PLANETARY SCIENCE: A Dry View of Enceladus Puts a Damper on Chances for Life There

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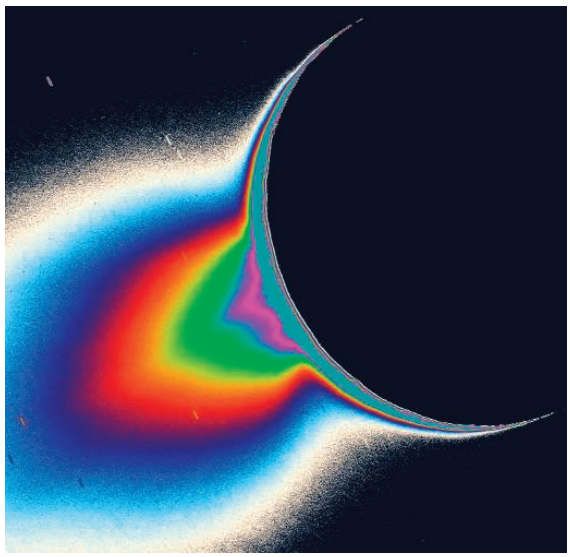
PLANETARY SCIENCE

A Dry View of Enceladus Puts a Damper on Chances for Life There

With the discovery last year of a great plume of water rising from the south pole of Saturn's icy moon Enceladus, astrobiologists had a new potential home for life in the solar system. Liquid water is the scarcest requirement for life, and the plume's striking resemblance to the Old Faithful geyser back on Earth seemed to imply subsurface pools. But an alternative explanation for the Enceladus plume, proposed on page 1764, would create the Old Faithful look without a drop of liquid water and therefore with no possibility of life.



A dry gusher? The plume of Enceladus (color-coded here for density) may be driven by gas-laden ice rather than boiling water.

The concept of an Earth-like geyser on Enceladus emerged from early observations by the Cassini spacecraft orbiting Saturn, reported in the 10 March issue of *Science* (p. 1422). Each second, about a bathtub's worth of water in the form of water vapor and tiny ice particles soared hundreds of kilometers above the airless moon from a relatively "warm" (145 kelvin) spot on the surface. Cassini team members concluded in one paper that liquid water as little as 7 meters beneath the surface could be boiling as it encountered lower pressures. That would generate vapor and frozen droplets that jet out from crevices in the moon's icy crust.

There was one snag, says Susan Kieffer, a geological fluid dynamicist at the University of Illinois, Urbana-Champaign, who has studied the dynamics of Old Faithful. On reading an accompanying Cassini paper, Kieffer and her colleagues learned that the spacecraft's mass spectrometer had detected considerable amounts of carbon dioxide, methane, and nitrogen in the plume. That was odd, they thought, because nothing like those amounts of methane and nitrogen could possibly dissolve in the water. Although water couldn't hold the gases, water ice could, by trapping individual gas molecules within the "cages" of ice's own crystal structure.

The existence of such clathrates on Enceladus had been hypothesized 20 years ago. Kieffer and her colleagues reasoned that if clathrates lurked beneath a several-kilometer-deep crust of water ice, and tectonic activity created fractures in the crust, the pressure release would drive explosive decomposition of the clathrate. The required gases would gush out, along with ice particles that would sublimate enough water vapor to reproduce the observed plume composition. Their rough calculations support that scenario.

"It's a noble and proper attempt to account for the gases," says planetary meteorologist Andrew Ingersoll of the California Institute of Technology in Pasadena, a member of the Cassini team. But "it's not as simple as" uncorking some clathrates, he says. There are many details in the physics, such as how much water vapor ice particles could yield, that he needs to understand before taking back a potential habitat for life.

–RICHARD A. KERR

INTERNATIONAL AFFAIRS

Iranians Fume Over a Closed SESAME

A scientific project that hopes to be a calming influence in the Middle East has instead increased tensions between two important countries in the region. At issue is the failure of 35 Iranian scientists to obtain Egyptian visas for a recent meeting in Alexandria of researchers hoping to work on the Synchrotron Light for Experimental Science and Applications in the Middle East (SESAME) project.

Eight countries are now members of a consortium creating a home for a synchrotron, donated by Germany, at a site 32 kilometers outside Amman, Jordan (*Science*, 26 November 2004, p. 1465). The machine, a first for the region, is intended to serve starting in 2010 as both a platform for research and a model for peaceful cooperation. Eight countries—Jordan, Bahrain, Cyprus, Egypt, Israel, Pakistan, Palestine, and Turkey—are already members, and the Iranian parliament is expected to vote sometime next year on a proposal to formally join a project in which its scientists have participated since 2001.

But that vote could be influenced by what happened after the Iranians applied for visas to attend the 5-day Alexandria meeting, held the last week of November. The scientists say they never heard from the Egyptian embassy in Tehran after submitting their visa applications at least 6 weeks beforehand. "If this is not hostile treatment, I don't know what is," says Reza Mansouri, a physicist at Sharif University in Tehran and one of two Iranian representatives on the SESAME council. Iranian contingents have attended four previous user meetings held elsewhere in the region, but Mansouri fears that the latest incident will bolster opposition in parliament to any collaboration.

Egyptian authorities deny snubbing the delegation. The Iranian scientists simply did not apply early enough, says Egypt's science minister, Hany Helal. "It is exactly the same when an Egyptian submits a request for a visa to [go to] the U.S. or a European country," says Helal.

The council, which met in Jordan last week (Mansouri stayed home in protest), seems willing to give Egypt the benefit of the doubt. "It appears that the Iranians were given incorrect advice by the Egyptian embassy," says Herman Winnick, a physicist at the Stanford Linear Accelerator Center in Palo Alto, California, who helped initiate the project a decade ago and remains an adviser. "It's extremely unfortunate." Winnick says he hopes the incident will not prevent Iran from becoming a member country. **–YUDHIJIT BHATTACHARJEE**

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