



Strategies to search for life on Mars

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Mars lies at the frontier of planetary science and the question of whether life arose on Mars has been widely debated. A combination of energetic ultraviolet radiation, the extreme dryness and the presumed oxidizing nature of the soil make Mars' present surface an inhospitable place for terrestrial organisms. However, conditions in the early history of Mars including a denser atmosphere and persistent liquid water at the surface may have been more favourable for life in the past. We may expect to find remnants of extinct life or eventually extant life in subsurface environments. Even without an active ecosystem on Mars the surface should not be totally devoid of organic carbon. Meteoritic infall ought to result in measurable levels of carbon compounds in the surface regolith. Apart from organic molecules, minerals may preserve evidence of the former presence of life processes over long time-scales. In order to support future endeavours to search for life on Mars we have to understand the processes that may alter organic matter on the martian surface, how we can distinguish biologic from abiologic organic matter and how we can trace the influence of microbial catalysis. A strategic search for life on Mars needs a thorough interdisciplinary preparation phase. We propose a comprehensive multidisciplinary program that includes Mars simulations, computational studies, extensive terrestrial field tests and in situ instrument development focussed on the future identification of biochemical and isotopic biosignatures on Mars.