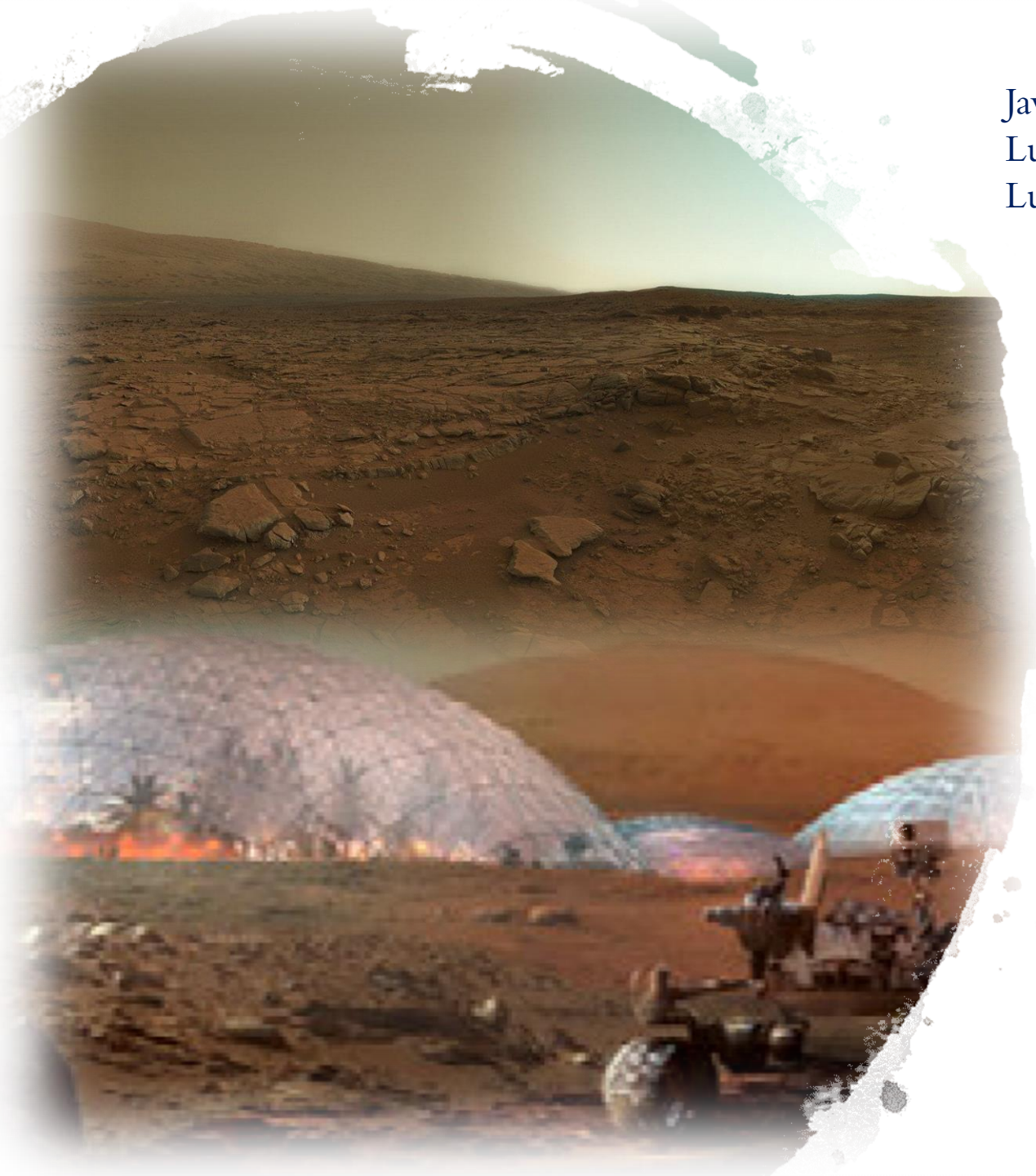
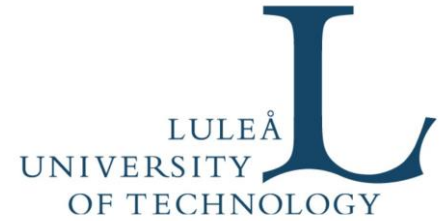
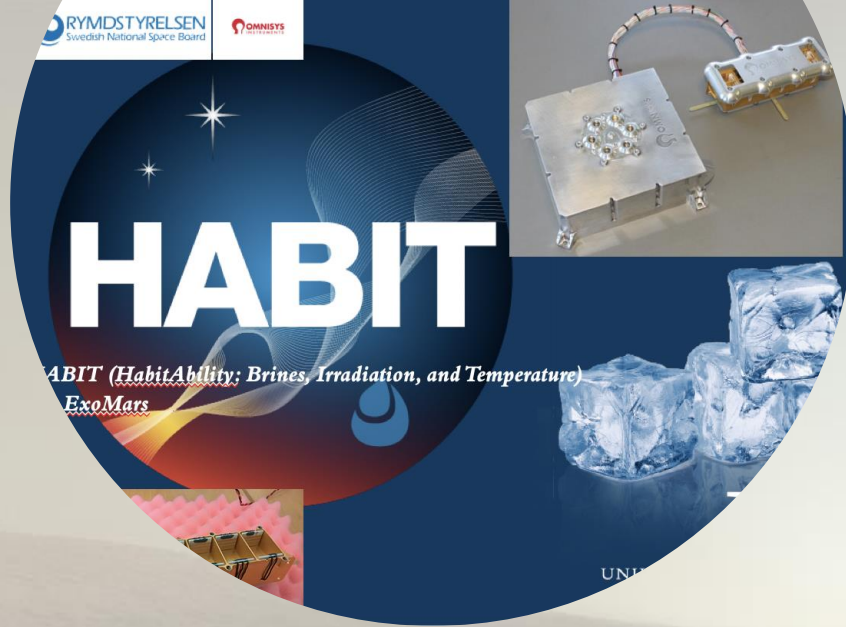


Javier Martin-Torres  
Luleå University of Technology,  
Luleå, Sweden



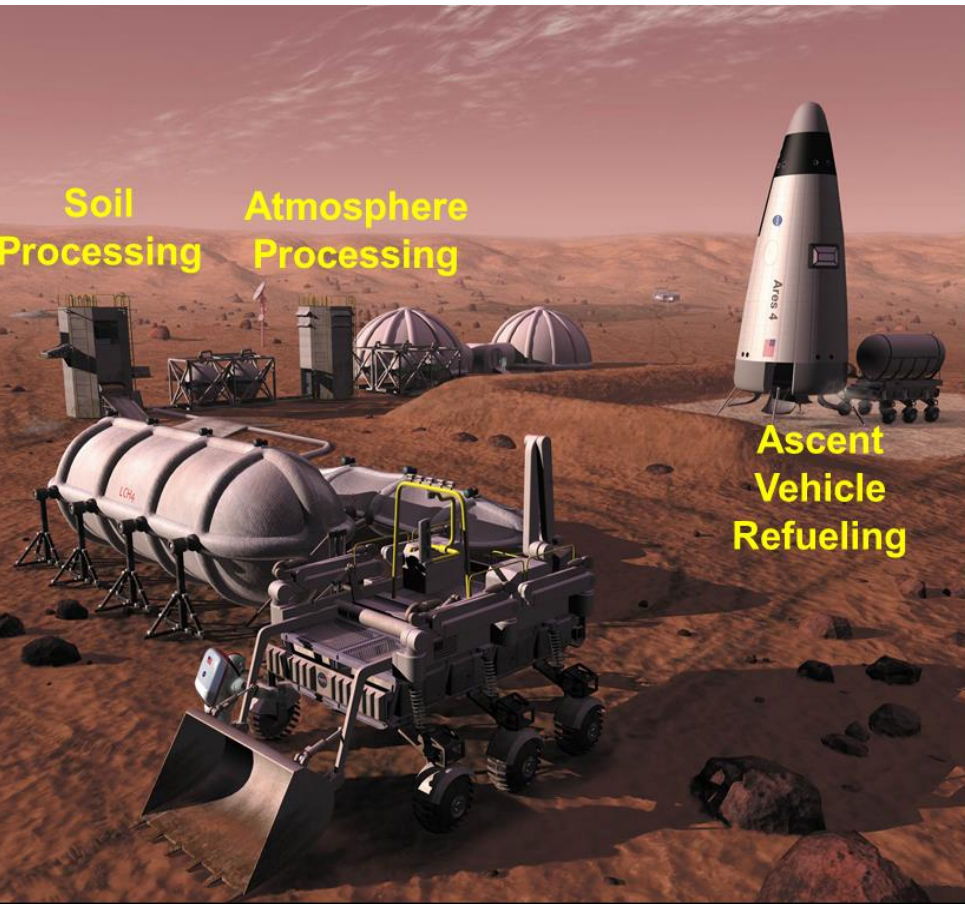
**Let's talk about the  
future ...**



We need, between other things,  
In-Situ Resource Utilization Instruments



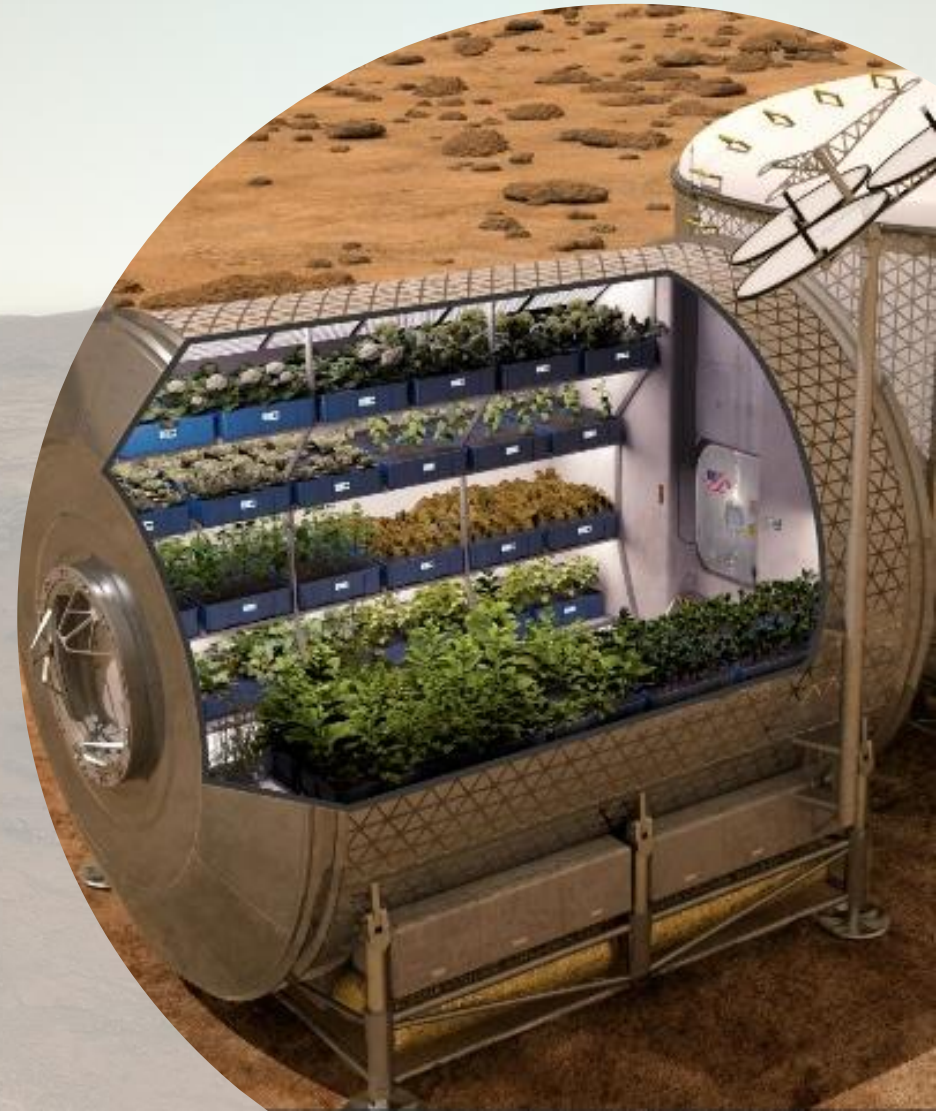
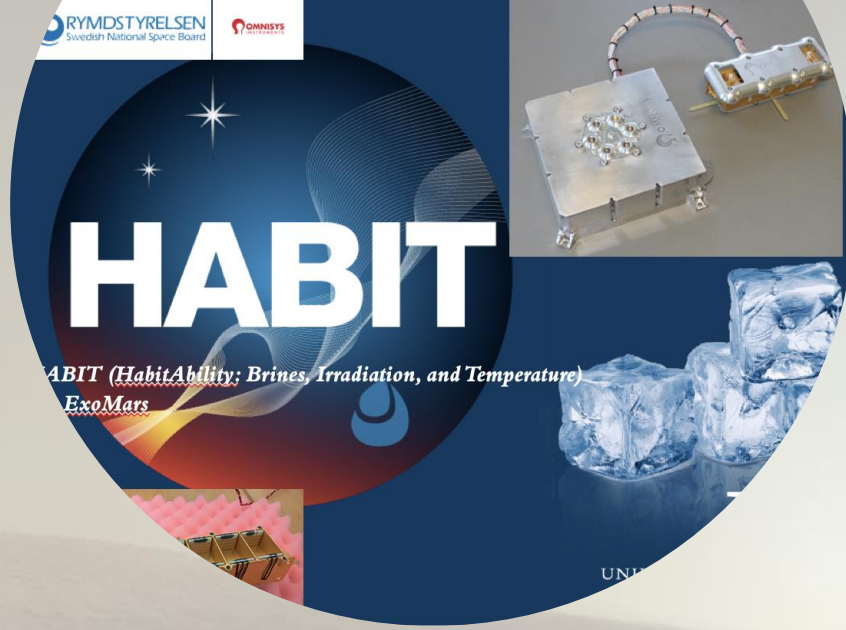
# In-Situ Resource Utilization (ISRU)



## Needed for Potential Future Human Exploration

- Decreases mission cost
- Increases payload capacity
- Increases surface access
- Reduces mission and crew risk
- Extends mission

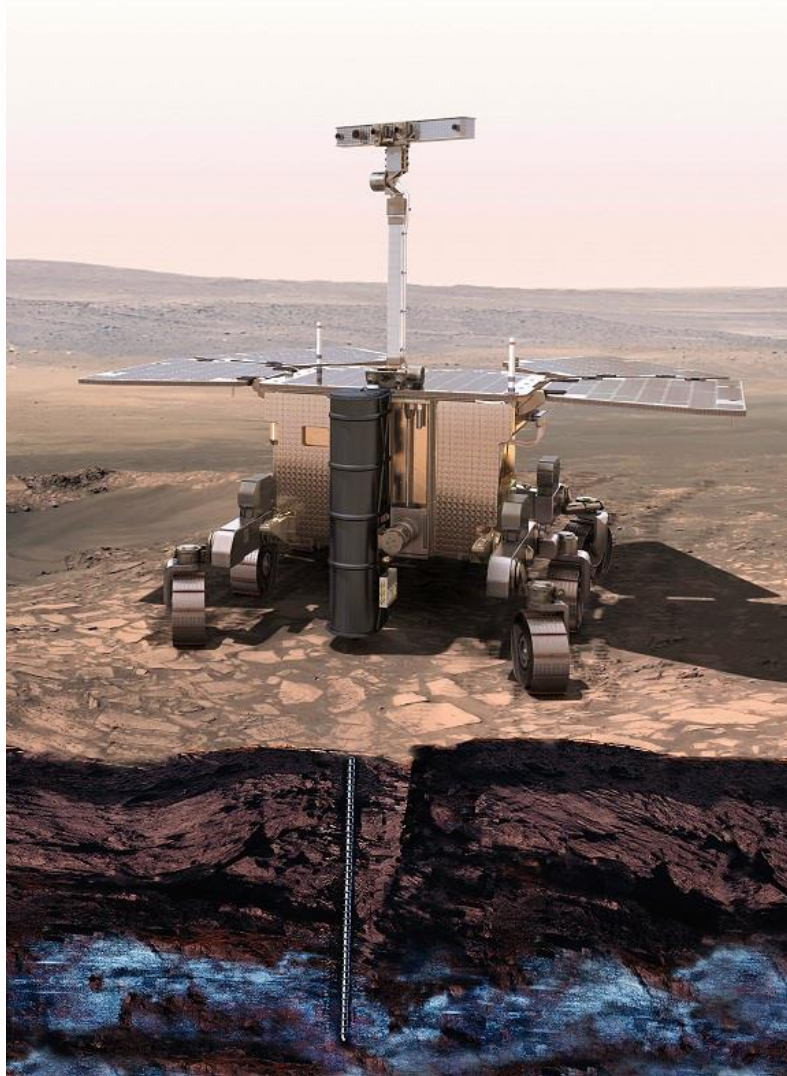
Besides its fundamental interest for the existence of present-day life, **water** on Mars can be used for greenhouse and human support and it can also be used to produce critical resources such as  $O_2$ ,  $H_2$ ,  $CH_4$  etc through reactions like Electrolysis, Sabatier, Reverse Water Gas Shift



We need, between other things,  
In-Situ Resource Utilization Instruments



# ESA-lead Scientific Payload



**PanCam** - The Panoramic Camera

**ISEM** - Infrared Spectrometer for ExoMars

**CLUPI** - Close - UP Imager

**Ma\_MISS** - Mars Multispectral Imager  
for Subsurface Studies

**MicrOmega**: A visible plus infrared imaging  
spectrometer for mineralogy studies on  
Martian sample

**LaRa**: Lander Radioscience experiment, will  
reveal details of the internal structure of Mars

**HABIT: ISRU instrument and Met Station**

**RLS** - Raman Spectrometer (minerals and  
organic pigments)

**MOMA**- Mars Organic Molecule Analyser

**HABIT** - Habitability of the environment and  
liquid brine formation

**WISDOM** - Water Ice

and Subsurface Deposit Observation On Mars

**ADRON**: To search for subsurface water and  
hydrated minerals

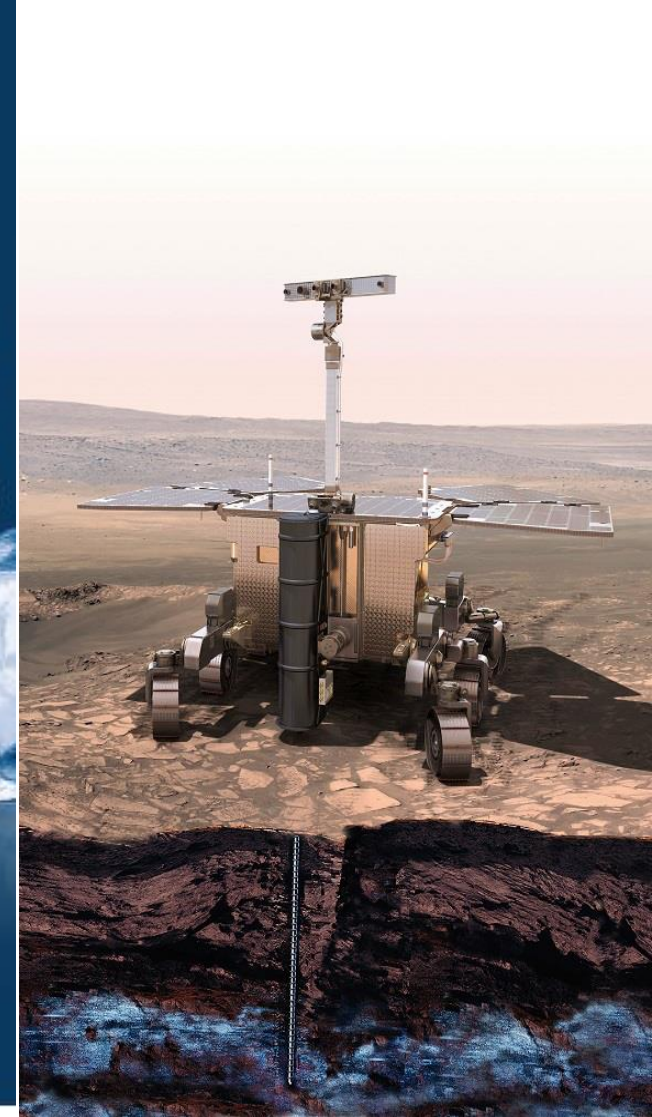
# The first European ISRU instrument

# HABIT

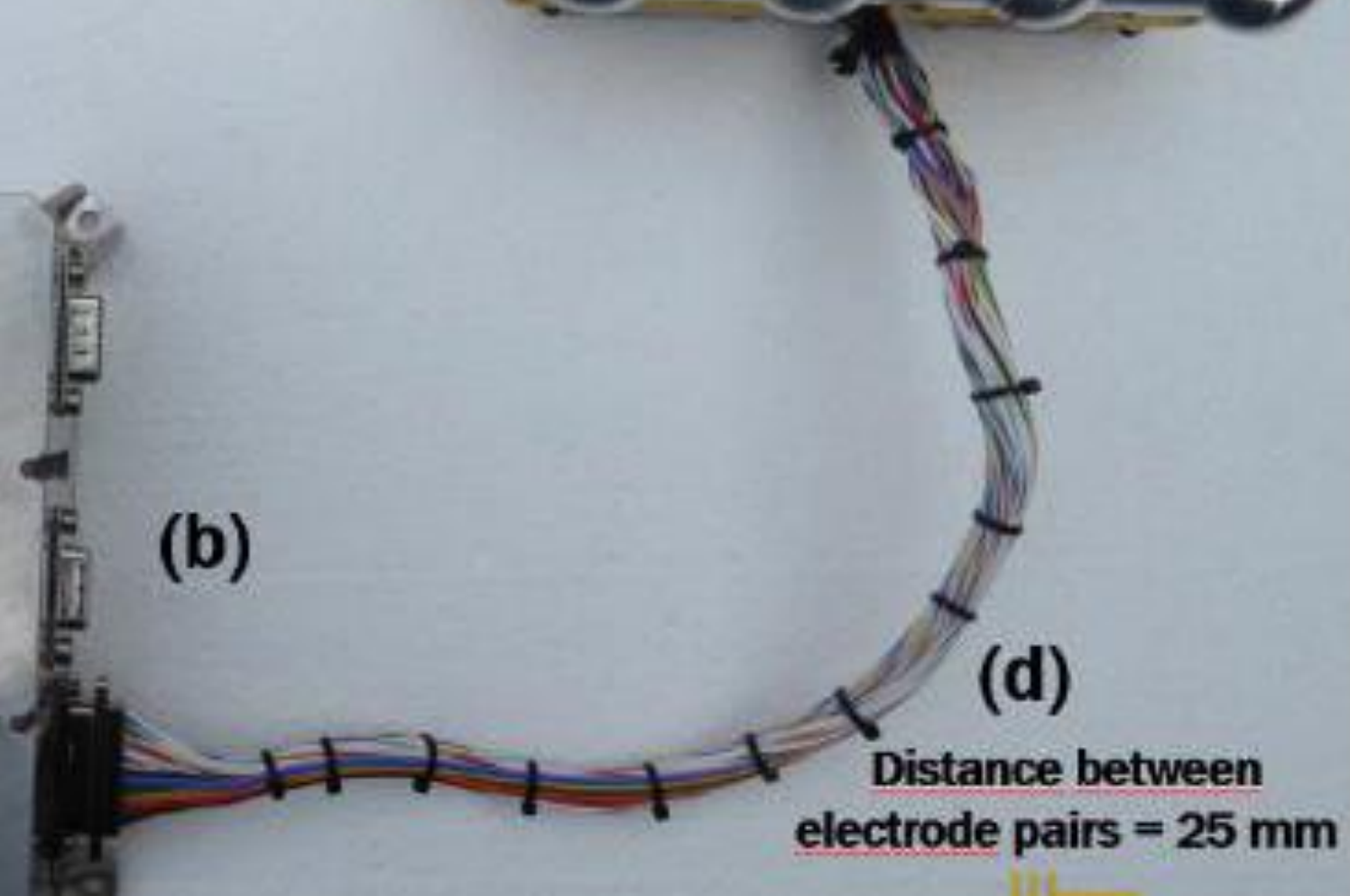
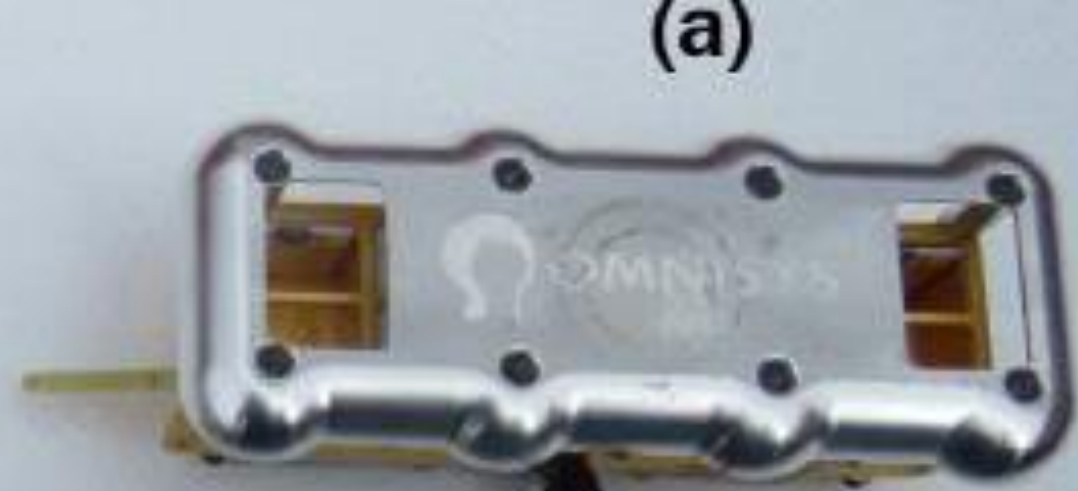
*HABIT (HabitAbility: Brines, Irradiation, and  
Temperature) for ExoMars*



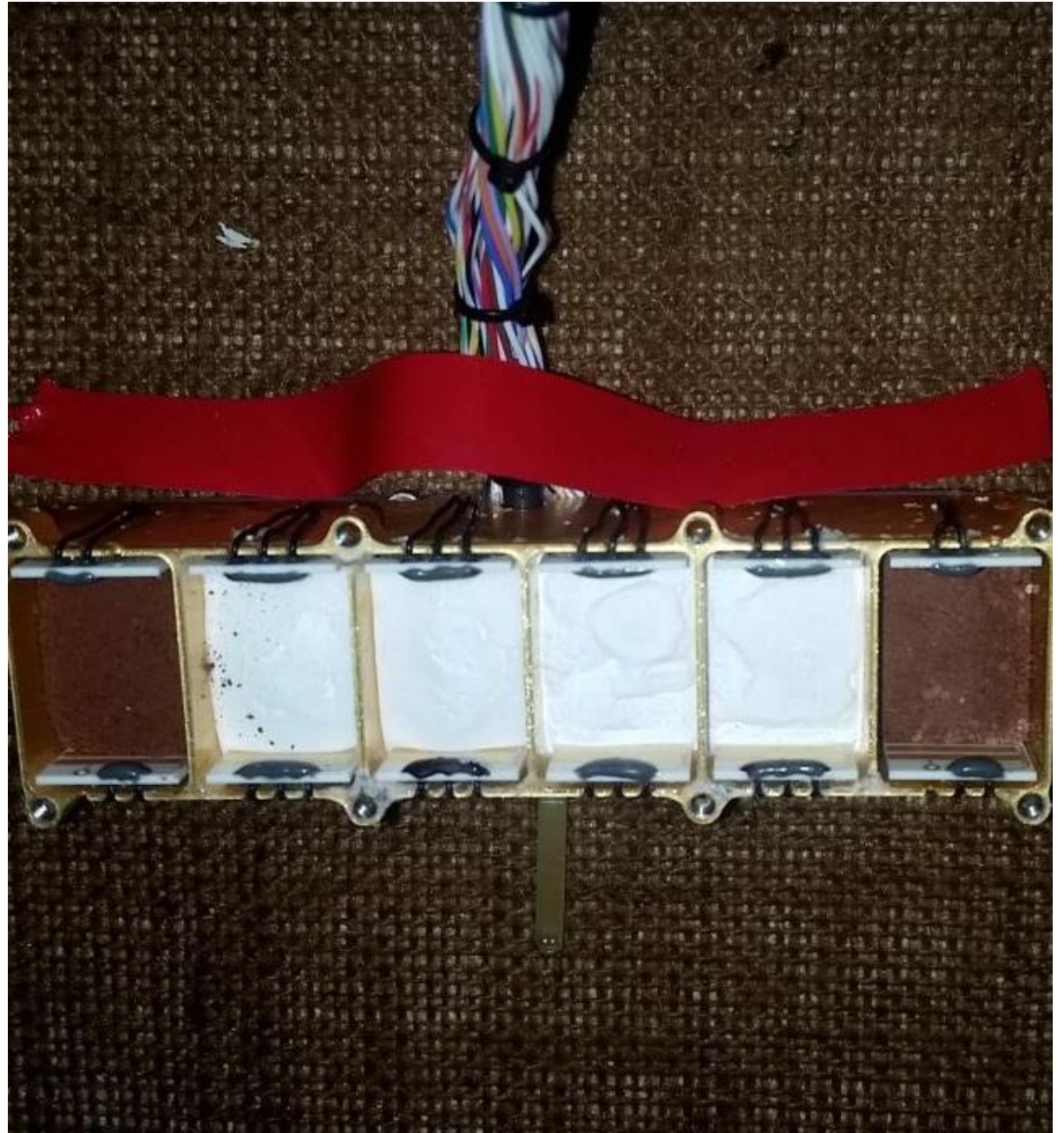
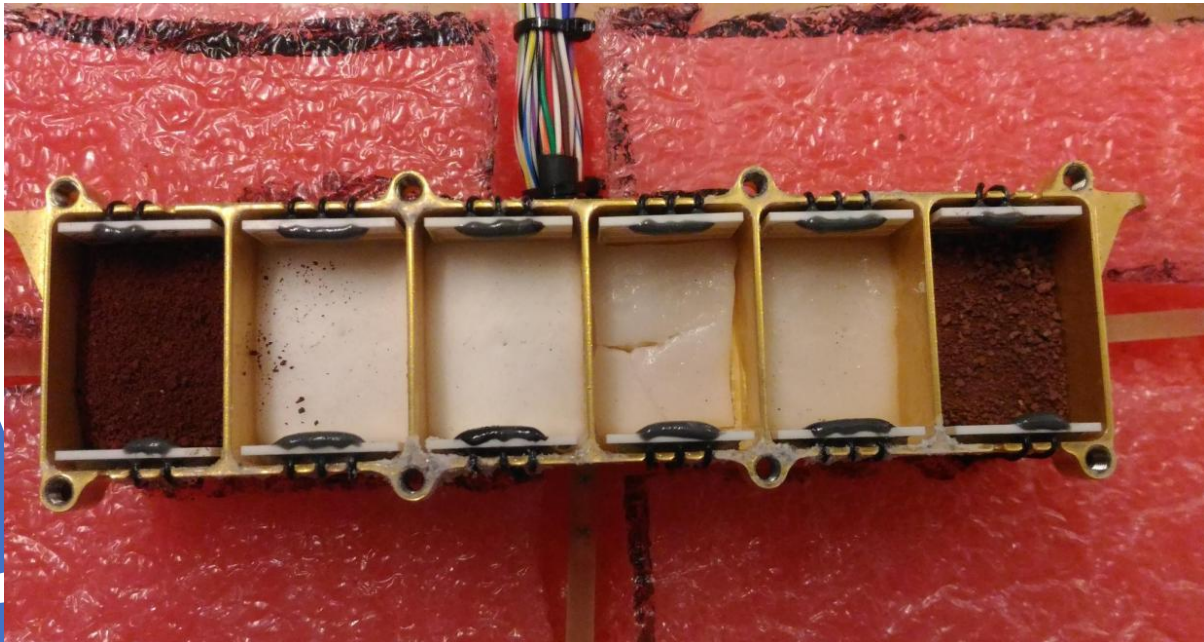
LULEÅ  
UNIVERSITY  
OF TECHNOLOGY



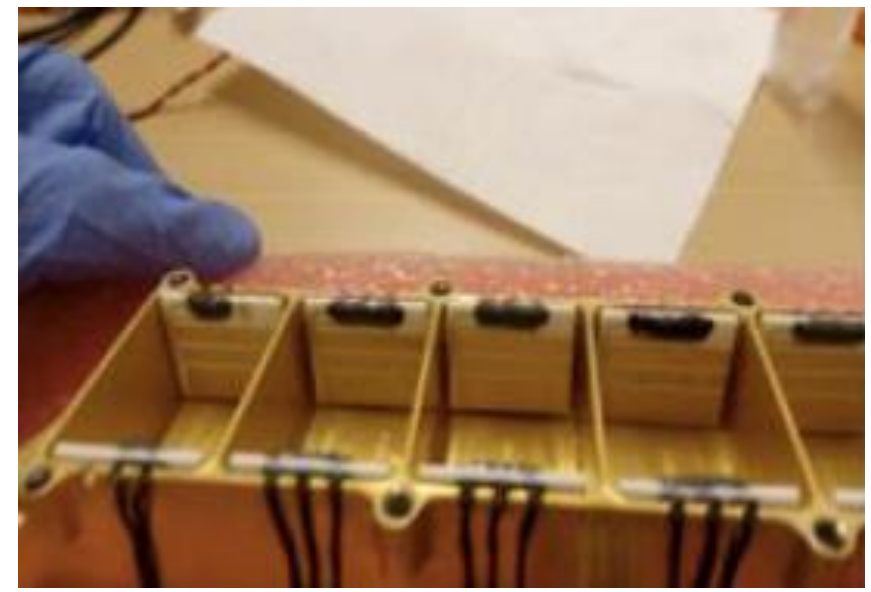
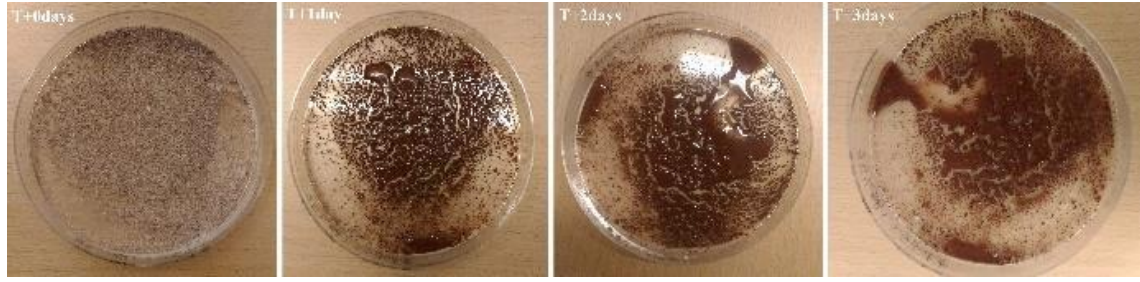
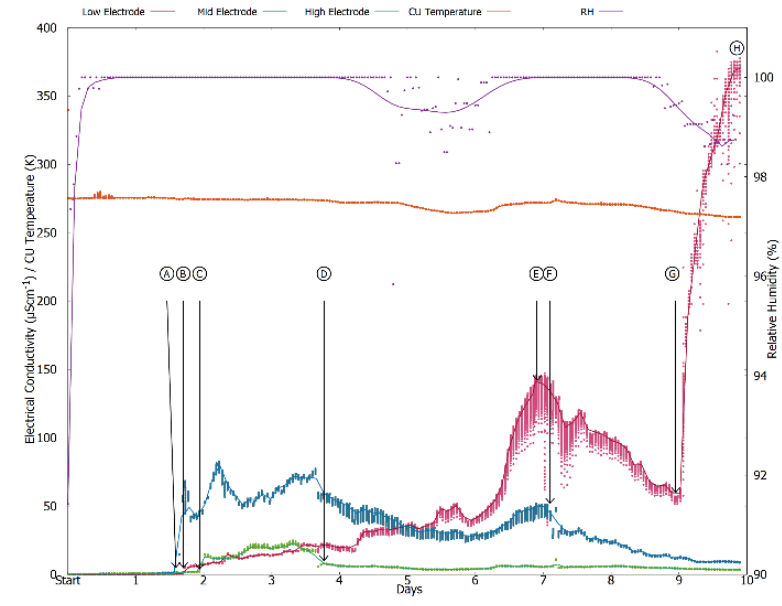
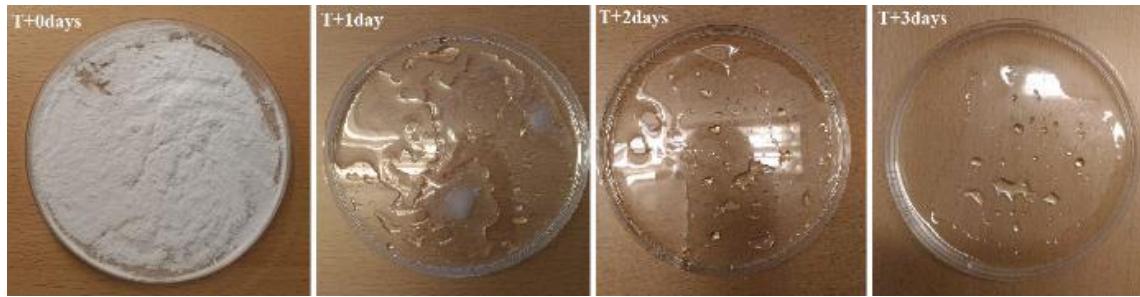


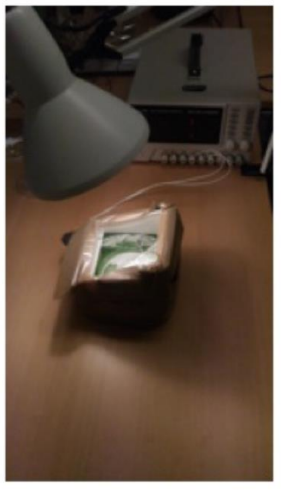
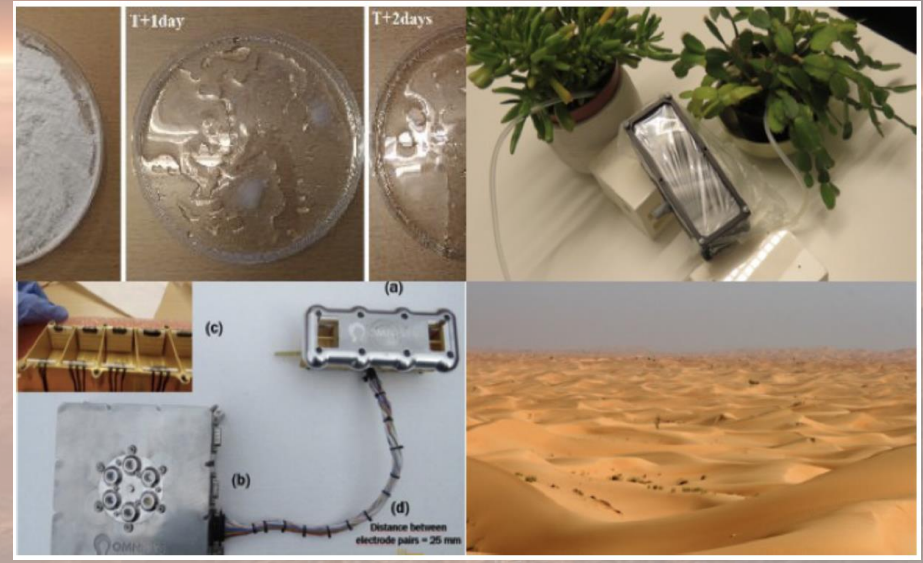
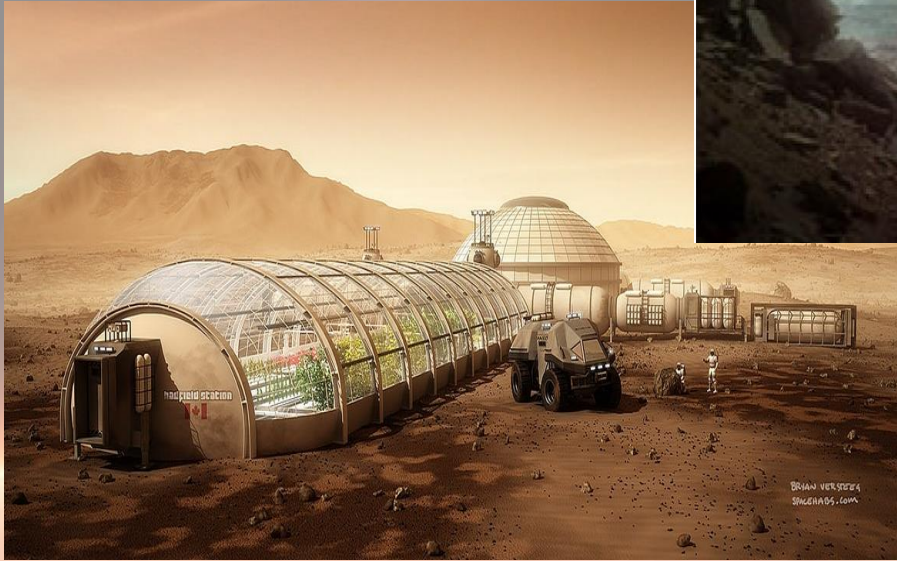
















Thank you very  
much !  
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