

## STAMP STORIES

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Our journal, *Biophilately*, is all about life and the portrayal of living things on postage stamps and other philatelic material. Currently, the only life we know about resides here on planet Earth. However, throughout recorded history, and undoubtedly even in prehistoric times, man has wondered about the possibility of life outside the range of the known world.

In early times, these thoughts concerned “gods” that existed in heavenly realms and mythical or magical vegetation and beasts that lived in uncharted lands, or under the seas. As knowledge progressed through exploration, and science came into being, people began to accept that these imaginary lifeforms did not exist.



Mythical Unicorn  
Great Britain Sc#2674



Corpse Flower  
*Rafflesia arnoldii*  
Malaysia 2014 not cat



Platypus  
*Ornithorhynchus anatinus*  
Australia Sc#3892



Penicillin  
*Penicillium* sp.  
US Sc#3186b

To be sure, explorers discovered many strange and exotic plants and animals and the menagerie of living things grew to include some that often exceeded the imagination of previous generations. The discovery of unsuspected life at the microscopic level further added to our knowledge and wonder about the variety of living things.

Discoveries of previously unknown life forms here on Earth continue almost daily, but one of the most fascinating current scientific endeavors involves the search for life outside of the Earth. There is no doubt that from the earliest times man has looked heavenward and wondered if other life existed on the Moon or among the stars, and what manner of life it might be.

### Mars Rovers

Much in the news recently has been the exploration of the planet in our solar system that is the most similar to ours. Mars is another rocky world like Earth. It has a day that is about 40 minutes longer than a day on Earth and its axis also tilts in relation to its orbit (25 degrees versus 23.5 degrees for Earth), which causes it to have seasons also. Though it has about the same amount of land area, it is a little more than half the diameter of Earth and only 71 percent as dense. Consequently, its gravity is 62.5 percent less than on Earth.<sup>1</sup>



Planet Mars  
US Sc#1759



Ice on Mars  
Great Britain Sc#3115

Mars orbits the Sun just on the outer edge of the so-called habitable zone (HZ). This is the region around a star where the temperature permits the existence of liquid water—water being the one thing required for all life that we know. Frozen water has been found on the surface of Mars. Evidence shows that at one time there must have been liquid water on the planet’s surface and possibly some still exists below the surface. But somehow in the past Mars lost much of its atmosphere and most of its water.

Scientists have sent several exploratory missions to Mars and one of the primary goals of these missions is to determine if life ever arose there. Currently there are five functioning spacecraft orbiting the planet and two others on the surface, the

<sup>1</sup> NASA: <http://mars.nasa.gov/allaboutmars/facts>

rover *Opportunity* and the science laboratory *Curiosity*. Several other defunct spacecraft sit on its surface including the recently located British lander *Beagle 2* that was lost in 2003. Imagery from some of these space probes is readily available to the public at various Internet sites. A manned mission to the planet will certainly take place, perhaps within a decade or two.

So far there have been no conclusive discoveries that show life ever existed on Mars. But within our solar system, Mars offers the most probable and accessible potential location for the discovery of the existence of extraterrestrial life.

## Exoplanets

Astronomers currently estimate that there are at least 125 billion galaxies in the visible universe.<sup>2</sup> Our own Milky Way galaxy has between 100–400 billion stars.<sup>3</sup> If you assume 200 billion stars as representative of a galaxy, this means there are 25,000 billion billion stars in the part of the universe that we can see.

One of the exciting and growing areas in astronomy is the search for extrasolar planets, or exoplanets. These are planets that orbit other stars besides our own Sun. Recent developments in technology including new space telescopes and more powerful computers have enabled astronomers to detect these planetary bodies. As of January 2015, astronomers have confirmed the discovery of 1,876 exoplanets<sup>4</sup> and there are more than 4,000 additional candidates awaiting confirmation, with this quantity increasing continually.

## Extraterrestrial Life

Based on the discoveries so far, astronomers believe that there is at least one planet on average per star.<sup>5</sup> However, the majority of these planets may be unable to support life as we understand it. The orbits of these planets lie outside the HZ of their star, or have traits inhospitable to life.

The size and location of the HZ varies with both the type of star and the type of planet. Heat produced by the star depends on its size and age. The HZ for a red dwarf star would be much closer to it than the HZ for a star like our Sun. A desert planet with little water would have a reduced greenhouse effect and could be habitable much closer to the star. The lack of water would mean less ice to reflect heat so its HZ could also extend farther away. Planet rotation rate and many other factors also affect the size of the HZ.

Just because an exoplanet does not meet the characteristics we expect does not mean that life cannot exist there. Many exoplanets are gas giants similar to Jupiter, but they could have moons that are habitable. More than half of Earth's biomass is from subsurface microbes. Thus, even planets that have a frozen surface could well support life deep underground.

Current discoveries indicate that about 22 percent of Sun-like stars have an Earth-sized planet located in their HZ. If this holds consistently across the galaxy, it means that there are potentially 11 billion habitable Earths in the Milky Way alone. This quantity rises to 40 billion, if you include red dwarf stars.

## Intelligent Life

Science fiction is replete with stories of invaders from Mars, or advanced civilizations on other worlds and it seems to be part of man's nature to speculate or dream about these possibilities. Considering the billions of probable planets that may exist, logic and probability argue that the odds are against the Earth being the only place where intelligent life has arisen.



Opportunity Rover  
St. Kitts 2014 not cat



Space Telescope  
US Sc#1919



Galaxy NGC 1316  
US Sc#3388

<sup>2</sup> Eicher, David J.; *Astronomy*, 43 (2): 6

<sup>3</sup> "NASA – Galaxy;" nasa.gov. November 29, 2007

<sup>4</sup> Schneider, J.; "Interactive Extra-solar Planets Catalog," *The Extrasolar Planets Encyclopedia*.

<sup>5</sup> Cassan, A., et al; *Nature*, 481 (7380): 167–69

The physicist Enrico Fermi pointed out in a paradox named for him that if such life exists, why have we never encountered it? The basic points of the argument are:

- The Sun is a relatively young, typical star and there are billions in the galaxy that are billions of years older
- There is high probability that many Earth-like planets exist and some will develop intelligent life
- Some of these civilizations will develop interstellar travel, a technology we are investigating ourselves
- Even at sub-light travel speeds, the galaxy could be colonized in a few tens of millions of years.

According to this reasoning, Earth should already have been colonized, or at least visited, but we have found no irrefutable evidence of this. Scientists have proposed several plausible explanations assuming that such life exists. The explanation that makes the most sense to me is that intelligent civilizations are too far apart in both space and time to encounter each other. Arthur C. Clarke provided an interesting analysis of this in his novel, *Rama Revealed*.<sup>6</sup>

Consider that an intelligent civilization arises 90,000 light years away from us on the other side of the galaxy. Over the course of time, it manages to colonize a few other nearby star systems. If we presume that this civilization coexists in the same timeframe as ours, it would still take 90,000 years for a signal from it to reach us even if such a signal was powerful enough and unblocked by the other systems and immense dust clouds between us.

Now, assume that this civilization arose 50 million years ago, long before intelligent species evolved here. There is little chance that we would ever learn of its existence even if it were to flourish for millions of years. There is also a strong possibility that such a civilization would be unable to last millions of years for many reasons and one of most likely natural reasons is a stellar phenomenon called a supernova. These events occur on average three times per century within our galaxy.<sup>7</sup> Such an occurrence within 3,000 light years of any inhabited planet would devastate the life thereon. Such an incident has been proposed as the cause of the Ordovician–Silurian extinction, which resulted in the death of nearly 60 percent of the oceanic life on Earth.<sup>8</sup>

The confirmed discovery of extraterrestrial life, intelligent or not, will be one of the most monumental events in human history and would dramatically change the way we view our place in the universe. I think it very probable that we will discover life on other worlds someday, but the likelihood of this life being intelligent is remote and, as Arthur Clarke noted, we may have to accept that loneliness is one of the underlying principles of our universe.



Is ET really out there?  
US Sc#3190m

<sup>6</sup> Clarke, A.C.; *Rama Revealed*, 1994: 591–96

<sup>7</sup> “Discovery of Most Recent Supernova in Our Galaxy.” NASA. 2008-05-14

<sup>8</sup> Melott, A. et al (2004). *International Journal of Astrobiology*, 3 (2): 55–61.