

# Natural Selection

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## 8.2 Is there life on Mars or Venus?

People have wondered for a very long time whether there is life elsewhere in the Universe. One obvious place to look first is in our own Solar System. Scientists quickly gravitated to Venus and Mars. Being closest to Earth, they seemed likely to have the most Earthlike conditions. But early explorations suggested that Venus would be hostile to life as we know it. Venus has almost no water, a crushingly dense carbon dioxide atmosphere, clouds of sulfuric acid, and a surface temperature of 462°C (864°F)! As a result, attention focused on Mars.

Mars is not obviously hospitable to life either. The planet is very dry, and its average temperature is only about -60°C (-80°F), though some parts can warm to a comfortable 20°C (68°F). Mars's thin atmosphere also lets through ultraviolet light from the Sun that would kill most living things on Earth. However, many of Mars's geological features were clearly carved out by water, and the evidence suggests that Mars once had oceans as well as warmer temperatures and a thicker atmosphere. But this was likely billions of years ago. Could there be life on Mars today?

### FIGURE 8.5

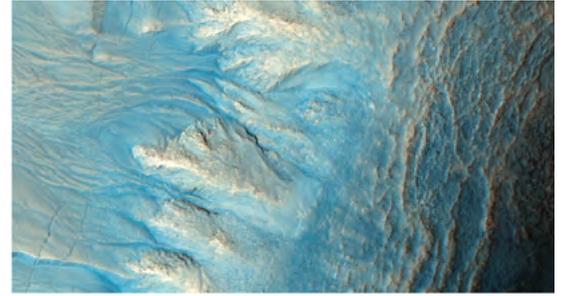
Since it landed in 2012, the Mars rover Curiosity, which is about the size of a small car, has been exploring the Martian surface. Its mission is to search for evidence of current or past Martian life.

Searching for life on Mars has meant searching for liquid water, since life as we know it cannot exist without water. Using orbiters around Mars and rovers on the Martian surface, the National Aeronautics and Space Administration (NASA) has looked for places on the planet where pockets of water might still exist (Figure 8.5). And they have found evidence for it! Specifically, they have seen seasonal streaks of damp soil in certain craters. This has encouraged scientists to look for larger water reservoirs that might still exist under the Martian surface. In 2020, NASA launched the new *Perseverance* rover towards Mars.



## FIGURE 8.6

Many features of Mars's surface provide evidence that there once was a large amount of water on the planet. This satellite image of a crater shows that it once held a large lake. The sediments that remain could be a good place to search for Martian fossils.



*Perseverance* will look for water as well as use ultraviolet light and X-rays to search for carbon molecules and other organic compounds. Even if there is no Martian life today, there could once have been life on Mars. This life may have thrived in the old Martian oceans and then gone extinct as the planet dried and the atmosphere thinned (Figure 8.6). If so, the living things may have left fossils behind. Scientists plan to search for fossils in Mars's sedimentary rocks, the same types of rocks that are often rich in fossils on Earth.

Of course, Martian life could be very different from life on Earth, in which case scientists will have to completely rethink what to look for. Interestingly, according to NASA scientists, there is one way in which we do know whether there is life on Mars. There *is* life on Mars, and we know that because we sent it there. A small number of microbes from Earth have traveled to Mars along with NASA's Martian rovers. These microbes survived NASA's best efforts to decontaminate spacecraft before they took off, as well as the harsh conditions of the journey itself. What this means is that the microbes have already survived high temperatures, radiation, and very dry environments with little or no food. They also have the ability to hibernate for long periods until conditions are favorable again. Having hitched a ride to Mars, the microbes are now sitting on the Red Planet and could well survive there for millions of years.

Although Venus initially seemed like a less likely place to find life than Mars, some recent discoveries have suddenly brought Venus back into the spotlight. In September 2020, scientists announced they had found the chemical phosphine,  $\text{PH}_3$ , in the Venusian atmosphere. On Earth, phosphine is associated with the activity of certain bacteria, although there are also inorganic processes that could produce it. Yet phosphine is an unstable chemical—it doesn't last very long. A stable amount of phosphine in the Venusian atmosphere, therefore, means that it's somehow being continuously generated. But how so? With this discovery, scientists began to speculate about the possibility of microbial life in Venus's atmosphere, where temperatures might not be as high as on the surface. The research continues.

## READING CHECK

**Why was Mars originally considered a more likely place to find life than Venus? What recent discovery has recently up-ended this?**

## CHECK YOUR ANSWER

Venus has almost no water and is extremely hot. Mars, on the other hand, once had plenty of liquid water. Although Mars is now much drier, there is evidence that some amount of water still exists on the planet. Renewed interest in the possibility of life on Venus came from the possible discovery of phosphine in the atmosphere, a chemical that is associated with bacterial activity on Earth.

For more on NASA's Mars missions, go to: <https://mars.nasa.gov>

