. Finally, the atoms themselves. Eventually, space-time is torn asunder, rendering the universe uninhabitable and rundown. This is may be a possible future and which known as the Big Rip. Such sounds scary and almost impossible to imagine, but the truly dismaying part is that some evidence seems to be pointing directly toward that fate of us. In cosmology, the Big Rip is a hypothetical cosmological model concerning the ultimate fate of the universe, in which the matter of the universe, from stars and galaxies to atoms and subatomic particles, is increasingly torn apart by the gravitational influence of dark energy at a certain time in the future, such that distances between particles infinitely increase. It is a hypothetical, catastrophic end to the universe where the accelerating expansion of space becomes so powerful that, it overcomes all other forces, eventually tearing apart all structures. In this scenario, galaxy clusters, galaxies, solar systems, planets, and ultimately atoms and subatomic particles would be ripped apart. The process occurs if dark energy becomes stronger over time or 'a form sometimes called phantom energy,' leading to a violent and complete dissolution of all matter.

Big Rip theory is based on the idea that dark energy, which drives the universe's expansion, could increase in strength over time. The first effect would be galaxy clusters being pulled apart. The expansion would be strong enough to tear individual galaxies apart, followed by solar systems. In the final moments, planets would be ripped from their stars, followed by stars themselves. Eventually, the forces holding atoms together would be overcome, and even subatomic particles would be torn apart. The current Hubble constant defines a rate of acceleration of the universe not large enough to destroy local structures like galaxies, which are held together by gravity, but huge enough to increase the space between them. A steady increase in the Hubble constant to infinity would result in all material objects in the universe, starting with galaxies and eventually in a finite time all forms, no matter how small, decomposing into unbound elementary particles, radiation and beyond. As the energy density, scale factor and expansion rate become infinite, the universe ends as what is effectively a singularity. In the special case of phantom dark energy, which has supposed negative kinetic energy that would result in a higher rate of acceleration than other cosmological constants predict, a more sudden big rip could occur. The Big Rip is a theoretical possibility and not the most likely outcome, as it requires dark energy to behave in a specific way. Current data suggests dark energy is roughly constant, and a Big Rip is not predicted by this model. However, the exact nature of dark energy is still a mystery, and some experimental evidence has hinted at possibilities that would make this scenario more likely, according to Universe Today.

Big Crunch. The Big Crunch is another hypothetical scenario for the final destiny of the universe, in which the expansion of the universe eventually reverses and the universe re-collapses, ultimately triggering the cosmic scale factor to reach absolute zero. And this is an event potentially followed by a reformation of the universe starting with another Big Bang. The vast majority of current evidence indicates that, this hypothesis may not be correct. In its place, astronomical observations show that, the expansion of the universe is accelerating rather than being slowed by gravity, suggesting that a Big Chill or Big Rip is much more likely to occur.

Nonetheless, some physicists have proposed that a "Big Crunch-style" event could result from a dark energy fluctuation. The Big Crunch hypothesis is a symmetrical view of the ultimate fate of the universe. This theory assumes that the average density of the universe will be enough to stop its expansion and the universe will begin contracting, just as the theorized Big Bang started as a cosmological expansion. We may imagine or a simple estimation would have all the matter and spacetime in the universe collapse into a dimensionless singularity back into how the universe started with the Big Bang, but at these scales unknown quantum effects need to be considered. Recent evidence suggests that this scenario is unlikely but has not been ruled out, as measurements have been available only over a relatively short period of time and could reverse in the future. Such scenario allows the Big Bang to occur immediately after the Big Crunch of a preceding universe. Again, if this happens repeatedly, it creates a cyclic model, which is also known as an oscillatory universe. The universe could then consist of an infinite sequence of finite universes, with each finite universe ending with a Big Crunch that is also the Big Bang of the next universe. A problem with the cyclic universe is that, it does not reconcile with the second law of thermodynamics, as entropy would build up from oscillation to oscillation and cause the eventual heat death of the universe. Current evidence also detects the universe is not closed rathe open ended. This has caused cosmologists to abandon the oscillating universe model. So, a similar idea is incorporated by the cyclic model, but this idea escapes heat death because of an expansion of the branes that dilutes entropy accumulated in the previous cycle.

Big Bounce. The Big Bounce may consider as another strong hypothesis and which is a cosmological model for the origin of the known universe. It was initially suggested as a phase of the cyclic model or oscillatory universe interpretation of the Big Bang, where the first cosmological event was the result of the collapse of a previous universe. It retreated from serious consideration in the early 1980s, after inflation theory emerged as a solution to the horizon problem, which had arisen from advances in observations revealing the large-scale structure of the universe. The Big Bounce is a theorized scientific model related to the beginning of the known universe. According to one version of the Big Bang theory of cosmology, in the beginning of the universe was infinitely dense. This description seems to be at odds with other more widely accepted theories, especially QM and its uncertainty principle. Therefore, QM has given rise to an alternative version of the Big Bang theory, precisely that the universe tunneled into existence and had a finite density consistent with QM, before evolving in a manner governed by classical physics. In case, where the universe is closed, this theory would predict that once this universe collapses, it will spawn another universe in an event similar to the Big Bang after a universal singularity is reached or a repulsive quantum force causes re-expansion. This theory states that the universe will continuously repeat the cycle of a Big Bang, followed by a Big Crunch. So, here inflation was found to be inevitably eternal, creating an infinity of different universes with typically different properties, suggesting that the properties of the observable universe are a matter of chance. An alternative concept that included a Big Bounce was conceived as a predictive and confirmable possible solution to the horizon problem. Investigation continued as of 2022. We may get some new explanation or clarification of present concept.

Big Slurp. Big Slurp theory suggests that the universe currently exists in a false vacuum and that it could become a true vacuum at any moment. In order to best understanding, before discussion of the false vacuum collapse theory, one must first understand the Higgs field which permeates the universe. It almost similar to electromagnetic field, it varies in strength based upon its potential. A true vacuum exists so long as the universe exists in its lowest energy state, in which case the false vacuum theory is irrelevant. However, if the vacuum is not in its lowest energy state or a false vacuum, it could tunnel into a lower-energy state., This is called vacuum decay. This has the potential to fundamentally alter the universe: in some scenarios, even the various physical constants could have different values, severely affecting the foundations of matter, energy, and spacetime. It is also possible that all structures will be destroyed suddenly, without any forewarning. However, only a portion of the universe would be destroyed by the Big Slurp, while most of the universe would still be unaffected because galaxies located further than 4,200 megaparsecs or 13 billion light-years away from each other. Again, they are moving away from each other faster than the speed of light while the Big Slurp itself cannot expand faster than the speed of light. To place this in context, the size of the visible universe is currently about 46 billion light years in all directions from earth. The universe is thought to be that size or larger.

One of the newest reports released suggests something ominous as if the Higgs Boson truly exists at the appropriate mass, our universe may be in some serious trouble. At least it is according to a theoretical physicist from the Fermi National Accelerator Laboratory in Batavia, Illinois, who claims, 'If you use all the physics that we know now and you do what you think is a straightforward calculation, it's bad news.' Many physicists have been discussing the possibility of our universe teetering on the edge of stability for many years now. Especially physicists Michael Turner and Frank Wilczek, who published a paper in Nature back in 1982 and that suggested this unfriendly scenario as per their statement 'without warning, a bubble of true vacuum could nucleate somewhere in the universe and move outwards at the speed of light, and before we realized what swept by us our protons would decay away.' According to Lykken calculations (which hinge on the mass of the Higgs being correct, or off by a small margin of 1%), many tens of billions of years from now, the universe would experience some catastrophic event as a bubble formed from quantum fluctuations. That is from some sort of an alternate universe with a lower-energy state might appear in ours, expanding and ultimately destroying us at the speed of light, to boot, they said. Even more interestingly, these calculations brought up a question more philosophical than anything else, bringing him to ultimately wonder if the state of our universe is instrumental in producing stars, galaxies, planets, matter and ultimately, life.

Cosmic uncertainty. It refers to the inherent limits on our ability to know the universe with perfect accuracy, stemming from two main sources: cosmic variance and fundamental physical principles. Cosmic variance is the statistical uncertainty that arises because we can only observe one universe, which is a single sample with random fluctuations. Fundamental principles, such as Heisenberg's uncertainty principle, place a universal limit on how precisely certain pairs of physical properties (like energy and time) can be known at the same time. Actually, Cosmologists can only ever study our one universe. Because of this, our observations of phenomena like the cosmic microwave background or large-scale galaxy distribution are limited to a single realization. The early universe had random quantum fluctuations that grew into the large-scale structures we see today. This means our observable patch is not necessarily a perfectly average representation of the entire universe. Cosmic variance introduces an unavoidable statistical uncertainty in measurements of cosmic properties, such as the density of matter or the characteristics of early universe fluctuations. For example, a region of sky surveyed might have a slightly higher or lower density of galaxies by chance. Each possibility as described in this paper so far is based on a simple form of the dark energy equation of state and the latest theories or hypotheses of physics. However, as the name implies, little is now known about the physics of dark energy or even black holes or vacuums in the universe.

On the other hand, if the theory of inflation is true, the universe went through an event dominated by a different form of dark energy in the first moments of the Big Bang; but inflation ended, indicating an equation of state more complex than those assumed for present-day dark energy. It is possible that the dark energy equation of state could change again, resulting in an event that would have consequences which are difficult to predict or parameterize. As the nature of dark energy and dark matter remain enigmatic, even hypothetical, the possibilities surrounding their role in the universe are unknown. As we investigate further into cosmology, bioinformation theory, and the different models of consciousness, we will be able to further hypothesize and validate our last survival resort when the universe dies. A positive cosmological constant is a problem. An accelerating universe means that galaxies and galactic entities eventually “grow” apart. Energy stored in these areas would be inaccessible. Unless, of course, if you bring in the dark house—dark energy. No one really knows what dark energy is and what it does. So, this remains unresolved. The largest obstacle towards achieving Dyson’s eternal intelligence is to pass below the physical threshold necessary to the maintenance of conscious awareness. Granted that organic lifeforms are certainly inefficient in turning energy into computations (and consciousness), perhaps inorganic lifeforms or even alternative molecular structures might require much less energy to give rise to consciousness.

7. Conclusion

What we perceive as the force of gravity is actually objects (like planets or light) following the straightest possible path (a geodesic) through this curved spacetime. Planets orbit stars because they are following the curves in spacetime created by the star's mass, not because of a direct pull. Again, Light from distant stars bends as it passes massive objects, confirming the curvature of spacetime. The famous summary ‘matter tells spacetime how to curve, spacetime tells matter how to move,’ captures the dynamic interaction, where mass dictates the geometry, and the geometry dictates motion. According to scientists, the expansion of the universe began with the Big Bang. This expansion was completely uniform everywhere. Matter was distributed equally everywhere. Then stars, planets and galaxies came into existence in the universe from them. NASA scientists were shocked when in 1981, Sir Robert Kirchner discovered a void in the constellation of Boötes, 800 million light years away from Earth, which was completely uninhabited. It was given this name because of this "constellation". If we calculate the expansion of the universe since the Big Bang and then. So, based on the expansion that has occurred so far, there should be at least ten to twelve thousand galaxies in this empty space, but there is nothing like that there. Although there are other empty spaces in the universe, such a vast area and that too completely empty is beyond "understanding".

As we know that, when physicists tried to combine quantum mechanics and general relativity, their equations resulted in infinities and anomalies. String theory avoids these issues but only if the universe has a specific number of dimensions. M-theory, an 11-dimensional theory involving membranes (p-branes) as well as strings, emerged in the mid-1990s as a powerful candidate for the unified theory. We experience only four dimensions, where three spatial and one temporal. The extra seven dimensions are theorized to be compactified or curled up into a space so tiny that they are not observable with current technology, perhaps having an effect only at incredibly small scales or in extreme conditions like within black holes. The God Equation itself has not been finalized or experimentally proven. The term ‘God Equation’ or ‘Theory of Everything’ is a conceptual name for a single, elegant mathematical formula, perhaps no more than one inch long, that would summarize all the rules of the universe. Kaku posits that the ability of string theory to automatically include gravity in its quantum calculations makes it the most promising avenue for discovering this ‘God Equation’ or ToE. So far, the finding it would allow humanity to potentially answer some of the deepest questions in science, from the moment before the Big Bang to the possibility of time travel.

Micho Kaku said, “First, there is the personal God, the God that you pray to, the God of the Bible who smites the Philistines and rewards the believers. He did not believe in that God. He did not believe that the God who created the universe interfered in the affairs of mere mortals. However, he believed in the God of Spinoza—that is, the God of order in a universe that is beautiful, simple, and elegant. The universe could have been ugly, random, chaotic, but instead it has a hidden order that is mysterious yet profound.” He also said, "mathematician's patterns, like the painter's or the poet's, must be beautiful; the ideas, like the colours or the words, must fit together in a harmonious way. Beauty is the first test; there is no permanent place in the world for ugly mathematics. And that beauty is symmetry." About string and M theory Kaku said, "If we had a microscope powerful enough, we could see that electrons, quarks, neutrinos, etc. are nothing but vibrations on minuscule loops resembling rubber bands. If we pluck the rubber band enough times and in different ways, we eventually create all the known subatomic particles in the universe. This means that all the laws of physics can be reduced to the harmonies of these strings. Chemistry is the melodies one can play on them. The universe is a symphony. And the mind of God, which Einstein eloquently wrote about, is cosmic music resonating throughout space-time." About difference between string and M theory Kaku said, "So string theory and M-theory are really the same theory, except that string theory is a reduction of eleven-dimensional M-theory to ten dimensions." Kaku also added, "Unfortunately, with the collapse of classical civilization, these philosophical discussions and debates were lost. The concept that there could be a paradigm explaining the universe was forgotten for almost a thousand years. Darkness spread over the Western world, and scientific inquiry was largely replaced by belief in superstition, magic, and sorcery."

The universe is often viewed by some scientists as an intricate tapestry, with every individual element like stars, galaxies, life forms and are representing a thread. Understanding the cosmos is like appreciating the immense and complex pattern of the whole, recognizing how all the threads interweave to form a masterpiece. Historically from Aristotle to Copernicus, the universe was metaphorically an onion, with the Earth at the centre, surrounded by concentric, crystalline spheres. Understanding the cosmos was peeling back these layers. This contrasts with modern understanding, but highlights how metaphors evolve with knowledge. Metaphors for cosmic understanding often compare the vast and abstract nature of the universe to more familiar, tangible human experiences or objects. These comparisons help to conceptualize complex scientific and philosophical ideas. So, this discussion emphasizes a profound truth that the cosmos is far more intricate and mysterious than once believed. By addressing open questions about dark matter, magnetic fields, time, neutrinos, inflation, and even the possibility of a simulated reality, this collection illustrates how modern astrophysics and cosmology are increasingly interwoven with cutting-edge physics, speculative ideas, and technological innovation. Ultimately, the evaluation suggests that the astonishing nature of the universe is inseparably linked to its uncertainties. Each new discovery provides answers to old questions while simultaneously paving the way for deeper, more challenging mysteries, embodying the dynamic nature of scientific exploration. The analysis and the findings of the latest physics is not only challenging existing paradigms but also offer hints into deeper layers of physical law, potentially reshaping our understanding of existence itself and uncertainty of universe. As our future observation will improves and theory of physics advances, the answers to these questions may unlock entirely new dimensions both factually and symbolically of cosmic consideration.

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