

# Cold case: Looking for life on Mars

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Evidence never dies in the popular TV show *Cold Case*. Nor do some traces of life disappear on Earth, Mars, or elsewhere. An international team of scientists, including researchers from the Carnegie Institution's Geophysical Laboratory, has developed techniques to detect miniscule amounts of biological remains, dubbed biosignatures, in the frozen Mars-like terrain of Svalbard, an island north of Norway. This technology will be used on future life-search missions to the Red Planet.

The work is presented in several talks at NASA's Astrobiology Science Conference (AbSciCon) 2006 in Washington, D.C., March 26-30.

"It might seem like we're looking for a needle in a haystack," remarked Carnegie researcher Marilyn Fogel.<sup>1</sup> "But it's much better than that. One of our studies showed that we can detect even the most minute amounts of the element nitrogen, which can be evidence of life. Interestingly, rocks might be particularly promising places to find traces left by the tiniest microbes. Svalbard is brittle cold, very dry, and rocky, much like the Martian environment, making it an excellent test bed."

Nitrogen is essential to DNA, RNA, and protein. All life depends on it. The scientists looked at how a certain type, or isotope, of nitrogen was distributed in soils, water, rocks, plants, and in microbes. They found that nitrogen quantities varied depending on how the element interacted with the environment and living organisms. "We found that organisms leave tell-tale nitrogen fingerprints on rocks," stated Fogel. "The technology is well suited for finding remains of life on the rocky terrain of Mars."

In another study, the group found that they could adapt techniques used in genetic laboratories to the field.<sup>2</sup> They found that DNA sampling and the polymerase chain reaction (PCR) method--which makes many copies of a specific segment of DNA for analysis--can detect genetic differences in rock-dwelling communities of blue-green algae (cyanobacteria) and fungi. Further, they identified over 90 different compounds that can be correlated to biosignatures of those life forms. These fingerprints will be part of an enormous library of signatures to which Martian samples can be compared in the search for life.

Link: <http://abscicon2006.arc.nasa.gov> for details.

Source: Carnegie Institution

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