

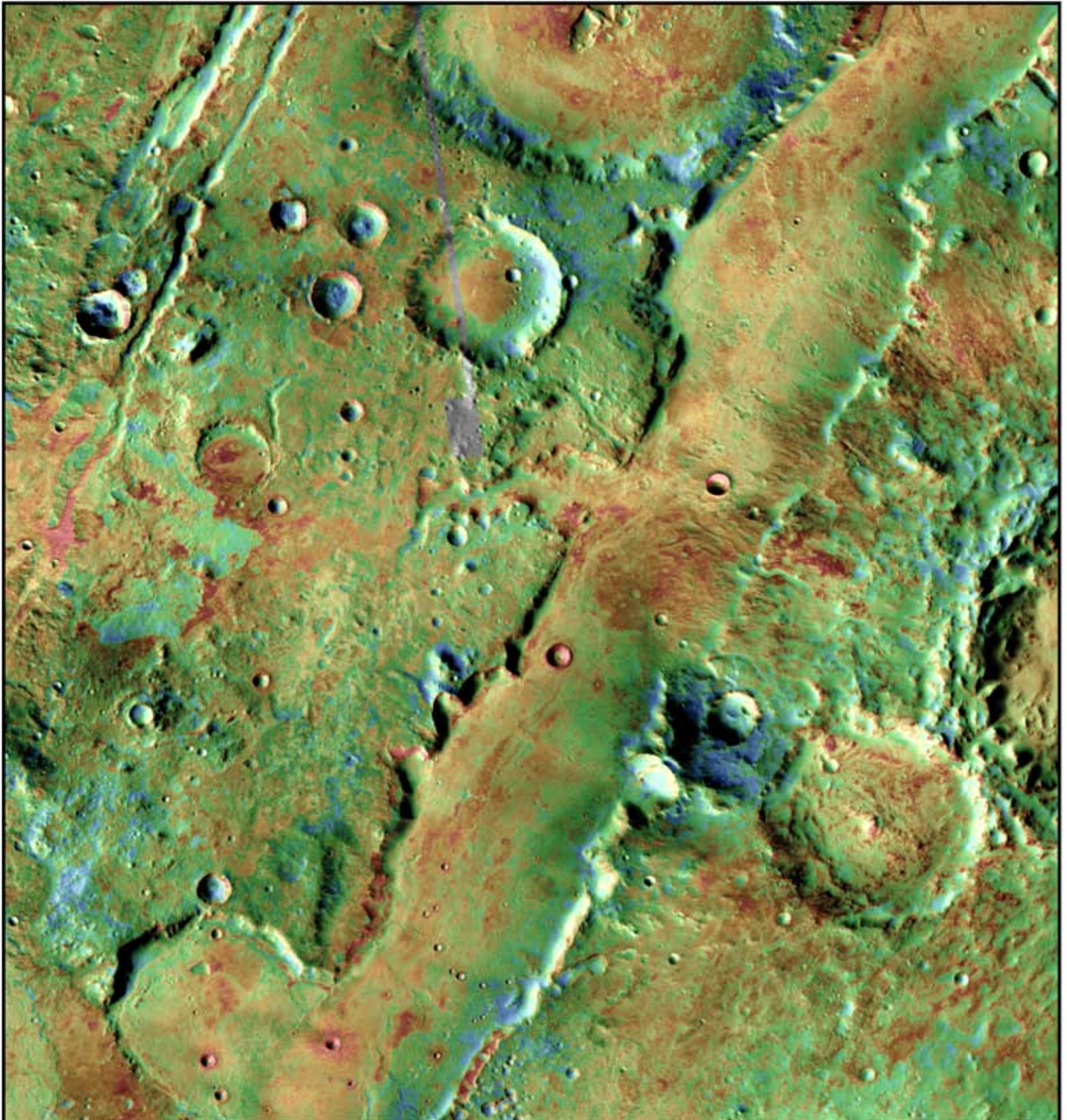
**MARS**  
ODYSSEY



# THEMIS

THERMAL EMISSION IMAGING SYSTEM

<http://themis.asu.edu>



**ASU**  
ARIZONA STATE  
UNIVERSITY

**TOUCHDOWN IN NILI FOSSAE?**  
COLORIZED NIGHTTIME INFRARED MOSAIC  
OVER DAYTIME INFRARED MOSAIC

**Raytheon**  
Santa Barbara Remote Sensing

**JPL**

**LOCKHEED MARTIN**



## VITAL STATISTICS

Location: 21N, 74.2E	Released: 28Aug2006	Instrument: IR	Image Size: 178x178 km, 1779x1778 px	Resolution: 100m
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In 2009, when NASA launches its next rover to the Red Planet - the Mars Science Laboratory, or MSL - scientists will send it to a location likely to preserve traces of early life.

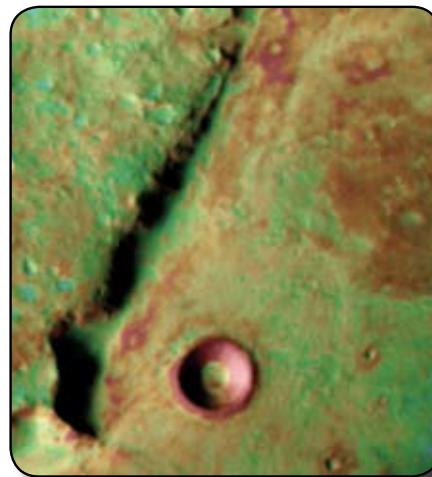
But where exactly is that? To find answers, Mars scientists met in June 2006 and developed a list of 33 candidate landing sites worth closer study. Top of the list, for now at least, is a location in Nili Fossae.

Nili Fossae is the name of a collection of curved faults and down-dropped blocks of crust between the faults. The "fossae," or troughs, lie northeast of the large volcano Syrtis Major and northwest of the ancient impact basin Isidis. The troughs, which are about 500 meters (1,600 feet) deep here, make concentric curves that follow the outline of Isidis; the faults likely formed as the crust sagged under the weight of lava flows filling Isidis.

In 2003 and later, scientists using the Thermal Emission Spectrometer (TES) on Mars Global Surveyor orbiter and the Thermal Emission Imaging System (THEMIS) on the Mars Odyssey mapped bedrock rich in olivine in Nili. Olivine is a greenish volcanic mineral that weathers easily; the discovery drew scientific attention to the region.

The main image shows the widest of the Nili troughs, with MSL's target aiming point almost in the middle of the picture. This false-color image combines infrared views taken during daytime and late at night by THEMIS. The daytime view shows the landscape, the nighttime view depicts heat radiation, with warmer surfaces appearing in redder tones and cooler ones in bluer tones.

This offers scientists clues about the surface materials. Rocks and harder sediments tend to hold daytime heat better than do surfaces covered with fine sand and dust. While the latter grow quite warm on a sunny day - as every barefoot beachwalker knows - dust and sand cool off rapidly after sundown. Viewed by THEMIS late at night, the slower-cooling rockier materials stand out clearly.



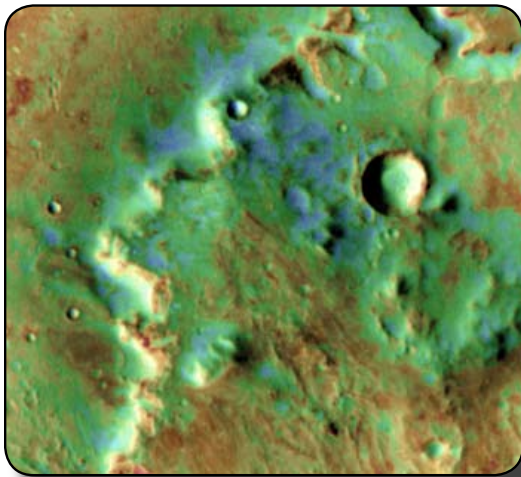
**In the Groove**  
MSL's possible landing site lies about halfway between the two small craters in the image at left. The craters are each about 3,700 meters (2.3 miles) across; the trough spans

about 26 km (16 mi) wide here.

Because MSL's intended driving range is at least 20 km (12 mi), it should be able to visit either side of the trough - or both sides, if it holds up as well as the current rovers Spirit and Opportunity have.

The false-colors indicate the ground in this part of the trough contains a mixture of loose, small-grain sediments as well as places with tougher materials or rocks and boulders. While MSL can straddle rocks up to about 50 centimeters (20 inches) high, scientists and mission planners will need to be certain that this site (or any other) is safe for

landing and driving. They will carefully evaluate potential sites using the recently arrived Mars Reconnaissance Orbiter and existing spacecraft.



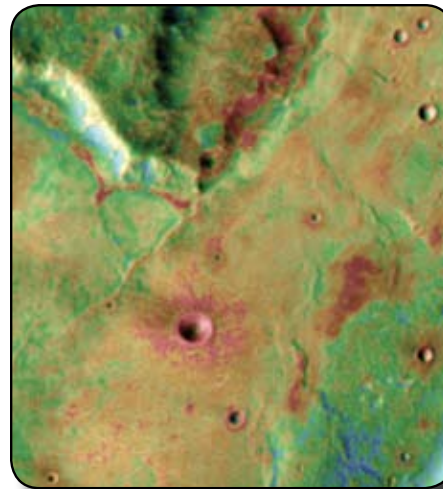
### Seeking Clay

The European spacecraft Mars Express has spotted areas in Nili Fossae where its OMEGA

infrared-sensing spectrometer detects iron- and magnesium-rich clay minerals. One area lies near the northern end of the main image; here scientists have detected clays in the cliffs flanking the trough.

The clays are called phyllosilicates and they point unmistakably to water at some point in the past. Clays are a tipoff to water because they form as rocks weather under wet conditions. Even better, the minerals suggest that conditions featured warm, but not extremely hot, water, perhaps in standing pools.

Also, the water was probably not too acidic - unlike the brines that drenched the sediments where Opportunity landed in Meridiani Planum. A relatively neutral acidity would have favored conditions for life. Again, good news for scientists hunting evidence of former life.



### Looking Under Lava?

The floor of Nili Fossae, and especially the southern end, is filled with lavas that flowed from Syrtis Major. While these would bury any water-laid clays or other

deposits, the lava flows are pierced here and there by craters.

A crater-making impact often acts as a geologist's hammer or drill, digging below the surface and bringing buried rocks and materials to light. If roughness, say, forces scientists to rule out other areas in Nili Fossae as a landing site for MSL, they might choose this stretch. The driving looks pretty smooth, and several craters have dug into the lava floor of the trough, exposing subsurface rocks.

OMEGA found clay minerals in the southern end of Nili Fossae, apparently deposited as debris thrown from a large crater about 40 km (25 mi) east of here.

Among the other locations under consideration as landing sites for MSL are Holden and Eberswalde craters and Gale Crater.

As printed from the THEMIS Website: <http://themis.asu.edu>

Questions? Email: [images@themis.asu.edu](mailto:images@themis.asu.edu)

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