# NASA's curious rover finds the ideal ingredients for Martian life

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A model of the space vehicle similar to what Mars One hopes to launch into space with its crew aboard. Photo: Mars One

They haven't found any little green men yet, but scientists now believe there could once have been life on Mars.

NASA's Curiosity rover landed on the Red Planet in August 2012 to explore and look for signs of living things. Last Monday, scientists said it had found the remains of an ancient lake that was filled with just the right chemical ingredients for life to thrive.

This existed billions of years ago at around the same time that early life was just taking hold on Earth.

Drilling into dry rock, the Curiosity rover discovered that Gale Crater was once watery. It might have been surrounded with ice and snow. This could have hosted an entire Martian world based on a type of microbe found in caves on Earth. These simple lifeforms, called chemolithoautotrophs, feed on chemicals found in rocks and make their own energy.

## Perfect Place For Life On Mars

“Ancient Mars was more habitable than we imagined,” said California Institute of Technology geologist John Grotzinger. He is lead scientist for the Curiosity mission. This wet, potentially Earth-like environment could have lasted for tens of millions of years. That could have given it a wide-open window for life to emerge.

The findings were announced on Dec. 9 in San Francisco and impressed scientists who were not involved with the mission. “They’re really quite amazing,” said Malcolm Walters, an astrobiologist at the University of New South Wales in Australia who helped find some of the earliest fossils on Earth.

Walters said we now know much more about the chemistry of Mars. He called it a "great leap forward.”

The history of the planet is written in its many layers of rock, and Curiosity set out to read this story. The rover’s main goal was to search for life-friendly environments at Mount Sharp, a 3-mile-high mountain. Mount Sharp's rock can possibly reveal many details about the planet's environment over billions of years.

## Digging Down Into An Ancient Lake

But rather than head straight to Mount Sharp, the rover took a months-long detour to an interesting spot called Yellowknife Bay. There, Curiosity drilled into two rocks, named John Klein and Cumberland.

It was a risk to turn away from the planned mission, and it paid off, Grotzinger said.

The rocks, dated to roughly 3.6 billion years ago, have turned up a huge amount of the chemicals and elements needed for life. These include carbon, hydrogen, oxygen, sulfur, nitrogen and phosphorus. The rocks also revealed signs of many compounds that could have provided fuel for living things.

What's more, the water that was once there would have been drinkable. Water detected by another NASA rover on the other side of the planet was too acidic to be drinkable.

David Catling, a scientist at the University of Washington, believes that the water in the lake would have been suitable for a wide range of simple lifeforms. The water found in a different part of the planet was only suitable for those that can survive salty, acidic environments.

## Still Missing A Piece Of The Puzzle

Curiosity has not yet found any organic carbon, which is a vital part of supporting life on Earth. That may be because the rover heats up soil samples to test the gases they contain. And this test may destroy some important information in the process.

Life could certainly evolve and thrive without this organic carbon. In a past watery environment, chemolithoautotrophs would have done just fine with the ingredients already found on Mars. That said, scientists do want to find organic carbon because it would mean that the planet once had a wider range of life friendly places.

But scientists feared that the planet's surface had been exposed to cosmic radiation — high-energy particles that travel through space — for far too long. This would mean that any traces of organic carbon within the reach of Curiosity's drill were long gone. Scientist Kenneth Farley said it was "a pretty serious concern" that all of this material had been destroyed over billions of years.

So Farley directed Curiosity to analyze several soil samples and found gases that helped pin down the age of the Martian surface. It was only about 78 million years old, much younger than scientists had expected. That meant the amount of cosmic radiation exposure was also lower than they had expected.

## Moving As Fast As Curiosity Can

The team then noticed a small cliff, called a scarp, located some distance from where Curiosity landed. The scientists realized that the edge of the scarp had once covered the rocks they were sampling, but over time the cliff had worn away, exposing the new rock underneath.

While the rover couldn't dig underneath the scarp, it could drill right by the base of it. This meant the scientists could test where radiation exposure was still very low. If any organic carbon exists in Gale Crater, the foot of one of these cliffs would be the best place to search for it, the scientists believed.

The scientists plan to take this information and run with it. But, they can only run as fast as the rover's top speed (of just 1.57 inches per second on flat ground) will allow.

In about two months, Curiosity will take a detour to an interesting cliff called KMS-9, Grotzinger said on Monday. Scientists are not sure whether it held a lake, but they hope to ride right up to a protected spot of rock and then use Curiosity's drill for more testing.

"You just never know what you'll encounter," said NASA scientist Douglas Ming, who led the study. "One thing I've come to expect, doing Mars research, is to expect the unexpected."