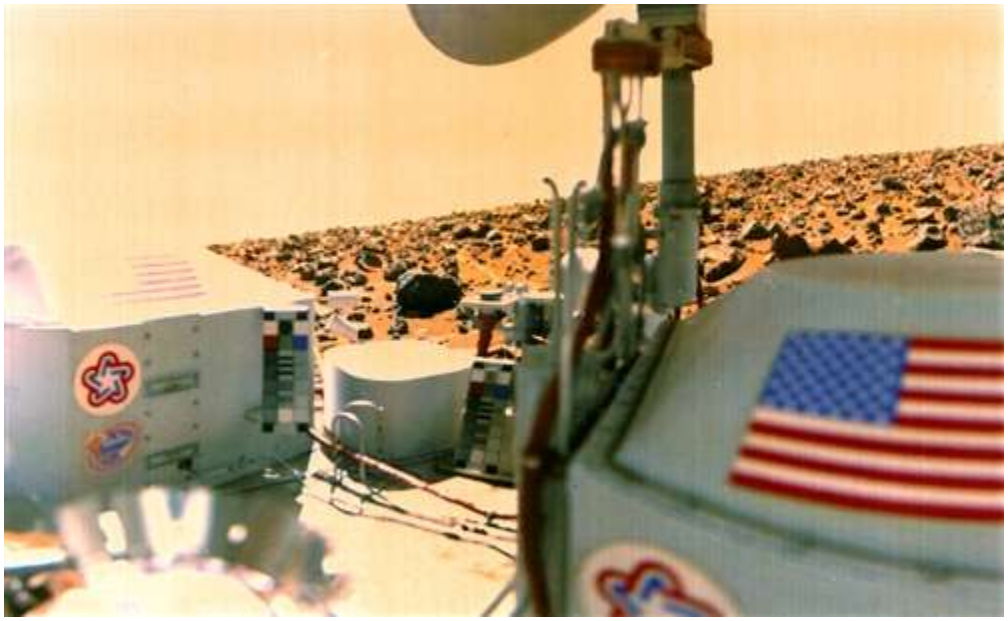
Mars life: Been there, done that?

By Alan Boyle

msnbc

March 27, 2012



NASA file

The Viking 1 lander sent back America's first pictures from the Martian surface in 1976. This picture shows off the lander's U.S. flag and Bicentennial logo as well as the planet's landscape.

Thirty-six years after an experiment conducted by NASA's Mars Viking lander sparked controversial claims about the presence of life on the Red Planet, NASA's next Mars mission could conceivably hint that those claims were correct after all.

At least that's the hope held by the experiment's principal investigator, Gil Levin, who is keeping the Mars Viking flame alive even in retirement. He still thinks Viking was "the most remarkable unmanned mission ever," but he worries that its legacy will be lost amid the scientific shuffle.

"Twenty or thirty years from now, when the economy permits NASA to rise again, there will be missions to Mars, and they will find life, and they will take credit for it and not mention Viking at all," he told me.

It might not take 20 or 30 years to bring Viking back into the spotlight, however. NASA's $2.5 billion Mars Science Laboratory mission is due to deliver the car-sized Curiosity rover to the Red Planet in August — and although the space agency insists that Curiosity

doesn't have the capability to detect life, Levin believes it could show that his experiment was on the right track when it detected the chemical traces of organic activity.

GilLevin.com

Gil Levin was principal investigator for the Mars Viking probe's Labeled Release experiment.

Hopes of confirming the presence of life on Mars were riding high when the twin Viking landers touched down on Mars in 1976. The scientific payload included the Labeled Release apparatus, designed by Levin and his colleagues, as well as three other life-detection experiments. The Labeled Release experiment, or LR, was set up to take a bit of Martian soil and add a drop of water containing nutrients tagged with radioactive markers. The air above the mix was then monitored to see if it gave off a radioactive gas such as carbon dioxide or methane. That could be read as an indication that organisms in the soil were metabolizing the nutrients.

If the experiment came up with a positive response, a duplicate soil sample — the control — was heated to a temperature that should have been high enough to destroy microbes, but not to destroy any strong chemicals that might have produced a similar response sans life.

The good news for Levin and the other life-hunters was that the LR experiment came out positive, and the control experiment came out negative. The bad news was that two of the other experiments came out negative, but they were based on different assumptions about potential Martian life. The really bad news was that the fourth experiment, conducted by Viking's Gas Chromatograph - Mass Spectrometer device, or GCMS, didn't detect any organic molecules in the soil.

The failure to find any organics led most scientists to assume that there was nothing living in the soil. Most scientists assumed that the LR findings were just a fluke. But not Levin.

"If these results are precisely the same as the results from biological entities on Earth, that's hard to get around," he told me. Dozens of explanations have been put forward for the LR results — for example, that the Martian environment is so chemically reactive, due

to ultraviolet radiation, that the nutrients were broken down without life playing a part. Levin, however, says those explanations don't match up with the results produced during the LR experiments and the control experiments.

Hoping for new evidence

This might have ended up as one of those cold cases where nobody totally convinces everybody. But Levin says Curiosity's impressive array of scientific equipment could provide some hot new evidence. It has a suite of instruments known as Sample Analysis at Mars, or SAM, which is capable of detecting organic molecules in Martian soil or atmosphere. Another instrument suite, called ChemCam, can fire a laser blast at a soil or rock sample up to 23 feet (7 meters) away and use a spectroscopic imager to analyze the chemical composition of the vaporized material.

"I predict that one or more of these instruments, possibly all of them, will indeed find organic matter that the Viking GCMS missed," Levin said.

Finding organic molecules is not the same as finding life. After all, organic compounds have been detected within the interstellar stuff of distant galaxies, and it wouldn't be earth-shattering to detect them on Mars as well. But it would answer the main objection raised about the LR results.

Even more telling evidence could come from Curiosity's high-resolution cameras. Some of the pictures taken during the Viking mission showed colored patches on Martian rocks that were a fair spectrographic match for the color of lichen on earthly rocks. "The spectra were identical, but of course the images were not sharp enough to be able to make a conclusion, and everybody pooh-poohed it," Levin said.

Curiosity's color cameras will have much better resolution, and Levin said they "could detect sufficient detail to establish whether these might be lichenlike organisms." It might even be possible to take multiple looks at the same rocks, and track whether their appearance goes through the kinds of changes one would expect from lichen.

Levin said lichen, which is one of the hardiest types of organisms on Earth's surface, could conceivably have hitchhiked from Earth to Mars on meteorites. "Preserved, frozen, they could survive the entry to Mars and grow under Martian conditions," he told me.

The long search for life

The scientists who are in charge of Curiosity and the Mars Science Laboratory say that they're aiming for the same goal that Levin has in mind, but they argue that the search for life on Mars has to follow a step-by-step process.

"What the world needs to understand is that this is really the very beginning of a very systematic and deliberate form of exploration," Caltech's John Grotzinger, principal investigator for Mars Science Laboratory, told me. "The era of 'Star Trek' exploration is not over, but ... one must be more deliberate about it, because that's the way we do it on Earth, and we know that works."

Levin, however, thinks the evidence to come will show that Viking was working correctly 36 years ago. "To suggest that we should go back and start at a lower level ... means we throw away a billion dollars, in 1976 dollars. That's about $5 billion or $6 billion today that we don't have," he said.

He'd like to see a future Mars mission duplicate the LR experiment with a few added technological twists, including a check to see whether the active agent that Viking

detected in the soil shows a preference for lefthanded or righthanded versions of the same molecule. Levin says that characteristic, known as chiral preference, would be strong confirmation of life, "since chemistry cannot distinguish chirality and reactions occur equally with both 'mirror images.'"

Levin also thinks the findings from Viking should be given another good, hard look.

"Let's convene a panel of astrobiologists," Levin said. "Let's have Levin present his data. Let's have the antagonists present their data. Let's examine this trove of data which we've never examined fairly."

Will that happen in Levin's lifetime? The researcher is now 88 years old, and nobody lives forever. But he's hoping that when the next episode in the saga of the search for life on Mars plays out ... maybe in the next few months ... the Viking missions will get their share of the spotlight.

"The stories increasingly omit any mention of Viking," Levin said. "I think Viking should be lauded rather than ignored."