

Examining the search for life, including alternative life forms, in our solar system.

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In this study we discuss plausible environments in our solar system capable of hosting terrestrial life forms, as well as alternative life forms, and the instrumentation used to search for such life. On Earth we find microorganisms in every environmental niche. The only environmental constraint on Life as we know it is the ability to access liquid water. Furthermore all life on Earth consists of the same biochemical building blocks. If there are novel organisms on other planetary bodies that have a similar building block pattern, but distinctively different biochemical constituents, how would we search for, detect, and identify these organisms? Technologies in pattern recognition would be useful in this method. Perhaps on other planets, such as Titan, methane would be the essential ingredient for life and fulfill the role of the water cycle on Earth. On Mars, a few meters below the permafrost in the Southern highlands is a likely place to find ancient organisms. However, the technology to aseptically collect such a sample is in its nascent stage. We review existing and developing technologies and methods needed to search for life in the solar system including novel life forms.