

# ILEWG EuroMoonMars programme & field campaigns

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PI ExoGeoLab, EuroMoonMars, Prof VU Amsterdam & Leiden U, ISAE, ISU,

**Bernard:Foing@esa.int SMART-1 & EuroMoonMars Team (2009-2020)**

**2020 Anna, Liza, Jolanda, Henk, Marc, Michaela, Anouk, Eibhlin, Ugo, Thomas, Geoffrey, Isabella, Victoria & EMMIHS 2-4 teams**

**2019 Henk, Michaela, Nity, Sebastian, Annelotte, Josh, Ben, Paul, Andrew, Dan & EMMIHS1**

**2018-19 Bram, Marc, Dieke, Marjolein, Bram, Isaac, Guido & VU Igluna**

**Anna S, Marius, Benjamin, Germaine, Yolanda, Carmen, Yvette & ILEWG,**

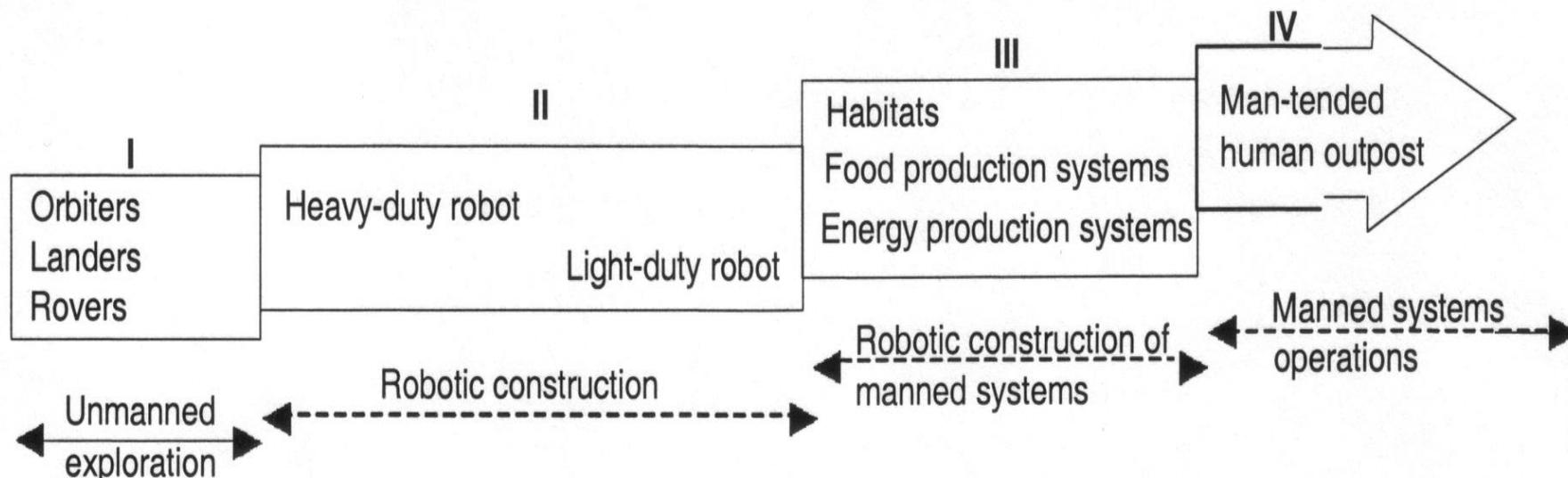
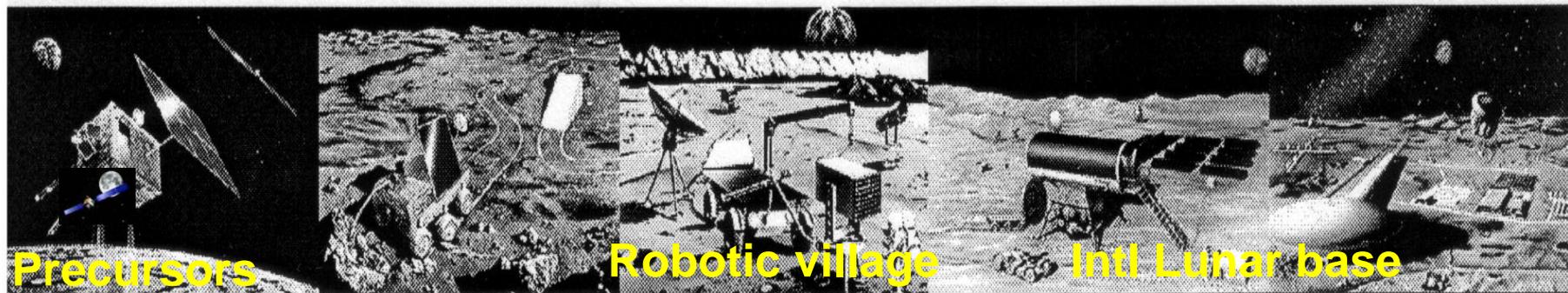
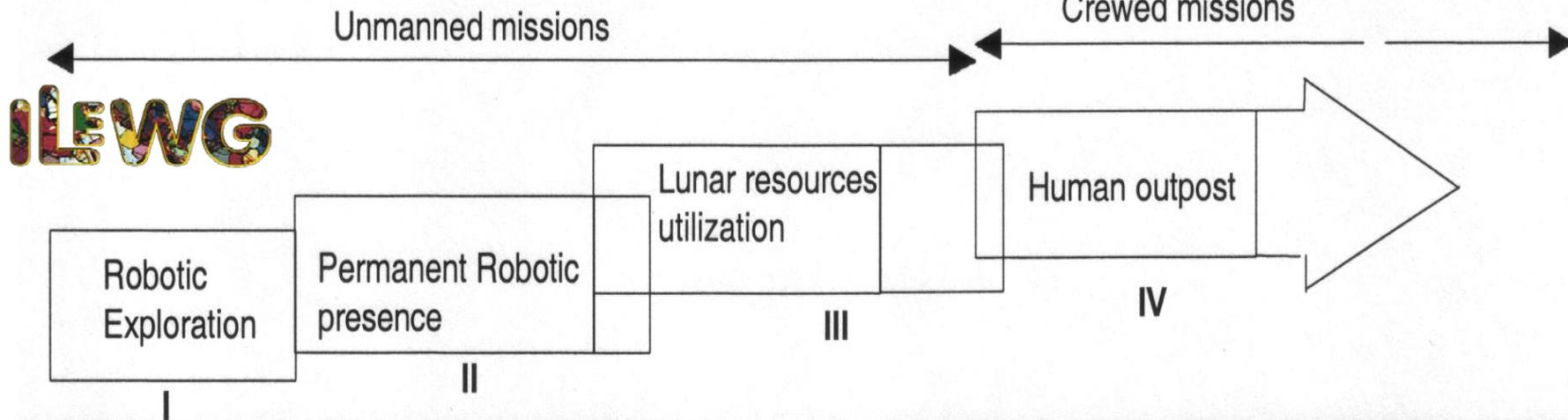
**2018 Elise C, Louis D, Sandro P, Anna, Anastasia I, Alexander Z ,**

**2017 Arthur L, Heleen V, Agata K, Matt H, Matteus K, Maria G, Andjela T, Pierre E, Lorene A, Axel B, Cynthia C. , Tibor P. , Angeliki, Yolanda et al**

**2016 Clément J, Oscar K, Valentin G, Manon M, Irene S, Christiane H**



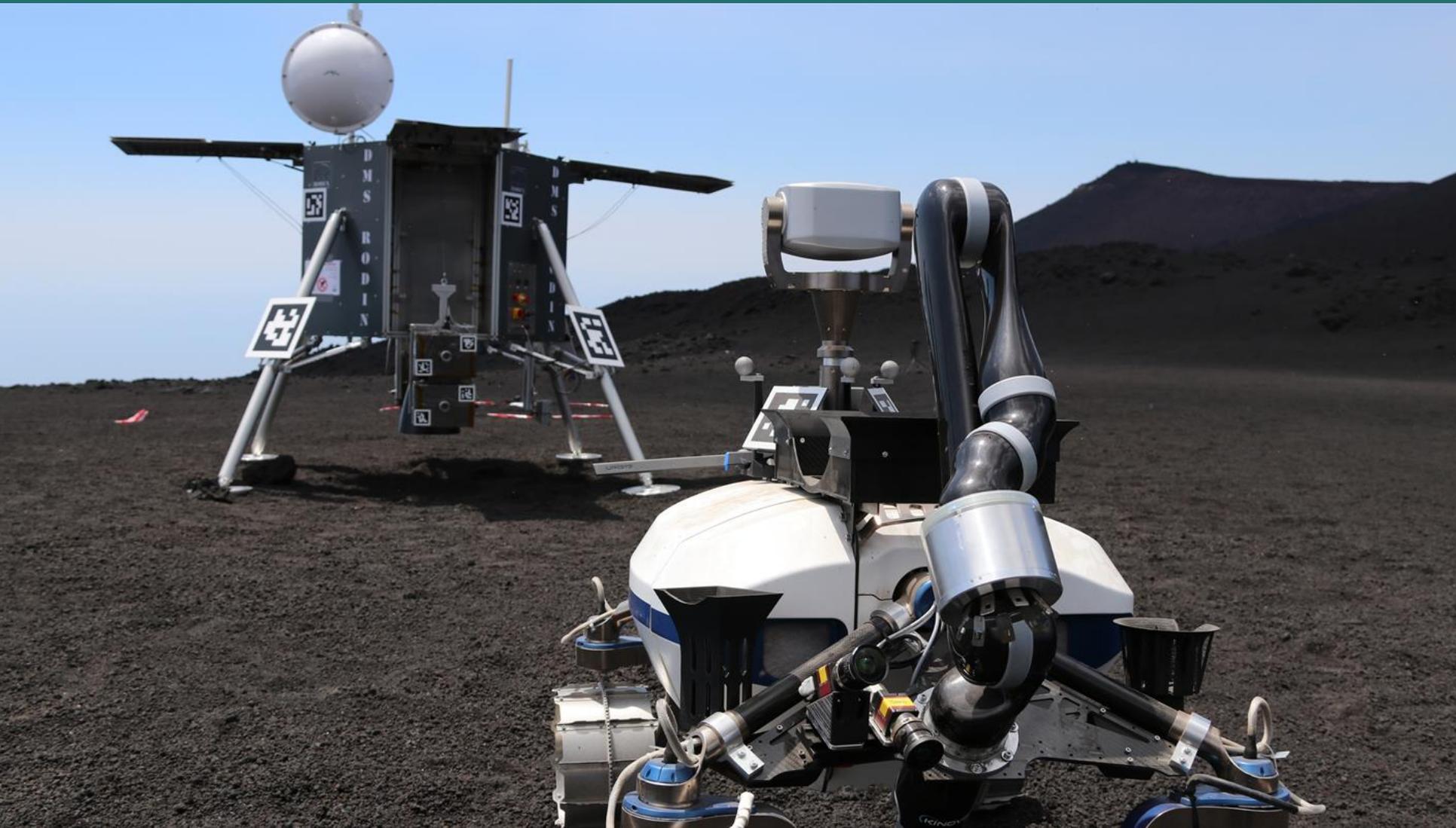
# MoonVillage Roadmap: International Lunar Exploration Working Group 1998



# Cooperative robotics



# ROBEX DLR lunar lander & rover campaign at Etna (June 2017)



# Human Robot partnership in ILEWVG/ESTEC/OWF MoonMars field tests at Eifel volcano region



# ESTEC/ILEWG ExoHab Lab module EuroMoonMars workshop July 2016



# ILEWG EuroMoonMars Field Campaigns 2009-2019

## ◆ Lab & Field research

- Geology in-situ and samples
- Astrobiology and life sciences

## ◆ Instruments demo

- Cameras, spectros, comms
- Rovers & drones, Navigation, maps
- Traverses, Sampling, GPR, drills

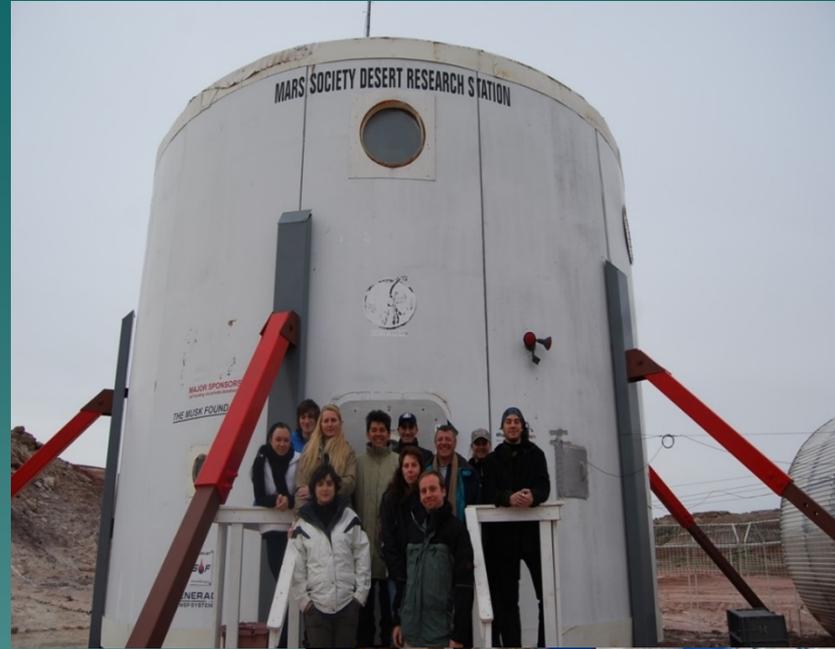
## ◆ Habitat technologies:

- Hab structure
- Architecture and layout
- Power, comms
- Grey water, Greenhouse
- Laboratory

## ◆ Human aspects

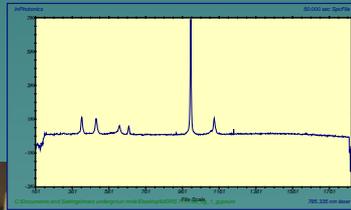
- Time sheets/Performance
- Astronauts & EVAs suits
- Food and medical study

## ◆ Training of young/advanced , outreach



# Geochemistry sample measurements

- ◆ X-Ray Diffractometer/ X-Ray Fluorescence
- ◆ Visible-Infrared reflectance\*
- ◆ Raman spectroscopy\*
- ◆ Microscopy\*



# Outside field instruments/EVAs

- ◆ Multiple camera system and data acquisition\*
- ◆ Ground Penetrating Radar\*
- ◆ Drilling core samples
- ◆ Remote control Field rover, cameras and instruments\*
- ◆ Optical Positioning/Navigation experiment \*



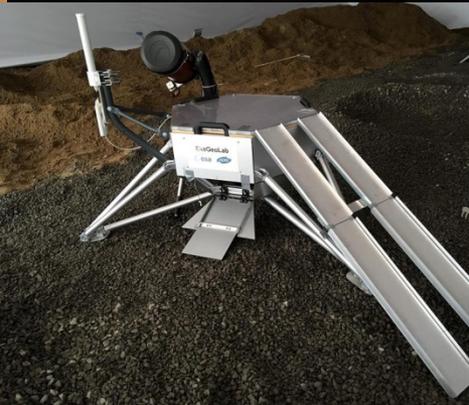
# 2017 ESTEC ExoLab 2.0



# EuroMoonMars Igluna Iceland sept 2018



# LunAres Simulation Base Poland (July-Aug 2017 & June-Aug 2018)



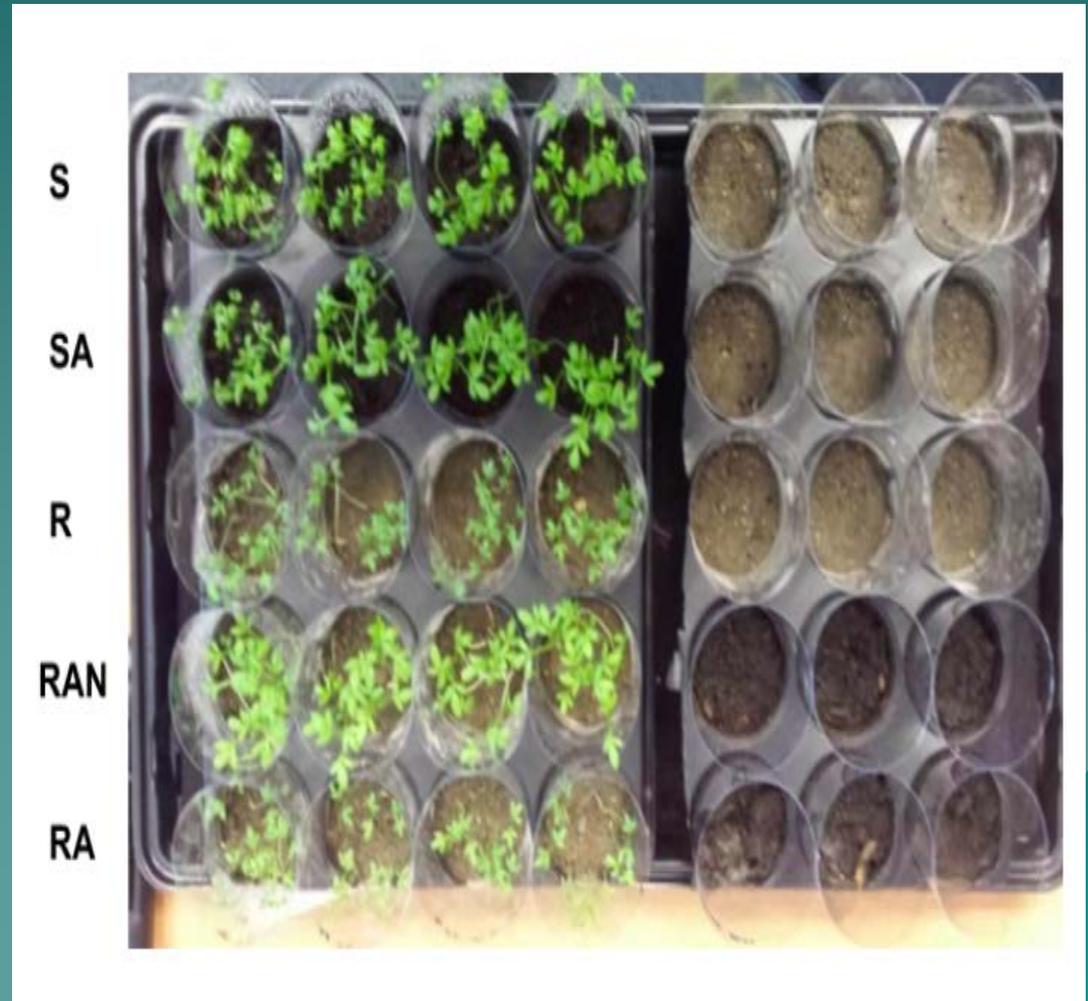


# Lunex1 Crew at LunAres Base



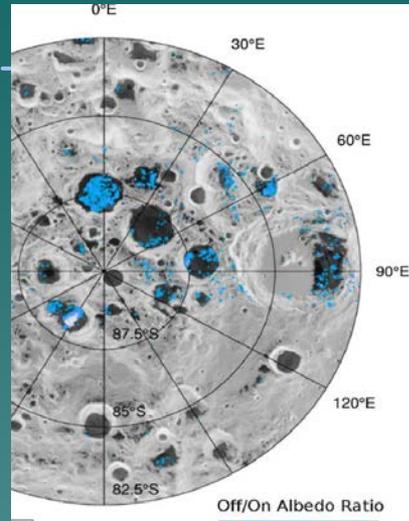
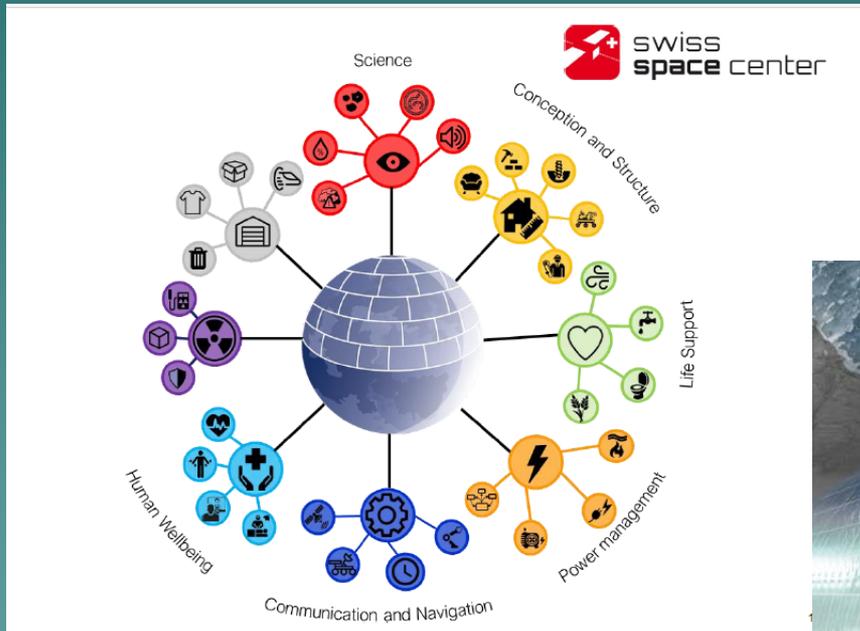
# Life Sciences on The Moon: Preparing for Moon Garden

- ◆ Using Lunar Regolith for Organics:
- ◆ Plant Growth using MoonMars Soils Analogues
- ◆ **Robotic gardener**
- ◆ **Remote supervision**



# ESA LAB IGLUNA

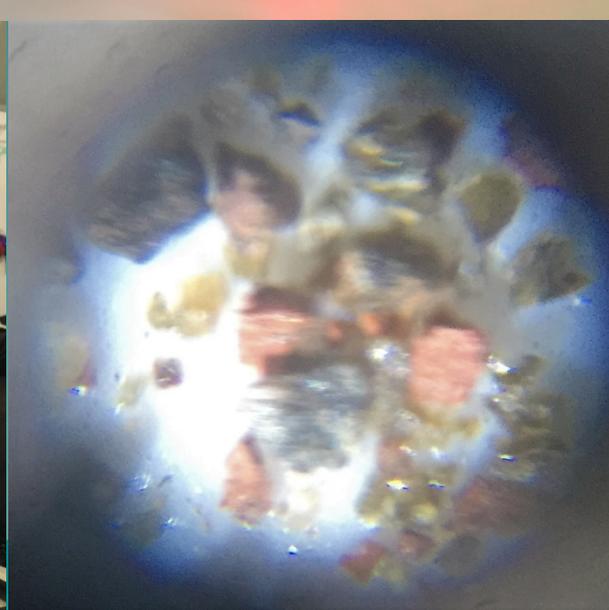
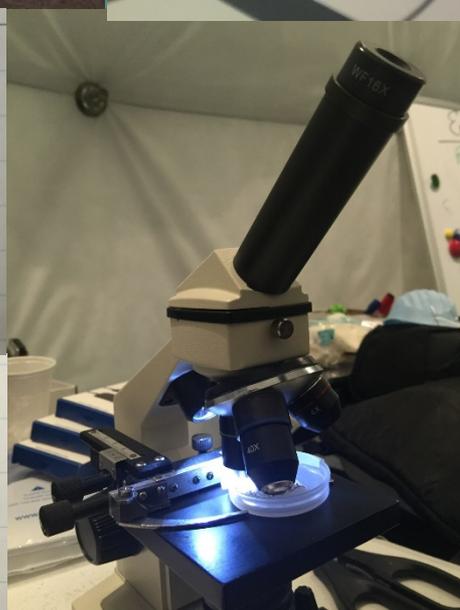
Moon Habitat & Lab in Ice  
Zermat June 2019



# IgLuna Ice Moon Habitat 2019



# Hawaii EuroMoonMars 2018 instruments





# MoonBase day 3 preparation









# Preparing MoonMars Village on Earth

## Robotic Village

- ◆ Landers and rovers , telerobotics
- ◆ Instruments
- ◆ Field tests in MoonMars analogues
- ◆ ISRU & life sciences
- ◆ Dusty Vacuum facilities



## Human Bases

- ◆ Habitats & pressurised vehicles
- ◆ Laboratories (geo, astro, bio)
- ◆ Infrastructures (transport, power, ISRU)
- ◆ Human facilities
  - ESTEC ExoHab/EXoLab , EAC Luna
  - LunAres isolation studies
  - ESA Lab & Ice Habitat (CH)
- ◆ MoonMars analogue bases
  - MDRS, HiSeas, Intl MoonBase Alliance

