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# *A Watery Lake Is Detected on Mars, Raising the Potential for Alien Life*

The discovery suggests that watery conditions beneath the icy southern polar cap may have provided one of the critical building blocks for life on the red planet.

By Kenneth Chang and Dennis Overbye

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For the first time, scientists have found a large, watery lake beneath an ice cap on Mars. Because water is essential to life, the discovery offers an exciting new place to search for life-forms beyond Earth.

Italian scientists working on the European Space Agency's Mars Express mission announced on Wednesday that a 12-mile wide underground liquid pool — not just the momentary damp spots seen in the past — had been detected by radar measurements near the Martian south pole.

"Water is there," Enrico Flamini, the former chief scientist of the Italian Space Agency who oversaw the research, said during a news conference.

"It is liquid, and it's salty, and it's in contact with rocks," he added. "There are all the ingredients for thinking that life can be there, or can be maintained there if life once existed on Mars."

The body of water appears similar to underground lakes found on Earth in Greenland and Antarctica. On Earth, microbial life persists down in the dark, frigid waters of one such lake. The ice on Mars would also shield the Martian lake from the damaging radiation that bombards the planet's surface.

Jonathan Lunine, director of the Center for Astrophysics and Planetary Science at Cornell University, who was not involved with the research, said the finding transforms Mars

from a dusty planet to yet another “ocean world” in the solar system.



“I think the more we explore Mars, the more intriguing and complex it becomes,” Dr. Lunine said.

For years, “follow the water” has been the mantra of NASA and indeed humanity’s search for life somewhere else. Without water, there is no life as we know it. In recent years, that has led the space agency to contemplate robot probes to the moons of Jupiter and Saturn, like Europa or Enceladus, where it is now known that salty oceans exist underneath thin shells of ice and where imaginative astrobiologists can envision microbes or more complex creatures.

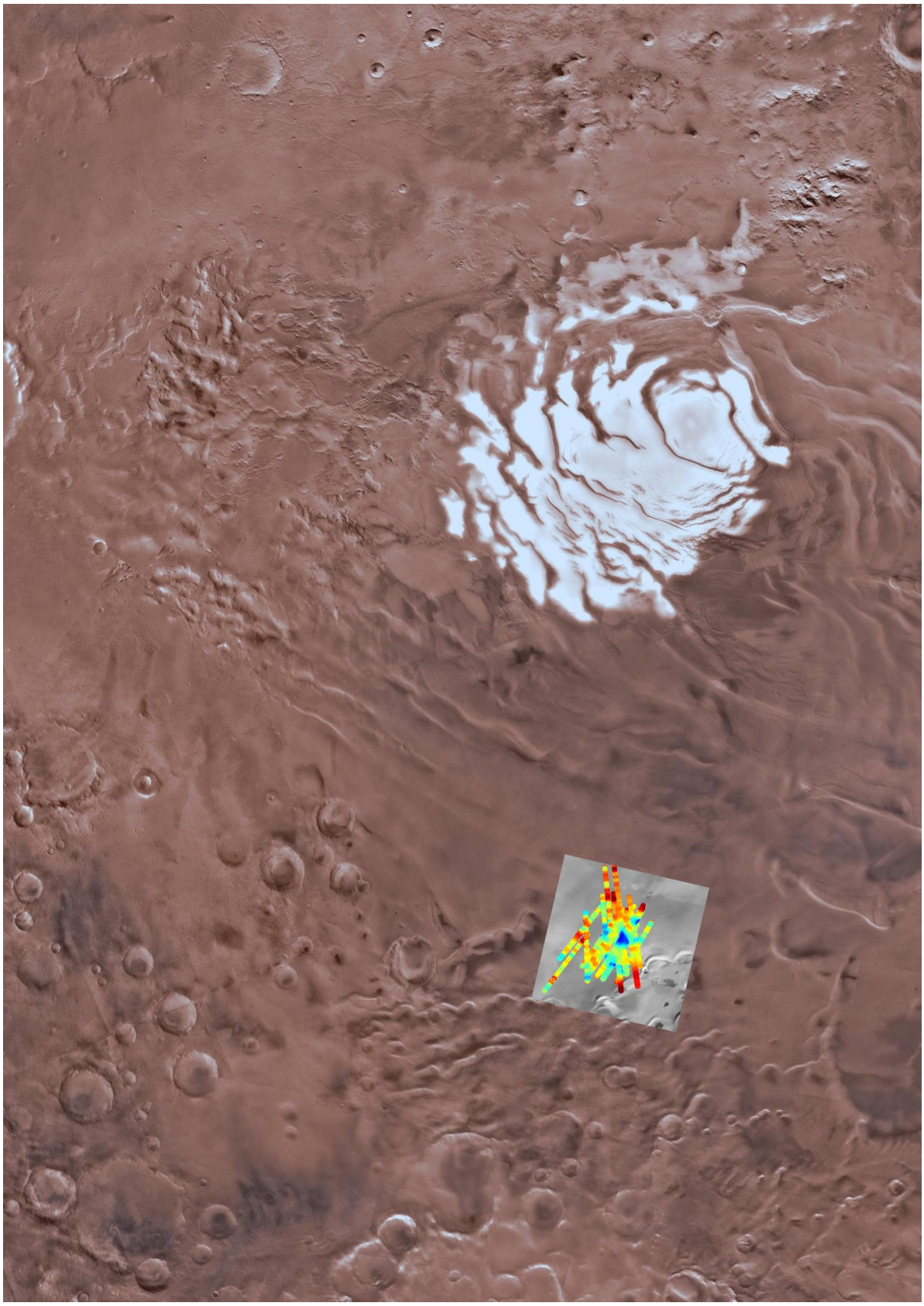
Since humans could see through telescopes across space, Mars has been the favorite abode of imaginary life, the backyard just over the fence where the astronomer Percival Lowell imagined he could see canals and even cities webbing the orange globe. In the final evenings of this month, the planet looms like a red lantern in the East, just 35,784,871 miles from Earth — the closest it has been in 15 years.

Those early science fiction visions were dashed when the first spacecraft photos of the planet revealed a dry, cratered and lifeless-looking surface — a seemingly dead planet. In the history of Mars exploration ever since, the more we learn, the more we think it could have had a watery, perhaps life-sustaining past. The surface is scored by old gorges, canyons, beaches, ocean basins and giant volcanoes, whose eruptions could have kept things riled up on the planet. Where this water went and how, taking most of Mars’s atmosphere with it, is one of the great and ominous environmental mysteries of our time.

If life did arise from those early, cozy conditions, it could have moved underground as the surface cooled and dried.

And if Mars was once flush with liquid, was it also flush with life? If astronauts ever crunch across the red sands, will they also be crunching over fossils of microbes?

The current findings, however, “cannot say anything more,” Dr. Flamini said. “We may guess about what are the conditions and if the conditions are favorable.”



A view of the southern polar plain of Mars, with the Mars Express's color-coded findings superimposed at the site where they were detected. The 12-mile-wide lake is believed to be about a mile deep. USGS Astrogeology Science Center, Arizona State University, INAF

Roberto Orosei, a co-investigator on the radar instrument and lead author of the paper published on Wednesday in the journal Science, said the scientists could not measure the thickness of the lake, but that it had to be at least a yard or so thick for the radar pulses to bounce back.

He said a back-of-the-envelope calculation indicated several hundred million cubic meters of water. That's tens of billions of gallons.

The Mars Advanced Radar for Subsurface and Ionosphere Sounding instrument, or Marsis, was developed and built by the Italians for the Mars Express mission, which entered orbit around Mars in 2003. Taking care not to damage the rest of the spacecraft, the team in charge of Marsis took two years to deploy the radar's 130-foot-long booms.

Once the instrument was working, it sent back uncertain, inconsistent findings over this polar region. But the scientists figured out how to send back the raw data to Earth. It revealed bright reflections in a triangular region as the spacecraft passed multiple times. Intense pressure of the overlying ice would warm the ice. Computer models indicate that temperatures would be about minus-90 Fahrenheit — far colder than the melting point of water. That suggests that the water is brim full of salts, allowing it to melt.

The region corresponded to a basin, adding to speculation that liquid water had flowed into this spot.

"Water tends to collect in lower topography," Dr. Orosei said.

Dr. Orosei said the scientists checked other possible explanations, like carbon dioxide ice, for the bright reflections, but those did not match the radar observations. The signals did match radar measurements of under-ice lakes in Greenland and Antarctica.

"We came thus to the conclusion that the only possible explanation for the bright reflection was the presence of liquid water," he said.

For some scientists, the bright radar reflection falls a bit short of proof.

Richard Zurek, the chief scientist in the Mars program office at NASA's Jet Propulsion Laboratory in Pasadena, Calif., said the complex, almost chaotic structure of the ice caps could affect the radar signals in unexpected ways. "You have a lot of interfaces that could do strange things to radar signals," said Dr. Zurek, who was not involved with the research. "It's the kind of signal we would expect for liquid water. Is it the only way that signal could be produced? That's the hard part."

If it is liquid water, the intense saltiness would make it hard for life, at least life as known on Earth, to survive in the lake, Dr. Lunine said. "It may exceed the salt content that any terrestrial organisms that we know of can survive in," he said.

Still, he said, "Having a stable body of liquid water today is very intriguing and worthy of study."

John Priscu, a professor of ecology at Montana State University, has been studying Antarctica biology. There, as on Mars, the surface is barren, but is more hospitable farther down. When he and his team drilled into a subsurface lake there a few years ago, they found microbes.

"They haven't seen the light of day for hundreds of thousands of years," he said. "They're eating the rocks for energy."

If it were possible to drill a mile into Mars into the newly discovered lake, he said he'd bet there was life there too. "I've been studying life in ice for 35 years," he said. "We've been finding life in places it shouldn't be according to our current thinking of life. But that's changing."

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