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NONMARINE STROMATOLITES AND THE SEARCH FOR EARLY LIFE ON MARS

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The available evidence permits one to conclude that streams flowed and lakes developed on Mars sometime in the remote past. Speculating that (1) biopoesis occurred on Mars during its earliest history, (2) life evolved and diversified, (3) life inhabited aqueous environments, and (4) sunlight was an important environmental resource, then the lessons learned from the Earth's earliest fossil record suggest that stromatolites might have formed on Mars. The most likely place to find stromatolites and possibly microbial fossils on Mars would be in ancient lake and stream deposits. If thermal spring deposits can be identified, then they too are sites for biogeological investigations.

Today, lakes and thermal springs are not uncommon sites for stromatolites. This appears to be true for the Phanerozoic. However, for the pre-Phanerozoic, little is known about the record of life in nonmarine settings. Understanding the Archean and Proterozoic record of nonmarine stromatolites is important for the general understanding of the diversity of habitats for early life on Earth, sites of prokaryote evolution and diversification, and biogeological interactions through time. The possibility that a number of Archean and Proterozoic stromatolites might be nonmarine rather than marine has commonly been overlooked. Unfortunately, recognition of pre-Phanerozoic nonmarine deposits is difficult and ambiguous. Unlike pre-Phanerozoic marine stromatolites which formed in peritidal to slope environments with submerged carbonate platform settings apparently favoring luxuriant stromatolite development, lacustrine stromatolites may have developed best in near-shore settings. Morphological variability may be greater in nonmarine stromatolites. Thus, environmentally and morphologically, some nonmarine stromatolites may be distinctive. Favored environments for formation of Archean and Proterozoic lacustrine stromatolites and knowledge of their size, shape, and other morphological attributes are important for the search for evidence of ancient Martian life.