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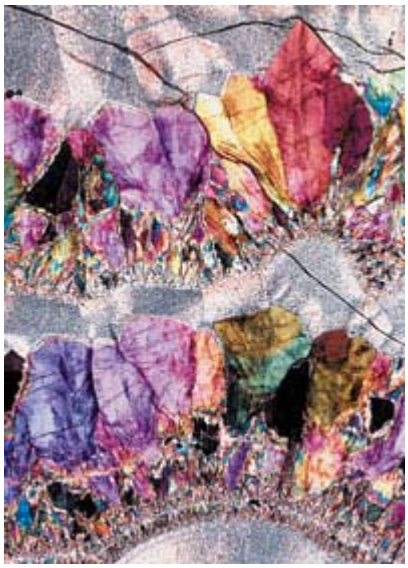
Biogeochemistry

Methane From Ancient Microbes

Evidence suggests the organisms lived much earlier than previously thought

Elizabeth Wilson

A provocative new analysis of 3.5 billion-year-old rocks has turned up evidence for the early existence of microbes that produce methane.



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Ancient Gas Fluid

bubbles inside this 3.5 billion-year-old sample of quartz (viewed in cross-polarized light) may contain biologically produced methane.

The study, conducted by geoscientist Yuichiro Ueno and colleagues at Tokyo Institute of Technology and other institutions, not only may push back the earliest known date of such organisms by 700,000 years but also suggests that they could have influenced climate during the early Earth age known as the Archean era.

"The results are entirely consistent with models we've published for the Archean atmosphere," says James F. Kasting, a geosciences professor at Pennsylvania State University.

Ueno's group examined fluid bubbles trapped inside quartz from an ancient, much-studied rock formation in Western Australia (*Nature* **2006,** *440*, 516). They found methane containing carbon with a low $^{13}C/^{12}C$ ratio, which is characteristic of biological origin. The authors did not find large hydrocarbons that would have suggested the methane could have been produced by thermal processes.

They "have probably uncovered the oldest known samples of biologically produced gas," writes Don E. Canfield, director of the Nordic Center for Earth Evolution at the University of Southern Denmark, in a commentary accompanying the Ueno report.

Methane-producing microbes belong to the biological domain Archaea, whose members frequently thrive under extreme conditions and are among the earliest forms of life. Methane is one of the greenhouse gases posited to have kept Earth warm several billion years ago when the nascent sun was relatively cold and faint

Conclusions drawn about early Earth from rare ancient rocks can be controversial, notes David Valentine, assistant geosciences professor at the University of California, Santa Barbara. The carbon

isotope signatures, he believes, may not be "the smoking gun" but are nonetheless "very interesting."

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