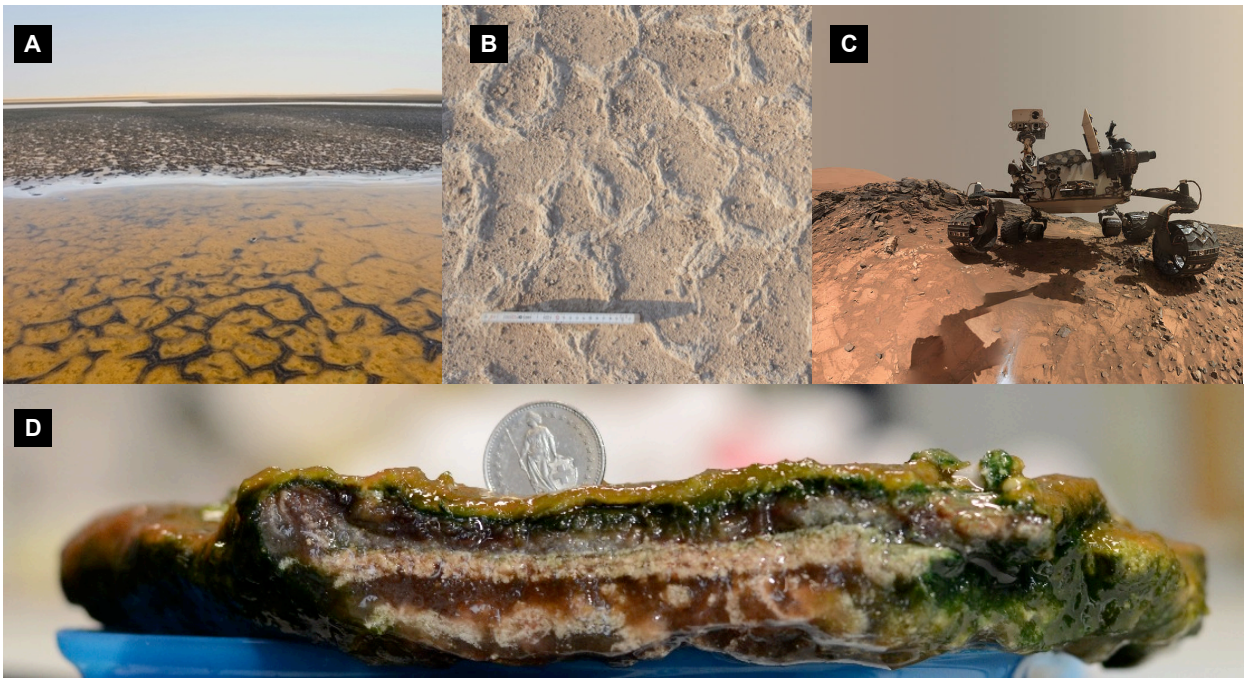
MORPHOLOGICAL BIOSIGNATURES ON MARS: WHAT TO EXPECT AND HOW TO PREPARE NOT TO MISS THEM

Tomaso R.R. Bontognali[1]

The presentation will focus on the strategies used during the current and forthcoming robotic missions to possibly find evidence for past life on Mars, with special emphasis on morphological biosignatures.

Key words: ExoMars mission, exobiology, biosignatures

Thanks to the new generation of rovers equipped with instruments capable of making "contact science", which includes acquiring high-resolution images of geological samples and performing sophisticated mineralogical and geochemical analysis, the search for life on Mars is in the middle of a particularly exciting phase. This contribution will focus on the general strategies that are used in the current and forthcoming robotic missions (MSL, ExoMars, Mars 2020) to look for signs of extraterrestrial life, with special emphasis on morphological biosignatures. To best prepare for the missions and to refine our ability to identify and correctly interpret putative morphological biosignatures, research is currently done on Earth in places referred to as Mars-analog sites, where conditions both in terms of geology and biology are similar to those we hypothesize may have existed billions of years ago on Mars. Examples of such research include microbe-mineral interactions occurring in the sabkhas of Qatar. In these extreme evaporitic environments, stromatolites and other microbially influenced sedimentary structures form thanks to the activity of primitive microbes, producing morphological biosignatures that are highly relevant for the field of exobiology.



(A) *The Khor Al Adaid sabkha in Qatar is studied as a Mars-analog site.* ***(B)*** *Outcrop showing morphological biosignatures consisting of fossil microbial mats* ***(C)*** *The NASA rover Curiosity (Image credits: NASA/JPLCaltech/ MSSS).* ***(D)*** *Microbial mat comprised of primitive microorganisms that induce the formation of a morphologically complex mineral structure. Except (C) all images were taken by Bontognali.*

[1] Research Scientist with PhD in Geobiology, CLUPI Science Validation Manager, ExoMars 2020, Space Exploration Institute, Neuchâtel, Switzerland