

1000 'Missions' And Counting

June 16 2005

ITHACA, N.Y., June 16 (SPX) -- Luck, it has been said, favors the well prepared. That explains, perhaps, the fortune of the plucky Mars rovers Spirit and Opportunity - and their creators back on Earth, including Cornell Professor Steve Squyres, scientific leader of the NASA mission.

To say June has been a good month for the Mars Expedition Rover (MER) team is - well, like saying getting to Mars is a bit of a hike. The mission has been, for the scientists and engineers who expected the rovers to explore the planet for 90 days, a remarkable 17-month adventure.

And it's not over. On June 4, Opportunity escaped from the sand trap now called Purgatory Dune. And last week Spirit, in Gusev crater on the opposite side of Mars, discovered a basaltic rock - valuable because its characteristics vary slightly from the rocks around it.

Opportunity's escape was a long-awaited thrill. The rover, which found itself unexpectedly mired in deep sand on Meridiani Planum on April 26, had been making slow, steady progress - turning its wheels 192 meters between May 13 and June 4. Each day, it gained a few centimeters.

And then, suddenly, it was free. "There was no ambiguity," said Squyres. "It was like night and day."

The news came in on the morning of June 4. "I knew instantly that we were out," said Cornell senior research associate Rob Sullivan, who with

Jet Propulsion Laboratory mobility engineer Jeffrey Biesiadecki and a small group of scientists and engineers built a giant sandbox - filled with sand, clay, and material used to treat swimming pools - to simulate the conditions on Mars.

("We cleaned out hardware stores and at least one Home Depot for some of these materials," Sullivan said. "I think if people wanted to treat their pools that week, they were probably out of luck.")

Mindful that time spent in the dune was time lost from the mission, the team worked almost nonstop until Opportunity was free.

"We've had a feeling over the past several days that this was coming," Squyres wrote that evening.

"Still, it's hard to describe how good it felt to check out the downlink and see all six wheels back on solid ground again. You develop pretty strong feelings for these vehicles once you've spent enough time with them, and when one of them gets into trouble you really sweat it until the trouble is over."

The following Tuesday found the black-cowboy-booted Squyres in his office in the Space Sciences Building, chatting easily with students between MER planning teleconferences.

"I don't think I realized how nervous I was about being stuck," he said. "Until we got unstuck."

With Opportunity now in the clear, its next assignment is to turn 180 degrees and examine the treacherous area with its sensing arm. Images of the dune sent back by the rover's panoramic camera, or Pancam, already indicate that all six wheels dug more deeply into the soil than any previous intentional wheel-trenching activity (in which only one wheel is

used to dig a shallower hole).

"There are these deep ruts, like little mini-canyons," said Jim Bell, Pancam team leader and Cornell professor of astronomy. Understanding their composition and origin will help the team spot and avoid similar traps as Opportunity picks up its journey toward Erebus crater.

Just half a kilometer to the south, Erebus is another mystery. Unlike the dark, hematite-rich ground Opportunity has spent its time on so far, the crater looks intriguingly bright.

The brightness may be exposed bedrock, says Bell - or it may be something else entirely. "I would say bedrock is a good working hypothesis, but we haven't seen it up close," says Bell.

"And whether it's the same kind of bedrock we've seen at Eagle crater (where Opportunity landed) and Endurance Crater (whose rim it explored last year), we don't know. We're just antsy to get there."

So far, both rovers have found strong evidence that Mars was once wet enough to support life. From Opportunity, the evidence has been orbs of hematite "blueberries" in Eagle crater and rippled patterns in bedrock; from Spirit it's been high chlorine, bromine and sulfur levels in the Columbia Hills.

And concern for Opportunity aside, no one is neglecting Spirit. The first rover launched crossed a symbolic milestone June 3, completing its 500th sol (a sol is a Martian day, which lasts 24 hours, 39 minutes and 35 seconds) at work on the planet.

Faithfully toiling in the Columbia Hills, Spirit had its own touch of luck last week.

For weeks Spirit has been doing meticulous strike and dip measurements, collecting data scientists need to work out a history of geologic events in the area. (Strike is the compass direction of a horizontal line on an inclined plane; dip is the angle of inclination measured from the horizontal.)

The rover was about to set out on a complex drive south when its mini-thermal emission spectrometer (Mini-TES, which measures infrared radiation) caught a glimpse of the rock now called Backstay.

"Backstay was different than anything we saw before," said Squyres.

"It's a loose rock, not bedrock, so maybe it was ejected from someplace farther away, or someplace deeper. The Mini-TES spectrum is nothing wildly exotic . . . the thing certainly seems to be some kind of basalt. But if it's a flavor of basalt we haven't seen before, then it's definitely worth a quick look."

As serendipity would have it, he added, the rover's drive that day took it to within four meters of the rock. "It was like we were meant to be there."

Over the next few days, Spirit used its Rock Abrasion Tool (RAT) to brush the rock clean for its Alpha particle X-ray spectrometer (APXS), which confirmed the basalt's different composition.

On Thursday night, as Spirit examined Backstay, planners sent the next sol's instructions up to Opportunity. It was their 1,000th uplink.

"For people who aren't on the project, that probably doesn't matter," said Squyres. "But it's what we do. And we've done it 1,000 times now, and that's a big deal."

"Actually," he added, "we're up to 1,003 now. It just keeps going."

Luck? Probably not. Luck, after all, only goes so far.

But then there's careful planning and persistence; dedication and flexibility.

And like jaunty black cowboy boots, those never go out of style.

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