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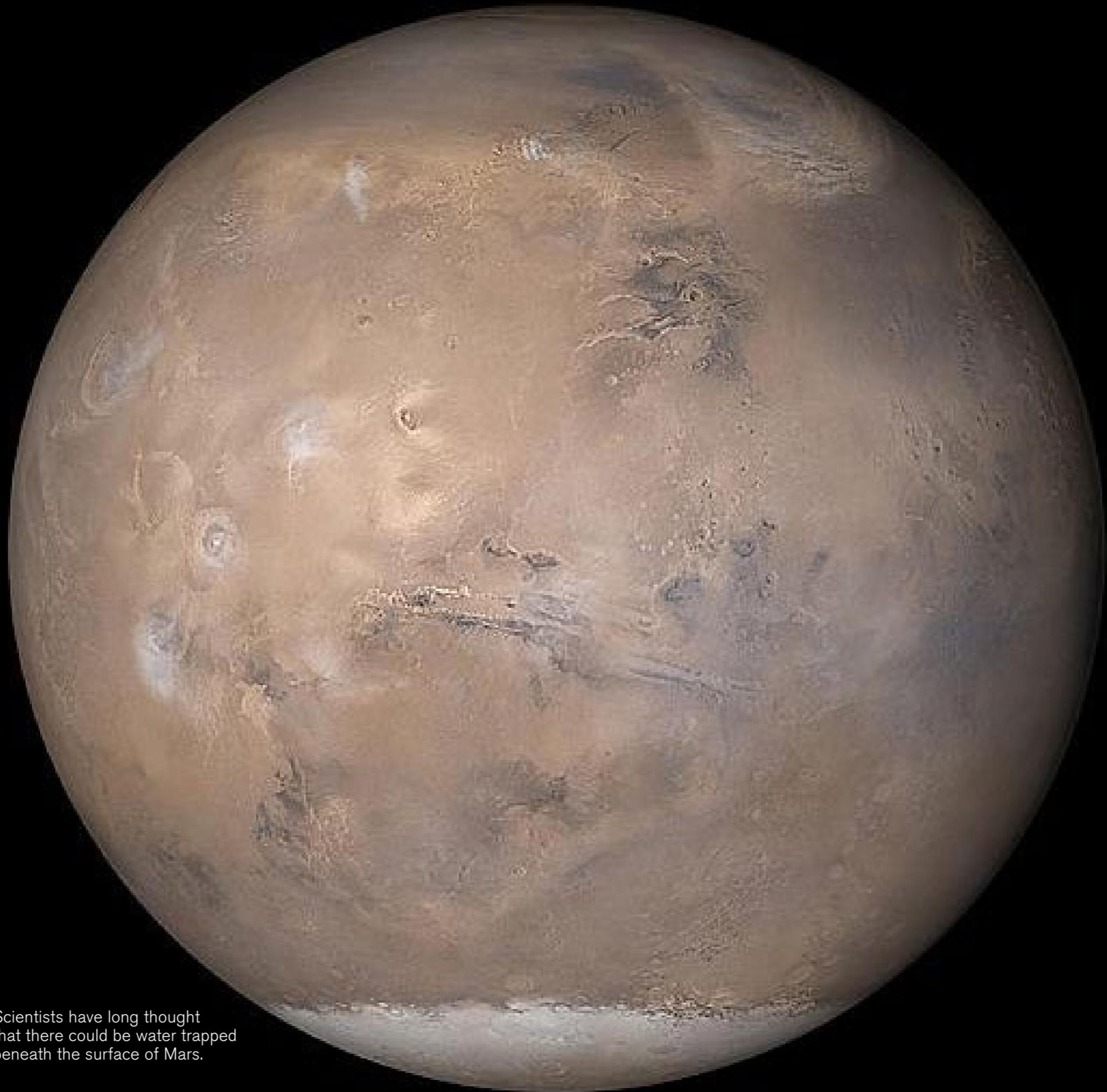
Water on Mars: Discovery of Three Buried Lakes Intrigues Scientists

Researchers say they have detected a group of lakes hidden under the Red Planet's icy surface

Two years ago planetary scientists reported the discovery of a large saltwater lake under the ice at Mars's south pole, a finding that was met with excitement and some skepticism. Now researchers say they have confirmed the presence of that lake—and found three more.

The discovery, reported on September 28 in *Nature Astronomy*, was made using radar data from the European Space Agency's (ESA) orbiting Mars Express spacecraft. It follows the detection of a single subsurface lake in the same region in 2018—which, if confirmed, would be the first body of liquid water ever detected on the Red Planet and a possible habitat for life. But that finding was based on just 29 observations made from 2012 to 2015, and many researchers said

Scientists have long thought that there could be water trapped beneath the surface of Mars.



they needed more evidence to support the claim. The latest study used a broader data set comprising 134 observations from between 2012 and 2019.

“We identified the same body of water, but we also found three other bodies of water around the main one,” says planetary scientist Elena Pettinelli of the University of Rome, who is one of the paper’s co-authors. “It’s a complex system.”

The team used a radar instrument on Mars Express called the Mars Advanced Radar for Subsurface and Ionosphere Sounding (MARSIS) to probe the planet’s southern polar region. MARSIS sends out radio waves that bounce off layers of material in the planet’s surface and subsurface. The way the signal is reflected back indicates the kind of material that is present at a particular location—rock, ice or water, for example. A similar method is used to identify subsurface glacial lakes on Earth. The team detected some areas of high reflectivity that they say indicate bodies of liquid water trapped under more than one kilometer of Martian ice.

The lakes are spread over about 75,000 square kilometers—an area

roughly one-fifth the size of Germany. The largest, central lake measures 30 kilometers across and is surrounded by three smaller lakes, each a few kilometers wide.

SALTY LAKES

On the surface of Mars, the low pressure that results from the planet’s lack of a substantial atmosphere makes liquid water impossible. But scientists have long thought that there could be water trapped under Mars’s surface, perhaps a remnant of when the planet once had seas and lakes billions of years ago. If such reservoirs exist, they could be potential habitats for Martian life. On Earth, life is able to survive in subglacial lakes in places such as Antarctica.

But the amount of salt present could pose problems. It is thought that any underground lakes on Mars must have a reasonably high salt content for the water to remain liquid. Although this far beneath the surface there may be a small amount of heat from the interior of Mars, this alone would not be enough to melt the ice into water. “From a thermal point of view it has to be salty,” Pettinelli says.

Lakes with a salt content about

five times that of seawater can support life, but as you approach 20 times that of seawater, life is no longer present, says John Priscu, an environmental scientist at Montana State University.

“There’s not much active life in these briny pools in Antarctica,” says Priscu, whose group studies microbiology in icy environments. “They’re just pickled. And that might be the case [on Mars].”

HEATED DEBATE

The presence of the Martian lakes themselves is also still debated. After the 2018 discovery, researchers raised concerns such as the lack of an adequate heat source to turn the ice into water. And although the latest finding supports the 2018 observation and involves much more data, not everyone is yet convinced that the regions identified are liquid water.

“If the bright material really is liquid water, I think it’s more likely to represent some sort of slush or sludge,” says Mike Sori, a planetary geophysicist at Purdue University.

Jack Holt, a planetary scientist at the University of Arizona, says that while he thinks the latest data are fine, he is not sure about the

interpretation. “I do not think there are lakes,” says Holt, who is on the science team for the Mars Shallow Radar sounder (SHARAD) on NASA’s Mars Reconnaissance Orbiter (MRO). “There is not enough heat flow to support a brine here, even under the ice cap.”

A Chinese mission that is on its way to Mars might offer one way to check the claims. The Tianwen-1 mission will enter orbit in February 2021, and in addition to deploying a rover onto the surface, the orbiter will carry a suite of scientific instruments. These include radar equipment that could be used to make similar observations. “Its capabilities are similar to MARSIS and SHARAD,” says David Flannery of the Queensland University of Technology.

For the time being, the prospect that these lakes are remnants of Mars’s wet past remains an exciting possibility. “There may have been a lot of water on Mars,” Pettinelli says. “And if there was water, there was the possibility of life.”

—Jonathan O’Callaghan

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