

Mars Exploration Rover Mission

**Spirit
and
Opportunity**



**Month in Review
October 9 - November 5**

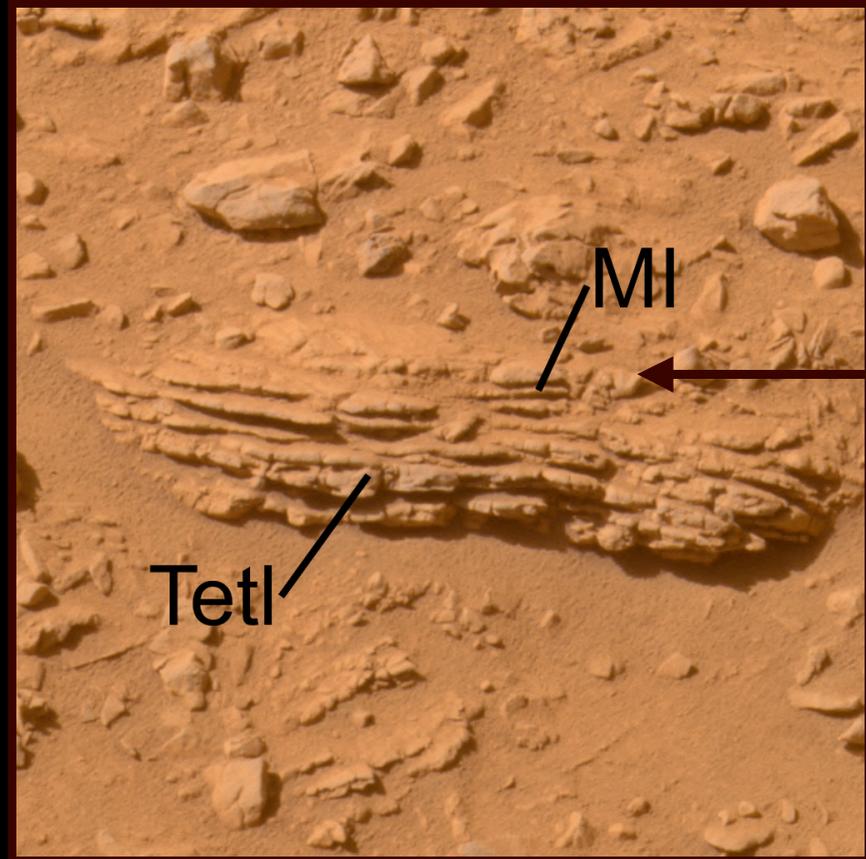
Both rovers have successfully completed their primary missions and first extended missions, and they began their second extended missions on October 1, 2004.



Panoramic camera image taken in the "Columbia Hills" on September 25, 2004.

This picture of the sundial-like calibration target was the rovers' 50,000th image taken on Mars.

Spirit examined the layered structure of this rock, called “Tetl,” in the Columbia Hills.



Area where Spirit used its microscopic imager to study the layers in more detail.

Approximate true-color panoramic image. Tetl is about 10 inches (25 centimeters) long.

Several possibilities exist to explain this type of layering. Volcanic ash may have fallen from the sky or flowed across the land. Alternatively, sediments may have been transported by water and deposited into layers.

Alternating layers of more-resistant and less-resistant material make up this portion of Tetl rock.

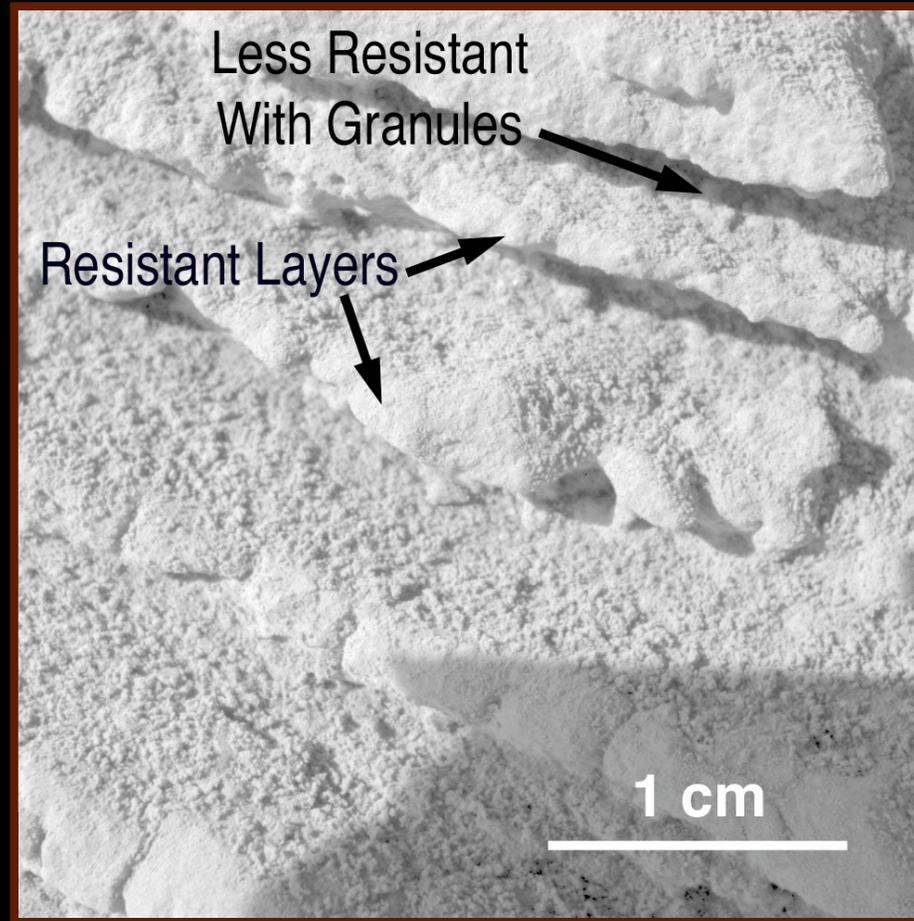
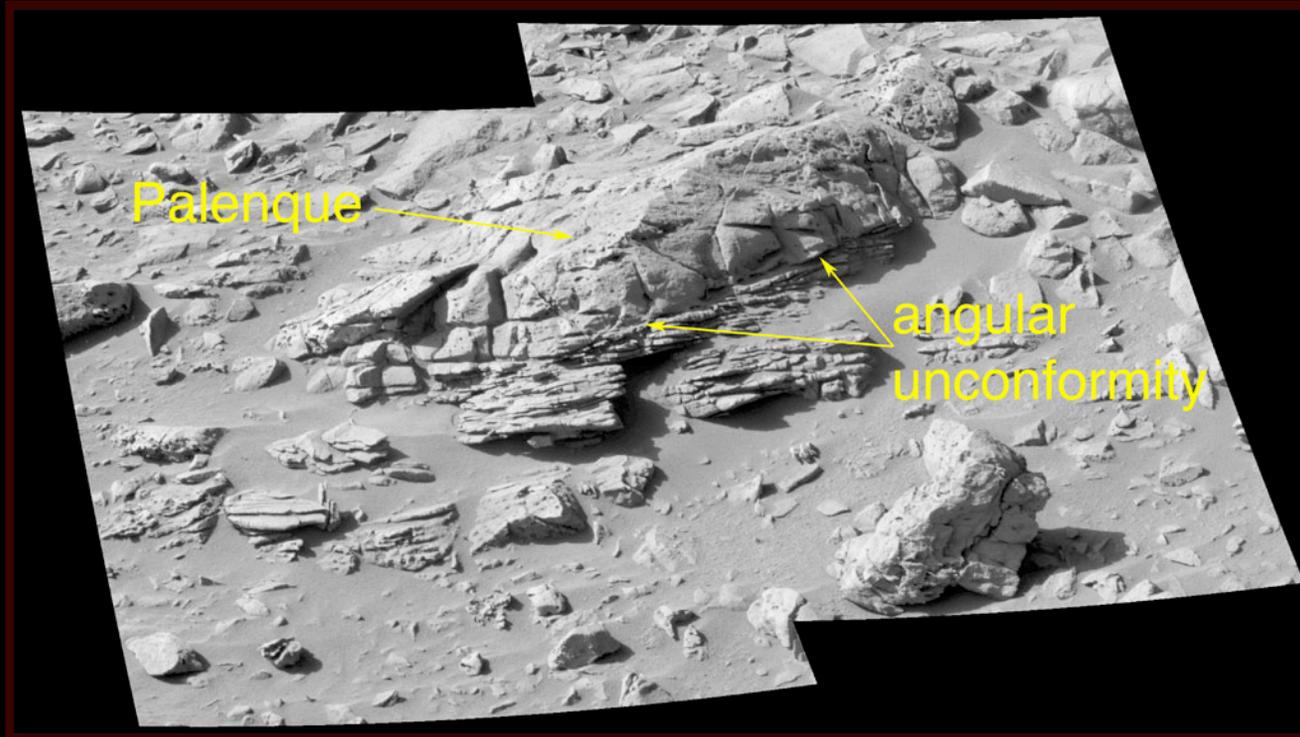


Image taken by the microscopic imager on October 7, 2004.

Granules of harder material can be seen eroding out of some layers.

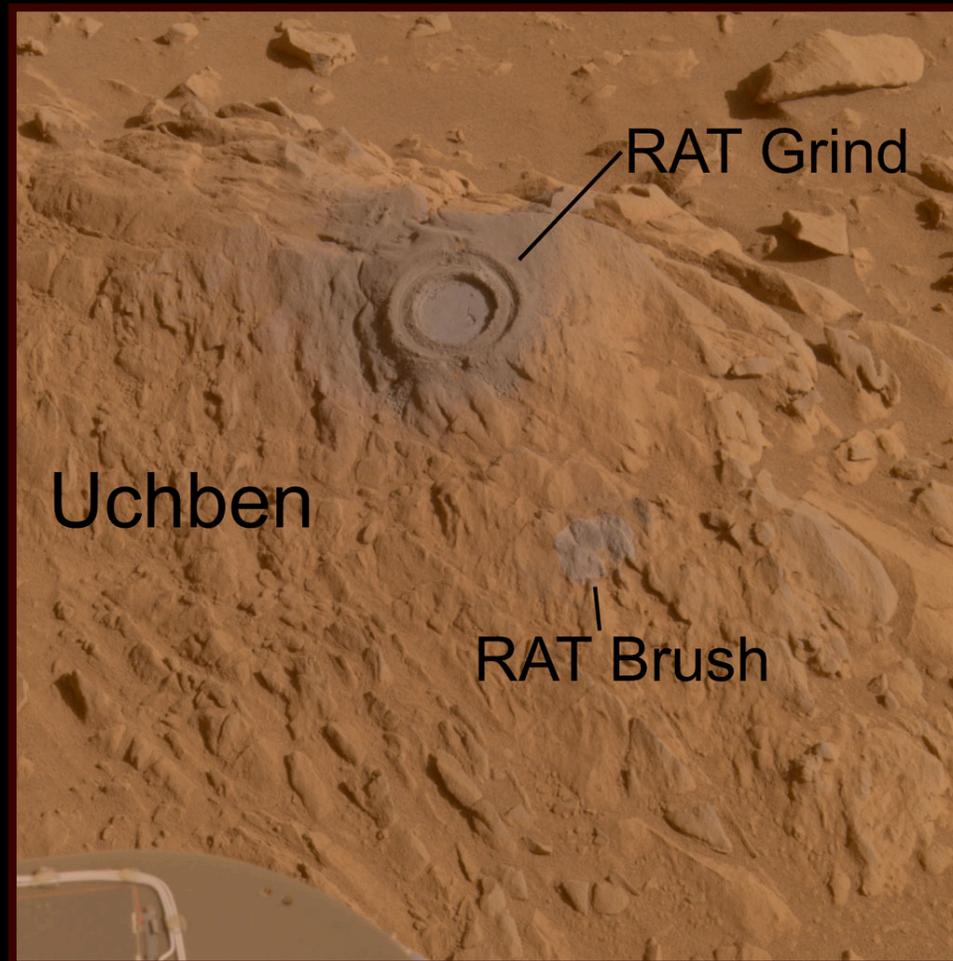
The rock “Palenque” has two different types of layering, which could mark a change in environmental conditions between the formation of the two portions of the rock.



Two panoramic camera images of Palenque in the Columbia Hills taken on October 14, 2004.

Scientists wanted to get closer, but Palenque is not located on a north-tilted slope, which is needed to keep the rover’s solar panels tilted toward the winter sun for sufficient energy.

Scientists used the Rock Abrasion Tool (RAT) to investigate a rock dubbed “Uchben.”

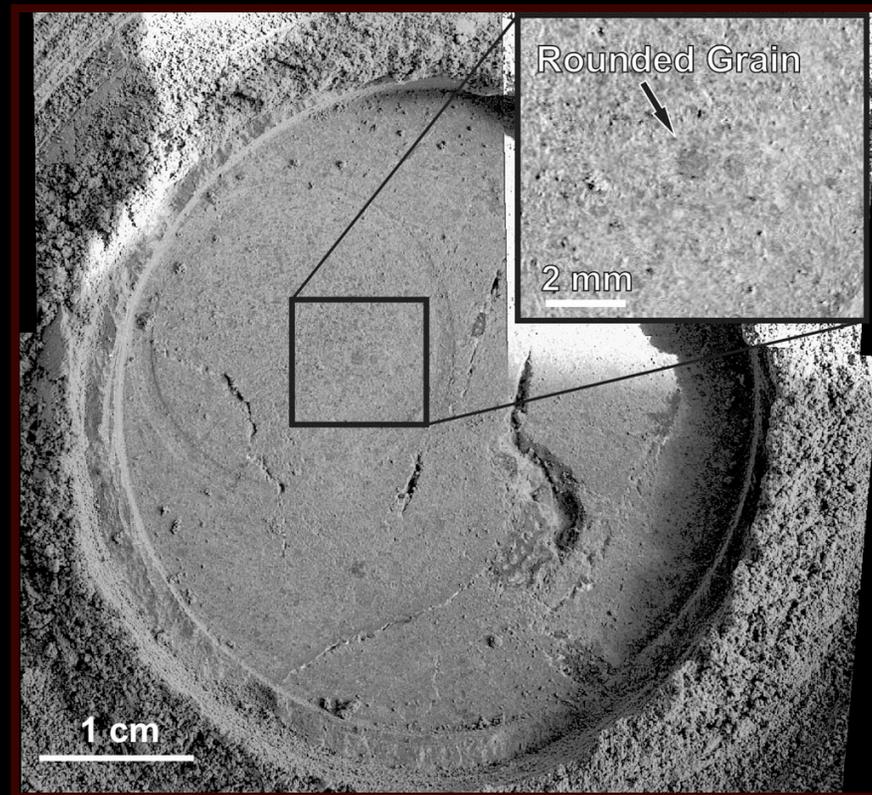


Panoramic camera image taken on October 29, 2004.

Spirit also used wire bristles to brush a section of the surface below to the right of the hole.

Close-up examination of Uchben reveals a variety of particle shapes and sizes in the rock's makeup, which suggests that the rock originated from particles that had not been transported very much by wind or water.

*Image taken by the
microscopic imager on
October 22, 2004.
The circle is 1.8 inches
(4.5 centimeters) in diameter.*



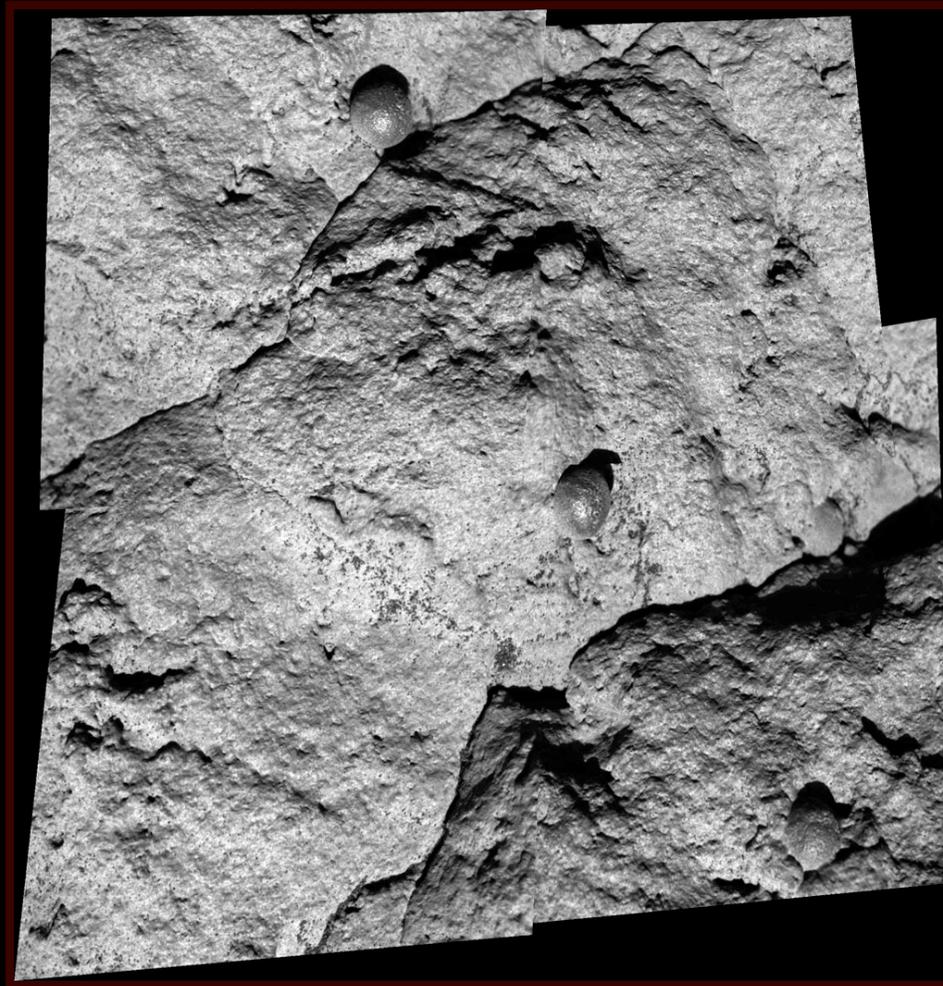
That's because such a transport process would likely have resulted in more sorting of the particles by size and shape.

Meanwhile, Opportunity's spectrometers and microscopic imager found consistent evidence that Wopmay and other rocks near the lower slopes of Endurance Crater were affected by water both before and after the crater formed.



False-color panoramic image of Wopmay taken on October 7, 2004. Wopmay is 3 feet (one meter) across.

This close-up look at the surface of Wopmay was given the informal target name “Twin Otter.”



*Close-up taken
by the microscopic imager
on October 15, 2004.
The area shown
is about 2.4 inches
(6 centimeters) across.*

**Twin Otter shows Wopmay’s crevices
and spherical concretions.**

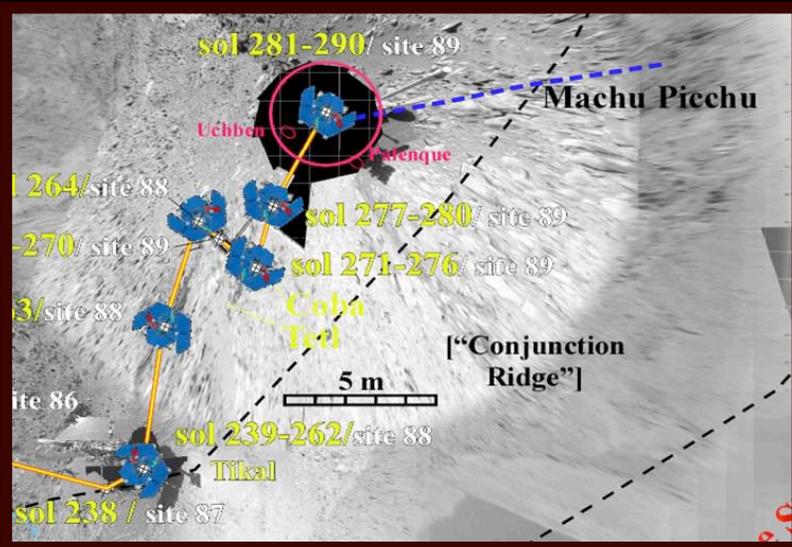
The slope of the ground and the loose material around Wopmay prevented Opportunity from getting close enough to use the rover's rock abrasion tool on the lumpy rock.



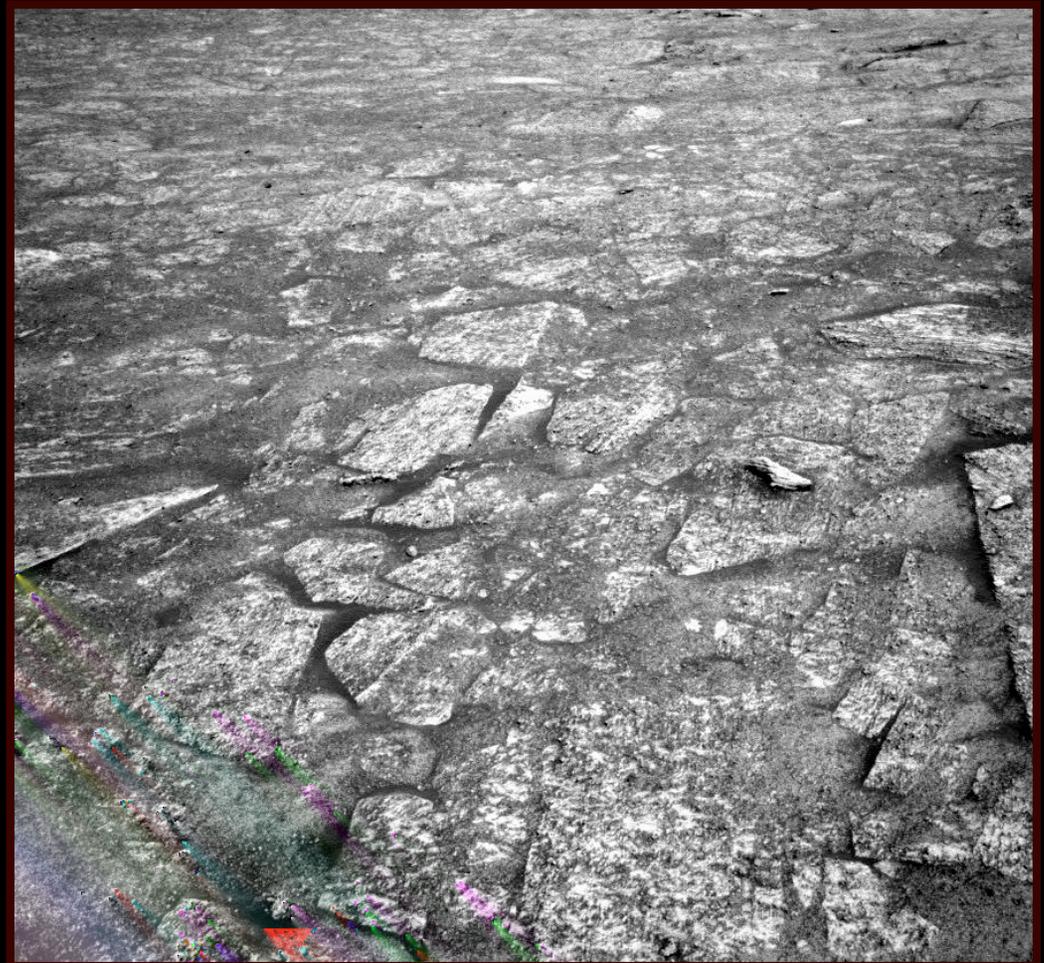
This navigation camera image taken on October 29, 2004 reveals wheel tracks from Opportunity where the rover struggled for traction around Wopmay inside Endurance Crater.



The mission team is taking fresh looks at the planned drive direction for Opportunity's "Escape Hatch" route to exit Endurance Crater.



Spirit's future plans are to drive to a target named "Machu Picchu" after an ancient Incan city in Peru.



Navigation camera, October 31, 2004
Base of "Burns Cliff" inside Endurance Crater.