

## Exploring for Martian Life

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A critical step in implementing a strategy to explore for evidence of past Martian life is to locate and sample surface outcrops of aqueously-deposited sedimentary rocks. Potentially important targets for Exopaleontology include fine-grained, clay-rich detrital sediments, water-deposited volcanic ash, and chemical precipitates. On Earth, such lithologies are especially favorable for capturing and preserving fossil biosignatures of ancient microbial life. High spatial resolution ( $\sim 100$  m/pixel) mineralogical (spectral) mapping from orbit is considered essential for the identification of exopaleontological sites for surface exploration. Once identified, improved landing precision will be required to place robotic platforms within reach of the best targets. On the surface, selection of the best rock samples for analysis (and/or return to Earth) will require a knowledge of mineralogy. Close-up imaging of rock surfaces provides a simple, rapid method for qualitative lithologic analysis; spectral analysis of rock surfaces provides the most direct approach to quantitative mineralogy. But, given the likelihood of weathering patinas, the success of such methods may depend on access of rover instruments to unweathered rock interiors via coring, grinding or breaking of rocks. Exploring for extant Martian life will require a radically different approach. A kilometers-deep subsurface hydrosphere has been touted as the most plausible haven for an extant Martian biota. But during the robotic phase of Mars exploration, robotic rovers are unlikely to penetrate deeper than a few tens of meters into the regolith. The technological challenge of deep drilling presently provides the most compelling scientific rationale for mounting human missions to Mars.