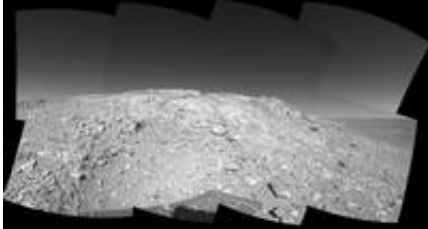


# Mars Rovers Continue Exploration

August 5 2004

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NASA's Spirit rover has climbed higher into rocky hills on Mars, and its twin, Opportunity, has descended deeper into a crater, but both rovers, for the time being, are operating with some restrictions while team members diagnose unexpected behavior.

Both rovers have successfully operated for more than double the span of their three-month primary missions. They have been conducting bonus science in extended missions since April.

While Spirit was executing commands on Aug. 1, a semiconductor component failed to power on as intended. The component, a programmable gate array, directly affects usability of the rover's three spectrometer instruments. Subsequent commands for using the miniature thermal emission spectrometer in that day's sequence resulted in repeated error messages.

Engineers on the Mars Exploration Rover team at NASA's Jet

Propulsion Laboratory, Pasadena, Calif., have determined the most likely cause is a timing issue of one instruction reaching the gate array microseconds before another that was intended to precede it. If that diagnosis is confirmed, a repeat could be avoided by inserting a delay between commands that might reproduce the problem, engineers expect. Until then, the rover science team's daily choices for how to use Spirit do not include using the miniature thermal emission spectrometer, the Moessbauer spectrometer or the alpha particle X-ray spectrometer.

"While we're being very cautious in how we operate today and tomorrow, we expect to verify the problem and resolve this issue with a relatively easy workaround," said JPL's Jim Erickson, project manager for the twin rovers.

Spirit has driven to a bedrock exposure near the top of a spur of the "Columbia Hills." The location sits about nine meters (30 feet) above a plain that the rover crossed for months to get from its landing site to the hills. Planners intend for Spirit to spend more than a week at this site, inspecting the rock exposure, dubbed "Clovis," and recording the panoramic scene from this viewpoint.

Halfway around Mars, Opportunity has driven about 20 meters (66 feet) into "Endurance Crater," examining increasingly older layers of bedrock as it advances. If assessments of traversability continue giving positive indications, the rover team plans next to send Opportunity counterclockwise across the inner slope of the crater to study possible targets of dune tendrils, boulders and the base of a cliff.

Four times in the past two weeks, Opportunity has sent error messages while successfully taking pictures with its microscopic imager. One theory for the cause is degradation of flexible cabling that runs down the rover's robotic arm to the instrument. As a precaution while undertaking further analysis, the rover team is treating use of the arm as a

consumable resource, with cable wear each time the arm is moved decreasing the possible number of future microscopic images.

"We are being very conservative about this because we certainly don't want to do anything to jeopardize the instruments," said Dr. Ken Herkenhoff of the U.S. Geological Survey Astrogeology Team, Flagstaff, Ariz., lead scientist for both rovers' microscopic imagers. "We are running more diagnostics that we hope will identify the problem. There are potential explanations that would mean we do not have to treat arm use as a consumable."

Erickson said, "We will no doubt have more issues with them in the future. We'll do everything we can to milk the most value out of them while they are usable, but they won't last forever."

JPL, a division of the California Institute of Technology in Pasadena, manages the Mars Exploration Rover project for NASA's Science Mission Directorate, Washington. Additional information about the project is available from JPL at [marsrovers.jpl.nasa.gov/](http://marsrovers.jpl.nasa.gov/) and from Cornell University, Ithaca, N.Y., at [athena.cornell.edu](http://athena.cornell.edu).

Source: [NASA](#)

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