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# In Lake, Photosynthesis Relies on Arsenic



Laurence G. Miller and Shaun Baesman

A pool with arsenic-fueled bacteria at Mono Lake in California.

By HENRY FOUNTAIN  
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Mono Lake in California is a strange place, with eerie spires of calcium carbonate along the shoreline and water that is extremely salty and alkaline.

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[Arsenic \(III\) Fuels Anoxygenic Photosynthesis in Hot Spring Biofilms from Mono Lake, California \(Science\)](#)

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But Ronald S. Oremland and Thomas R. Kulp of the [United States Geological Survey](#) and colleagues have found something weirder still at the lake: bacteria that use the toxic element arsenic in photosynthesis in the absence of oxygen.

The researchers found films of purple bacteria and cyanobacteria growing in pools fed by hot springs on Paoha Island in the lake. The water in these pools contains very little oxygen but is rich in arsenic-containing minerals that leach out of the rocks.

In laboratory tests, the researchers found that the bacteria use light to produce carbohydrates from carbon dioxide, as

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...all photosynthesizing organisms do.

But where most organisms use water as the source of electrons to reduce the carbon dioxide, producing oxygen in the process, at least some of the Mono Lake bacteria use arsenite ions as the electron donor, producing arsenate ions. The findings [were reported](#) in the journal Science.

Other photosynthesizing bacteria have been found that use sulfide, nitrite and ferrous ions as electron donors and are also anoxygenic, or non-oxygen-producing. And other bacteria have been found that employ arsenite as a reducing agent, but these microbes do not use light as the energy source. The Mono Lake bacteria appear to be the first example of photosynthesis using arsenite.

A version of this article appeared in print on August 19, 2008, on page F3 of the New York edition.

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