

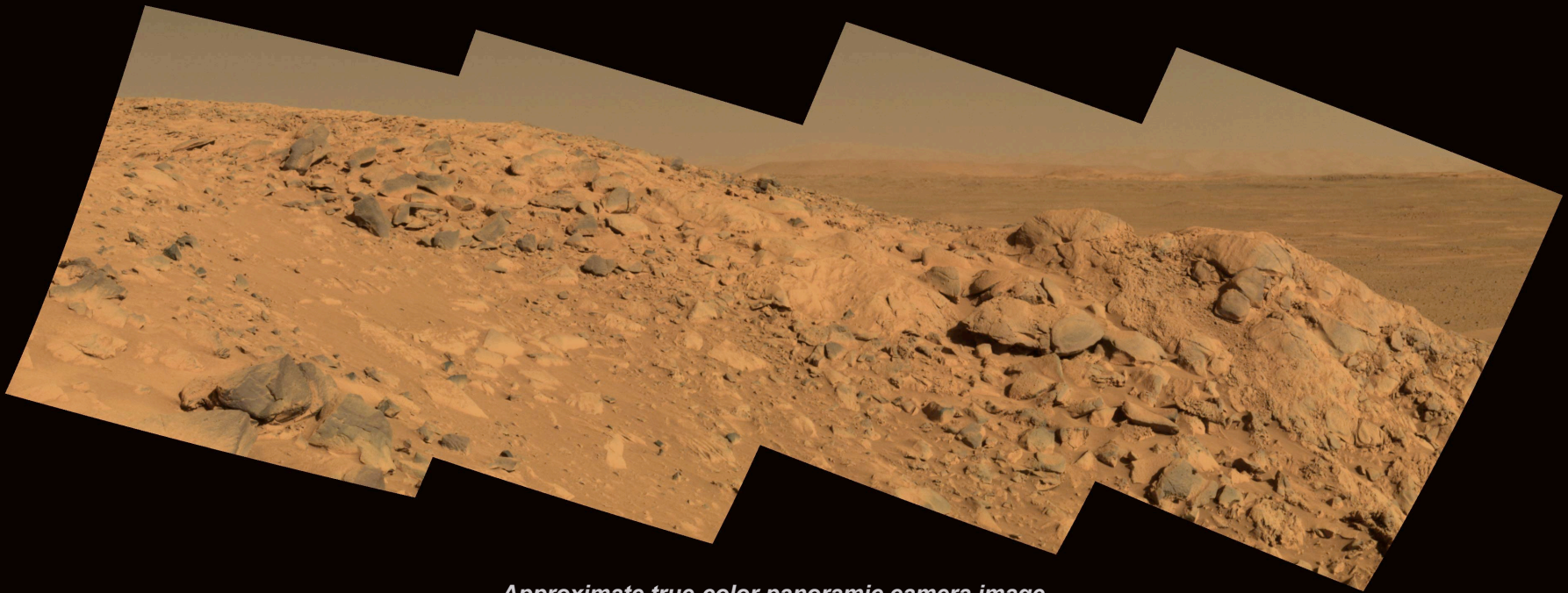
Mars Exploration Rover Mission

**Spirit
and
Opportunity**



**Week in Review
August 7 - August 20**

**Spirit has traveled more than 2.8 miles (3.5 kilometers)
for half a year to reach the outcrops
in the Columbia Hills.**



Approximate true-color panoramic camera image.

**This is a rock outcrop dubbed “Longhorn,”
and behind it are the sweeping plains of Gusev Crater.**

**The rim of the crater is on the horizon.
It is more visible now because the atmosphere
is less dusty than earlier in the mission.**

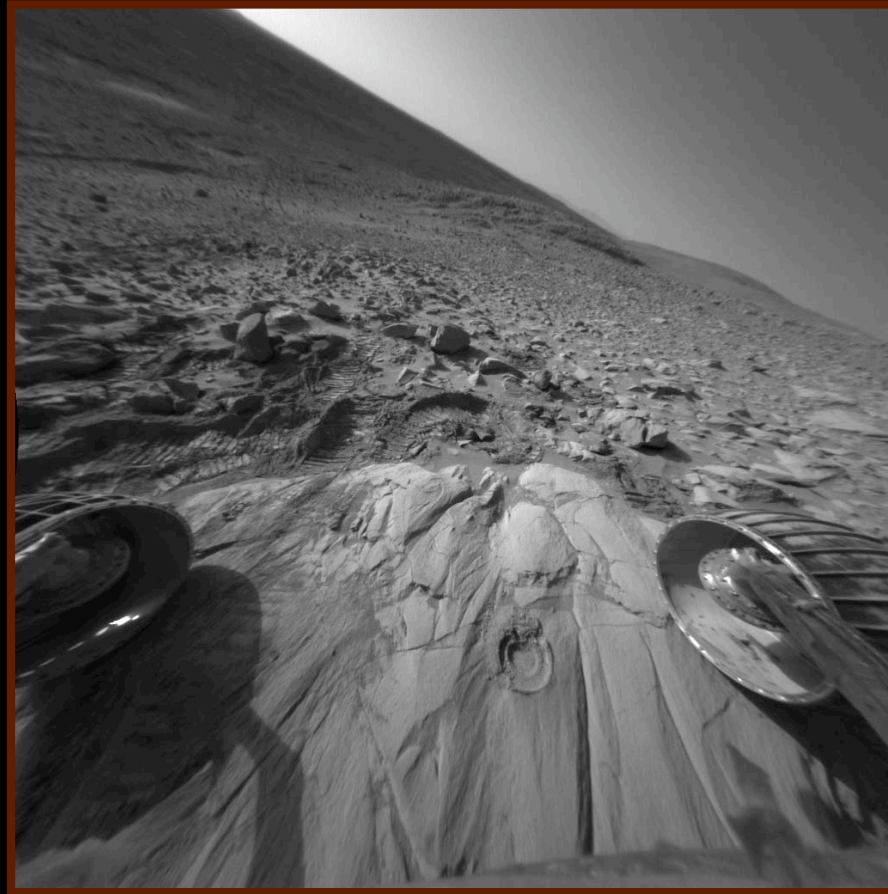
For a couple of weeks, Spirit has been extensively investigating “Clovis.”

Approximate true-color panoramic camera image taken August 13, 2004.



After the rover easily ground a hole into Clovis, it became clear that this rock, like Woolly Patch, is much softer than the basalt lava rocks studied previously at Gusev.

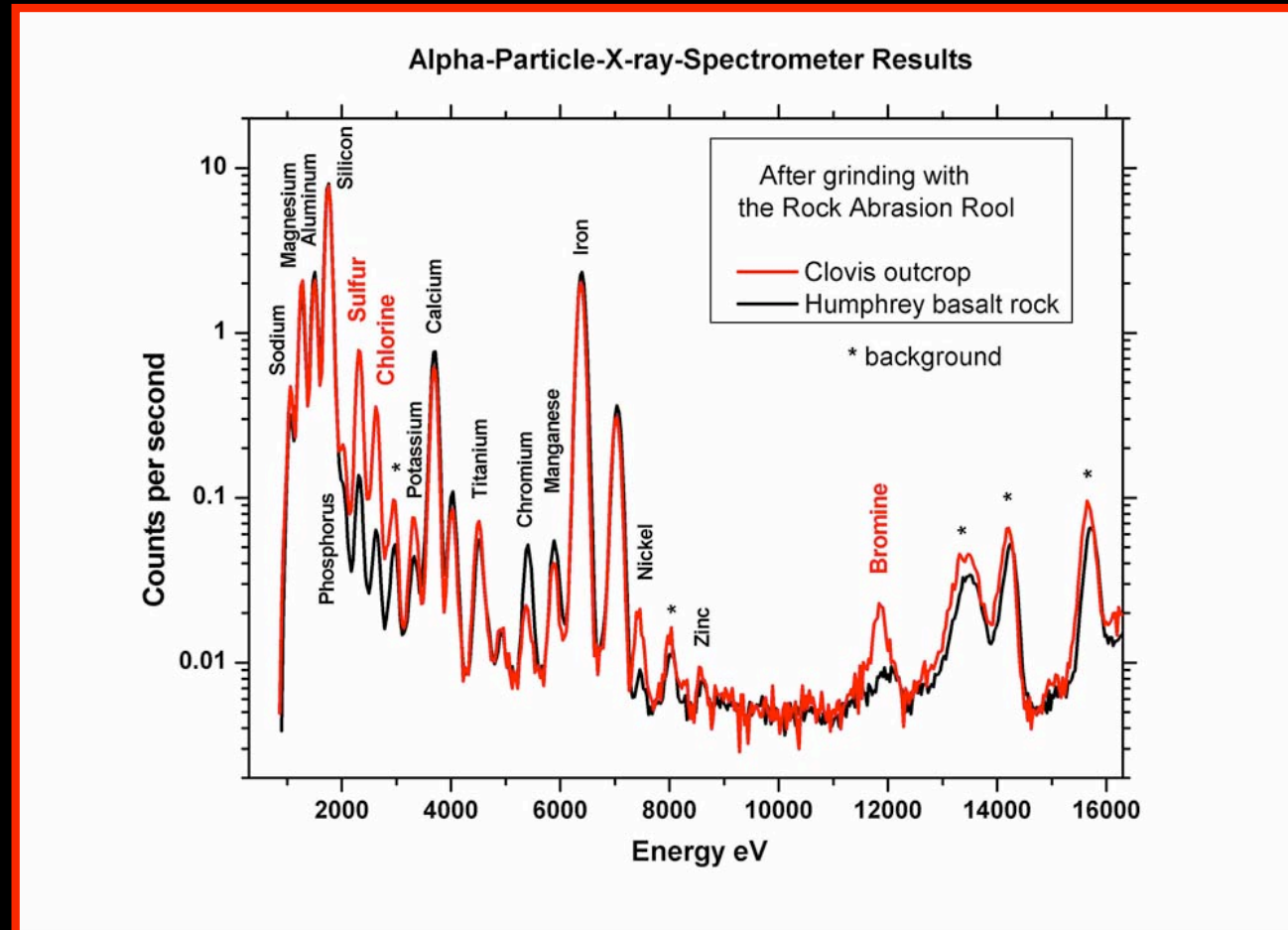
Spirit's initial chemical analysis of the hole dug into Clovis suggests that water was likely active in Gusev.



Navigation camera image taken on Spirit's sol 205.

Clovis has higher concentrations of sulfur, bromine, and chlorine compared to volcanic rocks in the plains.

These higher concentrations of sulfur, bromine, and chlorine indicate that fluids probably once flowed through the rock, depositing minerals containing these elements.



*Data from Spirit's alpha particle X-ray spectrometer after the rover dug into Clovis with its rock abrasion tool.
Image credit: NASA/JPL/Cornell/Max Planck Institute*

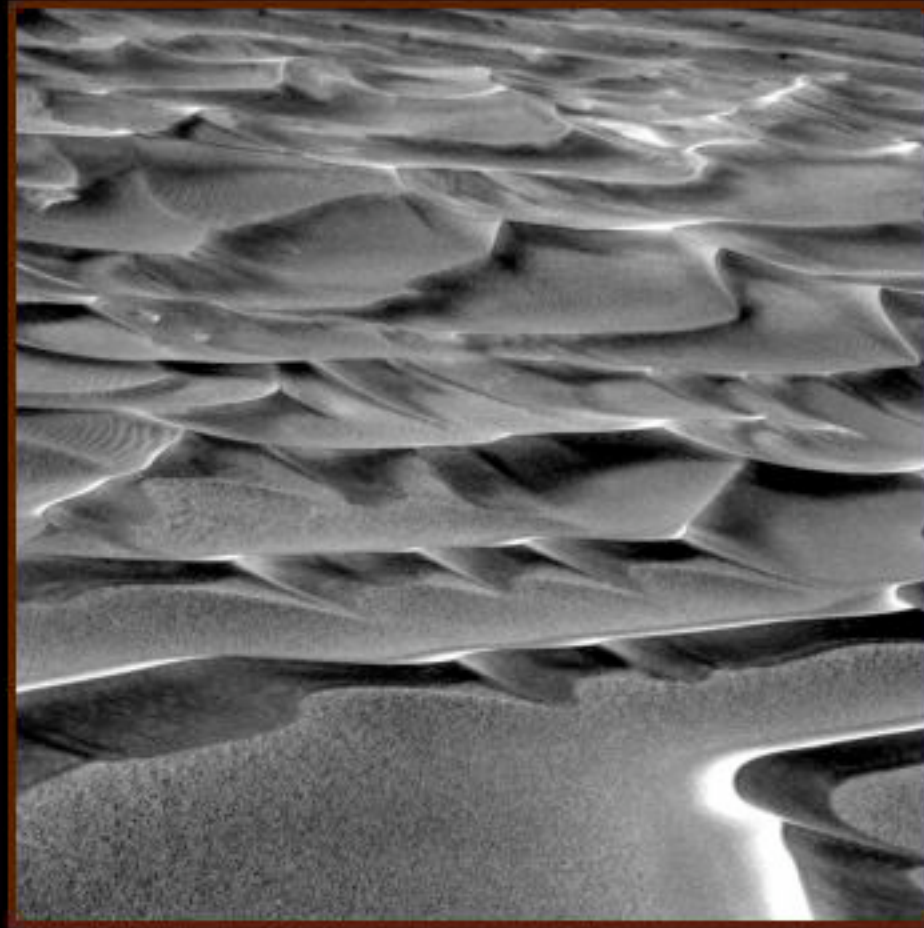
**A group of darker rocks dubbed “Toltecs”
are lying to the southeast of Spirit’s current position.**



False-color panoramic camera image taken on August 15, 2004.

**Scientists hope to use these presumably less altered
rocks as a standard for comparison to
strongly altered rocks like Clovis.**

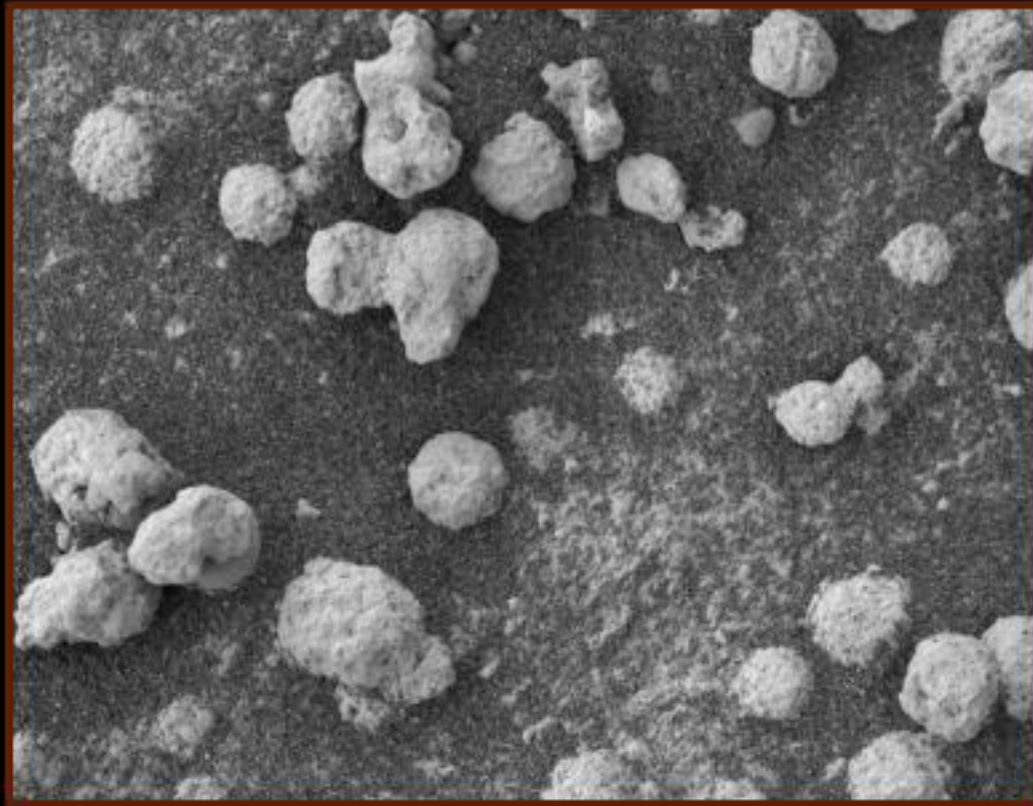
**Meanwhile, Opportunity neared the floor
of Endurance Crater.**



*Panoramic camera image
taken August 14, 2004.*

**The small scale ripples on top of larger dunes
suggest that wind has been moving these dunes
in geologically recent times.**

Opportunity found spherules on the surface of a rock dubbed “Bylot.” They are less round than the “blueberries” seen previously in Endurance Crater.



*Four-frame mosaic taken by the microscopic imager on August 15, 2004.
Image credit: NASA/JPL/Cornell/USGS*

Scientists are calling these light-colored, rough-textured spherules “popcorn.”

The red arrows point to blueberries partially covered with “popcorn” material.

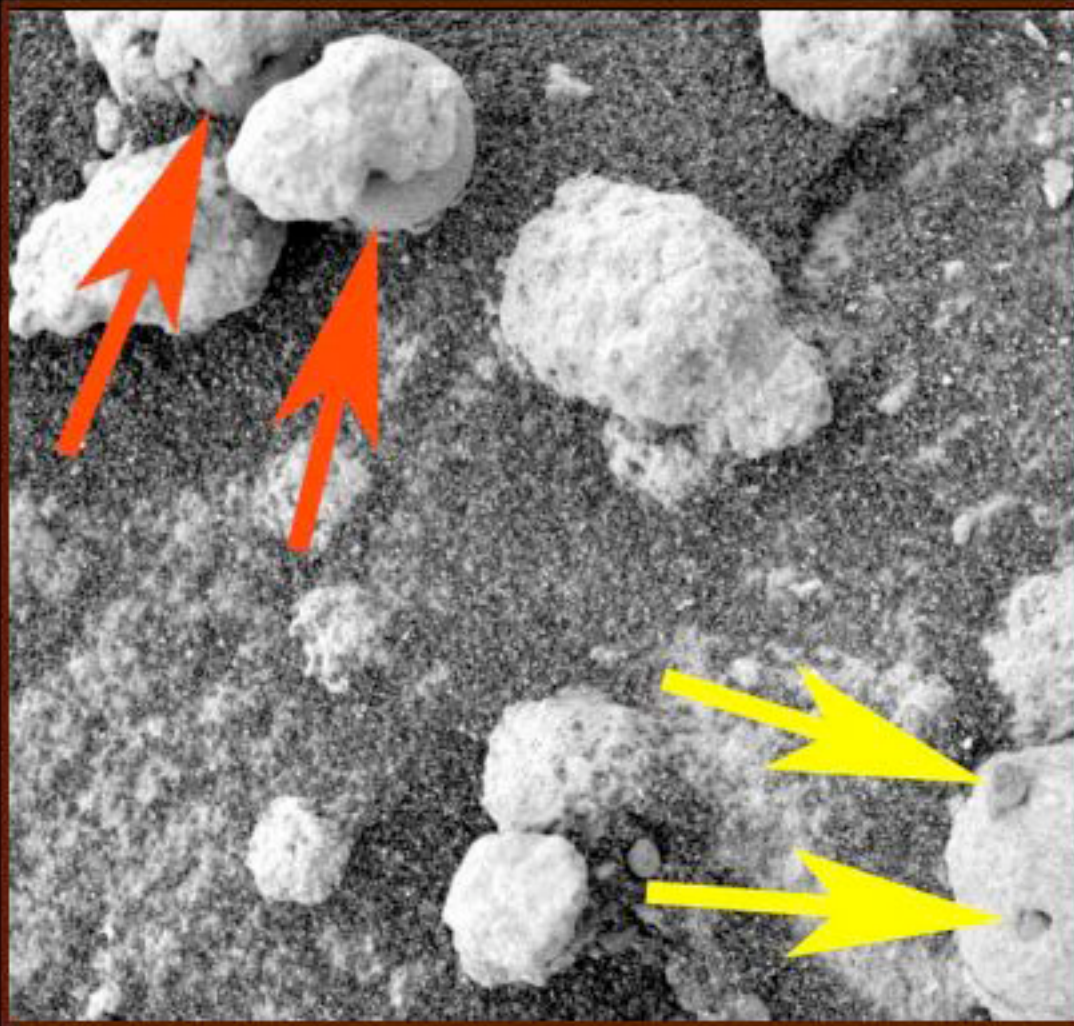


Image taken by the microscopic imager on August 15, 2004.

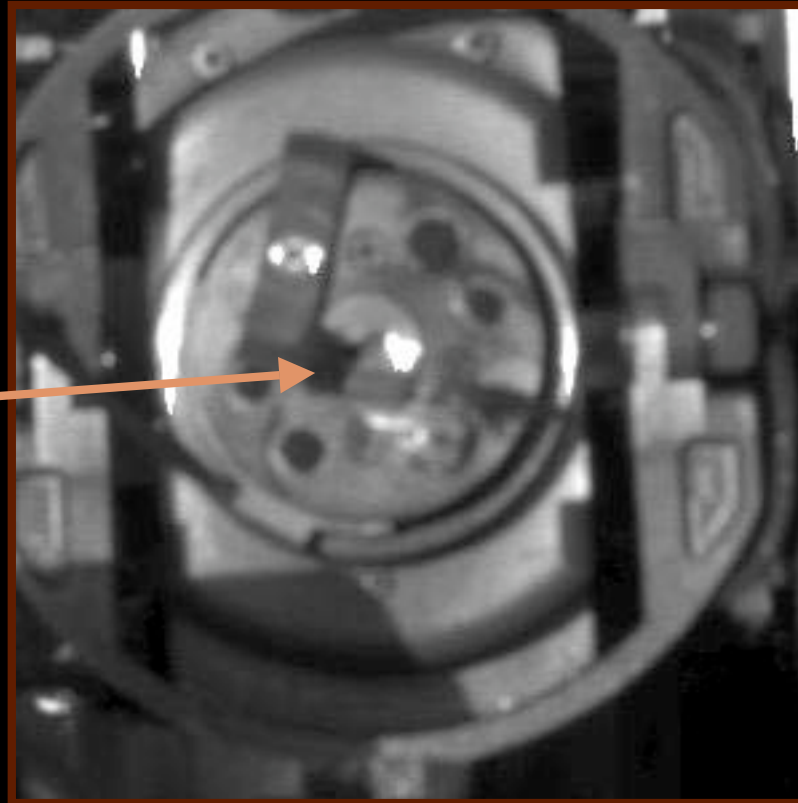
Opportunity



The yellow arrows point to more puzzling objects, which may be blueberry fragments emerging from the popcorn material as the pebble weathers away.

Opportunity's rock abrasion tool stopped working on August 15 most likely due to a pebble trapped between the cutting-blade and wire-brush rotors.

**Rogue
pebble?**

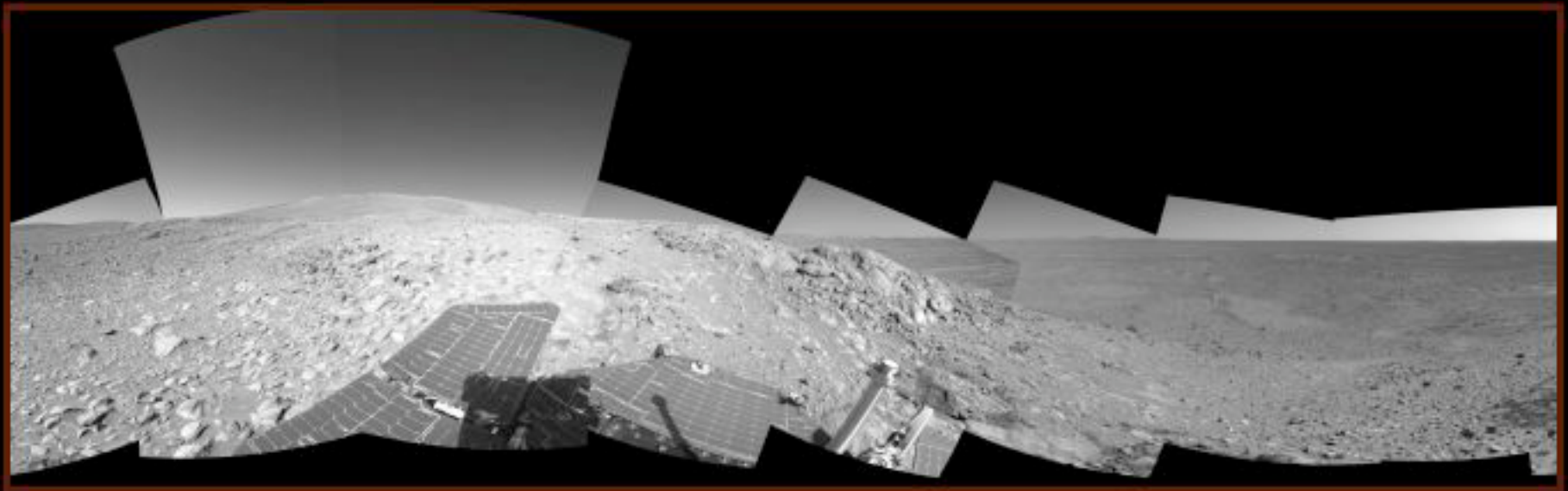


*Panoramic camera image of the rock abrasion tool taken on August 15, 2004.
The tool was closer than the camera could focus on sharply.*

Engineers are optimistic they can fix it by turning the rotors in reverse to release the pebble.



Spirit will continue studying the West Spur region of the Columbia Hills and take a color panoramic image from this location.



Spirit navigation camera mosaic taken between August 5 and August 8, 2004.

Scientists are currently deciding whether to send Opportunity to a distant tendril that is safer to drive to than ones nearby or to look at sand patches in the current area.