

Mars discovery spurs review of American space policy

by Marsha Freeman

On Aug. 7, in front of a packed auditorium at the headquarters of the National Aeronautics and Space Administration in Washington, D.C., four scientists briefed the assembled press on what promises to be one of the major discoveries in science—that primitive life once existed on Mars. For more than two years, these scientists have been investigating a 4.2 pound meteorite that had been determined to have come from Mars. It was discovered in 1984 on the Allen Hills ice sheet in Antarctica, having left Mars 16 million years ago, and arrived on Earth 13,000 years ago. It is one of a dozen Martian meteorites found at the South Pole, and at about 3.6 billion years of age, it is, by far, the oldest.

Project leader David McKay, who is a veteran of investigating Moon rocks brought to the Johnson Space Center lunar laboratory by the Apollo astronauts, described his team's work as a "detective story." The evidence they have is indirect, he said, and although each of the lines of evidence could have alternative explanations, "when you look at them all together, collectively, particularly in view that they all occur within a very small volume, we conclude that, taken together, there is evidence for early life on Mars."

Although there were cautionary words from NASA Administrator Dan Goldin, to the effect that there would have to be further confirmation, and that this did not mean there were "little green men" on Mars, the profound nature of the discovery was appreciated by most of the press, many in the scientific community, and by the President of the United States.

As the scientists were assembling to brief the press, a few blocks away, President Clinton stood on the south lawn of the White House and announced that he had asked Vice President Al Gore to convene a bipartisan space summit, at the White House, on the future of the space program. The summit would convene before the end of this year, to "discuss how America should pursue answers to the scientific questions raised by this finding."

The President said, "If this discovery is confirmed, it will surely be one of the most stunning insights into our universe that science has ever uncovered. Its implications are as far-reaching and awe-inspiring as can be imagined."

Dr. McKay explained that there are four lines of evidence for the conclusion they have reached that there was life on Mars.

The evidence for life on Mars

First, is verification that the meteorite is from Mars. This is arrived at by comparing the gases found trapped inside the meteorite, and the atmosphere of Mars. This meteorite, ALH84001, matches the unique Martian chemistry.

Second, scientists found that ALH84001 contains carbonate globules, which were probably formed when the carbon in the atmosphere of Mars combined with water which filled the cracks and fissures of the rock. But the mineralogy and chemistry of material contained in the globules, such as magnetites composed of iron and oxygen, and iron sulfides, indicate that there could also have been products of biota that contributed to the formation of the globules. Lockheed-Martin researcher Kathy Thomas-Keprta explained at the press conference that on Earth, these compounds are produced by anaerobic bacteria and other microscopic organisms.

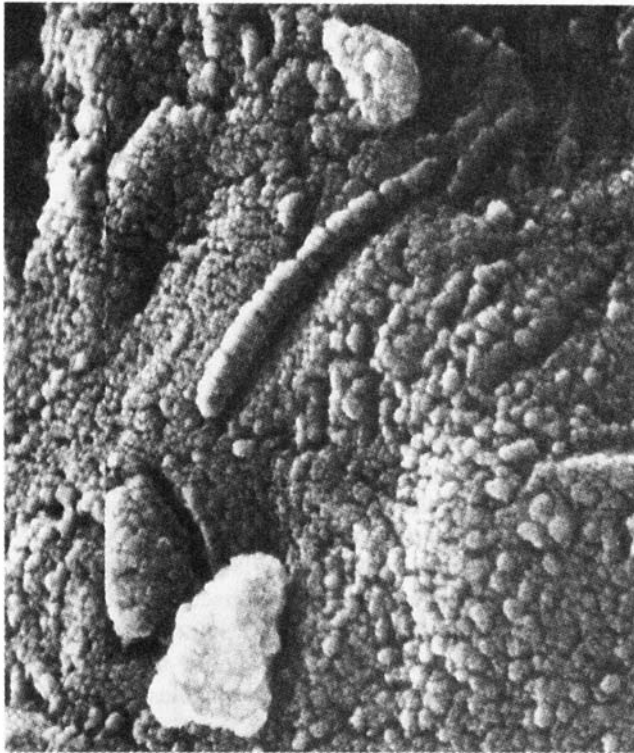
Third, organic molecules were found inside the carbonate globules, which could be the remains of microorganisms. Dr. Everett Gibson, from the Johnson Space Center, explained that although these polycyclic aromatic hydrocarbons can be by-products of incomplete combustion on Earth, they could also have been produced by the decomposition of now-fossilized Martian bacteria.

The most provocative evidence is a series of extremely tiny "strange" structures, one hundredth the width of a human hair, which resemble the fossilized remains of similar-sized nano-bacteria on Earth. Over the next year, teams of scientists will be continuing to probe, to see if they can find remnants of cell structures or membranes in what certainly look like fossils. Finding such structures, which would have held the "juices of life," would provide the crucial evidence of life on Mars.

Future plans

In answer to a question at the NASA press conference, Administrator Goldin said that the space agency would "listen to the scientific community" to see if, in the upcoming unmanned Mars missions, "we want to change some of the scientific objectives to help substantiate or refute this data." "I think we may have to accelerate some activities," Goldin asserted. Over the next decade, NASA is planning to send 10 spacecraft to Mars, two in each of the 26-month launch windows.

"One of the key areas that we have to look at is a sample



This image of the meteorite from Mars, made with a high-resolution scanning electron microscope, shows an unusual worm-like structure, which may be fossil evidence of primitive life. The size of the structure shown is less than one-hundredth the width of a human hair.

return, initially with robots and then, ultimately, if we have reason to do it, with human beings," Goldin stated. As of now, such a Mars sample return mission, to bring rocks back to laboratories on Earth, is not planned until the year 2005.

The scientific community has eagerly taken up Goldin's challenge. According to the Aug. 12 issue of *Space News*, a group of 35-40 space science experts from the space agency, industry, and academia, held a hastily convened teleconference within hours of the announcement of the possibility of life on Mars, and the group will soon include representatives from the European, Japanese, and Russian space agencies.

This group, which is in daily contact by phone, planned to meet at NASA headquarters on Aug. 15-16, and will, by the end of August, present their preliminary proposals for what scientific investigations should be pursued in the Mars program, to NASA Associate Administrator for Space Science Wesley Huntress.

In November, NASA will launch the first in its armada of new Mars missions, the Mars Global Surveyor, to do remote sensing observations of the Martian surface and atmosphere. The following month, the Mars Pathfinder mission will head toward Mars, and will deploy a 25-pound rover on the surface on July 4, 1997. While these two missions cannot be altered at this late date, upcoming voyages in 1998, 2001, and 2003

could be revised to meet new goals recommended by the scientists.

But there have been numerous warnings from the scientific community and the Congress, that even the goals that were set for the Mars exploration program *before* this recent announcement, could be in jeopardy.

The challenge is political

Two days before the science team made their startling announcement of the possibility of life on Mars, the Space Studies Board of the National Research Council released a report, "Review of NASA's Planned Mars Program." The Council characterizes the planned unmanned Mars missions as a "vigorous and challenging program in an era of reduced science funding."

The Committee on Lunar and Planetary Exploration of the Research Council cautions in the report that the instruments, and therefore, scientific accomplishments, of the upcoming missions, will be limited by the "faster, better, cheaper" fiscal constraints that have been placed on the program. Concerning future rover missions, they state: "Cost and payload limitations imposed on Mars Surveyor's small landers might prevent the flight of advanced rovers capable of adequate sampling of the rock record." Although the report was written before the recent announcement, it nonetheless points out that, "because evidence for past climate changes and ancient life, if any, is most likely embedded in the rocks, this is a major shortcoming."

The five-year budget projections for the space program, by both the Republican congressional majority and the White House, have come under attack by space exploration proponents from within and outside the government. Both sets of projections cut the NASA budget by nearly \$2 billion by the year 2002, to a level under \$12 billion. Critics have argued that not only will NASA not be able to start any new projects, it might be unable to adequately complete the missions already under way.

In frustration at this situation, Sen. Barbara Mikulski (D-Md.) issued a call, during May 16 hearings, for a bipartisan space summit at the White House, in order to clarify NASA's long-range budget picture. Under intense questioning by the members of the Senate Appropriations Committee, Administrator Goldin hinted that the administration will revise upward its budget projections for NASA. The recent finding that there may have been life on another planet in our Solar System, is the perfect opportunity for the President to take that initiative.

In his remarks at the White House on Aug. 7, President Clinton stated that he is determined "that the American space program put its full intellectual power and technological prowess behind the search for further evidence of life on Mars." Before the time of the White House space summit, scheduled for November, the American voters and the technical community must convince the President to take that important economic and scientific step.