

## JAMP (Japan Astrobiology Mars Project): Search for Microbes on the Mars Surface with a Fluorescent Microscope.

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**Introduction:** Among the planets and giant satellites in our solar system, the characteristics of Mars are most similar to those of Earth. This suggests that the life similar to terrestrial life may arise and survive on Mars.

Here we propose a new life detection project on Mars within the scope of MELOS (Mars Exploration with Lander Orbiter Synergy), to search for methane-oxidizing microbes by fluorescence microscopy [1]. We propose to search for cells from a depth of about 5 - 10 cm below the surface, which is feasible with current technology. Microscopic observation has the potential to detect single cells. The subsequent analysis of amino acids will provide the information needed to define the origin of the cell.

**Survivability of Life in the Mars Environment:** Physical and chemical limits for terrestrial life have been major foci in astrobiology [2], and are summarized in ref. [1]. Combining the environmental factors, anywhere in the Martian environment where we can find the three components, water molecules, reducing compounds and oxidative compounds could be an environment where life can be sustained for long periods of time, if other factors such as temperature, pressure, UV and other radiations permit.

**Methane Oxidizing Bacteria on Earth:** Recently, a microbial consortium that is capable of using manganese (birnessite) and iron (ferrihydrite) to oxidize methane has been predicted in marine methane-seep sediments in the Eel River Basin in California [3]. Thus, there are several mechanisms of methane oxidation carried out by Bacteria and Archaea on Earth, and possibly on Mars.

**Reference:**

[1] Yamagishi, A, et al. (2010) *Biol. Scie. Space*, 24, 67-82. [2] Marion, G.M. et al. (2003) *Astrobiol.* 3, 785-811. [3] Beal, E. J., et al. (2009) *Science*, 325, 184-187.

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