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Re: Yellowstone Offers Clue To Martian Life

From: [Stig Agermose@online.pol.dk](mailto:Stig_Agermose@online.pol.dk) (Stig Agermose)
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Stig

Yellowstone offers insight about Mars to NASA

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(May 6, 1998 12:56 p.m. EDT <http://www.nando.net>) -- Ten years from now, a spacecraft possibly carrying extraterrestrial life will land on Earth after an extended unmanned mission to Mars. While the purpose of that historic trip - bringing home Martian soil for firsthand examination - could yield substantive proof that we are not alone in the universe, the voyage itself comes replete with its own cosmic perils.

For NASA and world health officials, the essential challenge is determining how much of a biological threat, if any, microscopic organisms plucked from the Red Planet pose to both humans and the larger global ecosystem.

"There's no reason to put the Earth at risk due to our own biological ignorance. That's why we are exploring every possible safeguard," says John Rummel, NASA's newly appointed "planetary protection officer."

In its preparations for the mission, one of the first places NASA turned is the surreal, otherworldly interior of Yellowstone National Park, where scientists believe that microbes inhabiting park hot springs could provide a preview of what awaits the robotic lander on Mars.

Thriving in conditions where other animals would perish, Yellowstone microbes thrive in a place with 300-degree temperature fluctuations, surrounded by corrosive acids that can eat through steel, and within toxic, oxygen-deprived niches that appear deceptively sterile. Much like Mars.

Indeed, some astral ecologists believe the primitive life forms here may be distant relatives - analogues - of Martian microbes swept together through the Milky Way on comets or asteroids billions of years ago and deposited on the neighboring infant planets.

And in many ways, Yellowstone's enigmatic concentration of thermal phenomena provides a glimpse at earthly life when Gaea was younger, cradling a more hostile and simplified landscape.

"The premise behind our research is that if you want to better understand the organisms that may have existed, or still do exist, in the extreme conditions on Mars, a logical place to look for possible comparison is in the extreme environments on Earth," says microbiologist Fred Albert, hoisting a rack of colorful microbial "extremophiles" from hot springs.

>From their small laboratory at Montana Biotech, a company located at the end of a dirt road near Belgrade, Mont., Albert and fellow microbiologist Joan Combie are assisting NASA in identifying potential planetary parallels.

According to Carlton Allen, a scientist with Lockheed-Martin based at the Johnson Space Center in Houston, Yellowstone's role has grown in prominence since the discovery in 1996 of the so-called Mars meteorite in Antarctica.

This chunk of what could be Martian debris is believed to have been cast off into space 16 million years ago after an asteroid collided with the planet and sent the fragment sailing toward an eventual rendezvous with Earth 13,000 years ago.

Allen, who worked on the team assigned to investigate the meteorite, says it contains a tiny worm-like sliver of what might be a microbial fossil. What's remarkable is that it bears a likeness to organisms studied by Combie and Albert in Yellowstone.

Researchers say that many of Yellowstone's extremophiles occupy a different branch on the tree of life than the vast majority of other earthly organisms grouped in the domains eucarya (which includes humans, plants, and fungi) and bacteria.

Characterized under the heading archaea, these creatures have an amazing lineage that extends deep in the geologic record to the twilight of Earth's organic origins. Rather than deriving sustenance from other carbon life forms, some of the archaea are sulfur and silica eaters.

"To put the breadth of this domain in perspective, there is more similarity between people and trees than between certain species of archaea," Albert says. "They challenge us to expand the definition of 'normal life.' "

The theory is that ancestors of these tiny creatures, fertilized by cosmic dust and changed little by evolution over the past 3.5 billion years, sprang to life in our ancient oceans and persist in Yellowstone's geothermal zones because the habitat is still relatively unaltered.

It is possible that such life could have followed a similar path to Mars when it, too, had vast seas and active volcanism.

Allen says it is unclear whether any Martian remnants survive or what might happen if they were to somehow reawaken on Earth.

He notes that the next Mars lander will collect samples mostly from rocks and areas of subsurface crust where evidence of ancient life may be clustered. So "there are real concerns, both scientific and legal, about bringing back rock and soil samples from far away places because of legitimate worries about transporting hidden microbes and bugs," Allen says. "In the U.S. you can't even bring back a box of dirt from Central Africa without encountering tight restrictions, so you can imagine the fears about hauling back dirt from space."

In advance of that, Combie and Albert are refining the process of identifying microorganisms by isolating and, in some cases, arousing to life, microbes embedded in Yellowstone travertine to see how they can be manipulated.

"Using Yellowstone organisms ... NASA wants to know if they can sterilize whatever is brought back," Combie says. "What recent tests show is that some microbes are surprisingly resilient."

A few months ago, public-health officials bombarded organisms with high levels of gamma rays to see what it would take to destroy potentially hazardous microbes. It's the same sterilization techniques used to

successfully kill threats such as the Ebola virus - but the Yellowstone microbes were able to withstand the high dosage levels of radiation, leading researchers to view potential Martian life with greater reverence.

This is one reason NASA is reevaluating its quarantine procedure. While its methods worked 30 years ago when Apollo 11 returned with the first payload of moon rocks, Rummel says today that NASA would follow a different, more stringent protocol.

During the Apollo missions, astronauts were in the same, sealed compartment as the quarantined material. That caused problems when the humans needed to get out long before the moon rocks would have ordinarily been allowed out of quarantine. Those specimens proved biologically sterile, but Rummel says Martian rock has more potential for nurturing life.

Therefore, once the Mars lander returns, it is probable that any soil samples will remain enclosed for several months, if not years, before they are deemed safe.

Still, despite the potential dangers, officials say the benefits derived from probing Mars far outweigh any risks.

If evidence of life on Mars is confirmed, Allen says, the discovery will enable scientists to narrow their focus to two primary theories: Either life arose at one place in the solar system and meteorites flying back and forth have spread it, or life arose completely separately in the first two places humans looked.

"While both possibilities are exciting, the latter leads to endless speculation because it shows how easy it apparently is for so-called 'life' to get started," he says. "And that has some real implications for how we think about the rest of the solar system and the universe."

By Todd Wilkinson, Special to The Christian Science Monitor

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