



# Space4All Research & Capacity Building: EuroMoonMars, EuroSpaceHub, Space Renaissance

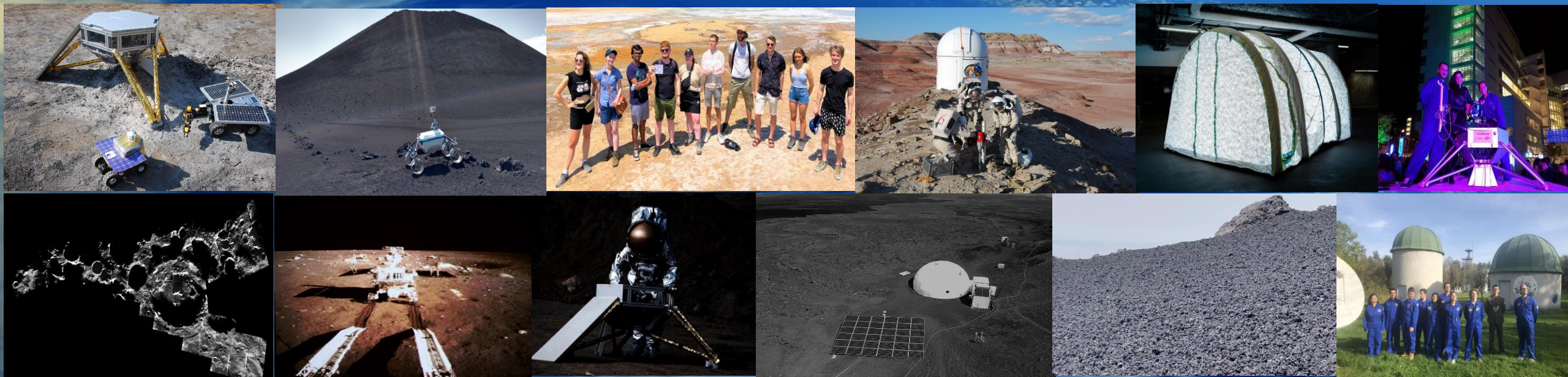
Science, Data, Instruments, Habitats, Analogues, Protection,  
Sustainable Goals, Training, Innovation and Business



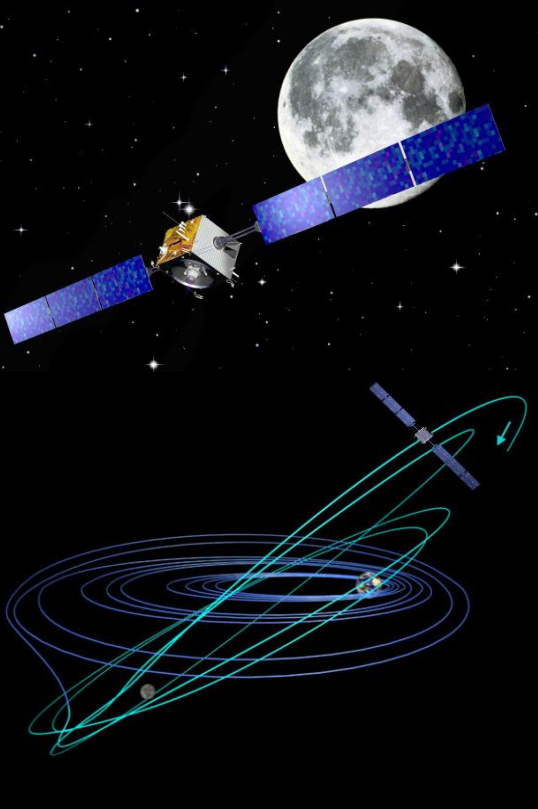
## Prof. Bernard Foing\* & EuroMoonMars/EuroSpaceHub/SRI teams

\*EuroSpaceHub, LUNEX-EuroMoonMars, Exec Director ILEWG, Prof Leiden/Amsterdam/EPFL/ISU/Riga  
chair IAF ITACCUS, Pdt Space Renaissance, Vice chair COSPAR SC-B planets & PEX Exploration Panel,  
SGAC founder, Former ESA Chief scientist, chair of ESTEC staff, SMART-1 Project scientist

foing@strw.leidenuniv.nl, ILEWG EuroMoonMars Espace InnovationTeam (2009-2023),  
EMMPOL1-18 teams, International MoonBase Alliance, Space Renaissance International, MVA/NSS





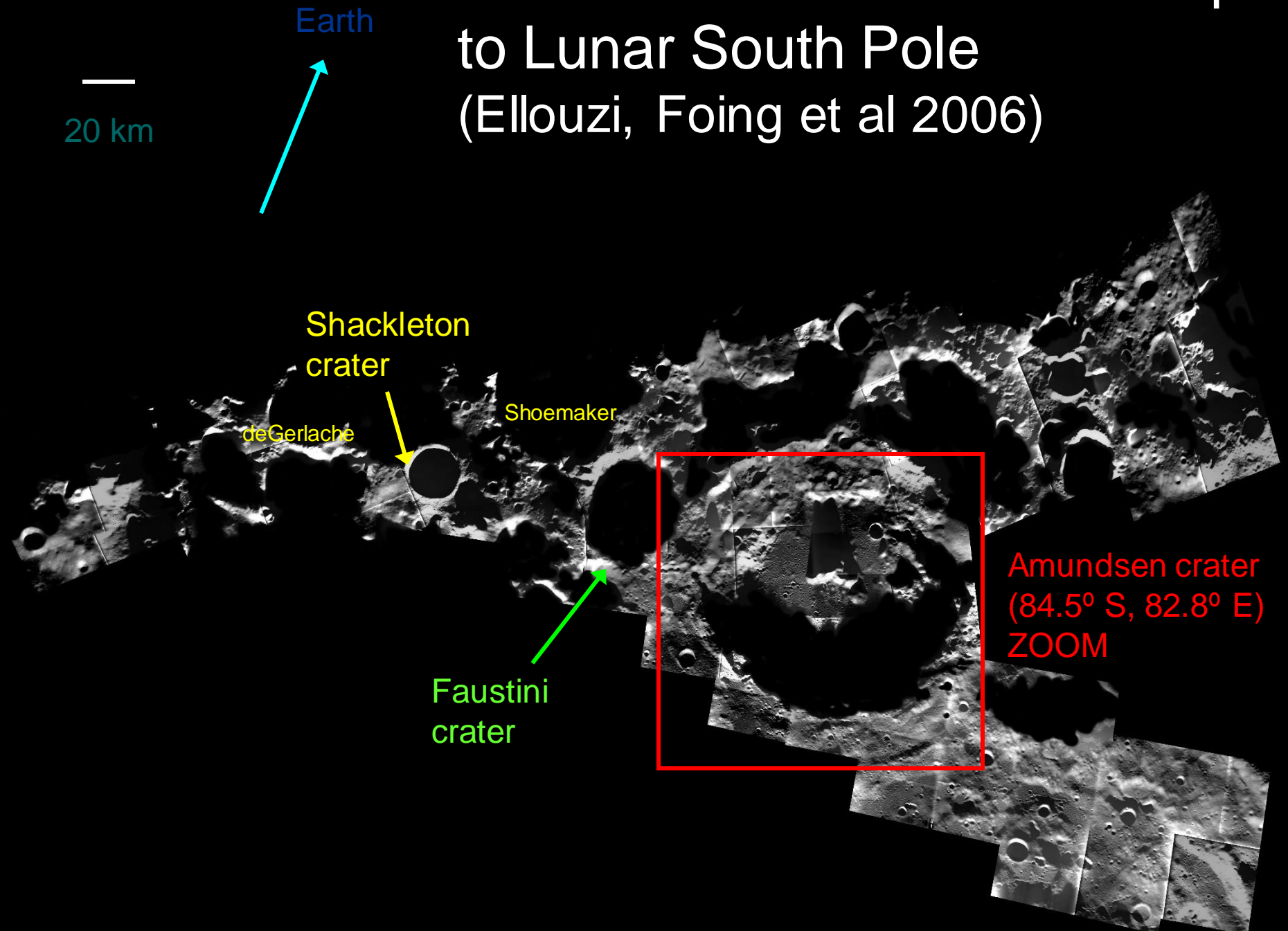


Permanent  
shadows  
and Ice

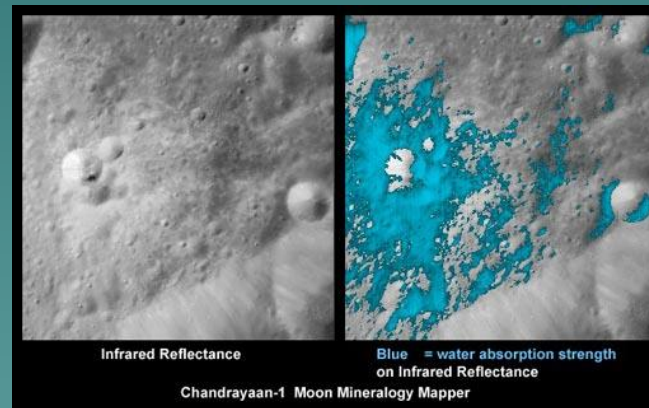
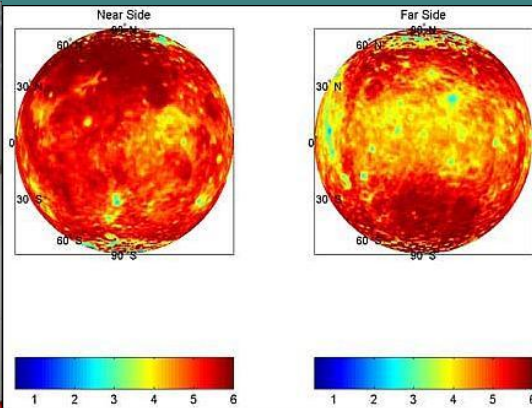
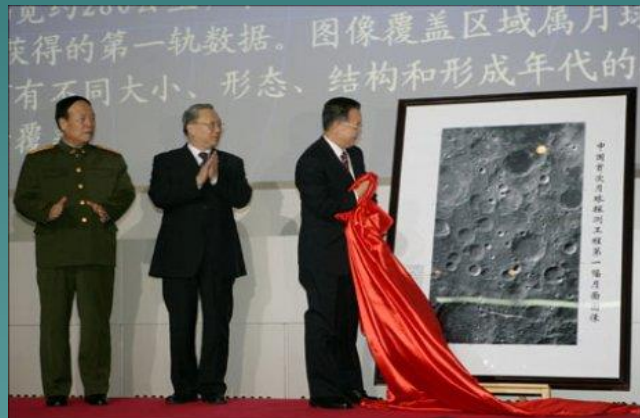
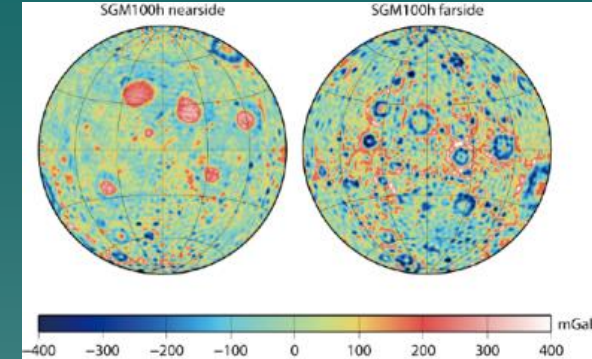
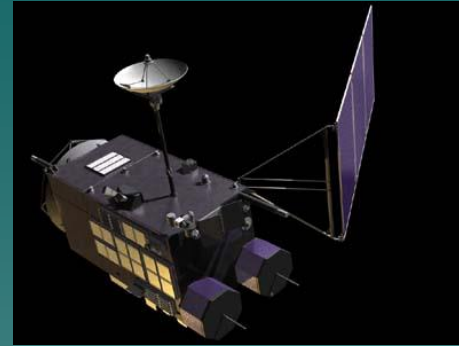
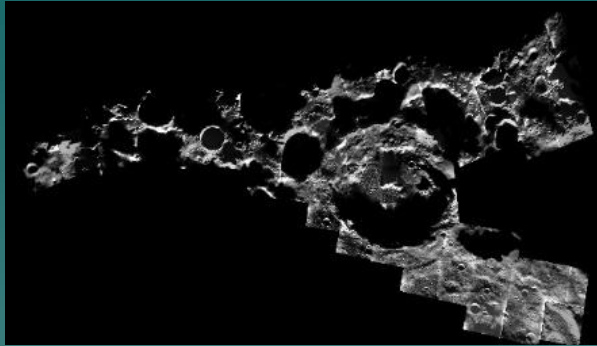
Volatiles &  
Organics



# ESA Data: SMART travel maps to Lunar South Pole (Ellouzi, Foing et al 2006)



# Data Resources from Peaceful Collaboration : Moon village orbital fleet 2003-2022: SMART-1, Kaguya, Chang'E 1 & 2 , Chandrayaan1-2, LCROSS, GRAIL, LADEE, LRO





# Technology Capacity : Cooperative Instruments & robotics





**EuroMoonMars / Austria Space forum:  
Eifel volcano campaign  
Human-lander-rover-instruments**

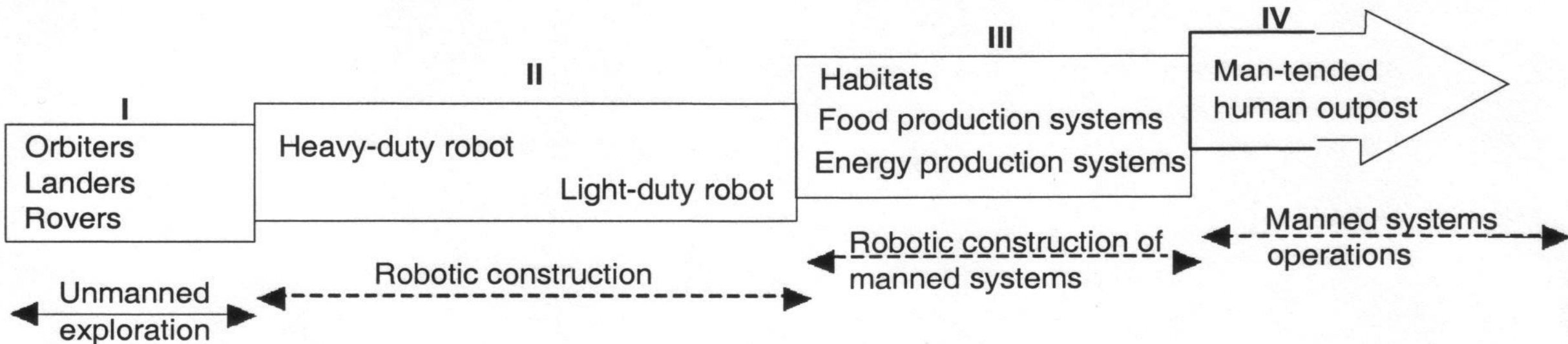
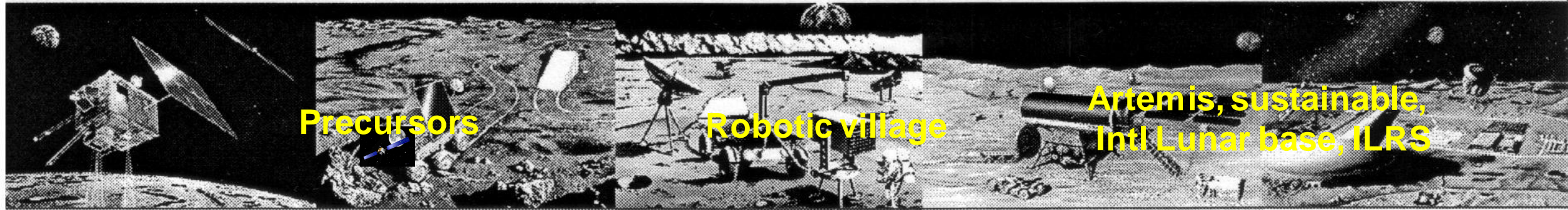
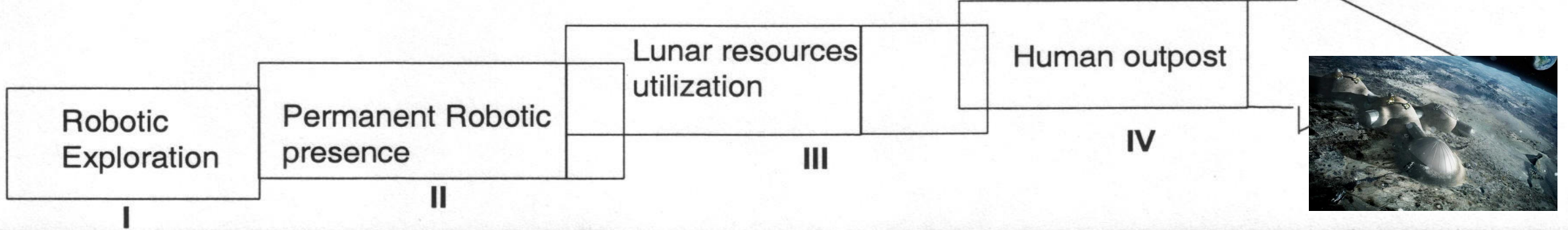






Unmanned missions      Crewed missions

ILEWG MoonVillage Roadmap: Initiative to Build a Sustainable Exploration Ecosystem





## COSPAR/IAF/IAA/ILEWG/EGU/UN events

Science, Tech, Community legacy  
Space Resources, Economy, Legal Protection

- ◆ COSPAR 1992 symposium: "Astronomy & space science from the Moon". 1994 ASR 14, BFoing, Ed
- ◆ ICEUM/COSPAR declarations:  
Beatenberg94, Kyoto96, Moscow98, ESTEC00, Houston02, Hawaii03, Udaipur04, Toronto05, Beijing06, Sorrento07, Canaveral08, Beijing10, Moscow14, Pasadena16, Sydney, Athens22 -> Vienna24, Busan24, Firenze26
- ◆ IAF IAC 2002-2024, next Baku23, Milano24
- ◆ EGU Vienna 2004-, next 2024 April15-19
- ◆ UN-IAF, UN-COPUOS, SGAC 1999 - now
- Aerospace Sciences;
- Astronomy;
- Lunar Observatories;
- Lunar Resources;
- Panels Summaries;
- Lunar Environment and Protection
- Chemical Analysis;
- Exobiology;
- Human Performance;
- Logistics;
- Robotics;
- Ground Support Systems
- ◆ Habitats and Analogue Simulations





# MoonVillage Sustainable Presence on the Moon



Credit: ESA/Foster + Partners







# Challenges for Moon Village Implementation

**Get there**

**Habitats, Labs**

**Survive**

**Robots**

**Operate**

**Communicate**

**Move**

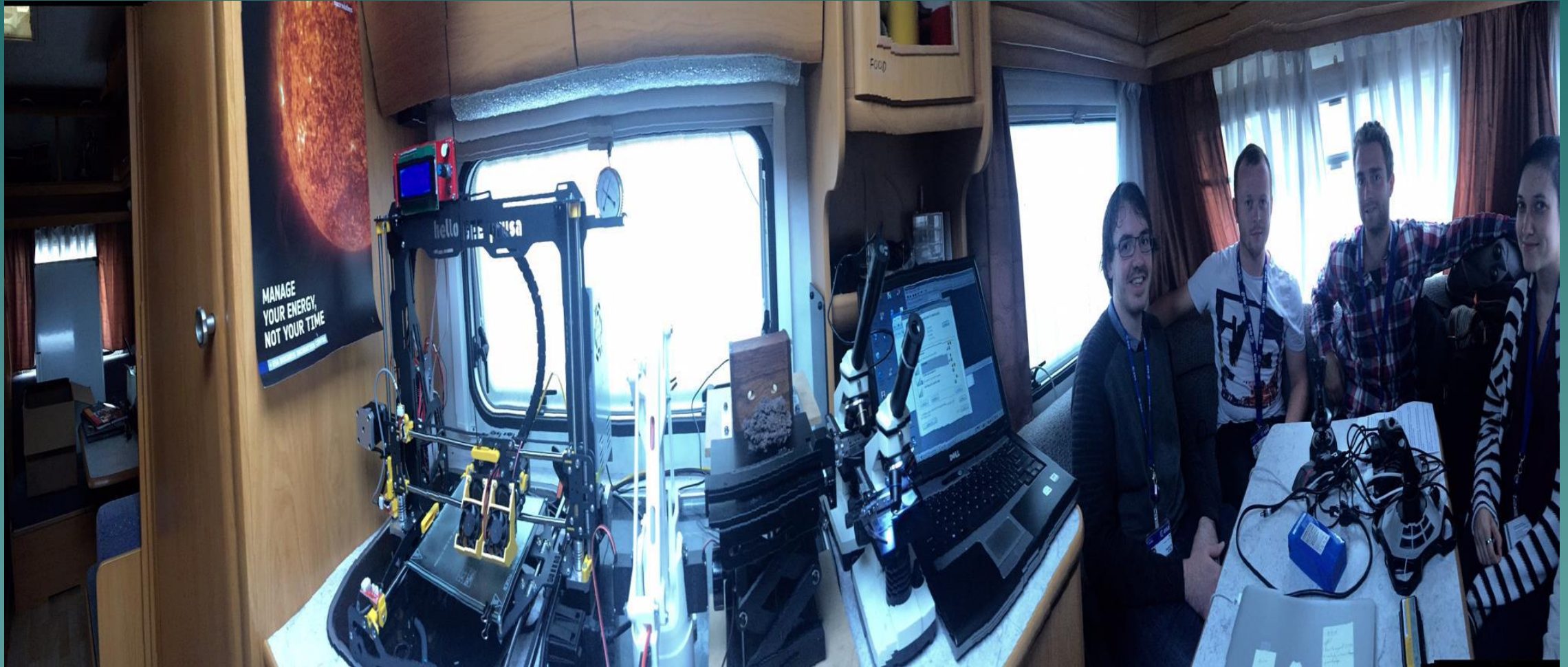
**Humans**

**Users**

**Resources**



# ExoHab Lab module, ESTEC/ILEWG EuroMoonMars workshop July 2016

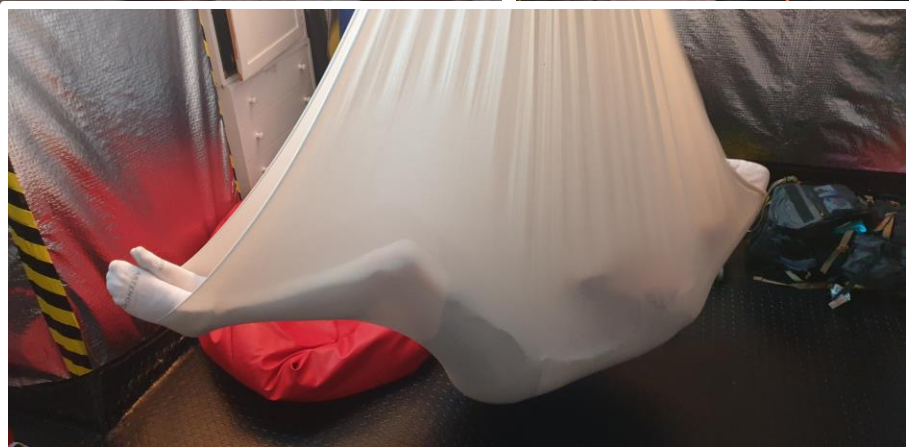
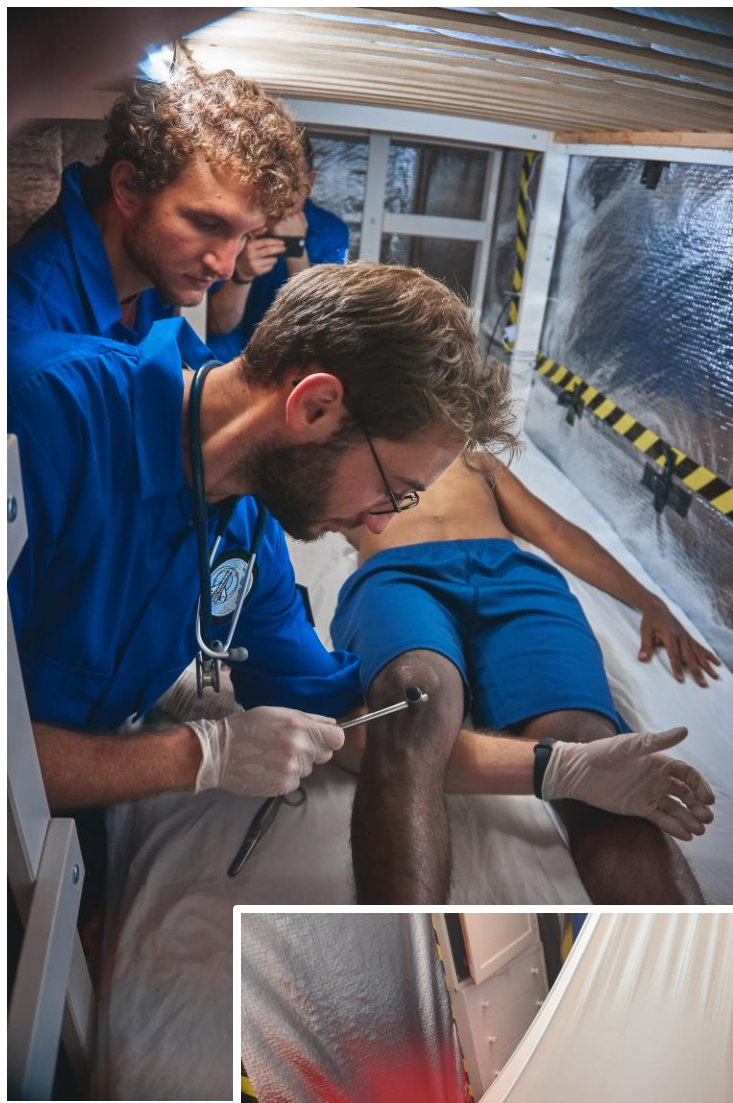
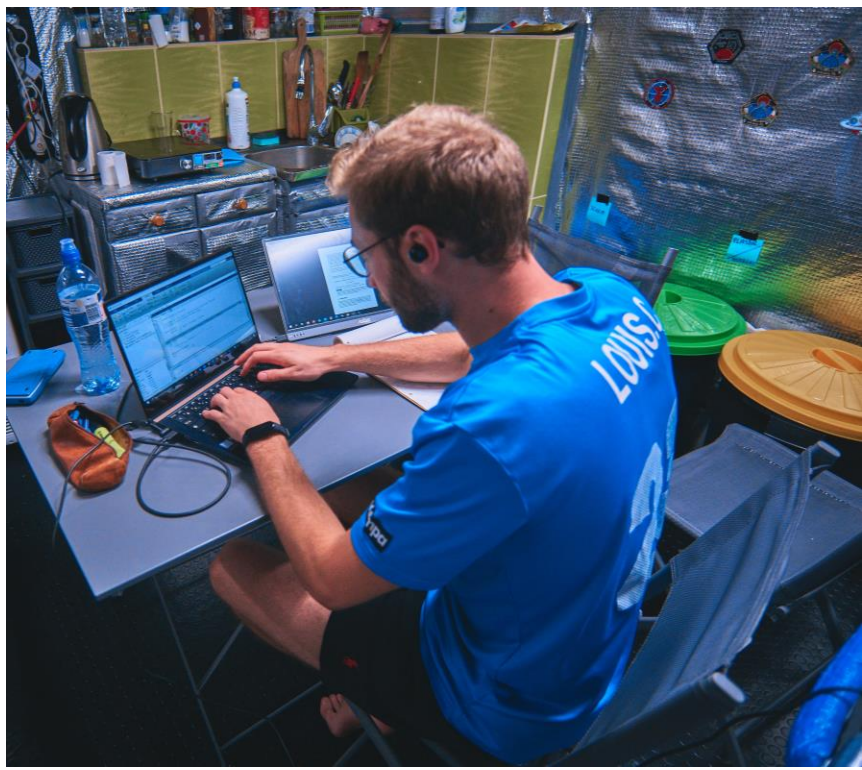




# EMMPOL14-15 EuroMoonMars Poland AATC 2023









# ExoSpaceHab-eXpress

## Assembly Mobile Habitat + Inflatable Extension









ANALOGUE CAMPAIGNS

Etna  
2017, EMM 2021,  
2022 ARCHES



UTAH MDRS



EMMIHS  
Intl Moonbase Alliance  
HI-SEAS Hawaii



Atacama desert, Chile



Iceland



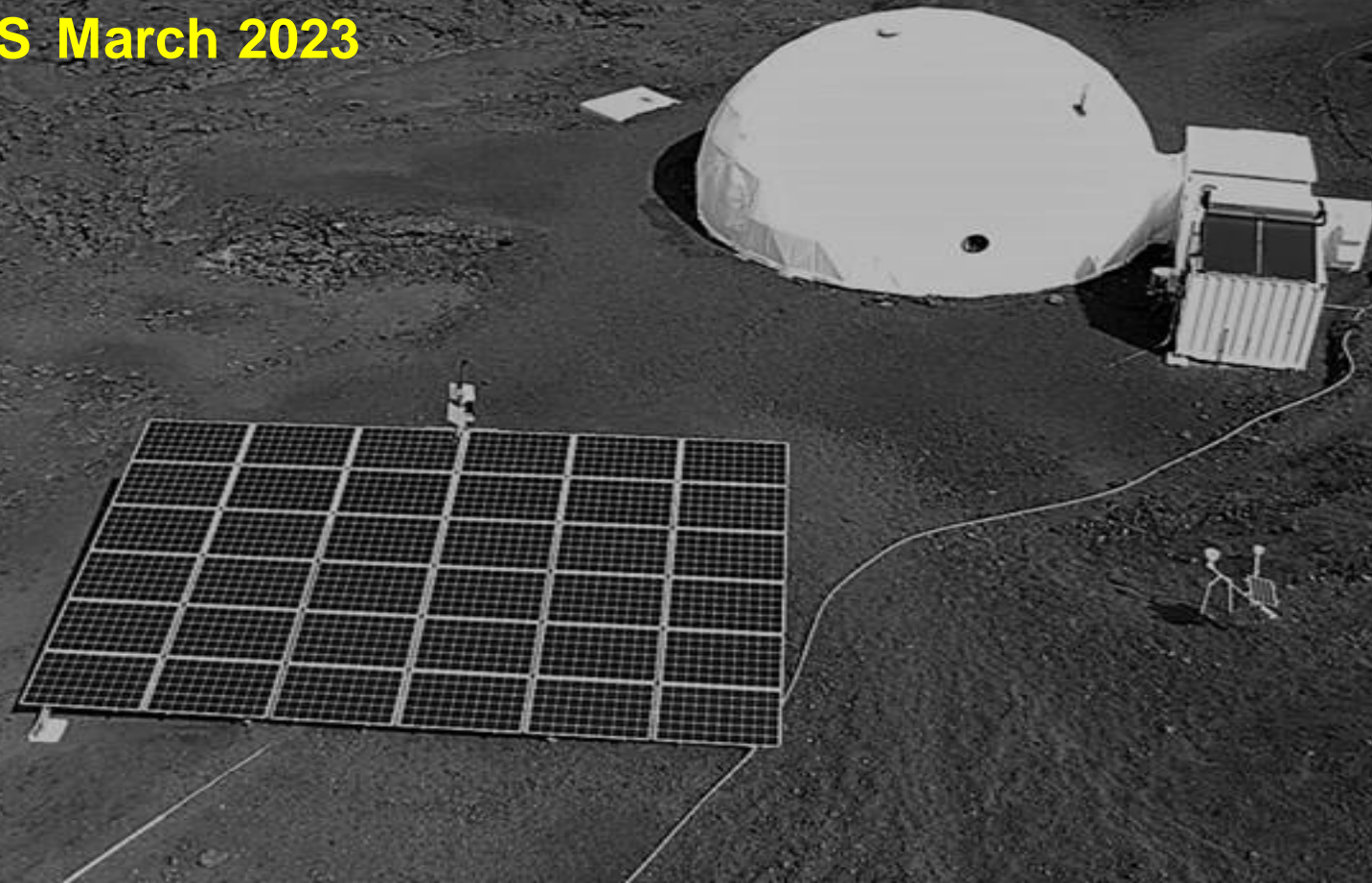
CHASM wiki database



# **HABITATS & EXTREME ANALOGUES ON EARTH : International Moonbase Alliance IMA HI-SEAS**

**EMMIHS EuroMoonMars IMA HI-SEAS  
campaigns 2018-2022 Hawaii**

**Restart IMA-HISEAS March 2023**





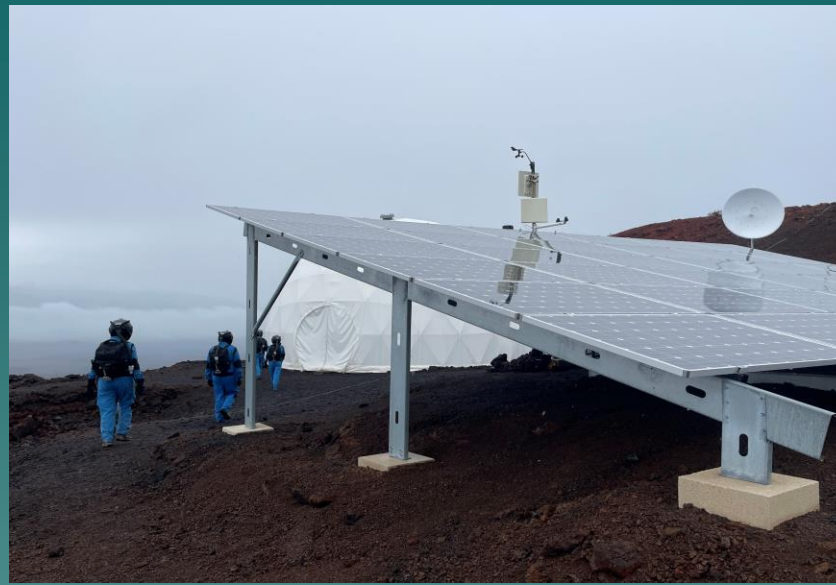








# EuroMoonMars Hawaii EMMIHS 2018- 2023



ILEWIG



Astronauts at  
Today's Art  
2014-2016

The Hague  
Central Plein

Bringing  
Space4All





# Space4All ArtMoonMars : Moonlife Academy





# MOONLIFE ACADEMY 2010



ExoGeoLan  
'Lunar lander



# ESTEC, MoonMars & SpaceArt





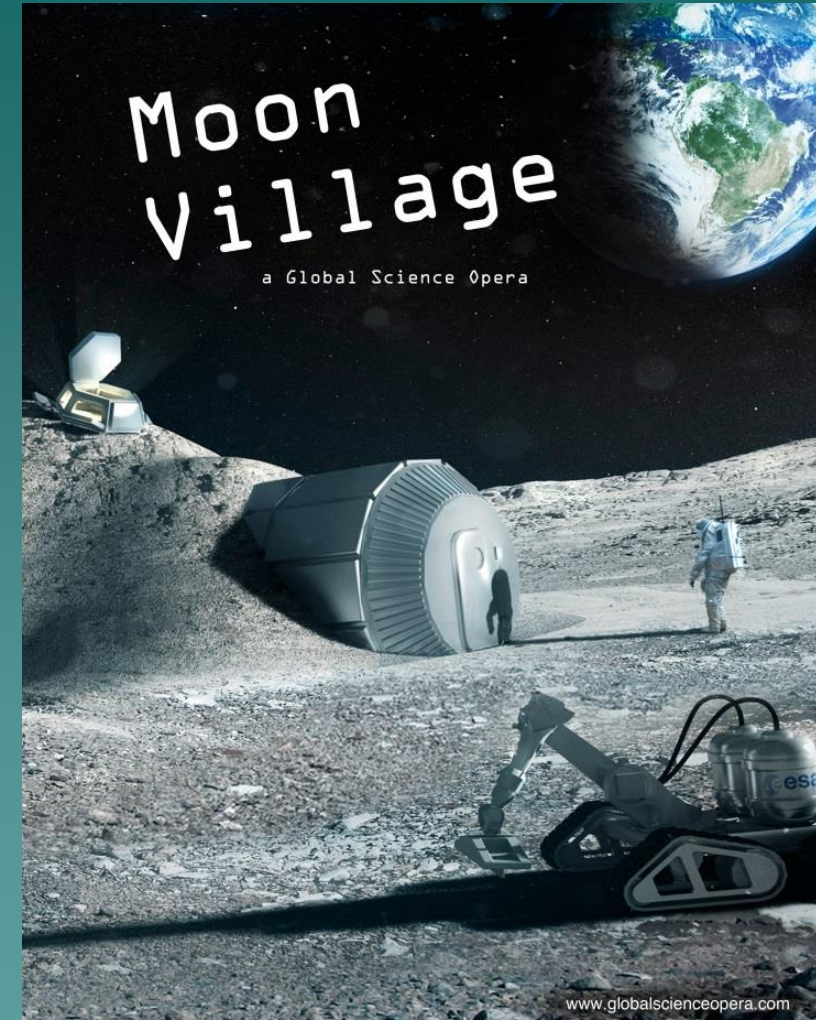
# Lunar Free Dome





# The Global Science Opera (GSO)

[www.globalscienceopera.com](http://www.globalscienceopera.com)





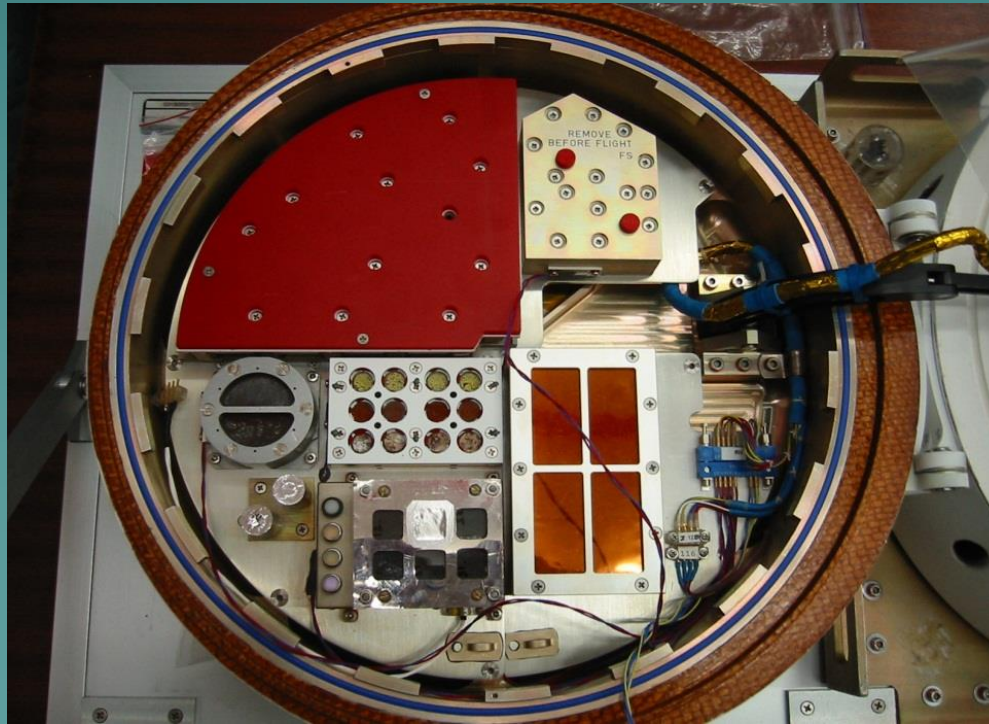
# ESA FOTON BIOPAN Integration

Towards  
MoonGallery



2002  
Rocket  
Explosion  
after 27 s

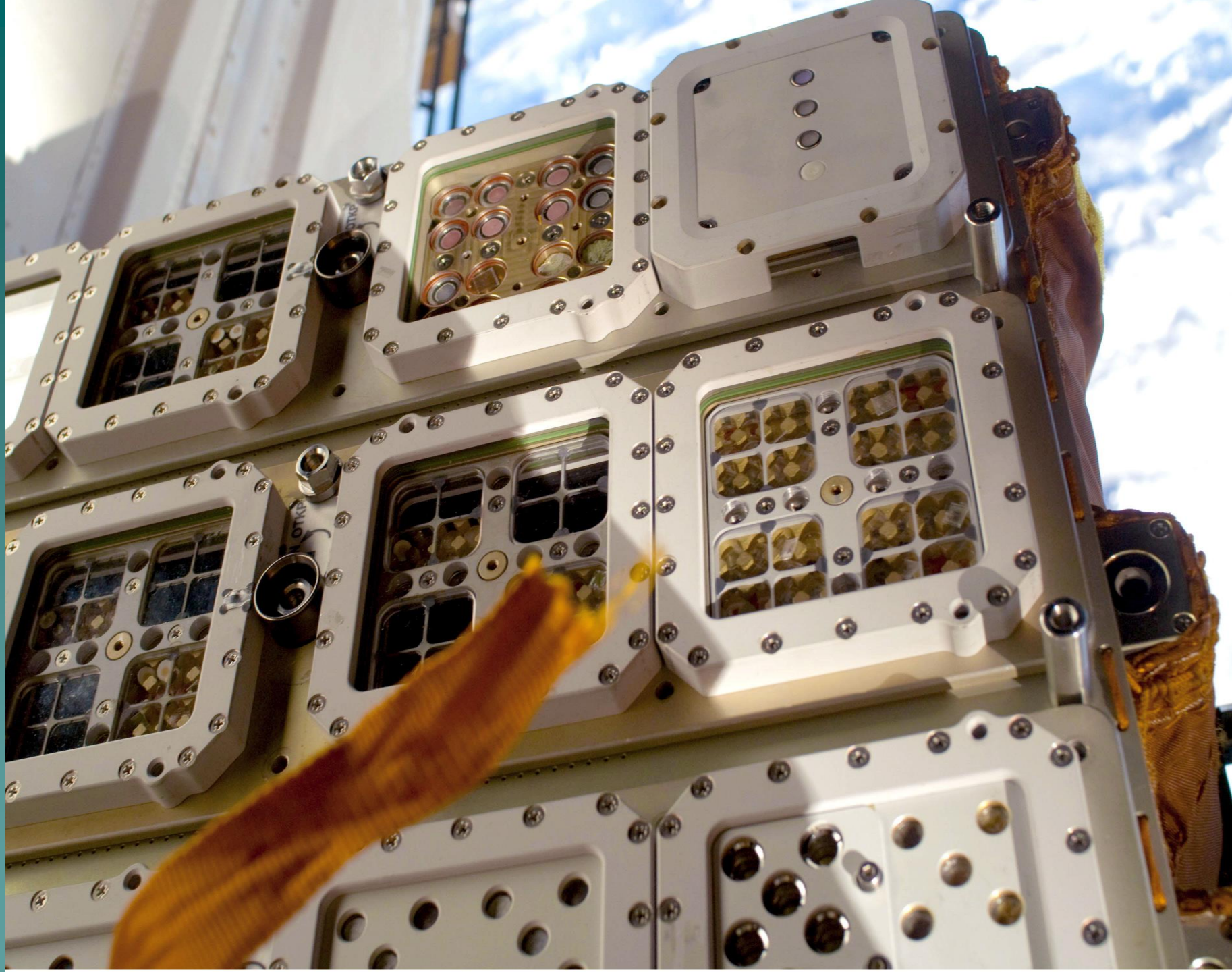
2005  
Success  
recovery





# ISS

- ◆ EXPOSE-R
  - 2009-2011
  - Samples
  - Seeds
  - Fungi
  - Organics
- ◆ Expose-R2
  - 2014-2016
- ◆ Gallery









# MoonGallery Exhibits: ESTEC, Leiden, Hague, Amsterdam, Prag, Milano, Switzerland, Portugal, Moscow, Paris, New-York, DC ...





# MOONGALLERY TEST FLIGHT

Launch 19 Feb 2022,  
Wallops Islands

ISS CUPOLA





# IAF ITACCUS Cultural Utilisation of Space

- ◆ Space & cultural Organisations + liaisons
- ◆ to **promote and facilitate** the innovative utilisation of space (data, systems, applications) by organisations in the cultural sectors of society internationally, including all arts and humanities, fine arts, entertainment, popular culture and tourism.
- ◆ Cultural (production, preservation, representation, education and development)
- ◆ **Advocacy** – promoting, developing and raising the profile and quality of 'cultural utilisation of space'
- ◆ Collaboration – Communication & Dialogue - Knowledge Hub - Promoting Quality Cultural Products







B R E M E N 2 0 1 8





# EARTHMOONMARS PILLARS

## EUROSPACEHUB ACADEMY

Physical & mental training	Theoretical & experimental training		
	Scientific / Technical	Humanities & Social Science	Management
Analog / survival mission EMM			
Rocket workshop			
Diving / Sports			
Zero-G			
High-G centrifuge Hypobaric chamber			
Robotics			
Stratospheric mission			
Basic flight training - MCC Human performance			
	Space Science	Human medical aspects and space biology	Policy-Law Business & economics
	Science instruments	Humanities	Mission / Project / Budget management
	Space Technology	Multi-cultural cooperation	Sponsorships / Career/Start-Up
	Flight instruments, POF, Radiocomms / Navigation	Art, design & space	Data management / programming
	Orbital mechanics (KSP mission challenge)	Social science	Sharing the education / public communication



# About us

## Our approach

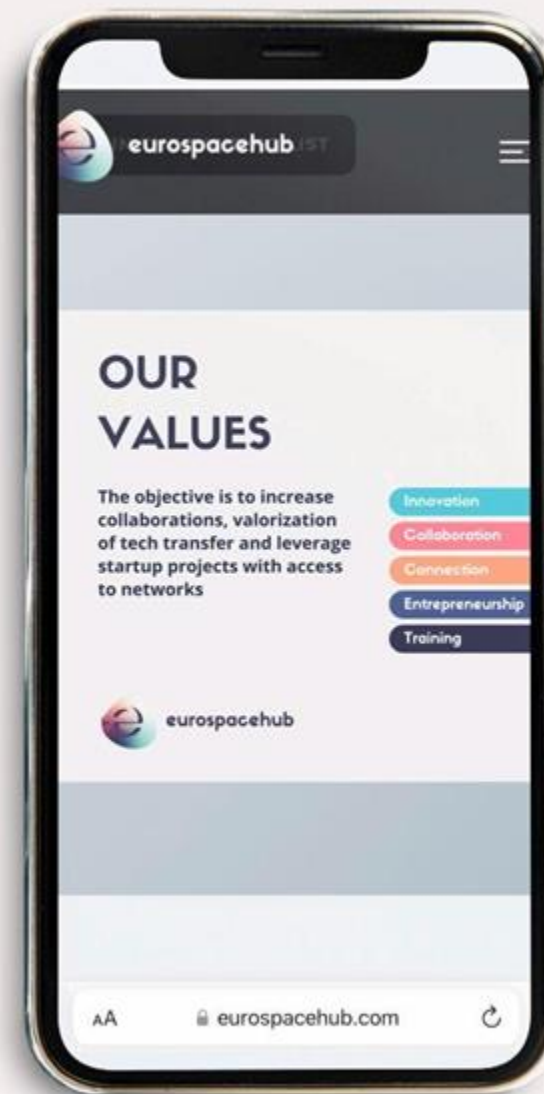
- Connecting different realities in the aerospace industry
- Facilitating collaboration between stakeholders
- Leveraging innovation by breaking down barriers

## Our tools

- Integrated digital platform for the SpaceTech Ecosystem
- Training programmes for Space entrepreneurs

## Our goals

- Exploring new educational models for entrepreneurship in Space
- Creating a new strategy for universities to strengthen entrepreneurship
- Building a network of collaborative SpaceTech realities
- Leveraging start-up projects with access to networks
- Connecting events with students and multi-disciplinary Space professionals





# EuroSpaceHub Consortium funded by EU HEI EIT



EuroSpaceHub Consortium

## Our Partners

Website Platform

- Funded by EU, within the **EIT-HEI Initiative**, EIT Manufacturing and Raw Materials
- Five **founding members**: VilniusTech, International Space University, Universidad Complutense de Madrid, Collabwith Group, Lunex Foundation



# Resources



## Free Resources

Demos, best practises, guidelines, reports to share with the SpaceTech Community inside the EuroSpaceHub digital Platform.



## Paid Masterclasses and Trainings

1 hour masterclasses recorded and PDF materials for homework, to increase the learning capacity of the student (business leaders, entrepreneurs, skills...)



## Startups Mentoring

We select the startups and scaleups to mentor from our programs and from our platform, thus leveraging the network of space and aviation experts. We offer multidisciplinary support and consultancy to aerospace newcomers



## Webinars

Training on Collaboration, Innovation Ecosystems and Innovation Communities for platform users, to teach them how to use the digital platform for efficient collaboration.



## Live Trainings

Trainings on innovation ecosystems, collaboration, entrepreneurship, emotional intelligence, space diplomacy, media expert influencer for partner organizations and ambassadors.



## Evergreen Trainings

30-Minutes video recorded training sessions available in the Resource Hub of the platform, on a variety of topics related to Space, Skills, Entrepreneurship and Innovation.

# Resources





### Contests and Events

- Connecting different communities of Space lovers
- Providing support and visibility to different aerospace players



### Trainings and Academy

- Classes, content and ad-hoc training to enhance entrepreneurial skills in the aerospace sector
- Digital content accessible via the platform

### Podcast “Business of Collaboration”

- Guests from the aerospace community and ESH partners
- Sharing success stories and knowledge



### Analog Missions

- Training young students by making them experience astronaut-like experiences
- Developing interpersonal, entrepreneurial and technical skills through unique field activities



EuroSpaceHub Consortium

# Some of our initiatives

- Supporting students, professionals, aerospace experts to improve their **entrepreneurial skills**
- Creating a EuroSpaceHub community in which to **share knowledge**, opportunities and expertise





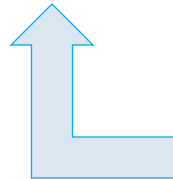
# SUSTAINABLE DEVELOPMENT GOALS & SPACE4ALL SDG18

Human Life

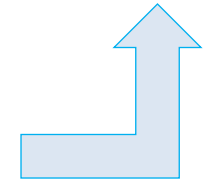


Key Pillars

SOCIAL GROWTH



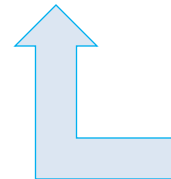
CULTURAL GROWTH



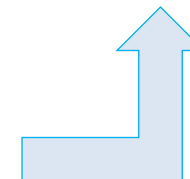
SUSTAINABILITY

Key Sustainability Factor

ABUNDANT  
RESOURCES



ENVIRONMENTAL  
RELIEF



Planet Earth  
Environment





# SPACE RENAISSANCE: A STRATEGY FOR CIVILIAN SPACE DEVELOPMENT

- **Sustain the development of fully reusable, safe and ergonomic vehicles** for civilian passengers and cargo transportation in space
- **Push the production of fuel in space**, from Moon and asteroid resources
- **Push the development of technologies to remove orbital debris** and their reutilization as in situ space resources
- **Start building logistic infrastructures and habitats** in orbit and **E**arth-**M**oon Lagrange points, endowed with simulated gravity
- **Promote moon and asteroids mining**, to get materials for space infrastructure construction
- **Sustain the new space industry worldwide**, by grants and fiscal reductions
- **Promote training and education**, collaboration between space agencies, private enterprises, schools and universities worldwide
- **Sustain the space tourism** industry and market segment, currently the only sector trying to transport untrained civilians in space