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Mars rover finds evidence of ancient habitability

Curiosity discovers water-borne minerals in first drill-sample analysis.

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NASA's Curiosity rover has found what it went to Mars to look for: evidence of an environment that could have once supported life.

Chemical analyses show that a greyish powder taken from the rover's first drilled rock sample contains clay minerals formed in water that was slightly salty, and neither too acidic nor too alkaline for life.

"If this water was around and you had been on the planet, you would have been able to drink it," says Curiosity project scientist John Grotzinger, a planetary geologist at the California Institute of Technology in Pasadena. He and other NASA researchers announced the findings today at a news briefing in Washington DC.

Previous missions to Mars have spotted clay minerals. And Curiosity itself had already found signs that liquid water once flowed across the surface. But the pinch of powder tested by Curiosity, from a rock nicknamed John Klein, is the first hard evidence of water-borne clays in a benign pH environment. "This is the only definitive habitable environment that we've described and recorded," says David Blake, principal investigator for the rover's Chemistry and Mineralogy instrument (CheMin) at NASA's Ames Research Center in Moffett Field, California.

NASA/JPL-Caltech/Cornell/MSSS

A sample from this 1.6-centimetre-wide drill hole contains minerals formed in salty water.

An X-ray analysis by CheMin showed that the ground-up rock comprised mostly igneous minerals such as feldspar, pyroxene, olivine and magnetite. But at least 20% of the rock was made up of clay minerals, such as smectite, that form in the presence of water. The salts in the rock, such as halite, are of the sort that life tolerates, Blake says, unlike the iron salts found elsewhere on Mars by the rover Opportunity, which indicate an acidic environment.

A second instrument on Curiosity, known as the Sample Analysis at Mars (SAM), heated a fraction of a gram of powder and analysed the gases released. Water was released from the sample at relatively high temperatures, which is characteristic of clay minerals and a good confirmation of CheMin's findings, says Paul Mahaffy, principal investigator for SAM at NASA's Goddard Space Flight Center in Greenbelt, Maryland.

The discovery means that the six-wheeled Curiosity rover will linger longer at the bottom of Gale Crater, Grotzinger says. Engineers are now troubleshooting a memory glitch that caused Curiosity's main computer to switch to a backup on 28 February. Earlier recovery efforts were delayed when mission managers shut the rover down, to protect against a solar radiation storm that washed over Mars earlier this month.

Science operations are expected to resume within a few days but will halt again in April, when Mars moves behind the Sun as seen from Earth. After communications resume, Grotzinger says, Curiosity will try drilling into John Klein again before packing up and starting the 10-kilometre drive to its ultimate destination, a 5-kilometre-tall peak known as Aeolis Mons.

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