

Astrobiology - from earth to space

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at GSI Main Lecture Hall (SB1 1.120)

Description

So far, life on Earth is the only example of life we know about. Therefore, the astrobiological research concentrates on what we can learn from terrestrial life. Important questions are: What are the physical and chemical boundaries for life? How can organisms adapt to extreme environmental conditions? Are there other planets and moons with habitable conditions in our solar system and beyond? Where and how should we search for life? What precautions are necessary to avoid false-positive results from Earth contamination? Our neighbour planet Mars and the icy moons in the outer solar system, especially Europa and Enceladus, are of great astrobiological interest because they might be habitable or even inhabited.

In the last decades our knowledge about life in extreme environments on Earth has increased substantially. Organisms have been found in places on Earth that were thought to be hostile not long ago. Examples are hydrothermal vents in the deep sea, permafrost, salt deposits, deep subsurface sediments, hot and cold deserts or hot springs. However, our knowledge about the capability of organisms from these extreme environments to survive combined environmental stresses as those experienced on Mars or in the subsurface oceans of the icy moons are very limited.

In the MASE project (Mars Analogues for Space Exploration) samples from different Mars analogue areas on Earth were collected and anaerobic microorganisms adapted to these extreme conditions were isolated. These new strains were subjected to mars-relevant environmental stress factors alone and in combination in the laboratory under controlled conditions, e.g. radiation, high salt concentrations, low water activity, oxidising compounds. The aim is to find out, if these organisms are also able to survive under martian conditions. So far, eight only distantly related microorganisms are under detailed investigation. The limiting factor for many but not all of these new strains is the exposure to desiccating conditions. Some strains survive surprisingly well. Some are also resistant against radiation or to strongly oxidising compounds, e.g. perchlorates, that have been found on Mars. The future experiments aim at the identification of the underlying cellular and molecular mechanisms and the comparison to other new isolates from Mars analogue environments on Earth. Selected microorganisms from the MASE project will also be tested in the space experiment MEXEM (Mars Exposed Extremophile Mixture) on the International Space Station.

This research will contribute to a broader perspective for 'life as we know it' and might allow a more targeted search for life in our solar system.

Organised by Christoph Scheidenberger