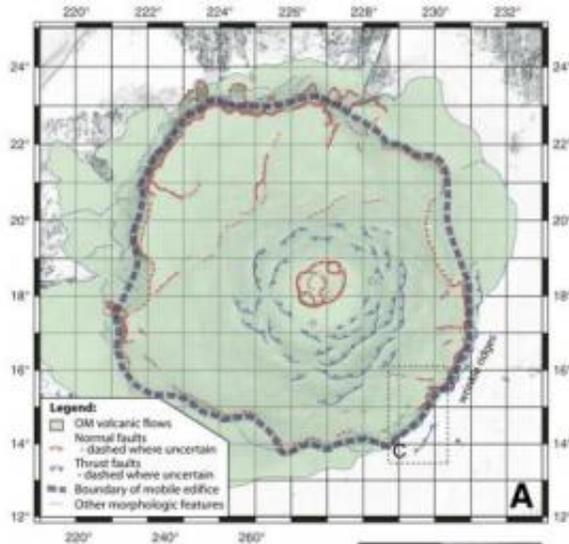


# Mountain on Mars may answer big question

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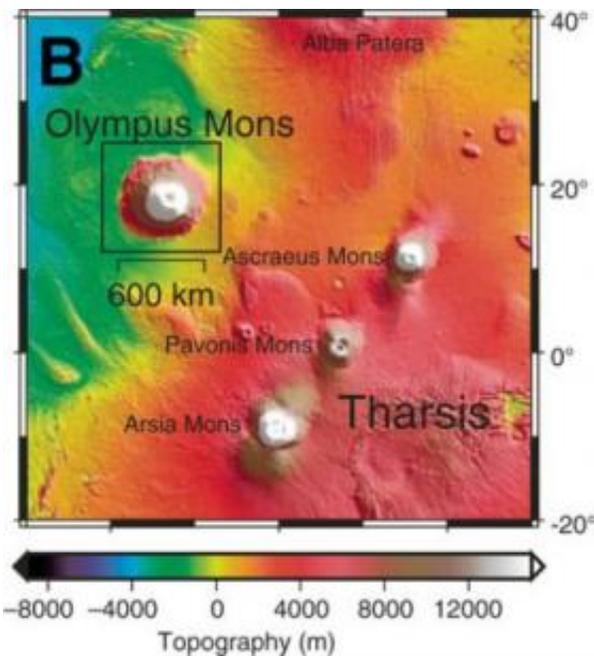
The Martian volcano Olympus Mons is about three times the height of Mount Everest, but it's the small details that Rice University professors Patrick McGovern and Julia Morgan are looking at in thinking about whether the Red Planet ever had -- or still supports -- life. Credit: Rice University

The Martian volcano Olympus Mons is about three times the height of Mount Everest, but it's the small details that Rice University professors Patrick McGovern and Julia Morgan are looking at in thinking about whether the Red Planet ever had - or still supports - life.

Using a computer modeling system to figure out how Olympus Mons came to be, McGovern and Morgan reached the surprising conclusion that pockets of ancient water may still be trapped under the mountain.

Their research is published in February's issue of the journal *Geology*.

The scientists explained that their finding is more implication than revelation. "What we were analyzing was the structure of Olympus Mons, why it's shaped the way it is," said McGovern, an adjunct assistant professor of Earth science and staff scientist at the NASA-affiliated Lunar and Planetary Institute. "What we found has implications for life - but implications are what go at the end of a paper."



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Co-author Morgan is an associate professor of Earth science.

In modeling the formation of Olympus Mons with an algorithm known

as particle dynamics simulation, McGovern and Morgan determined that only the presence of ancient clay sediments could account for the volcano's asymmetric shape. The presence of sediment indicates water was or is involved.

Olympus Mons is tall, standing almost 15 miles high, and slopes gently from the foothills to the caldera, a distance of more than 150 miles. That shallow slope is a clue to what lies beneath, said the researchers. They suspect if they were able to stand on the northwest side of Olympus Mons and start digging, they'd eventually find clay sediment deposited there billions of years ago, before the mountain was even a molehill.

The European Space Agency's Mars Express spacecraft has in recent years found abundant evidence of clay on Mars. This supports a previous theory that where Olympus Mons now stands, a layer of sediment once rested that may have been hundreds of meters thick.

Morgan and McGovern show in their computer models that volcanic material was able to spread to Olympus-sized proportions because of the clay's friction-reducing effect, a phenomenon also seen at volcanoes in Hawaii.

What may be trapped underneath is of great interest, said the researchers. Fluids embedded in an impermeable, pressurized layer of clay sediment would allow the kind of slipping motion that would account for Olympus Mons' spread-out northeast flank - and they may still be there.

Thanks to NASA's Phoenix lander, which scratched through the surface to find ice underneath the red dust last year, scientists now know there's water on Mars. So Morgan and McGovern feel it's reasonable to suspect water may be trapped in pores in the sediment underneath the mountain.

"This deep reservoir, warmed by geothermal gradients and magmatic heat and protected from adverse surface conditions, would be a favored environment for the development and maintenance of thermophilic organisms," they wrote. This brings to mind the primal life forms found deep in Earth's oceans, thriving near geothermal vents.

Finding a source of heat will be a challenge, they admitted. "We'd love to have the answer to that question," said McGovern, noting evidence of methane on Mars is considered by some to be another marker for life. "Spacecraft up there have the capability to detect a thermal anomaly, like a magma flow or a volcano, and they haven't.

"What we need is 'ground truth' - something reporting from the surface saying, 'Hey, there's a Marsquake,' or 'Hey, there's unusual emissions of gas.' Ultimately, we'd like to see a series of seismic stations so we can see what's moving around the planet."

More information: The paper appears online in Geology at: [geology.gsapubs.org/cgi/content/abstract/37/2/139](https://geology.gsapubs.org/cgi/content/abstract/37/2/139) .

Source: Rice University

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