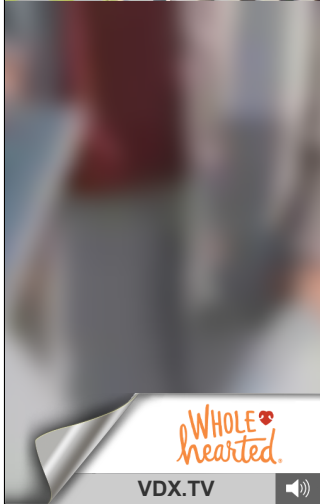
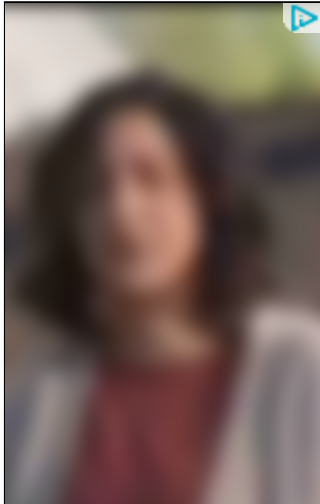


MARS DAILY

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MARSDAILY

Life on Mars - Viking Revisited

by Lee Pullen
for [Astrobiology Magazine](#)

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Mars is often suggested as a good location to search for alien life. Despite many missions to the red planet, it's still a mystery whether life existed there in the distant past or if it is thriving there today. Attempting to answer this question was an aim of the Viking missions of 1976, but the results of those experiments were frustratingly ambiguous.

At a recent science conference, Joop Houtkooper of the University of Giessen in Germany explained how he took another look at the data and came up with two reasons why the Viking experiments didn't provide conclusive answers to the life on Mars question. First, they didn't find organic material in the gas chromatograph - mass spectrometer, a device which detects the chemicals present in a sample. Although it was extremely sensitive, it didn't find any of the chemicals we associate with life.

And the second reason? "Upon moisturising the soil, they found a rapid development of oxygen, carbon dioxide and some nitrogen," says Houtkooper. A majority of scientists think an inorganic oxidant created this reaction, and that the Martian soil contains no life.

However, this interpretation doesn't sit well with Houtkooper, and he suspects that Viking may have discovered Martian microbes after all. "In my opinion, the search for an inorganic oxidant to explain the Viking results has not really come up with the definitive solution," he says. "I think it is time to look at alternatives. The biological explanation is an interesting one."

His theory to explain the Viking results is that Martian life may not be based simply on water, but on a mixture of H₂O₂ (hydrogen peroxide - a kind of bleach) and water. Such a creature could "drink" by absorbing small quantities of water from the atmosphere. But exposure to too much water would be disastrous for it.

"If these organisms consist of 50 percent water and 50 percent hydrogen peroxide, then they are sensitive to water, because they blow themselves up when they get too much," Houtkooper explains. "This could be what happened in the Viking experiment." Jack Farmer from Arizona State University thinks Houtkooper's idea may have merit. "It is generally assumed that if life is present on Mars, it must be in the deep subsurface where the mechanisms proposed by the H₂O₂ hypothesis would not be favored," says Farmer. "Still, (this idea) implies that an extant form of Martian life might have adapted to the relatively extreme thin skin of oxidized surface soils. Although there are some predictions that are unsupported by the Viking biology experiments, such as the observed low abundances of organic matter in the surface soils, this represents the kind of counterintuitive thinking that is needed to break our terra-centric views and begin to address the origin of life on a more universal basis."

A lifeform based on bleach may seem incredible, we already know of Earth-bound creatures that use hydrogen peroxide. The beetle *Brachinus crepitans* mixes this bleach with other chemicals to create a toxic spray that deters predators. It's also used by other organisms to help with various cell functions. It could be a useful kind of anti-freeze for life that survives in very low temperatures, such as those experienced on Mars. In theory, Houtkooper's Martian microbes could quite happily live at -50 degrees C, and probably at even lower temperatures.

"The fact that some terrestrial organisms utilize some of the mechanisms proposed in the model certainly strengthens the case," says Farmer. "If there is one thing that has been learned from extremophile research, it is that life continues to pop up in many of the places we least expect it. This is a testimonial to the capabilities of living systems to adapt to environmental extremes through natural selection and evolution."

Knowing where life is most likely to be active is important in order to successfully find it on Mars, and Houtkooper's research helps here, too. He suggests that the best place to search for these organisms would be cold areas with plenty of water in the atmosphere: specifically, around the edge of Mars's polar ice caps.

NASA's Phoenix mission is scheduled to land in such a region in May of 2008. Says Chris McKay of NASA's Ames Research Center, "The proposal for H₂O₂ life on Mars is highly speculative, but it is interesting because it can be tested -- possibly as soon as next summer with the instruments on the Phoenix mission to the Martian north polar region."

Phoenix is not specifically designed to test for hydrogen peroxide-based life, but even with the proper instruments detection would be difficult. If the temperature got too high or if too much water was added, the organisms would decompose quickly. Not adding water and conducting all experiments at sub-zero temperatures would be essential to make sure the microbes were kept alive. A sample return mission could collect some of the organisms and return them to Earth for study, but Houtkooper advises against this until we know exactly which conditions they can survive. Get it wrong and they'd die during the journey, making it a wasted trip.

If such organisms do exist on Mars, they may have made the trip to Earth before. "If there is life on Mars, there's a possibility that it has been transported either one way or the other, between Earth and Mars," says Houtkooper. "It may be part of the same evolutionary tree as us."

Richard Quinn from the SETI Institute, however, is skeptical that Viking may have found hydrogen peroxide life on Mars. The reasons, he says, have to do with temperature and humidity.

"In both the LR (labeled release) experiment and in the gas experiment, they used a heating protocol to "sterilize," to give a heat shock to diminish the population," says Quinn. "When heated to 145 degrees in the gas exchange experiment for three hours there was still a positive signal, and the claim is this was a positive signal for life. When heating at 160 degrees for three hours there was a negative signal, and the claim is in that case the life died. There's an incompatibility there, especially given that the decomposition temperature of hydrogen peroxide is typically much lower."

To say that humidity, or adding water, caused death also is incompatible with the Viking data, says Quinn. "In the PR (pyrolytic release) experiments, in some cases they didn't humidify and got a positive response and in other cases they did humidify and they still got a positive response."

Houtkooper is keen to emphasize that this theory of hydrogen-peroxide life is far from definite. "Of course, this is a hypothesis that needs confirmation," he says. "But there are some good grounds to think that life exists on Mars and we may find it with the Phoenix lander next year, so we are fairly tense about what will happen. It may give a new perspective on astrobiology."

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MARSDAILY

Opportunity Peers Beneath Surface Of Bathtub Ring



Pasadena CA (SPX) Nov 26, 2007

Opportunity remains parked at the rock layer known as "Smith" -- part of the "bathtub ring" of rock layers beneath the edge of "Victoria Crater" -- at "Duck Bay," the alcove where the rover entered the crater. During a test of the wire brush on the rock abrasion tool in a new mode of operation developed to work around recent encoder failures, Opportunity was mistakenly commanded to rotate the brush in the wrong direction.

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