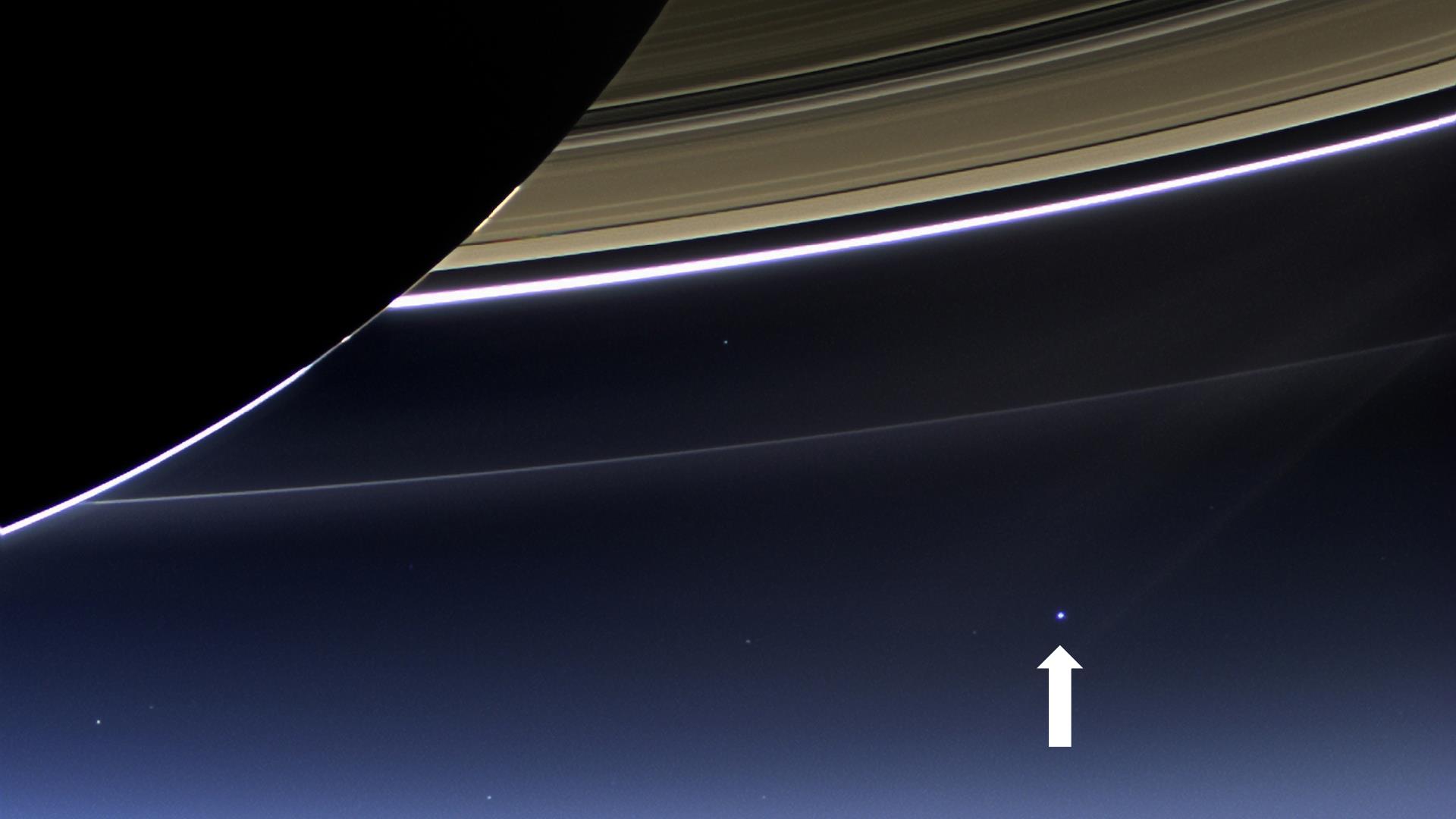


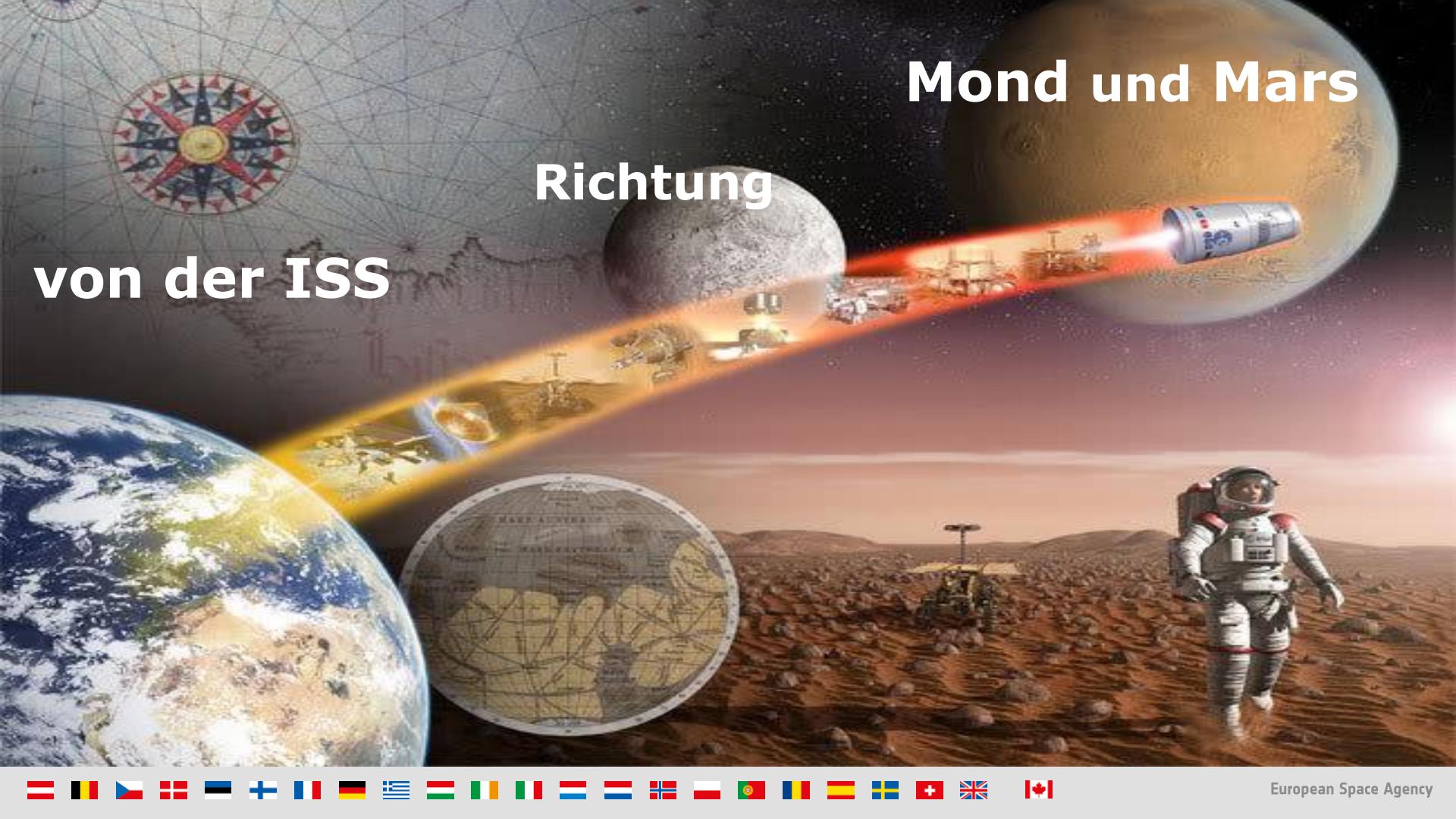
# Astronautische Raumfahrt heute und morgen

**Dr.-Ing. Matthias Maurer**  
**ESA / EAC Köln**

ESA UNCLASSIFIED - For Official Use







# Mond und Mars

## von der ISS

### Richtung



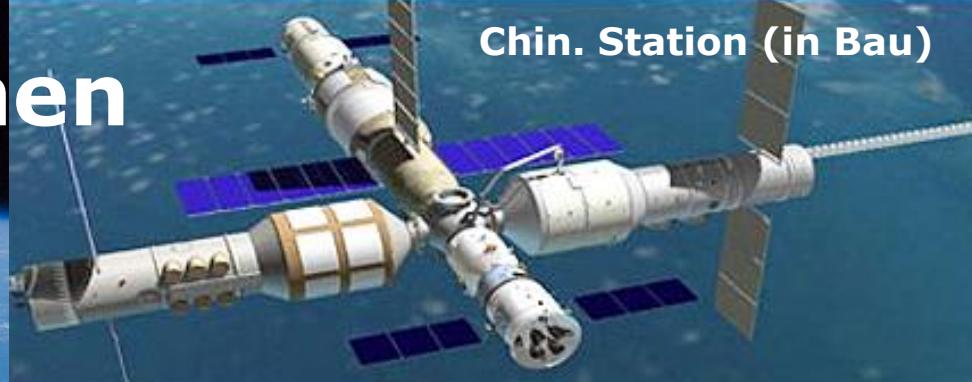
# Weltraumstationen



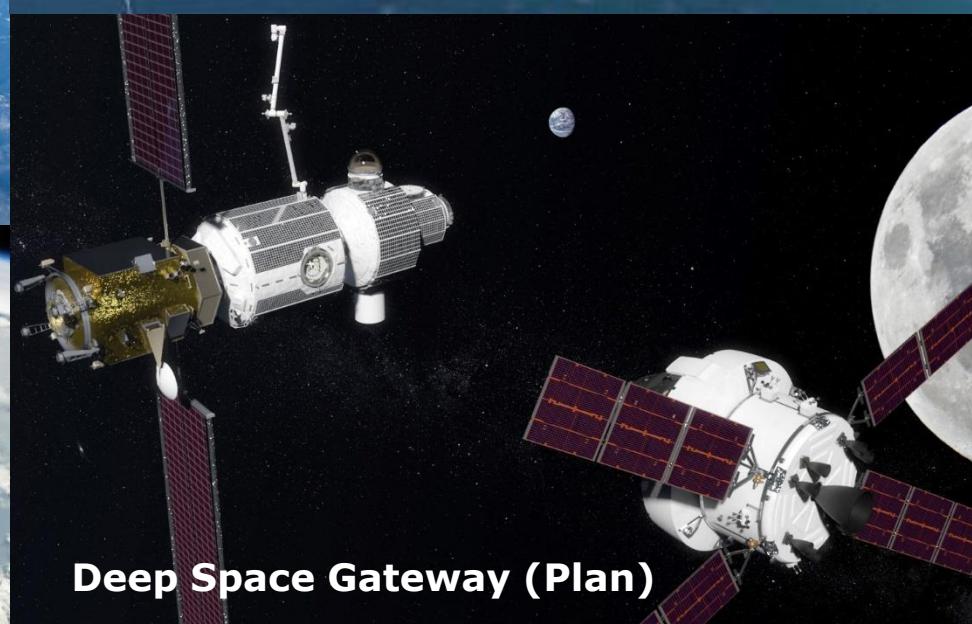
ISS



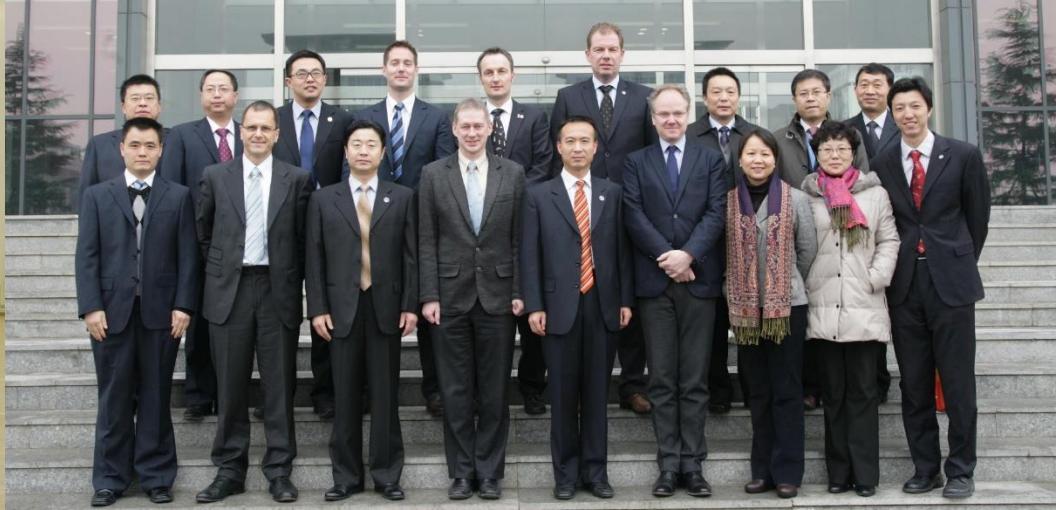
Kommerziell (Konzept)



Chin. Station (in Bau)



Deep Space Gateway (Plan)



## Kooperation mit China

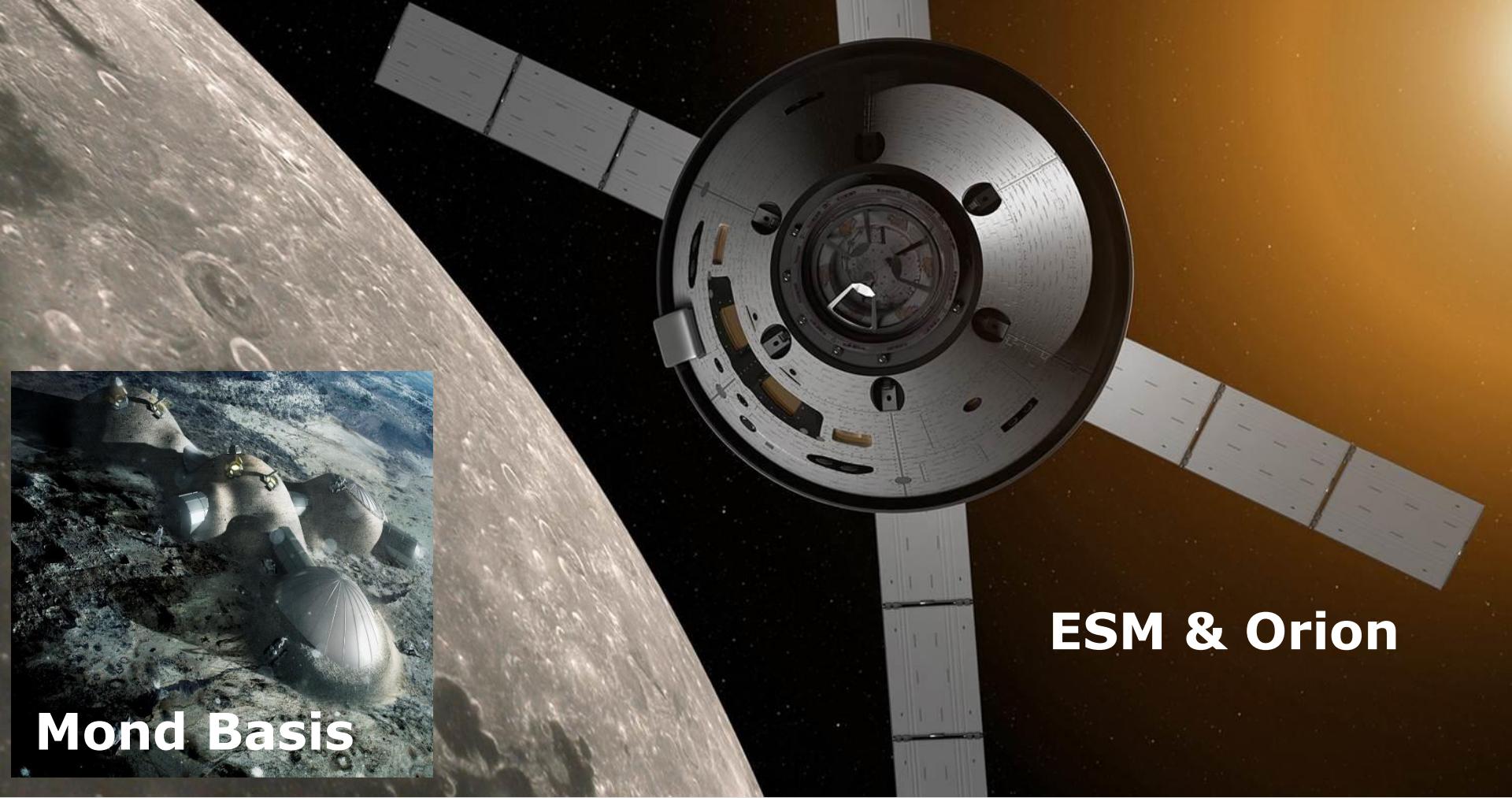




# Überlebenstraining in China

# Kooperation fängt beim Essen an ...





**ESM & Orion**

**Mond Basis**

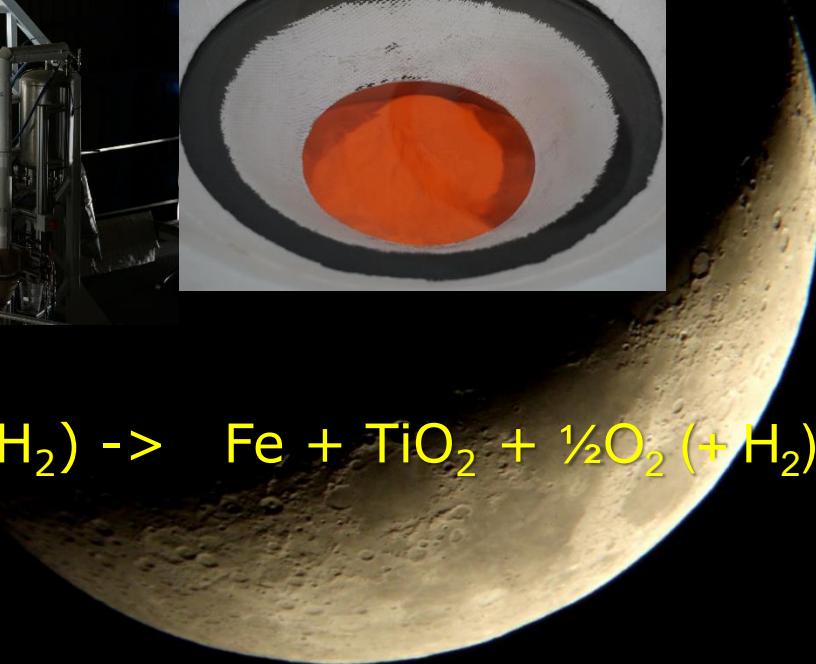
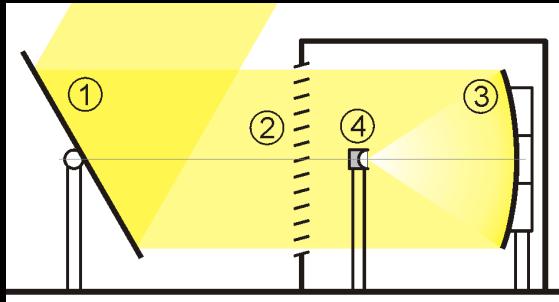
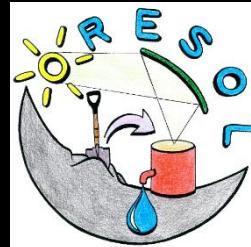


European Space Agency

# Wie bereitet sich die ESA auf die Mondexploration vor ?



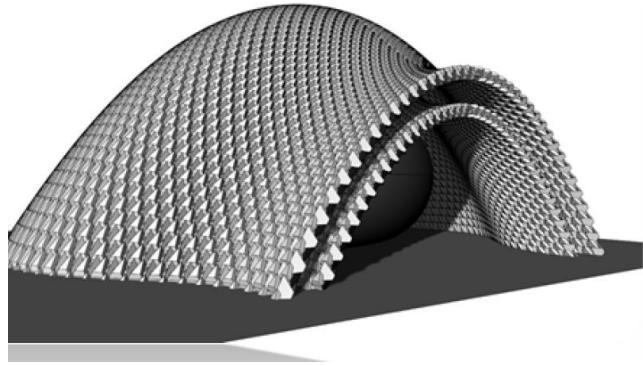
# Oresol: Oxygen on Moon from sand + sun



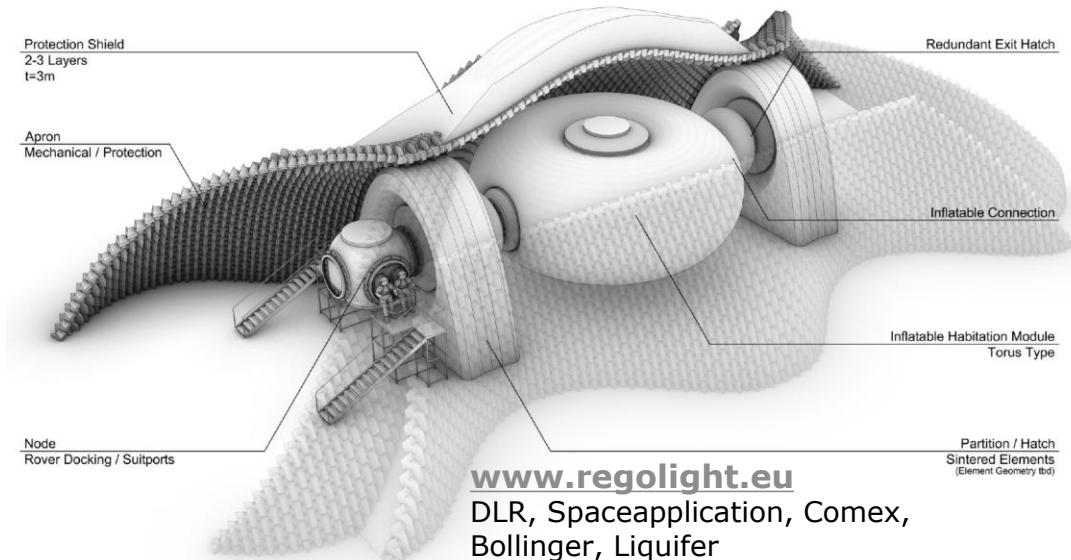
ref.: Thorsten Denk, Ciemat - Plataforma Solar de Almería; e-mail: tdenk@psa.es

# Additive Fertigung auf Mond: mit Sand + Sonne

Horizon 2020: RegoLight



➔ RegoLight: Habitat Scenarios

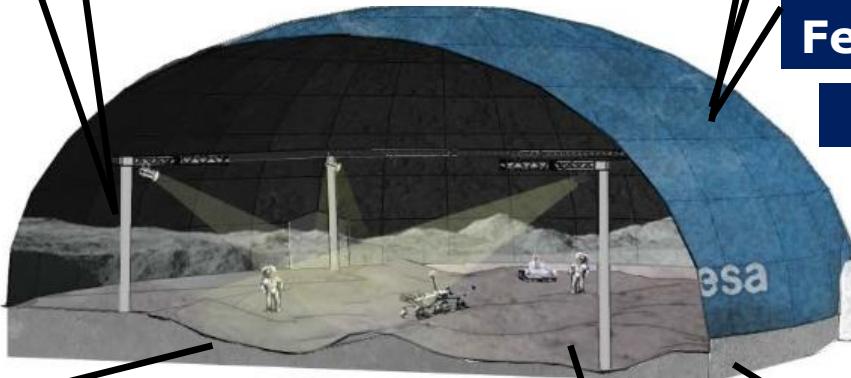


# **LUNA – das “Monddorf” in Köln**



# Lichtbedingung wie auf dem Mond

# **“Mondscherkraft”**



# **~1000 m<sup>2</sup> "Mond" für Monderkundung**

# Bohrproben

**instellbare  
oberflächen-  
elemente**

## **“Mondbasis”**

# System Simulation & VR

# Wohnbarkeit



# Gesucht: "Lotus-Effekt" gegen Staub

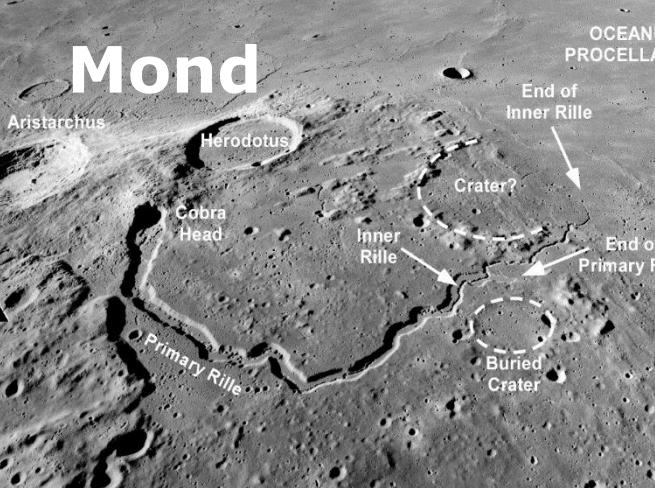
## Mondstaub ist hochabrasiv



1st Chang'e-3 Timelapse Color Panorama  
Credit: CNSA/Chinanews/Ken Kremer/Marco Di Lorenzo



# CAVES



# NEEMO



# Lavahöhle



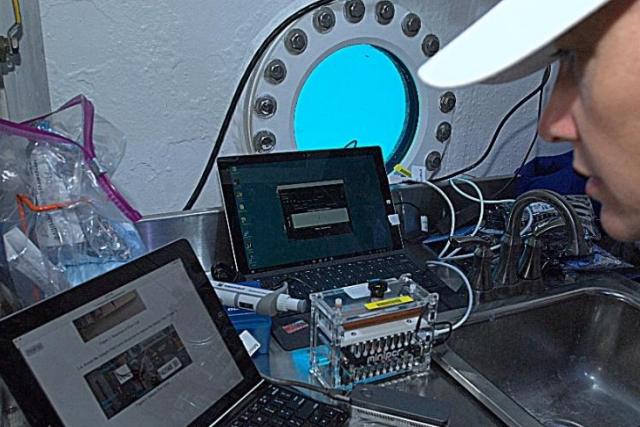
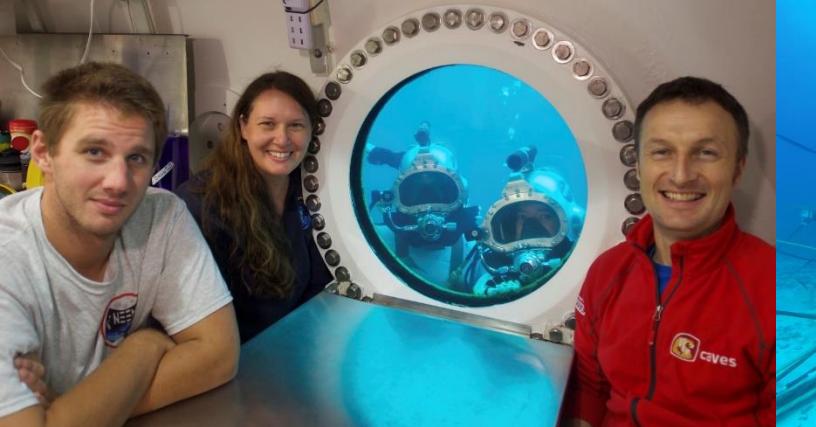
# Lanzarote



European Space Agency

# CAVES: “Internationale” Teamfähigkeit





European Space Agency

# Neue Technologien & Erkundungskonzepte

## Navigation, Identifikation, Markieren, Dokumentieren, Probennahme





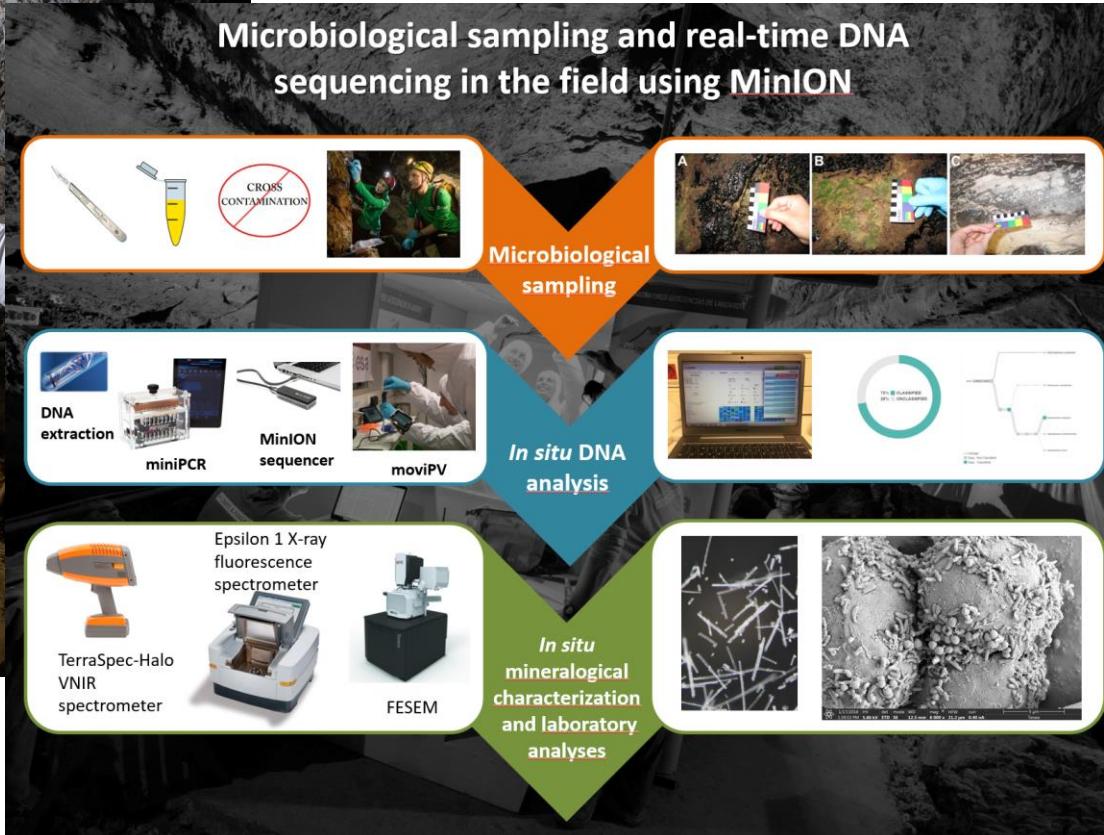
# PANGAEA





# „Leben“ in der Höhle?

**Microbiological sampling and real-time DNA sequencing in the field using MinION**



**Microbiological sampling**

- DNA extraction
- miniPCR
- MinION sequencer
- moviPV

**In situ DNA analysis**

- Epsilon 1 X-ray fluorescence spectrometer
- TerraSpec-Halo VNIR spectrometer
- FESEM

**In situ mineralogical characterization and laboratory analyses**



# The REAL SPACE COWBOYS

Ed Buckbee with Wally Schirra



## Berufsprofil Astronaut



European Space Agency