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First fossil of slime bacteria discovered

Myxobacteria are sometimes called slime bacteria because they produce a sugary slime in which they glide *en masse*. This collective gliding and other group activities make myxobacteria the most social and sophisticated prokaryotes (single-celled organisms lacking nuclear membranes) known. Living myxobacteria abound in soils today, but until recently no fossils of the microorganisms had ever been found.

Not only has William Lanier at Oberlin (Ohio) College discovered the first myxobacteria remains, but these fossils are very old, having been preserved in 2-billion-year-old rocks. Moreover, Lanier has found forms of the bacteria at different stages of their life cycle. This is the first time the life cycle of any organism from the Precambrian, or the earliest 2.5 billion years of the earth's history, has been described.

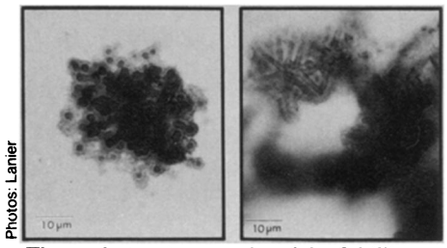
The discovery that such sophisticated microbes lived during the Precambrian, comments Gregary Retallack at the University of Oregon in Eugene, "tells us that things were quite a bit more complicated [then] than we suspected."

Adds Lanier, "When people think of microorganisms at 2 billion years ago, they think of [microbes] that are passive, just sitting in an environment that is optimal for their survival. But these organisms were active. The cells worked as communities." Lanier discussed his find at the recent meeting of the Geological Society of America in San Antonio, Tex.

The fossils come from Ontario's Gunflint Formation, which is famous for its microfossil treasures. The myxobacteria were in cavities that had formed between stromatolites — layered columns built by communities of microbes. Because the cavities were probably dark, Lanier thinks the myxobacteria were not photosynthetic but instead derived energy and nutrition from organic debris in the fluids that flowed through.

These myxobacteria, says Lanier, "are the oldest cavity-dwelling microorganisms yet described." The previously oldest known cavity inhabitants lived during the Cambrian period, about 1.3 billion years after the Gunflint myxobacteria.

Lanier says the fossil myxobacteria have the same shapes as the living organisms. But the life cycles of the two types of microbes are different. When times got tough for the fossil myxobacteria or they wanted to disperse their spores, says Lanier, some of the cells collectively formed a protective structure called a sporangiole, which housed myxospores, or cells in their resting stage. Later, the sporangioles burst, and the released myxospores glided in groups toward the walls, where they germinated into rod-shaped vegetative cells. Some myxospores also lined up to form stalks upon which sporangioles formed, beginning the process anew.



Photos: Lanier

These photomicrographs of the 2-billion-year-old fossils of slime bacteria show two stages of the microbe's life cycle. At left are myxospores, or cells in a resting stage. At right are rod-shaped vegetative cells.

In modern myxobacteria, the rod-shaped vegetative cells, which are germinated within the sporangioles, play a much more central role: They are thought to do all the swarming and to form stalks and sporangioles.

The life cycles of living microbes are not well understood, partly because they are hard to study in nature. Fossils such as Lanier's myxobacteria are important guideposts for learning about the life cycles and evolution of such microorganisms.

— S. Weisburd