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Water discovered in Martian soil



By **Elizabeth Landau**, CNN
updated 12:47 PM EDT, Wed October 2, 2013 | Filed under: **Innovations**

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The Curiosity rover took this image on September 10 of a rock formation informally dubbed "Darwin," first noted from the orbiting spacecraft. Scientists had the rover stop in this region, called Waypoint 1, because it appears to be a prime area to study the inner makeup and history of the floor of the Gale Crater. Analysis of Darwin may provide evidence of whether and how water played a role in the layering of rocks in this region. The rover touched down on Mars on the morning of August 6, 2012, with a mission to explore Gale Crater, which was thought to have once hosted flowing water, and find out if that environment was once habitable.

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Space

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updated 2:51 PM EDT, Sun September 29, 2013



Exploring with fancy orbiting telescopes like the Hubble is pretty routine for NASA. But the space agency is going low-tech to get a good look at an eagerly anticipated comet.

Voyager 1 first human-made object to leave solar system

updated 11:36 AM EDT, Wed October 2, 2013



Scientists have evidence that NASA's Voyager 1 probe has reached interstellar space, making history as the first human-made object to leave the the heliosphere.

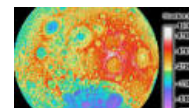
Water discovered in Martian soil
updated 12:47 PM EDT, Wed October 2, 2013



Scoop up some soil on Mars, heat it up, cool down the steam and ... slurp, slurp! You've got water!

NASA sends unmanned rocket to the moon

updated 3:18 AM EDT, Sat September 7, 2013



NASA launched an unmanned rocket to the moon Friday night to study its lunar atmosphere and environment.

Rocket frog takes a flying leap
updated 7:45 PM EDT, Thu September 12, 2013

Photos: Mars rover Curiosity

HIDE CAPTION



STORY HIGHLIGHTS

Mars rover Curiosity heated up soil to get water vapor

Astronauts may some day be able to use this as a water source

Scientists have identified two main soil types in Gale Crater

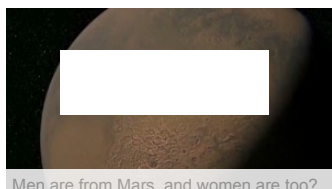
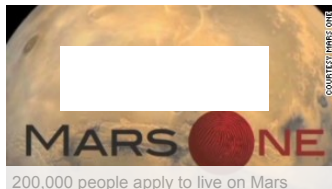
(CNN) -- Scoop up some soil on Mars, heat it up, cool down the steam and ... slurp, slurp! You've got water!

Mars might appear dry as a desert, but astronauts may someday be able to tap its soil to quench their thirst. Research recently published suggests that the soil from the Martian surface contains about 2% water by weight.

This is one of several insights emerging from data that the Mars rover Curiosity has been collecting. Five studies in the journal Science were published last week based on data from the rover's first 100 days on the Red Planet.

"The community was surprised that there was a large amount of water trapped in the ... Martian soil," said Chris Webster, manager of NASA's Planetary Sciences Instruments Office.

Curiosity, representing a \$2.5 billion NASA mission, has been on Mars since it made a dramatic landing there August 6, 2012. Earthlings celebrated as the two-ton rover arrived, carrying with it the most sophisticated suite of instruments and cameras to explore the surface of another planet.



Thanks to Curiosity, scientists now know more than ever about the composition of the Martian soil.

"It's the first time that the soil has been analyzed at this level of accuracy," Webster said.

Turning on the faucet

The rover's Sample Analysis at Mars (SAM) instrument helped scientists probe the soil by heating a sample up to 835 degrees Celsius.

The gases that came off included oxygen and chlorine as well as water vapor. Based on the ratio of isotopes within, scientists believe this water is coming from the recent Martian atmosphere.

"If you take about a cubic foot of dirt with the amount of water that we found and heated it up, you could get a couple of pints of water out of that," said Laurie Leshin, dean of science at Rensselaer Polytechnic Institute in New York, who led this study. "It was kind of exciting to me to see that, wow, it would be a significant amount."

More broadly, the analysis gives us new information about the hydrological cycle on Mars, said John Grotzinger, lead scientist on the Curiosity mission.

"Somehow, there's a process on Mars where, even though there are just trace quantities of water in Mars's atmosphere, this noncrystalline material is able to absorb it like a sponge and bind it into its framework," Grotzinger said.

The technical details about how future astronauts would use the soil as a resource for water haven't been worked out, Webster said. A condenser would be required to cool the water steam into a liquid form after heating up the soil. But from what we know so far, he said, it would be drinkable.

"This is a reservoir for water on Mars that we had not really appreciated before," Grotzinger said.

More than 100,000 want to go to Mars and not return

Soil types

Scientists are also learning about the diversity of the soil on Mars.

Pierre-Yves Meslin, a scientist at Universite de Toulouse in Toulouse, France, and colleagues used data from an instrument that fires a laser to analyze the soil and rock on Mars. It's called the ChemCam Remote Micro-Imager.

One main soil type on Mars, they said, is made of fine-grained particles and carries a significant amount of hydrogen. Scientists say this reflects the dust that covers the whole Martian surface. The dust that covers Mars is more akin to a fine sand than the fluffy film on the



Frogggsss in spaaacccceee!

Explore space from Earth

updated 9:05 AM EDT, Wed October 2, 2013



A one-way ticket to Mars.

New eyes for space station

updated 9:14 AM EDT, Thu August 15, 2013



A new window on your life may soon be opened from space -- in high quality video and in almost real-time.

Buzz: Space for everyone

updated 10:21 PM EDT, Thu August 6, 2013



Buzz Aldrin is one of the few to have walked on the moon, but he hopes space tourism will be for the masses.

Mars rover Curiosity celebrates 1 year

updated 9:28 AM EDT, Tue August 6, 2013



Here's what we've learned about the red planet over the course of a year.

Martian atmosphere destroyed long ago

updated 3:31 PM EDT, Sat July 20, 2013



If we want to see a live Martian, even a tiny microbial one, we may be billions of years too late.

World's gold came from collisions of dead stars

updated 5:57 PM EDT, Thu July 18, 2013



All that glitters is not gold, they say. But all the gold in the world may come from astronomical events that send a lot of high-energy light out in space.

NASA cuts spacewalk short

updated 2:25 PM EDT, Tue July 16, 2013



Water observed pooling inside an astronaut's helmet was reason enough for NASA to cut short a spacewalk.

Azure blue planet where it rains glass

updated 6:17 PM EDT, Sun July 14, 2013

floors of neglected attics on Earth, Webster said.

The other main soil type was coarse and is local to Gale Crater, the area where the rover is exploring. These particles, up to 1 millimeter in size, reflects what rocks in this area are made of.

Previous rovers -- Pathfinder, Spirit and Opportunity -- had less sophisticated technology to analyze soil but their insights about the mineral composition of the Martian soil are similar to what Curiosity found, Meslin said.

With ChemCam and Curiosity's other instruments, the latest rover can give scientists a deeper understanding of the composition, as well as how this soil was formed.

Complications with organics

New scientific insights also present the issue of chemical compounds that may complicate the search for life on Mars.

Curiosity is not capable of detecting life directly; it wouldn't confirm either modern life or ancient fossil organisms. It can, however, determine if the ancient environment was habitable -- which the rover told us it was -- and look for organic compounds.

Finding those compounds wouldn't prove the existence of life, either, because they can come from other sources. But the appearance of organic molecules would suggest that the environment is good at preserving them.

The release of chlorine and oxygen when the rover heated up soil suggests the presence of a chemical called perchlorate, at a 0.5% level in the soil, Leshin said. This substance can destroy organic carbon in a chemical reaction when the rover heats up soil. And so far, Curiosity has not directly detected organics in the soil.

Potentially the rover could avoid this problem using alternative techniques, which wouldn't heat the soil so much that perchlorates break down.

"Perchlorate is reacting with some organic compound to produce these simple molecules," Grotzinger said. "It leaves us asking the question: Is this from Mars, or is it something we brought with us? And right now we don't know."

Perchlorate in the planet's abundant dust could present a toxicity problem to humans on Mars; on Earth, it's known to cause thyroid problems, Leshin said.

The dust could generally pose a health problem as well -- both physically interfering with respiration and being a chemical hazard. Mars is known to have massive dust storms.

"It's one of the significant concerns to human exploration," Webster said.

Still no methane

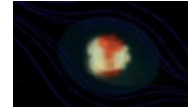
Scientists are interested in whether Mars has methane gas, which could be an indicator of the planet's habitability. About 90% to 95% of the methane in Earth's atmosphere is biologically derived, said Sushil Atreya, a University of Michigan researcher and co-investigator for



Astronomers have found a deep azure blue planet orbiting a star 63 light years away -- the first time they've been able to determine the actual color of a planet outside our solar system.

Space probe sees solar system's tail

updated 6:37 PM EDT, Wed July 10, 2013



Thanks to solar wind blowing out from the sun in all directions at a million miles per hour, material from comets gets whipped back into a formation that looks like a tail.

2020 mission to Mars

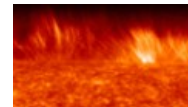
updated 10:40 AM EDT, Wed July 10, 2013



Life on Mars? Maybe we'll finally get a chance to find out.

NASA telescope to study mysterious part of the sun

updated 2:05 PM EDT, Fri June 28, 2013



How do the outer reaches of the sun get so hot?

Scientists find black hole bonanza

updated 5:45 PM EDT, Fri June 14, 2013



You're in no danger of falling in, but a large group of possible cosmic vacuum cleaners have just been identified.

Shields up! Scientists work on deflector device

updated 12:39 PM EDT, Tue July 2, 2013



You've answered the call for volunteers, signed up for the Mars trip and you are looking forward to boldly going to space, the final frontier, to explore a strange new world.

Newly found planets might support life

updated 11:32 AM EDT, Wed June 26, 2013



Our everyday concerns seem small when we consider that there's a whole universe out there where other life may exist.

NASA shoots for asteroid, new manned missions

updated 12:14 PM EDT, Thu April 11, 2013



NASA plans to capture an asteroid and start sending astronauts aloft again by 2017, even with a tighter budget.

NASA: Yes, Mars could have hosted

SAM, said in November 2012.

But the rover still has not detected methane gas, as [scientists noted in Science](#) earlier in September.

Even if there were methane, nonbiological sources such as volcanic activity can produce it.

It's still possible that methane will turn up in future measurements, however, Webster said.

[Studies: Martian atmosphere was destroyed long ago](#)

Where it's going now

Curiosity is about one-fifth of the way to Mount Sharp, its final destination, where it will climb while testing the peak's sedimentary layers that have formed over time. Mount Sharp is 3.4 miles high, and its rock layers represent a series of chapters of the planet's history and the environmental conditions present in various eras.

Along the way, the rover stopped at a location called Waypoint 1, where scientists found a conglomerate rock that would have been found in an ancient stream bed. The rock with the pebbles has strange veins, filled with material that scientists don't quite understand.

"The implication of that is that again we're seeing the involvement of water, and it looks like this water was very widespread across the landing area," Grotzinger said.

It appears that the river would have extended from the rover's landing site all the way to Waypoint 1. The entire area that Curiosity has been driving across would have been covered by a stream bed, at one point or another, in the ancient history of Mars.

Curiosity isn't the only moving human-made object on Mars. The Opportunity rover, which launched in 2004, is still chugging along.

In 2020, NASA [plans to send](#) an even more advanced rover to "explore and assess Mars as a potential habitat for life, search for signs of past life, collect carefully selected samples for possible future return to Earth, and demonstrate technology for future human exploration of the Red Planet."

NASA recently [announced a competition](#) for proposals of what instruments the 2020 rover could carry.

It, too, may get humans closer to drinking water, and possibly even showering, on Mars.

[Follow Elizabeth Landau on Twitter at @lizlandau](#)

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life

updated 12:22 PM EDT, Wed March 13, 2013



Curiosity, humanity's most powerful rover to land on Mars, has made a startling discovery: Conditions that could have supported life once existed there.

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