Reports raise questions about Martian rock

Two new studies chip away at—but do not entirely undermine—the case that a meteorite from Mars contains fossils of ancient life from the Red Planet. The studies indicate that much of the organic content of the 4.5-billion-year-old rock did not come from Mars but is earthly material that contaminated the meteorite after it landed in an Antarctic ice field 13,000 years ago.

In 1996, researchers announced that the meteorite ALH84001 might contain signs of past life on the Red Planet (SN: 8/10/96, p. 84). The evidence included ovoid features that the scientists suggested were microfossils of Martian bacteria.

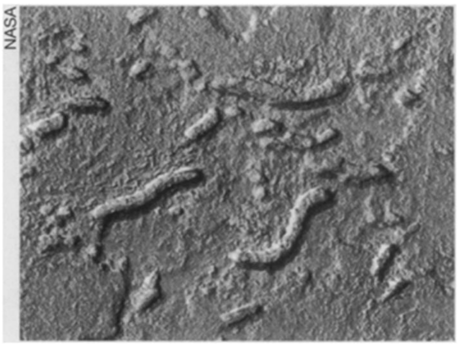
The new findings do not directly refute the notion of Martian microfossils, but they do raise the possibility that terrestrial organisms infiltrated the rock.

One team analyzed the structure and type of amino acids in a sample of the meteorite. Although 20 amino acids are required to make all of the proteins on Earth, trace amounts of only three—glycine, serine, and alanine—were found in the rock. These are also the most common amino acids found in Antarctic meltwater, and their relative abundances in the rock match those in the water, notes Jeffrey L. Bada of the Scripps Institution of Oceanography in La Jolla, Calif.

The structure of the amino acids also suggests that they are terrestrial contaminants, Bada's team asserts. Amino acids occur in right-handed and left-handed forms that are mirror images of each other. Although nonbiological processes produce equal amounts of each type, all amino acids in living things on Earth are left-handed. Scientists theorize that if life exists elsewhere in the solar system, its amino acids would be all of one type.

After an organism dies, its amino acids can slowly convert from one form into the other. After a million years or so, says Bada, terrestrial fossils have about equal amounts of both types. Although the last time that the meteorite could have been exposed to life on Mars was 16 million years ago, when it was blasted loose from the Red Planet, Bada and his colleagues report in the Jan. 16 SCIENCE that virtually all of the amino acids in the rock are left-handed. They therefore conclude that the meteorite was exposed to amino acids from living material quite recently, during the rock's residency in Antarctica.

NASA



New studies challenge whether these elongated features in a Martian meteorite are microfossils from the Red Planet.

In the same issue of SCIENCE, A.J. Timothy Jull of the University of Arizona in Tucson and his colleagues detail their findings on the isotopic composition of carbon in ALH84001. The carbon-13 abundance in nearly all of the organic components of the rock matches that found in Earth's organic carbon, they say.

The team also examined carbon-14, which is markedly more abundant on Earth than on Mars. Both the total abundance of carbon-14 and its age, estimated from radioactive dating at between 5,200 and 11,900 years old, demonstrate that it originated on Earth, Jull says.

Jull's work "does cast new doubt on our hypothesis that the meteorite contains evidence of past Martian life," says Richard N. Zare of Stanford University, a member of the 1996 discovery team. He notes "the possibility that some [terrestrial] 'bugs' lived in the rock that we didn't recognize" and might even account for the putative Martian microfossils found by other members of the discovery team.

Zare still maintains, however, that polycyclic aromatic hydrocarbons (PAHs) found in the meteorite may have originated on Mars, regardless of the origin of amino acids. PAHs are sometimes a residue of living material, such as that left over from the combustion of plants. Zare notes that in contrast to amino acids, PAHs do not dissolve in water and thus could not be transported into the meteorite by Antarctic meltwater. Bada argues that terrestrial PAHs might still have coated the meteorite and found their way in through myriad cracks in the rock.

Bada emphasizes that the new results in no way diminish the possibility that life once existed on Mars. To resolve that debate, researchers may have to wait until 2008, when a NASA mission is expected to bring fresh samples of Martian soil back to Earth. —*R. Cowen*

Novel X rays highlight clogging arteries

Though doctors can gauge the degree to which a buildup of plaque is restricting blood flow, they would rather find incipient plaque long before these fatty deposits narrow vessels and cause angina and other symptoms of atherosclerosis. Scientists now announce a nuclear medicine technique that can do just that, quickly and inexpensively.

If the method works in people as well as it did in studies on rabbits, says David R. Elmaleh of Harvard Medical School in Boston, it could become a routine diagnostic exam for people at risk of atherosclerosis, much as a mammogram or dental X ray is for people at risk of breast cancer or tooth decay.

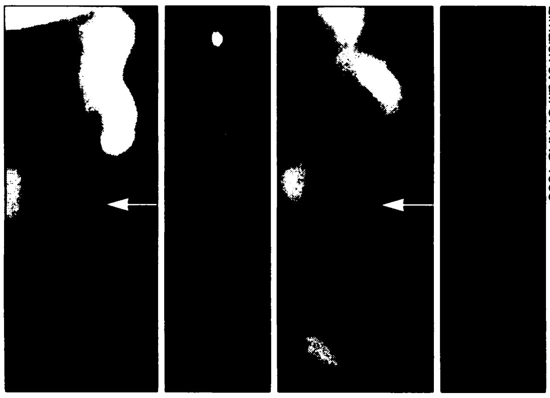
Elmaleh chemically linked technetium-99m—a short-lived, radioactive isotope—to a compound known as Ap_4A, which readily binds to purine receptors. Tissues in which plaque is developing contain copious amounts of these receptors. When Ap_4A was injected into rabbits whose arteries had been damaged to provoke atherosclerosis, more than seven times as much of the compound homed in on plaque as on healthy artery surfaces.

In X rays taken 15 minutes after the injection, Elmaleh's team pinpointed the plaque via its radioactive tag. The group reports its findings in the Jan. 20 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

What makes this technique "very, very interesting and promising," says H. William Strauss, chief of nuclear medicine at Stanford University Medical Center, is that it can pick up symptomless disease "when it may still be treatable, such as with diet or cholesterol-lowering drugs." It may also help identify "unstable plaque—the type that is able to rupture suddenly, causing a stroke or sudden cardiac death."

Moreover, because active plaque tends to attract the isotope-tagged compound, Strauss says, X rays of it would permit doctors to scout for recurrent disease in people who have undergone angioplasty or bypass surgery. This use "could be equally as important" as initial diagnosis of latent disease, he says.

Elmaleh's team has licensed the technology to Imaging Biopharmaceuticals of Cambridge, Mass., for development. Testing on people could begin in a year, says Elmaleh, the company's acting chief scientific officer. —*J. Raloff*



Elmaleh et al./©PNAS 1998

The arrow in the far left X ray points to new plaque in a rabbit artery, also shown stripped away from other organs (second from left). The same regions show no plaque in X rays on right, from a healthy rabbit.