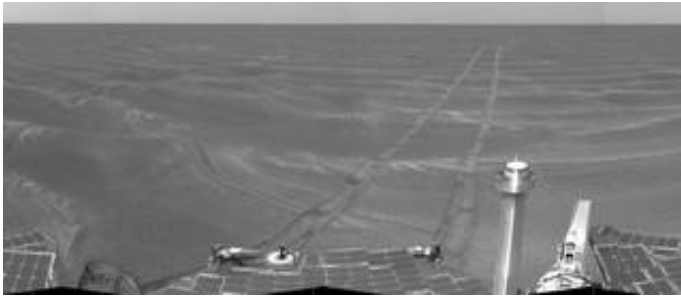


Mars Rovers Break Driving Records, Examine Salty Soil

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On three consecutive days, NASA's Mars Exploration Rover Opportunity accomplished unprecedented feats of martian motion, covering more total ground in that period than either Opportunity or its twin, Spirit, did in their first 70 days on Mars.

Spirit, meanwhile, has uncovered soil that is more than half salt, adding to the evidence for Mars' wet past. The golf-cart-size robots successfully completed their three-month primary missions in April 2004 and are continuing extended mission operations.

Image: Opportunity used its navigation camera to take the images combined into this view of the rover's surroundings on Opportunity's 387th martian day, or sol (Feb. 24, 2005). (NASA)

Opportunity set a one-day distance record for martian driving, 177.5

meters (582 feet), on Feb. 19. That was the first day of a three-day plan transmitted to the rover as a combined set of weekend instructions. During the preceding week, engineers at NASA's Jet Propulsion Laboratory had sent Opportunity and Spirit an upgrade of the rovers' software, onboard intelligence the rovers use for carrying out day-to-day commands.

The new record exceeded a two-week old former best by 13 percent. As on all previous long drives by either rover, the traverse began with "blind" driving, in which the rover followed a route determined in advance by rover planners at JPL using stereo images. That portion lasted an hour and covered most of the day's distance. Then Opportunity switched to "autonomous" driving for two and a half hours, pausing every 2 meters (6.6 feet) to look ahead for obstacles as it chose its own route ahead.

The next day, Opportunity used its new software to start another drive navigating for itself. "This is the first time either rover has picked up on a second day with continued autonomous driving," said Dr. Mark Maimone, rover mobility software engineer at JPL. "It's good to sit back and let the rover do the driving for us."

Not only did Opportunity avoid obstacles for four hours of driving, it covered more ground than a football field. Opportunity has a favorable power situation, due to relatively clean solar panels and increasing minutes of daylight each day as spring approaches in Mars' southern hemisphere. This allows several hours of operations daily.

On the third day of the three-day plan, the robotic geologist continued navigating itself and drove even farther, 109 meters (357 feet), pushing the three-day total to 390 meters (nearly a quarter mile). In one long weekend, Opportunity covered a distance equivalent to more than half of the 600 meters that had been part of each rover's original mission-

success criteria during their first three months on Mars.

Opportunity has now driven 3,014 meters (1.87 miles) since landing; Spirit even farther, 4,157 meters (2.58 miles). Opportunity is heading south toward a rugged landscape called "etched terrain," where it might find exposures of deeper layers of bedrock than it has seen so far. Spirit is climbing "Husband Hill," with a pause on a ridge overlooking a valley north of the summit to see whether any potential targets below warrant a side trip.

As Spirit struggled up the slope approaching the ridgeline, the rover's wheels churned up soil that grabbed scientists' attention. "This was an absolutely serendipitous discovery," said Dr. Steve Squyres of Cornell University, Ithaca, N.Y., principal investigator for the rovers' science instruments. "We said, 'My gosh, that soil looks very bright. Before we go away, we should at least take a taste.'"

The bright patch of disturbed soil, dubbed "Paso Robles," has the highest salt concentration of any rock or soil ever examined on Mars. Combined information gained from inspecting it with Spirit's three spectrometers and panoramic camera suggests its main ingredient is an iron sulfate salt with water molecules bound into the mineral. The soil patch is also rich in phosphorus, but not otherwise like a high-phosphorus rock, called "Wishstone," that Spirit examined in December. "We're still trying to work out what this means, but clearly, with this much salt around, water had a hand here," Squyres said.

Meanwhile, scientists are re-calibrating data from both rovers' alpha particle X-ray spectrometers. These instruments are used to assess targets' elemental composition. The sensor heads for the two instruments were switched before launch. Therefore, data that Opportunity's spectrometer has collected have been analyzed using calibration files for Spirit's, and vice-versa. Fortunately, because the sensor heads are nearly

identical, the effect on the elemental abundances determined by the instruments was very small. The scientists have taken this opportunity to go back and review the results for the mission so far and re-compute using correct calibration files. "The effect in all cases was less than the uncertainties in results, so none of our science conclusions are affected," Squyres said.

Source: NASA

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