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# Something Intelligent This Way Comes

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**Abstract -** Mankind's anthropocentric view of itself impedes our ability to take an open-minded view of our uniqueness or lack thereof in the universe. Technological advances in astronomy have begun to tear away at the uniqueness of Earth. The question to entertain is the likelihood of intelligent life in the universe.

**Keywords -** Extrasolar, Earth-like, SETI, Habitable zone, Extraterrestrial life, Kepler, Vogt, Gliese, NASA

## 1. Anthropocentric

"It's all about me," smart phones, cars, vacations, money, homes, and whatever else I need. Perhaps that phrase goes beyond describing a generational label for individuals and also describes something embedded within the psyche of mankind. Man has always considered himself the center of all that is important. And for the last several thousand years we have not shared our sovereignty with any other living creature. They have all bowed before us—the lion, wolf, elephant, buffalo. We have remained the superior species on planet Earth and all of our needs and beliefs have revolved around us. Our anthropocentric position on this planet is centered in our industries, our lifestyles, and our view of who we are.

Such anthropocentric beliefs extend even into the world of science. The scientists of ancient Greece believed that the universe revolved around the Earth. Surely we were the center of the universe. It was not until the 16th century that the Copernican Theory moved the center of the universe from the Earth to the Sun. That change did not come easily. Religion is often held primarily responsible for condemning Galileo for supporting a belief that the Earth was not the center of the universe though the scientific community of the time also castigated the renegade scientist. But with time and evidence, science finally acquiesced and removed the Earth from the center of the universe with the comfort that now the Sun and our solar system would be the center of everything. It has only been in the last 100 years that modern science has recognized that we are not even the center of our own galaxy. Our geographical uniqueness was gone.

Nonetheless, our desire to be the center of importance continues today. Twenty-five years ago there were no known planets that existed outside of our solar system. All was good—there was no evidence to argue against our unique position in the universe. Yes, there was debate amongst astronomers as to whether our solar system was unique or was a common occurrence in the universe, but the pre-Copernican beliefs of uniqueness were the favored arguments. It was believed that most stars did not have planets and that our solar system was a rarity in its development of life. Some cosmic roll-of-the-dice gave us all of the right ingredients for life to develop. Our solar system was provided the giant planet Jupiter so that the Earth would not be constantly bombarded by asteroids. Additionally, a key theory that is still harbored to this day is that our moon is unique in that its orbit around the Earth provides conditions such as the tides and the seasons that were necessary for life to have evolved. Many scientists believed that man existed through coincidental events critical to the formation of life. In 1992 part of that veil of uniqueness was torn away when the first planet outside of our solar system was discovered by Wolszczan and Frail [1].

## 2. Extrasolar Planets

In less than twenty years since that first discovery, our ability to detect extrasolar planets has grown immensely although with limitations. By December 2009, there had been over 400 extrasolar planets detected. Because most current methods of detection of extrasolar planets depend on gravitational interaction between the planet and its star, they are limited in their capability. These methods are predisposed to detection of very large planets in the size range of Neptune to Jupiter and/or planets that orbit extremely close to their star. But none of these types of planets are likely to harbor life. The ability to detect a smaller planet has improved as astrophysicists have turned to the use of the transit method. This technique measures the decrease in light given off by a star when one of its planets transits between it and Earth. The launch of the Kepler space telescope in March 2009 placed a platform in space that used the transit method of planet detection. Kepler's capability now brings us close enough to be able to detect

planets the size of the Earth that orbit their star at a distance that could support life as we know it. By December 2013 analysis of data from the Kepler telescope had increased the number of extrasolar planets to 3603 candidates [2].

How many Earth-like planets are out there? If the distribution of the size of planets in a solar system is similar to ours then based on the number of large planets already discovered, we can expect there to be hundreds of Earth-like planets within twenty light years of us. Within a hundred light years that number would mushroom to thousands of planets similar ~~is~~ in size to Earth. That does not mean that our technology can detect all of those planets. Currently the 'transit' method of detection is the most capable of finding an Earth-like planet yet that method will only find 1 in 200 earths, because the planet must line up perfectly between us and its parent star before we have an opportunity to detect it. Despite this difficulty, an international team of planet hunters lead by Professor Steven Vogt of the University of California has already discovered as many as six low-mass planets around two nearby Sun-like stars named 61 Virginis and HD 1461. These stars are located respectively 28 and 76 light years away. According to Professor Vogt, "These detections indicate that low-mass planets are quite common around nearby stars. The discovery of potentially habitable nearby worlds may be just a few years away." [3] But in less than a year (September 2010) Professor Vogt and his team discovered the first extrasolar world that exists in the habitable zone of its solar system [4]. The star is a red dwarf and is called Gliese 581; the planet was named Gliese 581g. Within a year five Earth-similar planets had been found in a habitable zone that could support life. It would seem that our planet and solar system may not be the unique vessel of life that we have for so long believed. Seth Shostak, a noted SETI astronomer, has estimated that in all likelihood there are at least 30,000 habitable worlds within 1000 light years of Earth [5].

## 3. Earth-Like Planets

As each of these Earth-like worlds is discovered, the next step will be to determine if the planet can support life similar to ours. The key ingredient is water. Does the planet exist in the habitable zone of its star where water can exist in a liquid state? Is water present on the planet? We know that the existence of water beyond the Earth is much more common than previously thought. Water has been found in comets, on Mars, and even on our own desolate Moon. Jupiter's moons Callisto, Europa, and Ganymede harbor large quantities of liquid water beneath frozen oceans. Europa's ocean is estimated to be 60 miles in depth and recent evidence from the Hubble Space telescope indicates that water plumes have erupted on the surface [6]. Water is plentiful in our solar system but the Sun and its group of planets is not unique, as water also exists in interstellar space. A team of U.S. astronomers, led by Cornell University astrophysicist Martin Harwit, discovered a massive concentration of water vapor within a cloud of interstellar gas close to the Orion nebula. The amount of water measured is so high that it is enough to fill the Earth's oceans 60 times a day [7]. NASA's Spitzer Space Telescope has discovered large amounts of simple organic gases, carbon dioxide, and water vapor in a possible planet-forming region around an infant star named AA Tauri. They have also found water in the same zone around two other young stars [8]. All of this evidence draws us to the supposition that it would not be unexpected to find water on some of these Earth-like worlds. Other key ingredients for the development of life have been found to exist in space. Samples of a comet returned to Earth by NASA's Stardust spacecraft show the presence of the amino acid glycine, a key ingredient in protein. Carbon-isotope testing verified that the glycine came from space and was not due to earthly contamination [9]. As the evidence mounts, it becomes more and more clear that the ingredients needed for life are not unique to Earth.

## 4. Intelligent Life on Other Worlds

Although life may exist on other worlds, is there intelligent life; is there life that has reached our state of development or beyond? Within the next few decades, more advanced space-based telescopes will give us the capability to look for the signs of life by taking a spectrum of the light coming from an extrasolar planet's atmosphere. The planet's light will be examined for ratios of oxygen, water, carbon dioxide, methane, and other potential bio-signatures that indicate the possible presence of life. Perhaps someday the presence of spectral signatures of heavy radioactive elements such as uranium and plutonium isotopes will be a hint about the presence of a developing civilization. A civilization that has apparently begun to pollute its atmosphere with nuclear by-products, similar to the signature that mankind has already left on our planet.

Many scientists already believe that the existence of other intelligent life in our galaxy is a reasonable possibility. In 1959 a short paper was published in *Nature* by Cocconi and Morrison arguing that the monitoring of radio waves would be a logical way to try and detect the existence of an intelligent extraterrestrial civilization [10]. This paper initiated the modern SETI era. By the late 1970s NASA had begun the search for extraterrestrial intelligence in our galaxy by looking for radio transmissions from other civilizations. Their hope was to detect either an intentional signal directed at our planet or the more likely radio signals that are a byproduct of a developing civilization. It was difficult for NASA to obtain a constant supply of funding for this project. In 1979 Senator William Proxmire awarded his "Golden Fleece" award to NASA's use of taxpayer dollars to search for extraterrestrial civilizations. The pressure from Congress made it difficult for NASA to fund the SETI effort. Partly as a result of this impediment the SETI Institute was formed in 1984 as a non-profit corporation for the purpose of detecting such radio signals. Today there are over 50 scientists working on projects at the SETI Institute, which works closely with NASA.

On August 15, 1977, a potential non-terrestrial radio signal from outside our solar system was detected by Jerry Ehman. It became known as the "Wow" signal. The signal lasted for 72 seconds but has never been heard again. Other than that signal, no other potential non-terrestrial signal has been detected. Whether it is because other civilizations use different frequencies of the electromagnetic spectrum to communicate; communicate with much lower power levels; or some other reason, we have not detected other intelligent life in our galaxy. The scientists at SETI continue their work in the hope that one day that piece of evidence will be obtained.

Meanwhile, other scientists are working on more than just the detection of intelligent life in our galaxy. They are researching how we can develop interstellar travel. The National Space Society, whose board members include former astronaut Buzz Aldrin, has created a road-map to space colonization of the stars [11]. In 1996, NASA launched the Breakthrough Propulsion Physics program. Its purpose was to examine unique space propulsion techniques that could be used for interstellar space travel. They looked at everything from nuclear propulsion to the possibility of traveling through warps in space. This type of work has continued into the 21st century with NASA's Ames Research Center and the Defense Advanced Research Projects Agency (DARPA) collaborating on a project to study the requirements to build a spacecraft capable of interstellar travel. This project was begun with a symposium in October 2011 in Orlando, Florida, that brought together papers from scientists around the nation who were to think "outside of the box" on the topic of interstellar space travel [12]. Already research has begun at NASA's Johnson Space Center in Houston to look at the possibility of warp travel through space by the end of this century [13]. But, despite our attempts to conquer interstellar travel, as a society we have difficulty dealing with the possibility that intelligent life may reach us first and may have already done so.

## 5. Has Intelligent Life Detected Us

If life on Earth is not unique then it should be a given that out of the millions and possibly billions of planets in our own galaxy, some of them have intelligent life. How advanced is that life? A logical deduction would be that a portion of that life is at least as advanced as ours and some of that life may be far advanced of us. What would be the capabilities of our civilization in another 100 years? What would we see if we were looking back at the Earth from 30 light years distance? Such a civilization would have already identified our planet as teeming with life using a far more advanced version of our Kepler telescope. A spectrograph would have long ago detected that our atmosphere contained water and oxygen, the molecules vital for life, and that our world existed in the habitable zone of our solar system. This would be sufficient information for that civilization to dedicate a telescope to observe our planet for longer periods of time. Soon they would detect much more. The spectral wavelengths of artificial light generated by our cities would be seen. This alien civilization would have identified the presence of uranium and plutonium isotopes in our atmosphere and their telescopes may have recorded the sudden and intense light signatures released from our early above-ground nuclear detonations of the 1950s and 1960s. Perhaps they wondered if we were just developing nuclear capabilities or whether we were in the beginning throes of our own self-destruction.

What would be the next step taken by such an "Earth-similar" civilization? Like us, they probably have not yet developed the capability of interstellar travel. Sending a space craft 30 light years to our solar system might take them thousands of years. But what about a civilization 100 years more advanced than us; it is possible that their scientists have learned other ways to reach us. Perhaps they have learned to control energy fields so rather than use a physical object to send to our solar system as an observer, they might send packets of energy that are capable of observing us and sending back information. This would take 60 years for a round trip; a long time but feasible. Perhaps they would watch us on their version of a NASA-TV station just as we currently observe Mars from the Curiosity Rover.

But what happens when we are detected by civilizations that are a thousand or thousands of years more advanced than us? It would be close minded of us to assume that such a civilization is not capable of rapid interstellar travel. Yes, the laws of physics are real boundaries. What has changed and will continue to change is not the laws of physics but our knowledge and understanding of those laws. Our scientific breakthroughs of the last hundred years have been increasing at an exponential rate. Assuming that we don't destroy ourselves, imagine where our civilization will be in a thousand years. A civilization one thousand years ahead of us in development has likely already achieved the capability to quickly travel interstellar distances. And based on the numbers, there is not just one civilization out there that is a thousand years ahead of us; there must be many. Many civilizations are capable of reaching us. Our anthropocentric views and our psyches argue against this. But logic argues that if intelligent life in the universe is common then many of those civilizations have observed our planet and know that we exist and know exactly where we are located.

So why haven't these civilizations contacted us? As Enrico Fermi once asked, where are they? Why have they not sent us a radio signal across the cosmos? Surely they know the value of making contact with us, but no one has landed on the White House lawn or the door step of the Kremlin. We feel certain that if they are out there, they would want to let us know about themselves. After all, "It's all about us."

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