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A whiff of life on the Red Planet

19:00 16 February 2005
Exclusive from New Scientist Print Edition
Jenny Hogan

A leading European Space Agency scientist says he has found a gas in the Martian atmosphere that he believes can only be explained by the presence of life. But the few researchers who have been privy to the facts say that such a conclusion is premature.

Vittorio Formisano of the Institute of Physics and Interplanetary Science in Rome will be speaking next week at the first conference dedicated to the results from ESA's Mars Express spacecraft. The craft has been orbiting the Red Planet since December 2003. Agustin Chicarro, the project scientist for Mars Express and the organiser of the conference in Noordwijk, the Netherlands, says he expects sparks to fly. "We have allocated one full hour of debate - it could be a lively discussion."

Scientists are understandably cautious. The list of discredited claims for life on Mars is long: from canals built by intelligent beings that early astronomers thought they saw, to "bacteria fossils" found in a Martian meteorite that fell in Antarctica. The fossil-like structures, which were discovered in 1996, are now thought to have been etched by chemical processes.

The debate reignited last year when three teams, including one led by Formisano, independently detected methane on Mars - a gas that bacteria produce on Earth. Some speculated that similar microbes could be producing the methane on Mars. But others argued that methane at the observed concentrations could be explained by non-biological processes producing about 150 tonnes of methane per year. A comet that crashed on Mars long ago or some kind of volcanic activity could supply that amount.

Soil-based life

Now Formisano is saying that there is much more methane on Mars. He bases this on the detection of a different gas, formaldehyde, by the Planetary Fourier Spectrometer (PFS), an instrument on Mars Express that he runs. Formisano averaged thousands of measurements taken by the PFS and calculated that the Martian atmosphere has formaldehyde in concentrations of 130 parts per billion.

He thinks that the gas is being produced by the oxidation of methane and estimates that 2.5 million tonnes of methane per year are needed to produce it. "I believe that until it is demonstrated that non-biological processes can produce this, possibly the only way to produce so much methane is life," he says. "My conclusion is there must be life in the soil of Mars."

The presence of formaldehyde could explain why earlier studies found uneven distributions of methane on Mars, says Formisano. Because methane takes hundreds of years to break down by itself, the wind should even out the concentration of the gas around the planet. But if it is being oxidised in some regions, such as those that are rich in iron compounds, then you would find less methane in those areas.

But other experts, including Formisano's collaborators on the PFS and other principal investigators on the Mars Express mission to whom Formisano has presented his work, advise caution. He may be alone in pursuing formaldehyde, says one of his collaborators, Sushil Atreya from the University of Michigan, Ann Arbor, US.

Pushed to the limit

Others warn that Formisano is pushing the instrument to its limit in trying to look for formaldehyde. To identify compounds, the PFS looks for dark absorption lines in the spectrum of light reflected from Mars. Formaldehyde absorbs a handful of infrared wavelengths, but the instrument is not sensitive enough to see the individual lines.

"It is not 100% convincing," says Therese Encrenaz, from the Paris Observatory, France, another of Formisano's colleagues. "But I think it deserves further work."

Even if Formisano has found formaldehyde, it is not necessarily coming from the oxidation of methane. And even if there are large amounts of methane on the Red Planet, it might not be biological in origin.

"Frankly, we don't know what the internal geology of Mars is like. To draw conclusions on whether it is biological or not at this stage is damn risky," says Michael Mumma of NASA's Goddard Space Flight Centre in Greenbelt, Maryland, US, who last year found methane on Mars using Earth-based telescopes.

Formisano agrees that he has no conclusive proof. "I cannot demonstrate for sure," he says. "But these hints for life I have found are the best one can get. The next step is to go there and look for it." Future missions, such as NASA's Mars Science Laboratory now in the planning stage, will look for and analyse organic molecules in the soil.

While other evidence suggests that Mars was and may still be hospitable to life, ESA is playing it safe. "If this issue was a bit less controversial, then maybe we would be at the point of having some kind of press conference," says Chicarro. "But we need to leave the scientific community to its natural course and have it debated there." Debate at next week's

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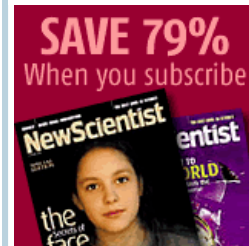
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