**Are We Alone in the Universe?**

First draft

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**Outline**

1. **Introduction**

Vastness of the universe

Fascination with extraterrestrial life

Personal interest and purpose

1. **Theories and Evidence**

Life in harsh environments

Panspermia theory

Survival of microbes in space

1. **SETI and Technological advancements**

SETI's mission

COSMIC project and advancements

James Webb Space Telescope and technology

1. **Discoveries of Exoplanets**

Importance of exoplanets

Kepler and TESS missions

Notable exoplanet discoveries

1. **Conclusion**

Ongoing mystery

Increasing likelihood of finding life

Impact on our understanding of life and the universe

In a universe with over 100 billion galaxies, the question of whether we are truly alone has fascinated people for centuries. This mystery continues to captivate scientists and the public alike, especially with the growing number of UFO sightings and recent government reports. As someone who loves the idea of aliens and is deeply interested in the possibility of life beyond Earth, I believe that understanding the theories and evidence of life in extreme environments, the advancements in the search for extraterrestrial life, and the discoveries of planets outside our solar system may bring us closer to answering this question.

Various theories and pieces of evidence suggest that life could exist in harsh environments, both on Earth and beyond. One interesting theory is panspermia, which proposes that life could be spread across the galaxy by meteorites, comets, or asteroids. This idea suggests that simple life forms, such as bacteria and extremophiles (organisms that live in extreme conditions), could survive the harsh conditions of space and potentially start life on other planets. While some scientists argue that space conditions would destroy most organisms, experiments on the International Space Station have shown that certain microbes and spores can survive in space, adding support to the panspermia theory. These findings suggest that life could be more common in the universe than we previously thought.

A key player in the search for extraterrestrial life is the Search for Extraterrestrial Intelligence (SETI). Established in 1984, SETI's mission is to receive and analyze signals from space that could indicate the presence of extraterrestrial civilizations. The recent launch of the COSMIC (Commensal Open-Source Multimode Interferometer Cluster) project at the Very Large Array (VLA) in New Mexico marks a significant step forward for SETI. This new project allows scientists to examine millions of star systems at various frequencies. The quick data processing abilities of COSMIC improve the chances of identifying real alien signals in real-time. Additionally, new telescopes like the James Webb Space Telescope offer greater sensitivity and resolution, allowing scientists to study the atmospheres of distant planets in detail. Improved methods for detecting radio signals and the development of more advanced space probes have also increased our ability to explore the universe.

Supporting SETI's efforts are the discoveries of exoplanets, or planets outside our solar system, which have become a major focus in the search for extraterrestrial life. The discovery of thousands of exoplanets by missions such as Kepler and TESS have changed our understanding of the universe. Many of these planets are located in the habitable zone, where conditions might be right for liquid water. Notably, a blog post on February 29, 2024, reported the discovery of two exoplanets in the habitable zone of the small red star TOI-715. One of these worlds is a "super-Earth," around 1.5 times the size of Earth, while the other, possibly the same size of Earth, is the smallest known habitable-zone exoplanet. These findings emphasize the growing potential that life may exist elsewhere in the universe.

In conclusion, the question of whether we are alone in the universe remains one of the most profound mysteries of all time. The efforts of SETI, the discovery of exoplanets, and technological advancements bring us closer to possibly answering this question. As we continue to explore the universe, the likelihood of discovering life beyond Earth increases, affecting our understanding of life and our place in the universe.

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