

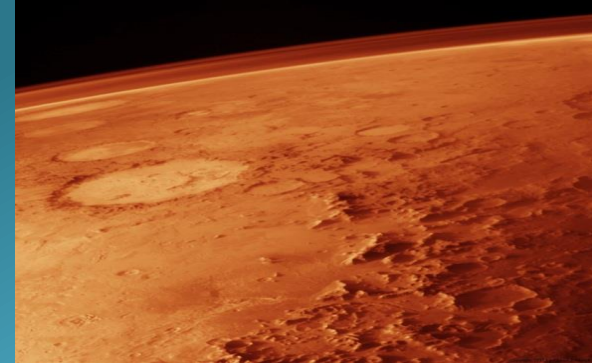
The future of space exploration - an international endeavor

Pascale Ehrenfreund

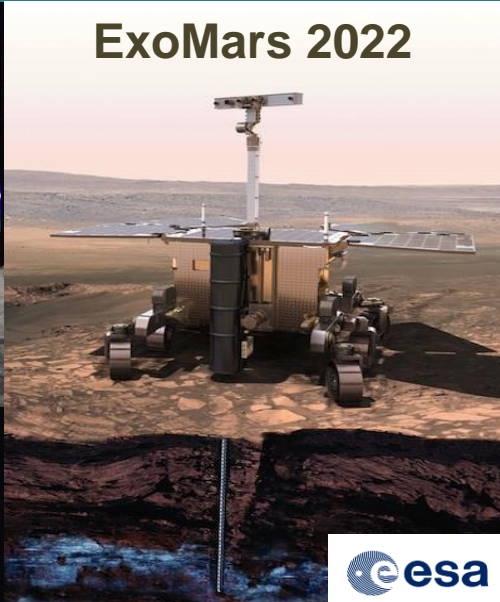
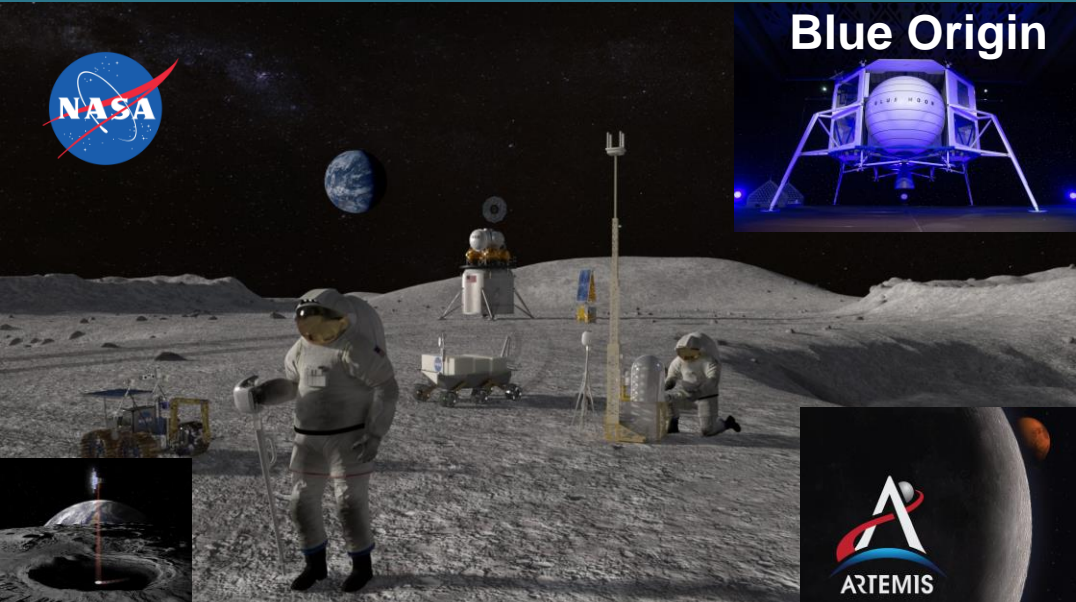
Space Policy Institute, the George
Washington University (GWU)

President, International Astronautical
Federation (IAF)

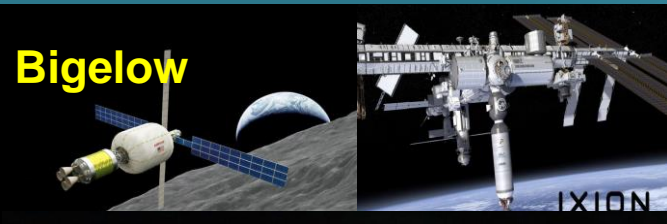
10th December, 2020



Space exploration - Entrepreneurs - Visions



Asteroid exploration



Transition Phase Commercial LEO



Starship

Colonizing Mars



The future of LEO

First operational SpaceX commercial CREW-1 mission to the International Space Station in 2020

ISS hits 20 years of continuous human habitation, over 3,000 investigations from 108 countries

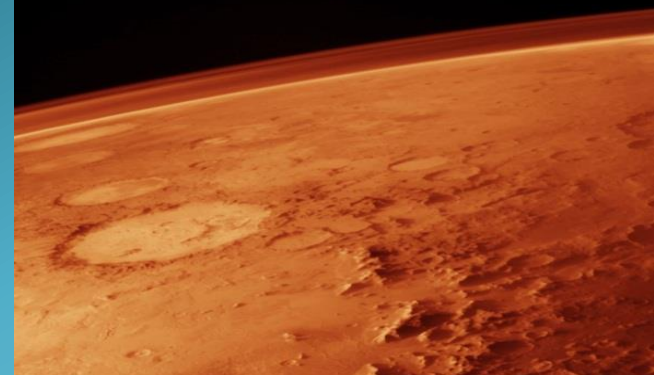
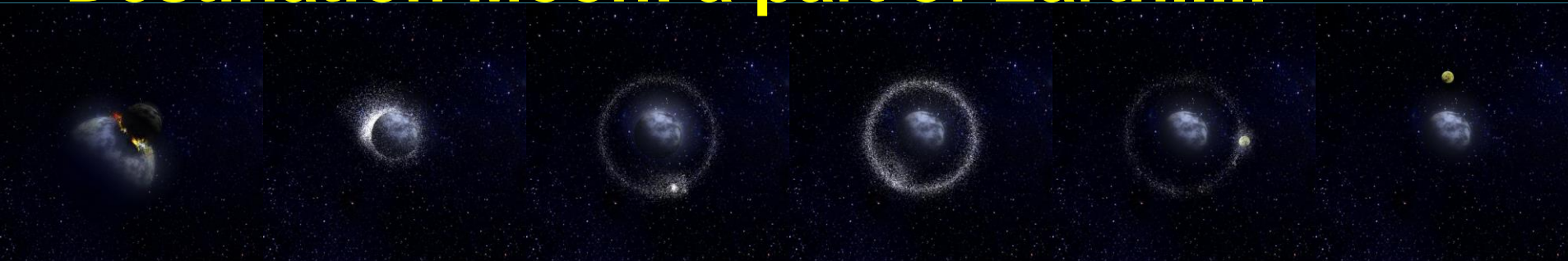
Transition phase to a more commercial LEO (e.g. Axiom etc.)

Tianhe

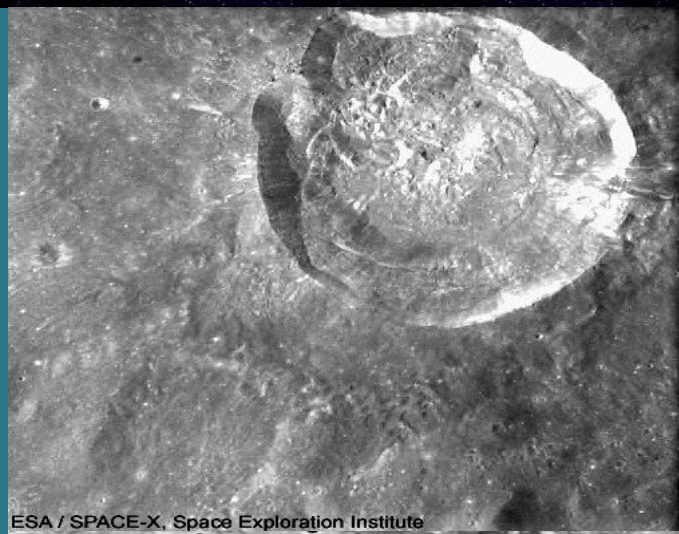
China prepares to carry out >10 missions to construct its new space station



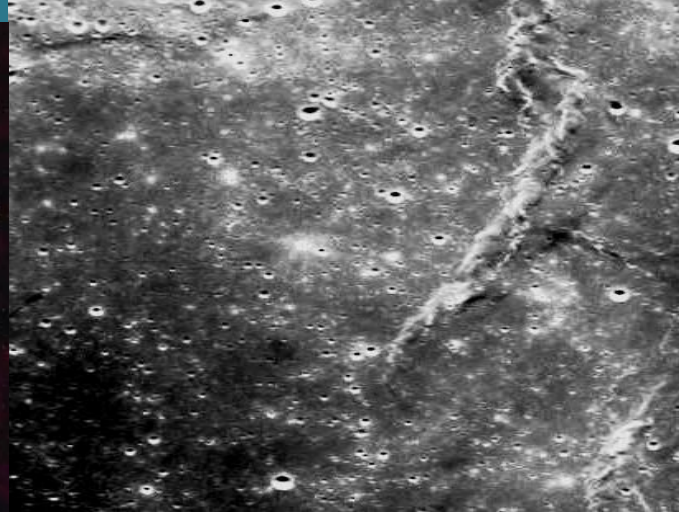
Destination Moon: a part of Earth.....



- Early Earth-Moon System
- Solar System Impact Record
- Lunar Environment



ESA / SPACE-X, Space Exploration Institute



Destination Mars

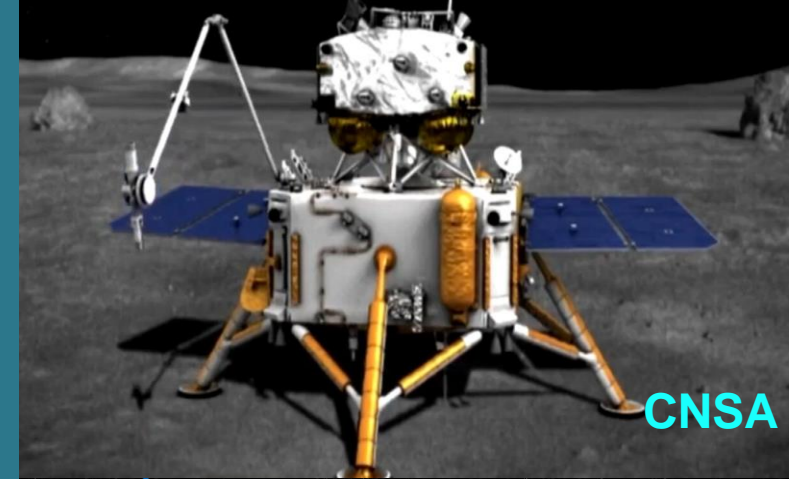
- Habitability
- Searching for life on Mars.....
- Identification of biomarkers
- Telerobotic
- Human Exploration



Chang'e 5

China National Space Administration (CNSA)

Lunar Sample Return Mission



Hayabusa-2

JAXA mission Mission to C-type asteroid Ryugu

Surface and sub-surface sampling

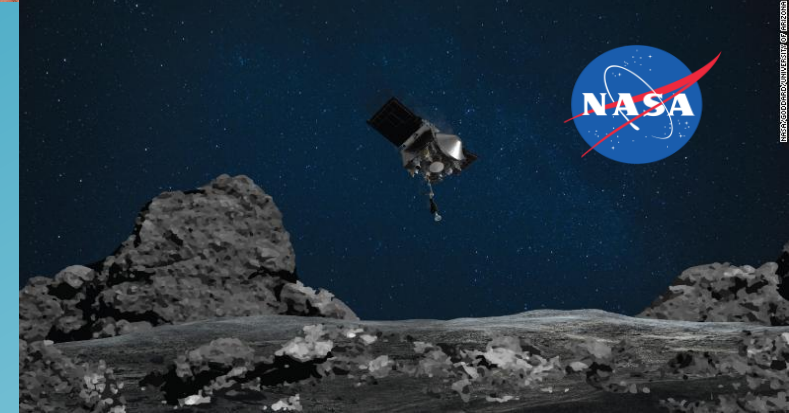
Capsule returned to Earth 6/12/2020



OSIRIS-Rex

Asteroid sample return from asteroid Bennu

Samples were collected in October 2020



The Mars fleet 2020

Tianwen-1

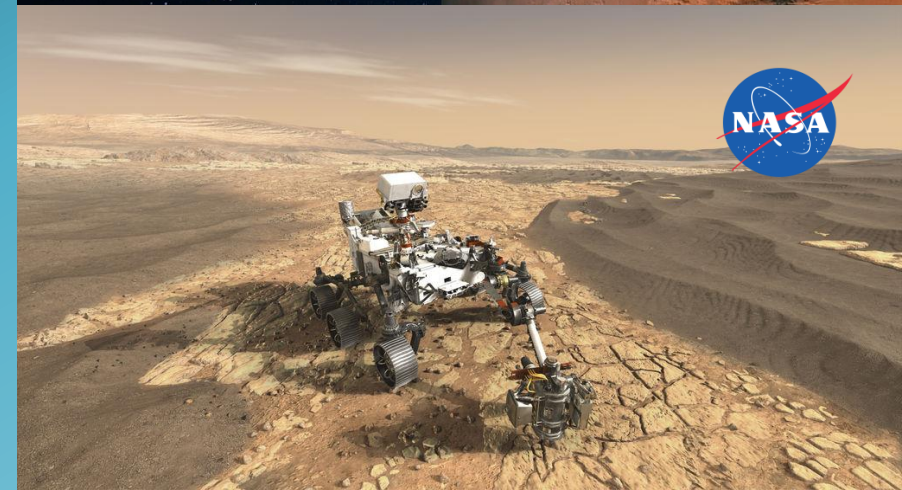
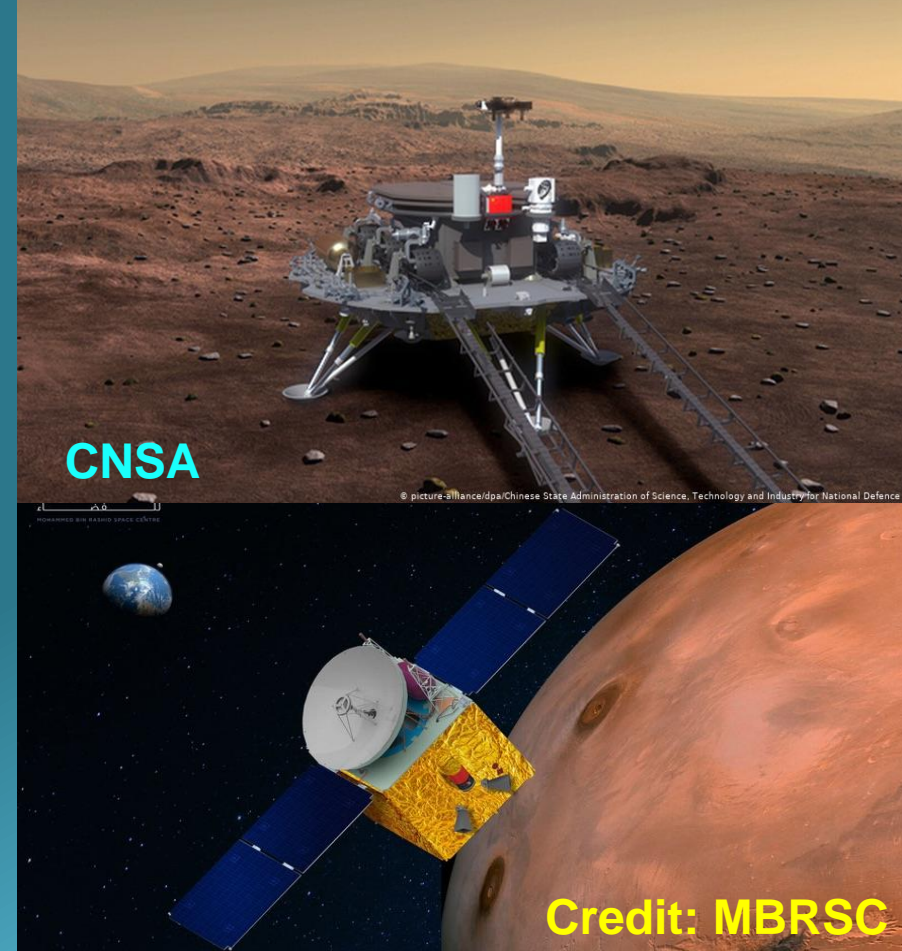
Chinese Mars mission consisting of an orbiter and lander/rover

UAE Mars orbiter Hope

will provide data on the Martian atmosphere, including monitoring weather and climate

Mars2020

Mars rover mission by NASA -
Perseverance rover will land in the Jezero Crater, explore and collect samples



Exploring the Earth-Moon-Mars Space



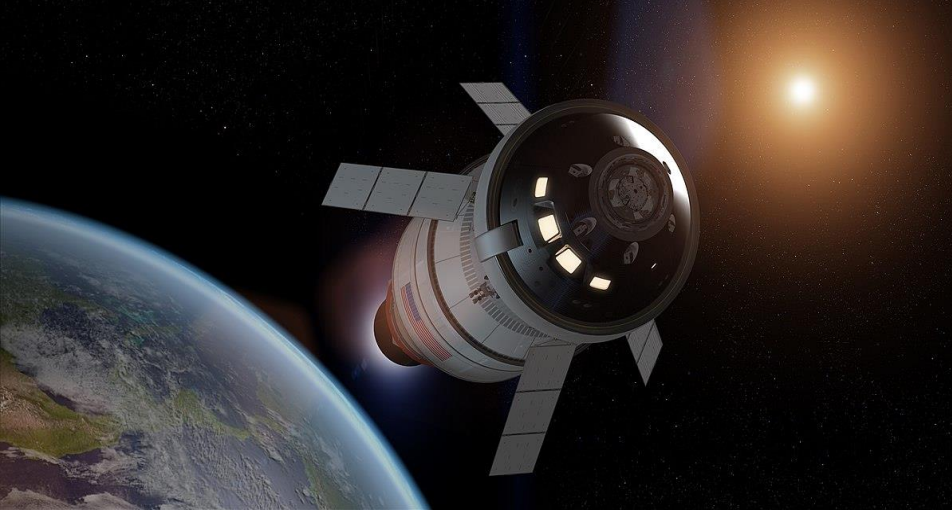
Preparation:

- Laboratory simulations
- Field research
- Experiments in low Earth orbit
- Astronaut health tests



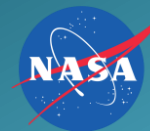
Science
Technology Development
Benefits for Society
International cooperation
Inspiration





International exploration endeavors

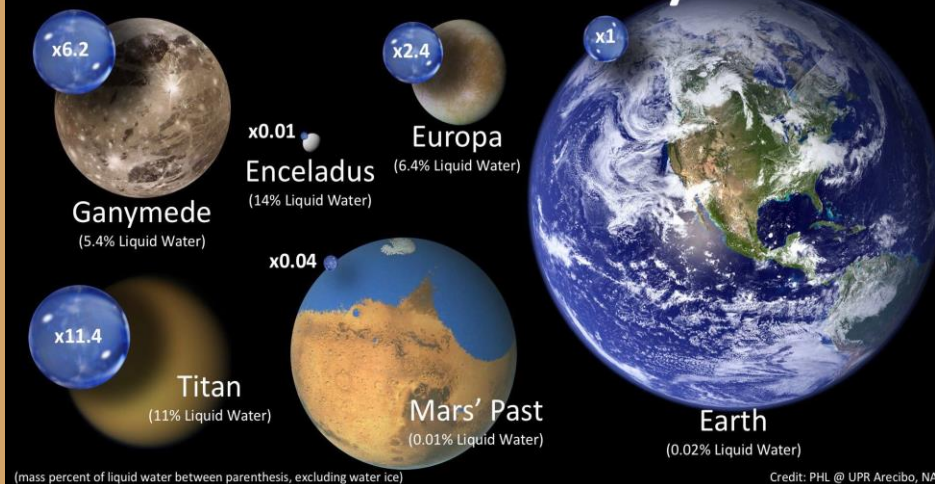
Artemis-1 mission is the first in a series of missions that will enable human exploration to the Moon and Mars



Mars Sample-Return mission will collect rock and dust samples on Mars, return them to Earth to enable high precision laboratory analysis



Oceans in the Solar System



Exploring **Ocean Worlds** in **our Solar System**

The space exploration arena is changing



- Increasing participation of **new and emerging space countries** as well as **commercial space actors** worldwide is leading to a new context for space exploration
- **New activities planned to all destinations: LEO, Moon, Mars and beyond** by many actors: USA, ESA, China, Russia, Japan, India, UAE, etc.
- Robotic and human space exploration endeavors require **innovative technologies** and often **multinational cooperation** to exploit worldwide expertise
- There is a growing need to establish more comprehensive regulations governing **diverse activities on the Moon and other celestial bodies**





INTERNATIONAL
ASTRONAUTICAL
FEDERATION

Mission



**Raising
Awareness**



**Advancing
International
Development**



**Preparing the
Workforce**



**Sharing
Knowledge**

**Promoting
Cooperation**

**Recognising
Achievements**



Connecting @ll Space People



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Upcoming Events

Global Space Exploration Conference GLEX 2021

- **14 - 18 June 2021, in St. Petersburg, Russian Federation**
- Co-organized with the IAF Member **ROSCOSMOS**
- **Call for Abstracts open**
- **Next generation Seminar**, organized in cooperation between the **IAF Workforce Development and Young Professional Programme Committee** and **SGAC** will take place on the **Monday 14 June 2020**

