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Mysteries of the Universe

Anubhav Sabu

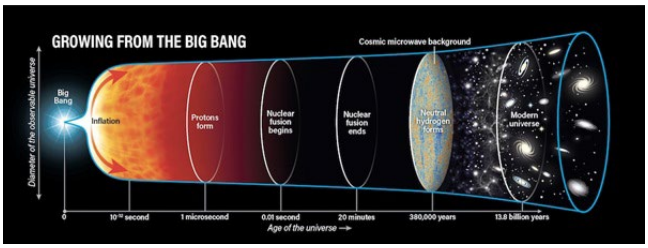
Mysteries of the Universe-

Introduction-

The mysteries of the universe have fascinated scientists and the general public alike for centuries. With advancements in technology and scientific research, we have been able to unravel some of these mysteries, but many questions still remain unanswered. This document will explore the knowledge that has been gained, to date by reviewing current research and theories in these areas and shed some light on these mysterious phenomena and encourage further exploration and discovery.

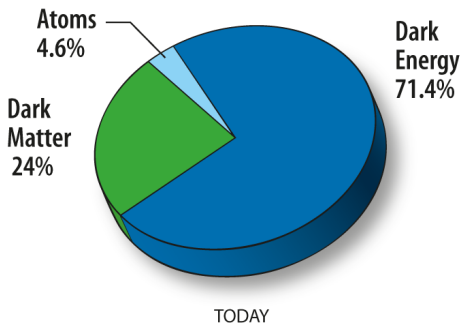
The Big Bang-

The Big Bang is a cosmological model that describes the origin and evolution of the universe. According to this model, the universe began as a singularity, a point of immeasurable density. This singularity contained all the matter and energy that would eventually form the universe as we know it today. Then, around 13.8 billion years ago, the universe began to expand quickly and cooled down and allowing matter to form. In the first few moments after the Big Bang, the universe was incredibly hot and dense, with temperatures fluctuating and reaching many trillions of degrees. During this time, the four major forces, gravity, electromagnetism, the strong nuclear force, and the weak nuclear force merged into a single force. As the universe cooled, these forces began to separate and become different forces. As the universe continued to expand and cool matter began to clump together under the influence of gravity. This led to the formation of galaxies, stars, and planets. While we have learned a lot about the Big Bang through observations and experiments, there is still a lot that we don't know about the formation of the universe. One of the biggest mysteries is what caused the Big Bang in the first place. Another mystery is what happened in the moments immediately following the Big Bang. The universe was extremely hot and dense, so understanding and explaining how matter and energy interacted with each other in these conditions is a major challenge for scientists.



Matter in the Universe-

The Universe is made up of dark matter, dark energy, and ordinary matter. Dark matter makes up around 27% of the universe's total mass-energy. It does not interact with light or any other form of electromagnetic radiation, making it invisible to telescopes. Scientists know that dark matter exists because it has a gravitational effect on visible matter, but they still are not aware of what it is made of. Dark energy makes up around 68% of the universe's total mass-energy. Dark energy is a hypothetical form of energy that permeates all of space and is causing the expansion of the universe to accelerate. Scientists don't know what dark energy is or how it works, but they believe it could be related to the vacuum energy of space. Ordinary matter only makes up 5% of the entire universe, consisting of atoms and subatomic particles (European Space Agency, 2023). Dark matter is thought to be responsible for holding galaxies together, while dark energy is believed to be the force behind the accelerating expansion of the universe.



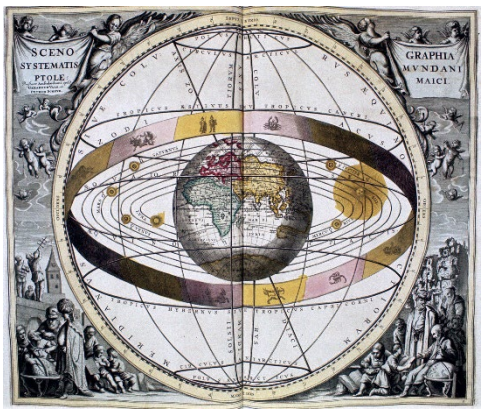
Black Holes-

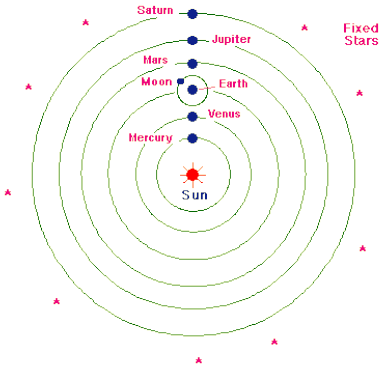
Black holes are truly captivating and mysterious celestial bodies in the universe, created when enormous stars collapse under their own gravity. Their colossal mass and density warp the fabric of space and time around them, making them invisible to the human eye. Despite years of investigation, most information about black holes remains a mystery, including their formation, evolution, and interaction with the surrounding matter. One of their most interesting aspects is the event horizon, which beyond nothing can escape their gravitational force. When objects venture too close, they are sucked in, producing dangerous beams of radiation that can be detected by telescopes (NASA, 2023). These detections of radiation are the only reason why black holes can be detected in the first place.

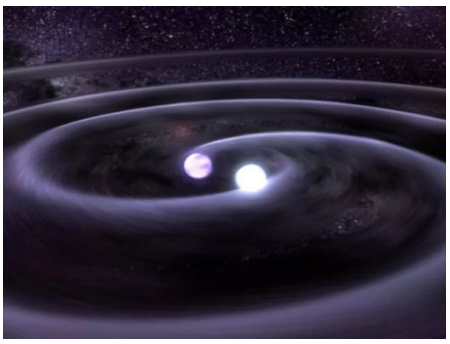
According to many renowned scientists there is a super-massive black hole at the centre of every large galaxy as our Milky Way (NASA Science, 2023).

Current Solar System Model and how it may be wrong-

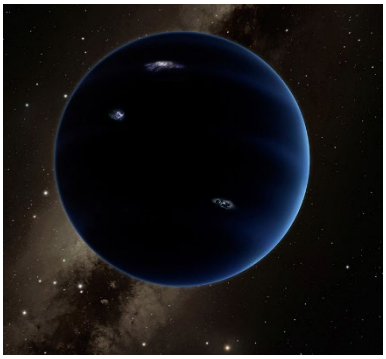
The current solar system model is called the heliocentric model. In our current view of the solar system, the Sun, a hot ball of glowing gases and plasmas (Solar System Exploration NASA, 2023), is the centre and there are eight planets- Mercury, Venus, Earth, Mars, Jupiter, Saturn, and Uranus, that revolve around the Sun in elliptical orbits. There is also an asteroid belt between Mars and Jupiter. In addition to this belt, there is also another asteroid belt located outside the eight plants called the Kuiper belt. Further outside this region is the Oort Cloud a region of almost nothing that separates our solar system from others. Moreover, there are also celestial objects with no predefined orbits that pass through the solar system occasionally. However, there are many aspects of this model that may be wrong and different from thought before. Before discussing the failings of the current model, it is important to note that even though the heliocentric model is the currently acknowledged theory, there were many more before this. A significant model prior to the heliocentric o ne was the geocentric model. A model in which the Earth was the center of the solar system and the other celestial objects revolved around it. This theory was disproved in the 16th century with the introduction of the Heliocentric theory by Nicolaus Copernicus (Britannica, 2023). Now on to ways that the current solar system model may be wrong. Firstly, the heliocentric model states that the sun is the centre of our solar system and has been since the formation of the Solar System. However, evidence has pointed towards the fact that our Sun used to have a companion star, making our solar system a binary one (Siraj A, Loeb A, 2020). A binary solar system has two stars instead of one star. The companion star of the Sun has been hypothesised to be off nearly the same mass. This would explain how the Oort Cloud, a spherical layer of space debris surrounding the solar system (Solar System NASA, 2023), was formed. A binary star system capturing all the objects that







are currently part of the Oort cloud is more plausible than a single star being able to capture those same objects (Siraj A, Loeb A, 2020). The beforementioned companion star of the Sun may have been pulled from orbit by other stars in the birth area of the sun and that star. Another possible addition to the solar system model may be the long-debated Planet 9 (Rowan-Robinson M, 2021). Currently, the solar system model facilitates for eight planets, (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune) (Solar System Exploration NASA, 2016). There used to be a ninth planet, called Pluto, until it was proved to be a dwarf planet based on the definition adopted by the Astronomical Union in 2006 (Solar System Exploration NASA, 2023). The criteria for an object to become a planet is, it must orbit a star, it must be large enough to have enough gravity to force it into a spherical shape and that it must be large enough to have enough gravity to clear away any other objects of a similar size in it orbit. There are many theories that point towards a possible Planet 9 and how it may look like. These theories vary from, Planet 9 being a large planet many times the mass of our Earth, Planet 9 being a collection of multiple objects in the Kuiper belt (trans-Neptunian objects) (Pedro H, 2020) to it being a black hole (Futurism, 2023). All of these theories are possibilities and have their own merits.



‘Knowledge is finite but infinite to meagre human understanding’-

Despite centuries of scientific inquiry, our understanding of the universe is still incomplete. Finally, our understanding of matter and energy is limited by the fact that we are only able to observe a small fraction of the universe, such as dark matter and dark energy. All of the knowledge that we have gained, thanks to the hard work of others, has only scratched the surface of what is left to be explored. Our curiosity will, hopefully, guide us through the journey of finding the truth to the universe.

Humanity and the Universe-

Humanity has always been fascinated by the universe and our place within it. As we continue to explore and discover more about the cosmos, it is becoming increasingly clear that these mysterious elements of the universe will play a crucial role in shaping our future. One of the key challenges facing humanity is the need to find new sources of energy, which, one day, may come from outside Earth. We may also look to harness more exotic forms of energy such as nuclear fusion. We will also need to develop new technologies that can withstand the harsh conditions of space, such as materials that can withstand extreme temperatures and radiation, and propulsion systems that can take us to the outer reaches of the solar system and beyond. This is our future and while we may not be adept enough to brave the dangers of outer space individually, we can do so together.

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