TARGETING SITES FOR FUTURE ASTROBIOLOGICAL MISSIONS TO MARS. Jack Farmer (Arizona State University, Dept. of Geological Sciences, PO Box 871404, Tempe, AZ 85287-1404; jfarmer@asu.edu)

In defining a site-selection strategy to explore for a martian fossil record, a key concept is contemporaneous chemical precipitation, or mineralization. This process entombs microorganisms, stabilizes morphological information and protects biosignatures during subsequent diagenetic changes. On Earth, geological environments where microorganisms are often preserved in this way include: 1) mineralizing spring systems (subaerial, subaqueous, and shallow subsurface hydrothermal systems, and cold springs of alkaline lakes), 2) saline/alkaline environments of arid marine shorelines (sabkhas), or terminal (evaporative) lake basins, 3) duricrusts and sub-soil hard-pan environments formed by the selective leaching and re-precipitation of minerals within soil profiles, and 4) periglacial environments ground ice or permafrost (frozen soils) have captured and cryopreserved microorganisms and associated organic materials.

Successful implementation of a strategy for Mars exopaleontology will depend on targeting the most favorable landing sites for in situ robotic exploration and sample return. As demonstrated by the MER mission, mineralogy provides the most robust means for discovering ancient aqueous environments and comprises a fundamental step in selecting the sites that have the best chance for having capturing and preserved a record of ancient life or pre-biotic chemistry. Given the complexity of heavily cratered ancient terrains, the identification of exopaleontological targets is likely to require orbital mapping at a spatial resolution that can resolve small outcrops. The aqueous mineral deposits of most interest (silica, phosphate, clays, carbonates, evaporites, oxides and sulfides) have characteristic spectral signatures and may be identifiable from orbit using hyperspectral methods that allow the identification of discrete mineral signatures within complex mixtures. The CRISM instrument to be delivered to Mars in 2005 is likely to provide a quantum jump in our knowledge of Martian surface mineralogy, marking an important next step toward implementing focused missions for Astrobiology.