Are We Alone?

"Absence of Evidence
Isn't Evidence of Absence"

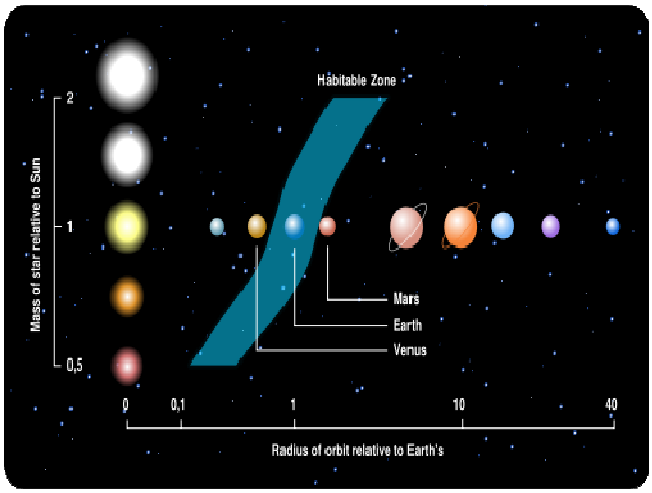
The vast space is one of the most undiscovered areas in our whole universe. Unlimited discoveries and mysteries lie uncovered within them. Over the years, we, as human beings have constantly been challenging and pushing our limits by venturing into space and beyond.

In the beginning, when all was fire, there were no stars or planets, no atoms or molecules... and no life. Eons passed, and life appeared on at least one small planet orbiting an average star in a spiral galaxy called the Milky Way. On that planet, one species, endowed with the capacity to think and speak, began to wonder: Did it happen only here?

Perhaps not. Terrestrial life is embedded in a cosmic web, and it seems reasonable to speculate that life is cosmically commonplace. The challenge facing science is to move from speculation to fact... by learning how life and intelligence originated on Earth and by searching the universe for signs of life elsewhere…

Many scientists believe that if extraterrestrial life exists, its emergence occurred independently, in different places in the universe. An alternative hypothesis is panspermia, which suggests that life might emerge in one location and then spread between habitable planets.

Now that we know that our dear old earth is 4.5 billion years old and about 500 million years ago the most dramatic burst of biological inventiveness occurred, the Cambrian Explosion, when a whole array of creatures equipped with claws and teeth and tentacles appeared. It's interesting that from the center of the Earth to the far-flung galaxies, we find evidence that life arose from cosmic processes. The iron in our blood and the calcium in our bones were made inside stars. All silver and gold was forged by stars that exploded long ago. Terrestrial life is embedded in a cosmic web, and it seems reasonable to speculate that life is cosmically commonplace.

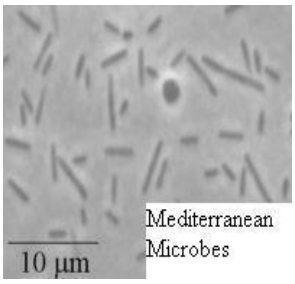


If life is in fact cosmically commonplace, where might we find it? The search begins within the solar system, as we try to locate three ingredients upon which life depends: water, energy, and organic molecules (or carbon). Recent discoveries inform us that these requisites may exist well beyond the planets closely orbiting the sun. This area — where conditions might potentially support life — is called The Habitable Zone.

Suggested locations that might have once developed or continue to host life include Mars, natural satellites of Jupiter and Saturn (e.g. Europa, Enceladus and Titan), and most recently Gliese 581 c, which is the only known extrasolar planet in its star's habitable zone and is predicted to have liquid water.

Recent researches suggest that the strong gravitational pull caused by large planets may produce enough energy to sufficiently heat the cores of orbiting moons. Life has proven itself tough here on Earth. Perhaps it could thrive in more extreme environments.

As we learn more about the diversity of life, particularly microbial life, we expand our definition of what life is and how life can exist in some very hostile (to humans) environments. Scientists have discovered microbes that are resilient to levels of heat, cold, salt, acidity, and radiation that would kill humans. Some of these so-called **"extremophiles"** have been found thriving in complete darkness, in parched deserts and even miles below ground. Extremophilic microbes are a wild bunch. These hardy microbes are interesting because they suggest the potential for life on other planets.



Mediterranean Microbes

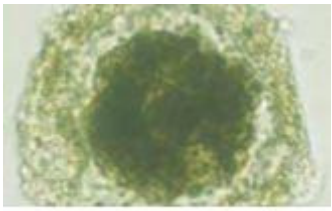
For example Extremophilic microbes have been found in the depths of the Mediterranean at nearly 2.5 miles (4 kilometers) below sea level, with salt concentrations ten times higher than seawater, pressure 400 times greater than atmospheric pressure, and a lack of oxygen to boot - the conditions that are some of the most hostile environments on Earth.

The European Mars Express mission detected hints of methane in Mars's atmosphere last year, and some astrobiologists have speculated that the methane could be a by-product of extremophilic methanogens or some other form of microbial life.

Hiding beneath sheets of ice in Siberia and Antarctica are microbes called pyschrophiles or psychrotrophs. They consist mostly of bacteria, fungi, and algae, thrive in freezing temperatures ranging from 23 to 68 degrees Fahrenheit (-5 to 20 Celsius). What is interesting is that the environments that these microbes are found in are sometimes at tremendous depths - sometimes over two miles below the surface.

Scientists say that extraterrestrial life could be similar to this class of microbes. In a solar system where many of the planets -- including Mars -- have large ice deposits and colder temperatures in general, pyschrophiles might thrive.

That's not all. Rising as high as 15 stories off the ocean floor at depths of 7,000 feet, hydrothermal vents that spew acidic, mineral rich water are the places to be - if you can stand the heat. The water coming out of the vents can reach temperatures as high as 400°C, but that's just fine to undersea thermophiles.


Pacific Wonder

A sediment sample recently drudged up from Challenger Deep, the deepest part of the Pacific Ocean, was abundant in single-celled protists called foraminifera. Researchers were surprised to find these soft-shelled critters at depths of nearly 7 miles, where the pressure is 1,100 times greater than at the surface.

All of this is good news for astrobiologists who dream of finding life beyond Earth's confines, as many of the extreme environments on our planet are thought to be the norm for other worlds. Earth's deserts, for example, have analogues on dry, dusty Mars. Saturn's moon Titan is a world of meandering rivers and lakes, and beneath the icy crust of another Saturn moon, Enceladus, might lie environments resembling the frigid ocean depths of Earth.

Since man has made their technological advances mainly in the past 200-300 years, there could well be much more advanced extraterrestrials that have progressed for the past millions of years. CETI (Communication with ExtraTerrestrial Intelligence) attempts to initiate a dialogue with such intelligent extraterrestrials. It does this by actively sending out coded signals at specific target stars, star clusters, or galaxies. Let us wait and see who discovers who first (if at all)!

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