MICROBIAL TRACE FOSSILS IN ANTARCTICA AND THE SEARCH FOR EVIDENCE OF EARLY LIFE ON MARS

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It is possible to hypothesize that, if microbial life evolved on early Mars, fossil remnants of these organisms may be preserved on the surface. However, the cooling and drying Mars probably resembled a cold desert and such an environment is not suitable for the process of fossilization.

The frigid Ross Desert of Antarctica is probably the closest terrestrial analog to conditions that may have prevailed on the surface of the cooling and drying Mars. In this desert, cryptoendolithic microbial communities live in the airspaces of porous rocks, the last habitable niche in a hostile outside environment. The organisms produce characteristic chemical and physical changes in the rock substrate. Environmental changes (deterioration of conditions) may result in death of the community. Although no cellular structures are fossilized, the conspicuous changes in the rock substrate are preserved as trace fossils. Likewise, microbial trace fossils (without cellular structures) may also have been preserved on Mars: Discontinuities in structure or chemistry of the rock that are independent of physical or chemical gradients may be of biological origin. Ross Desert trace fossils can be used as a model for planning search strategies and for instrument design to find evidence of past Martian life.