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SPACE COLONIZATION

- DVS SIDDHARTHA

SPACE COLONIZATION

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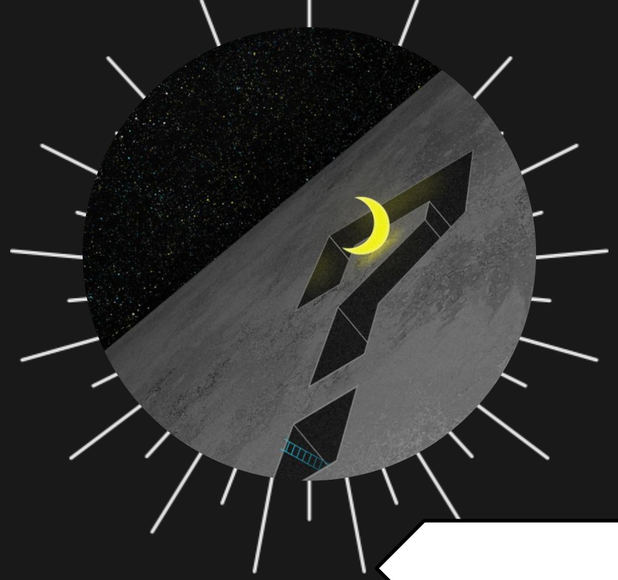

WHY?

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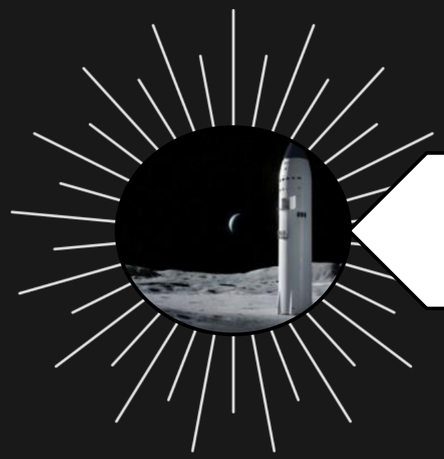
- Survival of human civilization
- Utilize resources accessible in space
- Expansion of boundaries
- Mitigate the negative effects of population explosion
- Spread life throughout the universe
- Ensure the survivability of our species

CHALLENGES



Rockets

Our Ships Are Way Too Slow!

Chemical propellants are great for an initial push, but your precious kerosene will burn up in a matter of minutes. After that, expect to reach the moons of Jupiter in, oh, five to seven years.

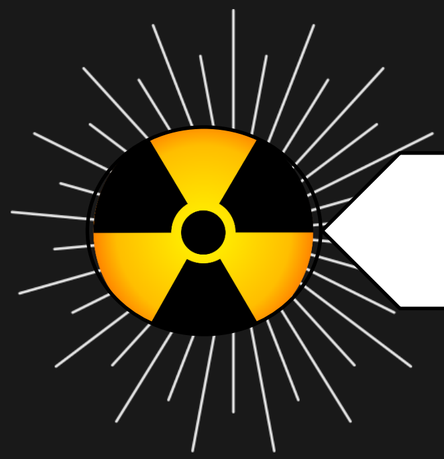
CHALLENGES

Communication

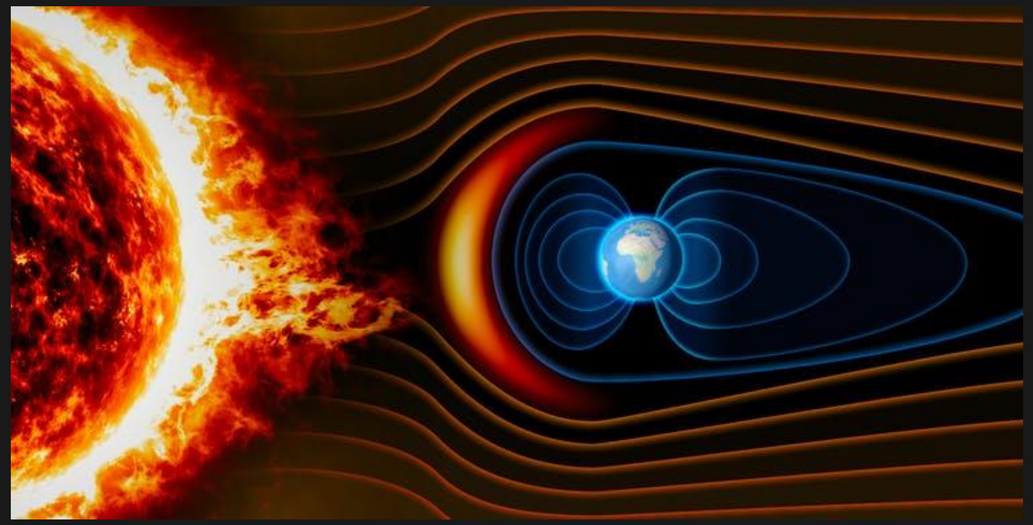
There are No Signal Towers in Space!

The Deep Space Network, a collection of antenna arrays in California, Australia, and Spain, is the only navigation tool for space, With a latency.

CHALLENGES



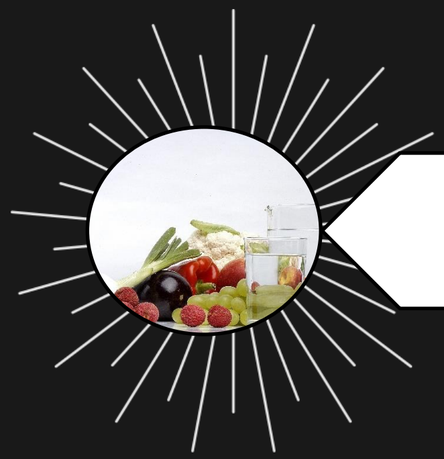
Radiation



Space Turns You Into a Bag of Cancer!

Outside the safe cocoon of Earth’s atmosphere and magnetic field resides radiation it has sufficient energy to change or break DNA molecules, which can damage or kill a cell.

CHALLENGES



Food and Water

Space Has No Supermarkets!

To survive in harsh space environment nutritious food and water has to be taken but large-scale gardening in zero g is tricky, Water wants to float around in bubbles instead of trickling through soil and you cannot carry all food and water to space.

CHALLENGES

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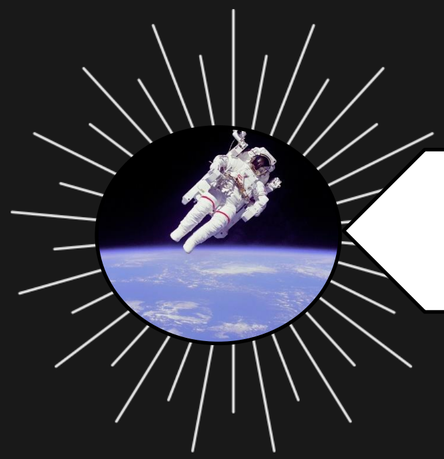


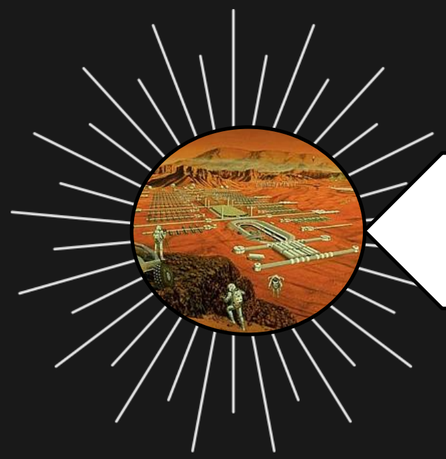
Effect on human body

Zero Gravity Will Transform You into Mush!

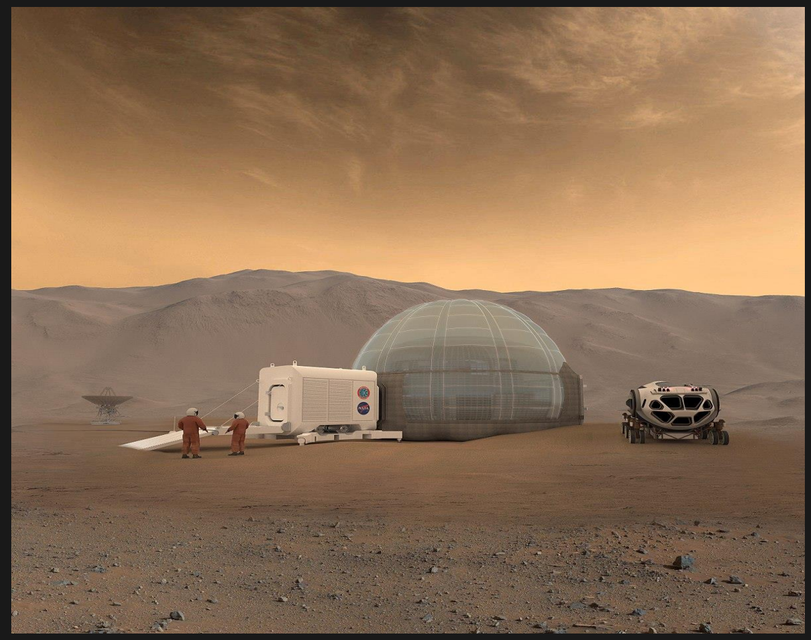
Weightlessness wrecks the body, The most significant adverse effects of long-term weightlessness are reduced muscle mass, strength and performance.

Source :NASA

CHALLENGES



Location and Resources



You need to make every place your home!

The place you colonize should be having basic resources. The availability of resources like metals, gases need to taken into account for selecting location.

What data we have?

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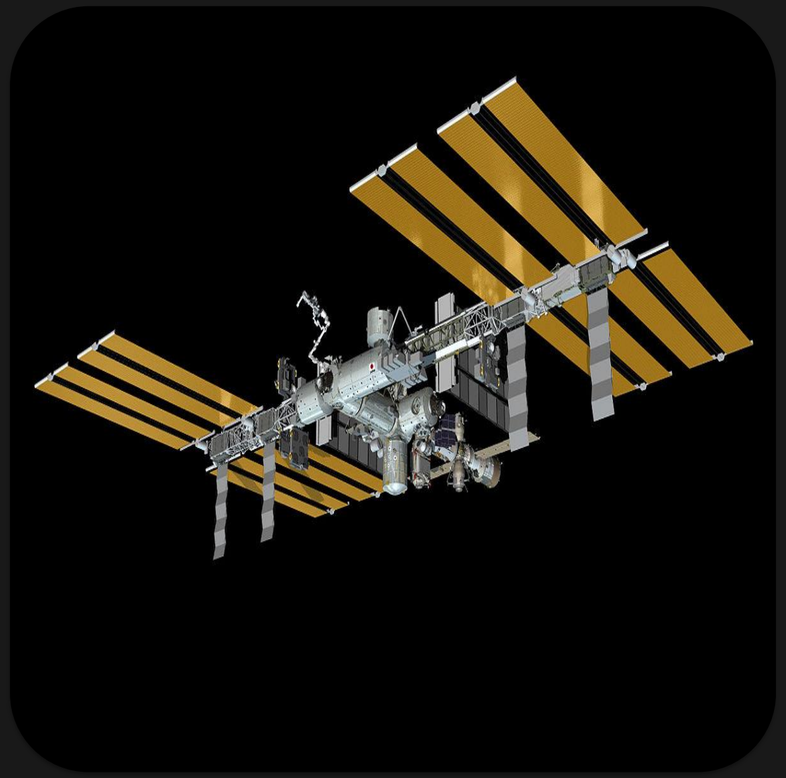
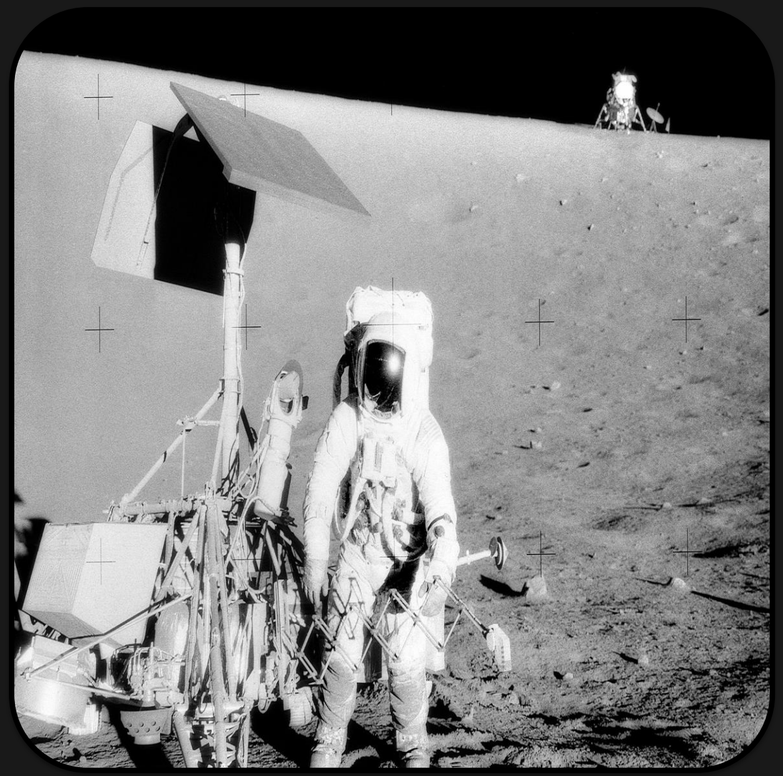


Provides microgravity laboratory



Provided samples of moon rocks

Provided Martian topography

INTERNATIONAL SPACE STATION (ISS)

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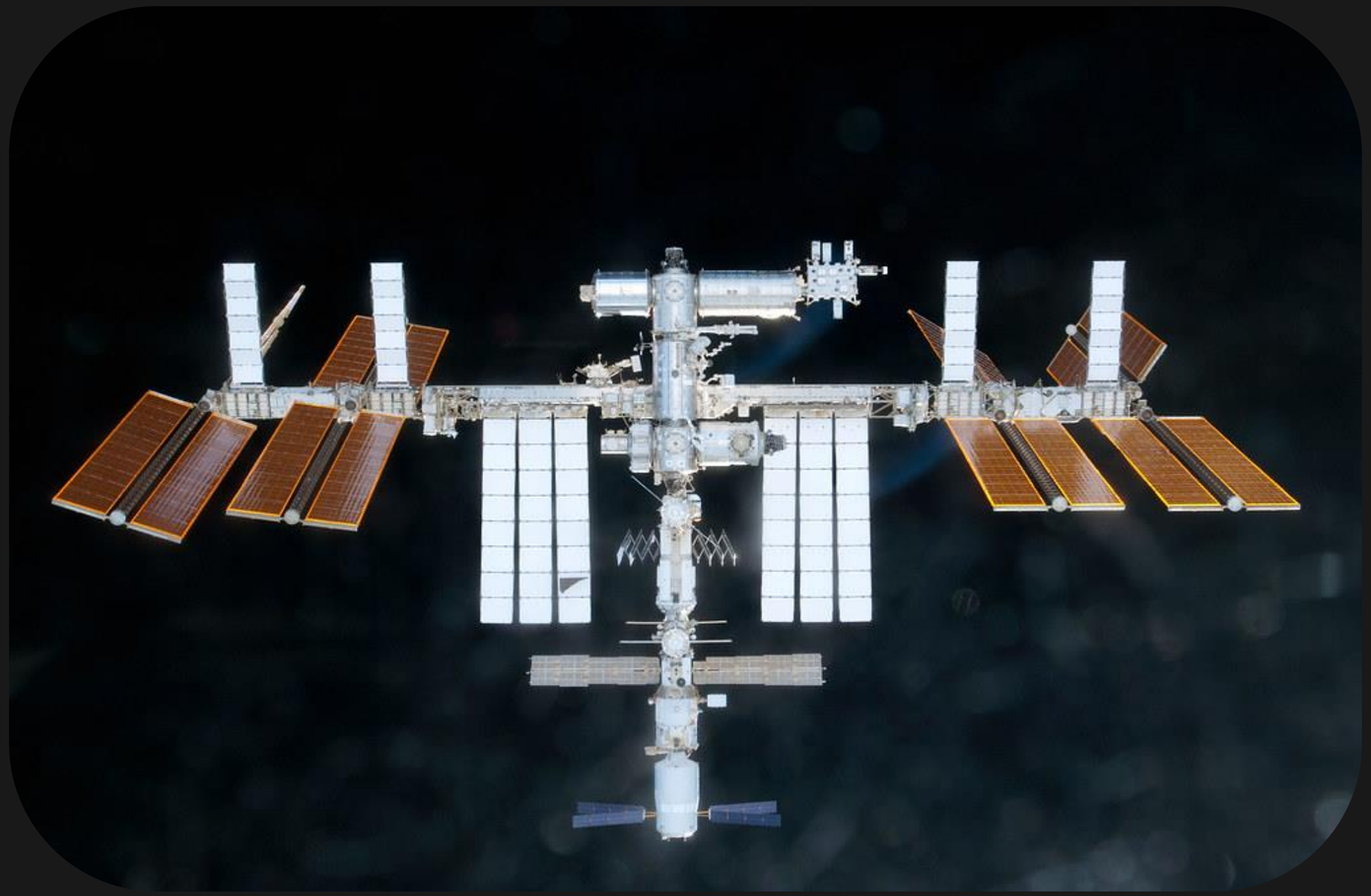

" The last date that all living humans were together on Earth was November 2nd 2000. Since then there has always been someone onboard the International Space Station. "

Source :NASA

ISS

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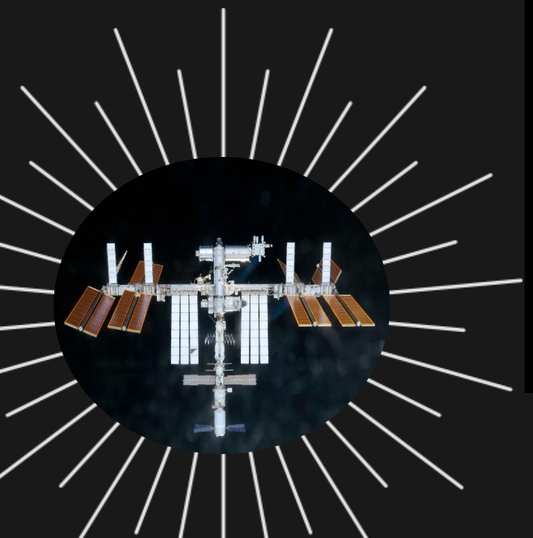

1A/R

"Zarya" Functional Cargo Block (FGB)

Source : video-NASA

Audio-No Time for Caution · Hans Zimmer

PHYSICAL SCIENCES

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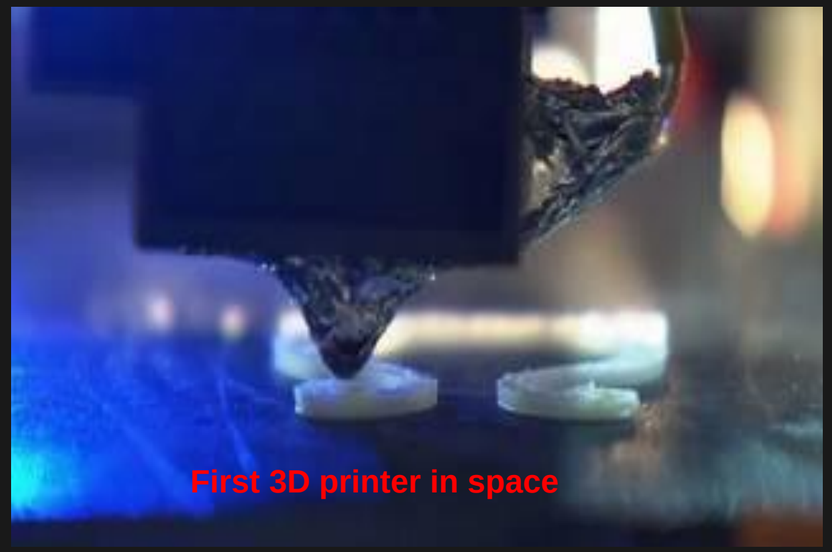
- IN ORBIT PRODUCTION
- MATERIAL TESTING
- COMBUSTION



Source :NASA

LIFE SCIENCES

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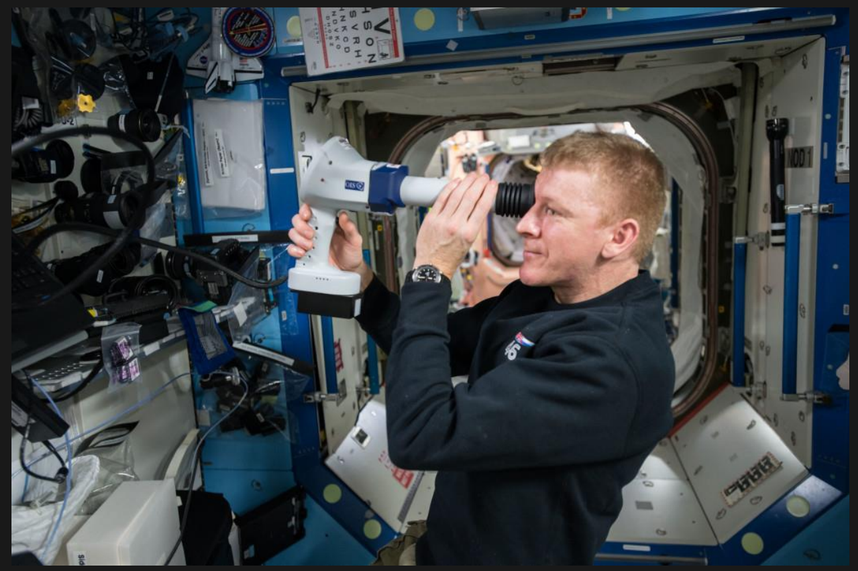
- EFFECT OF MICROGRAVITY ON BODY
- STUDYING PLANT BIOLOGY



Source :NASA

TECHNOLOGY DEVELOPMENT

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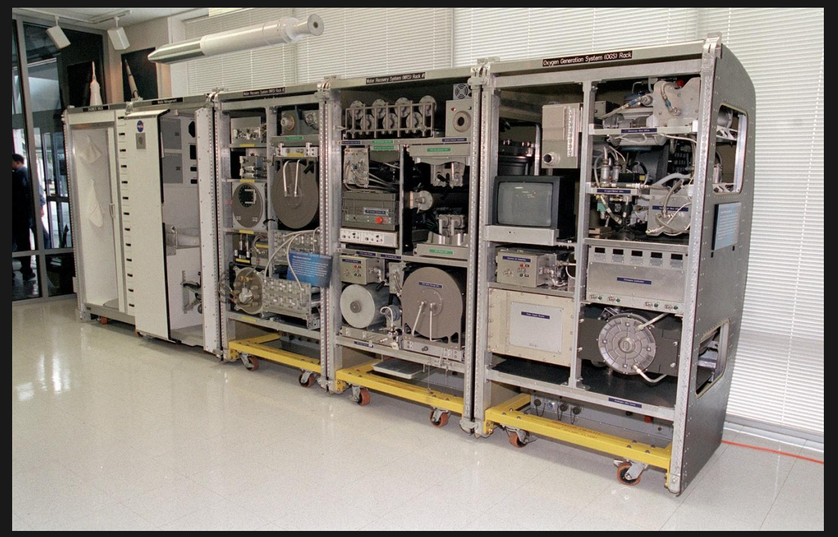
- Energy efficiency
- ECLSS systems-1. Water Recovery System (WRS)
  2. Oxygen Generation System (OGS)



Source :NASA

MOON

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"Houston, **tranquility base** here.
The **eagle has landed**.“
-Neil Armstrong

Why moon?

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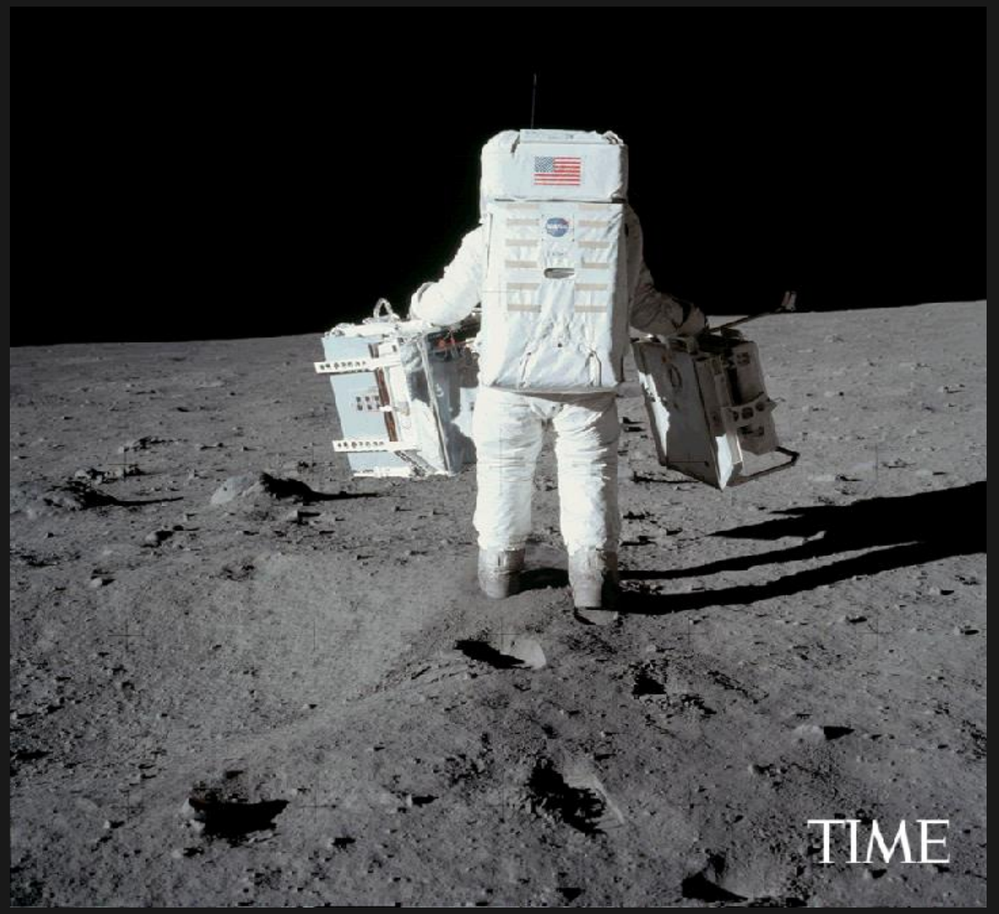
There are almost as many answers to this question as there are craters on the Moon (6000 approx.)!!

- Nearest planet laboratory.
- It is an excellent place to test technologies.
- First hand experience of living and working on another world
- How robots can be deployed



Source :NASA

Moon topography

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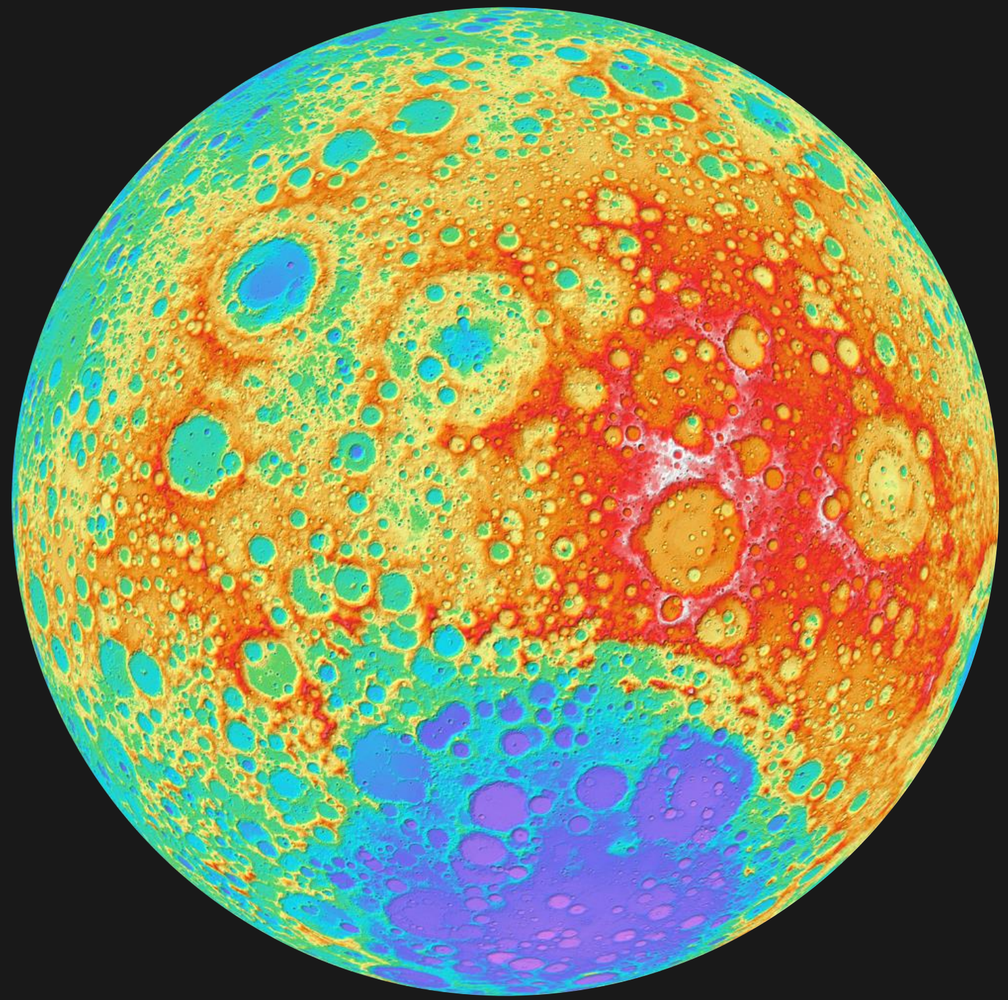
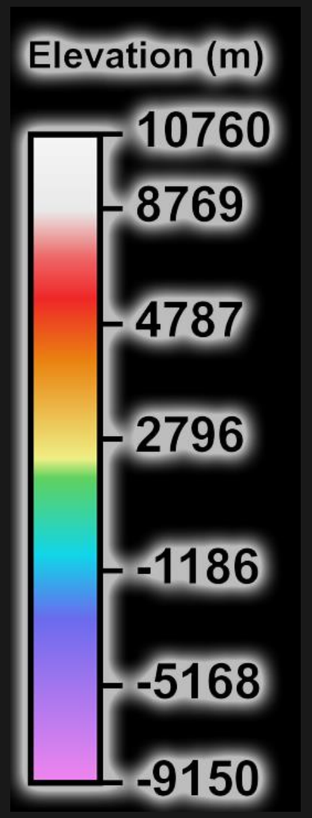
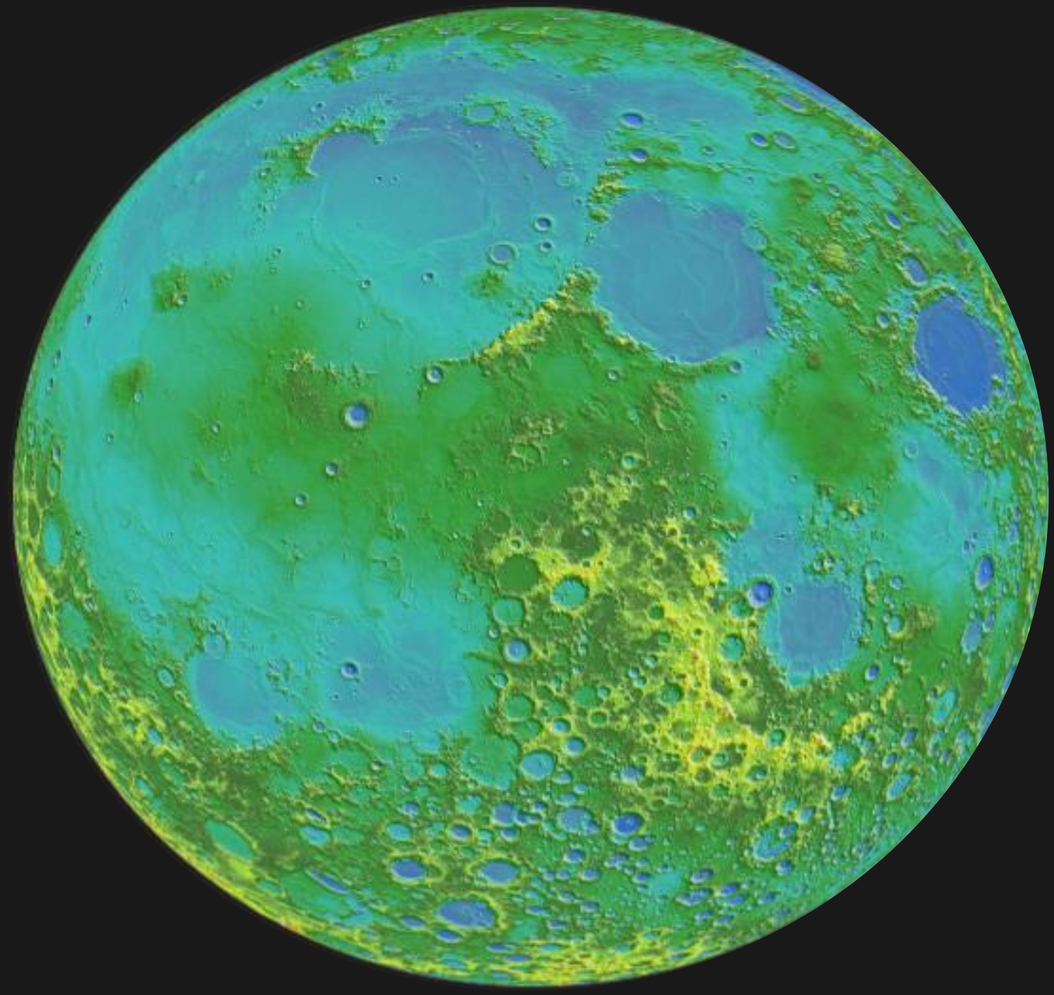


FAR SIDE





NEAR SIDE

Source :NASA

Apollo findings

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- Similar age of Earth and Moon rocks.
- The Earth and Moon were formed from same materials.
- The Moon is lifeless
- The Moon was melted to great depths to form a "magma ocean”.
- The lunar magma ocean was followed by a series of huge asteroid impacts that created basins which were later filled by lava flows.

Source :NASA, National Air and Space Museum

MARS

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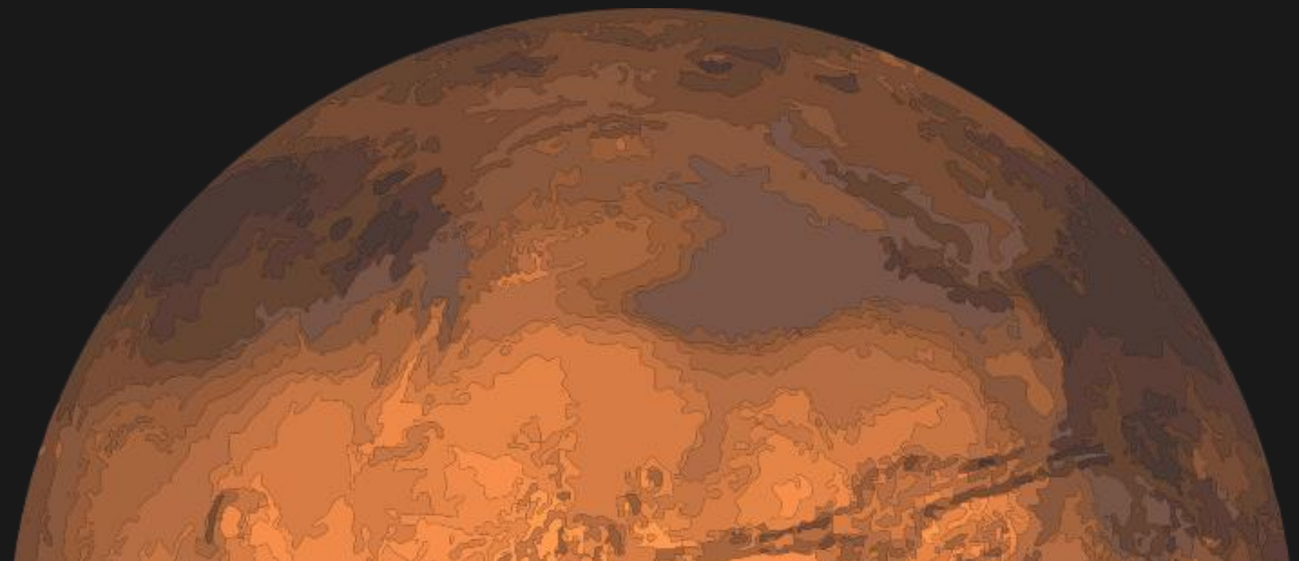
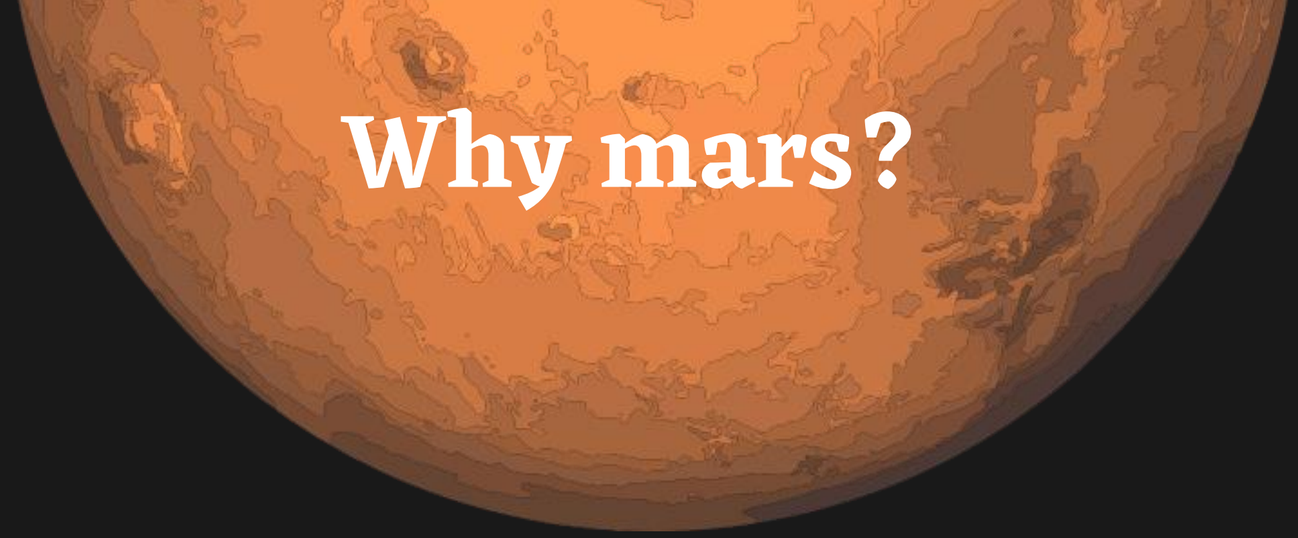
“You want to wake up in the morning and think the future is going to be great - and that’s what being a spacefaring civilization is all about. It’s about believing in the future and thinking that the future will be better than the past. And I can’t think of anything more exciting than going out there and being among the stars”.

-ELON MUSK



Why mars?



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- At an average distance of 140 million miles
- It isn’t too cold or too hot (average temperature is -60^{0}C)
- There is enough sunlight to use solar panels (mainly at equator).
- Gravity on Mars is 38% that of our Earth’s.
- Mars has atmosphere of 1% density when compare to earth.
- The day/night rhythm is very similar to ours here on Earth: a Mars day is 24 hours, 39 minutes and 35 seconds

Mars topography

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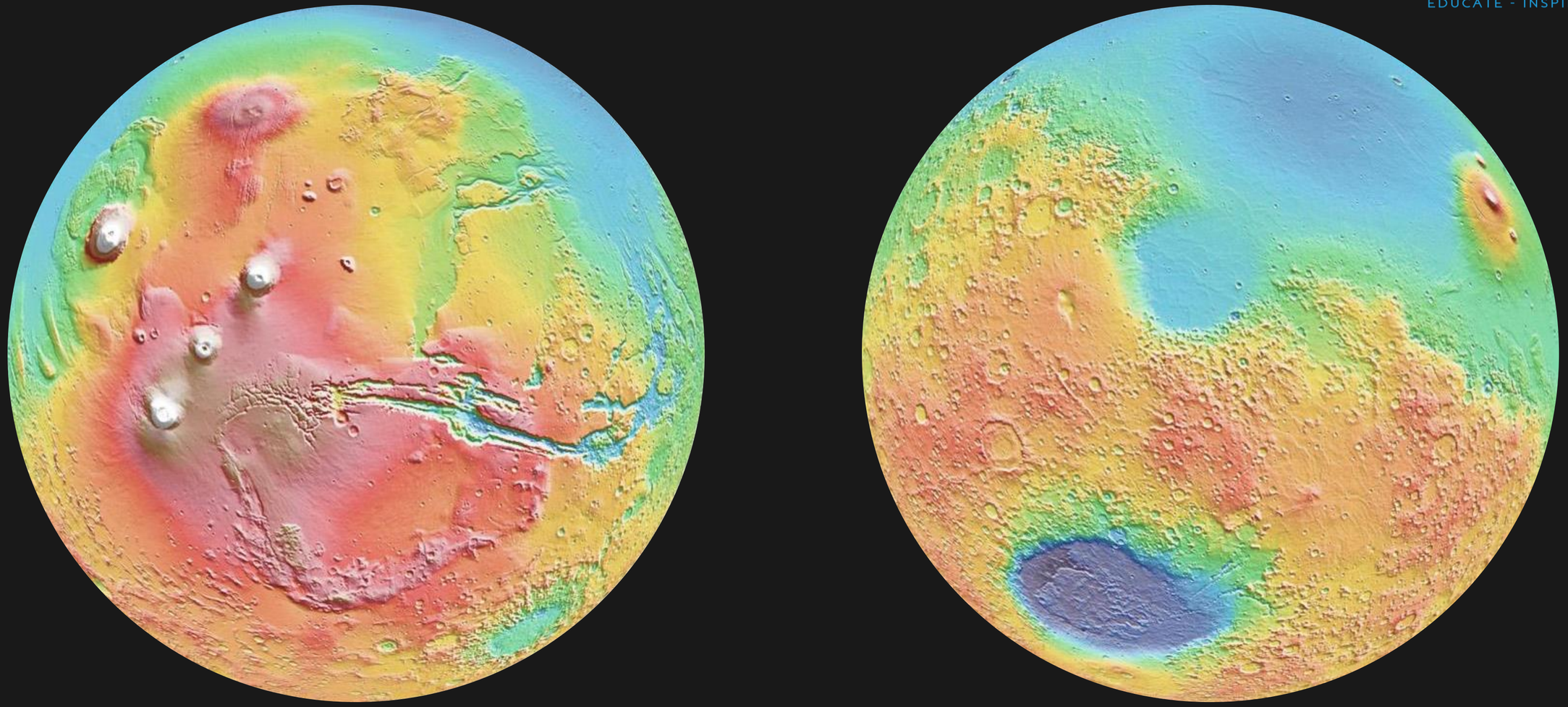

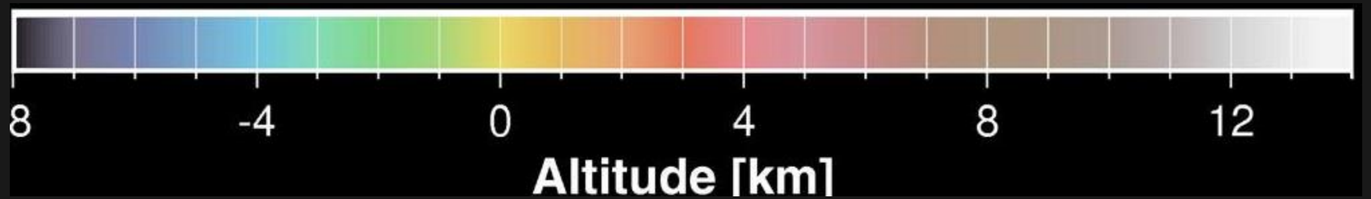

Source :NASA

Rover findings

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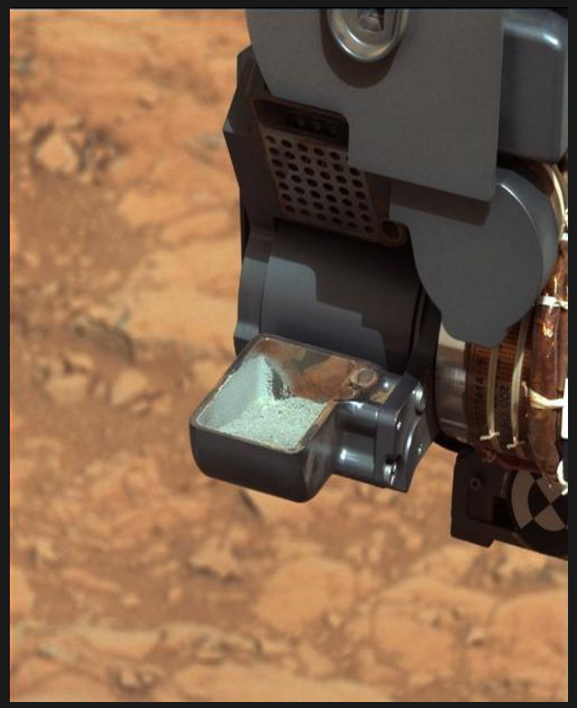
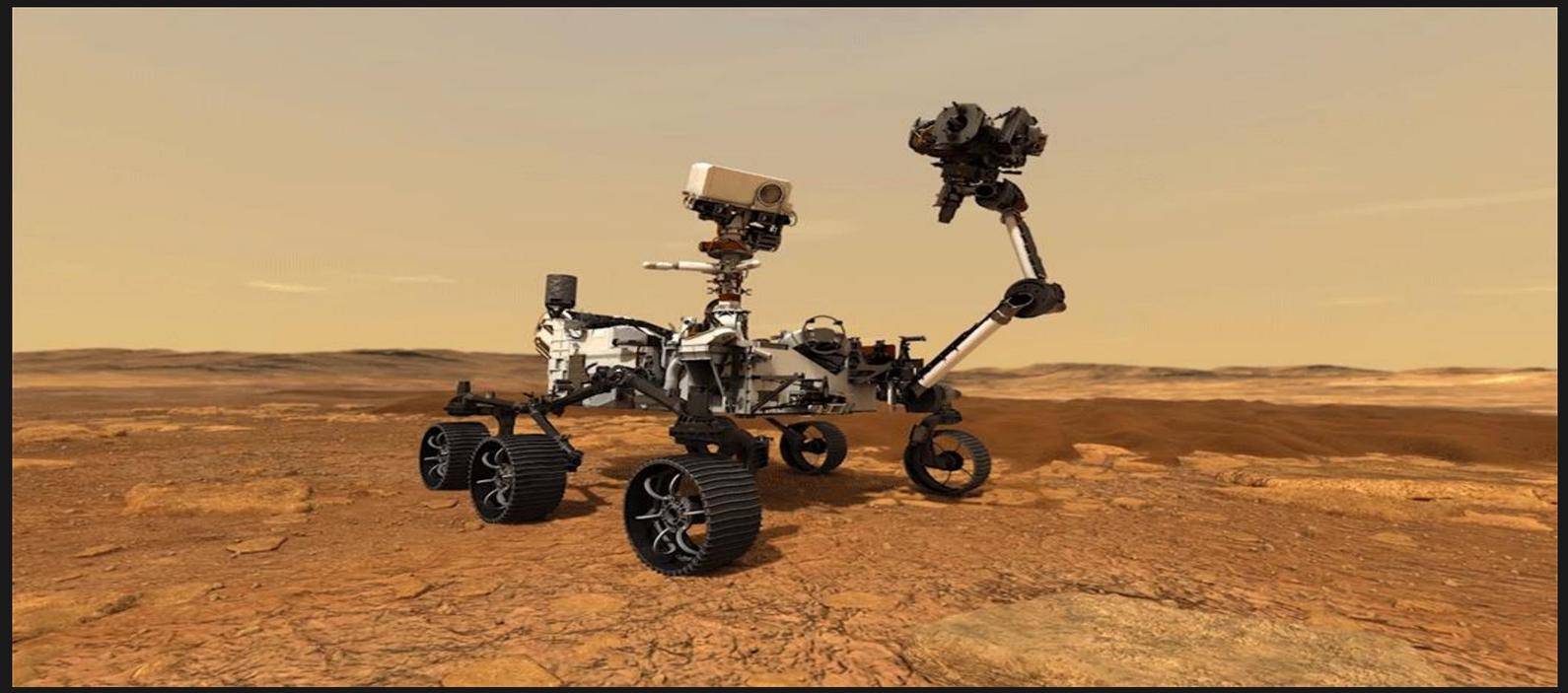
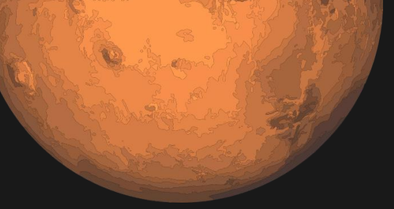
- Curiosity rover finds evidence of persistent liquid water in the past.
- Ancient mars had the right chemistry to support living microbes.
- Organic molecules are the building blocks of life, and they were discovered on mars.
- Present and active methane in mars' atmosphere.
- Radiation could pose health risks for humans.





Source :NASA



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Activity

Take one of the challenges as shown below and come up with a solution.

1.Rockets Efficiency

2.Radiation shielding

3.In-situ Resourses utilization

4.Habitat design

Future Moon endeavors

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- Artemis program

The Gateway is an outpost around the Moon to support human and scientific exploration in deep space.

Future Mars endeavors

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- SPACEX Interplanetary transport program

The key things beings REUSIBILITY, Methanol and oxygen powered rocket engines.

What are the other places we can live?

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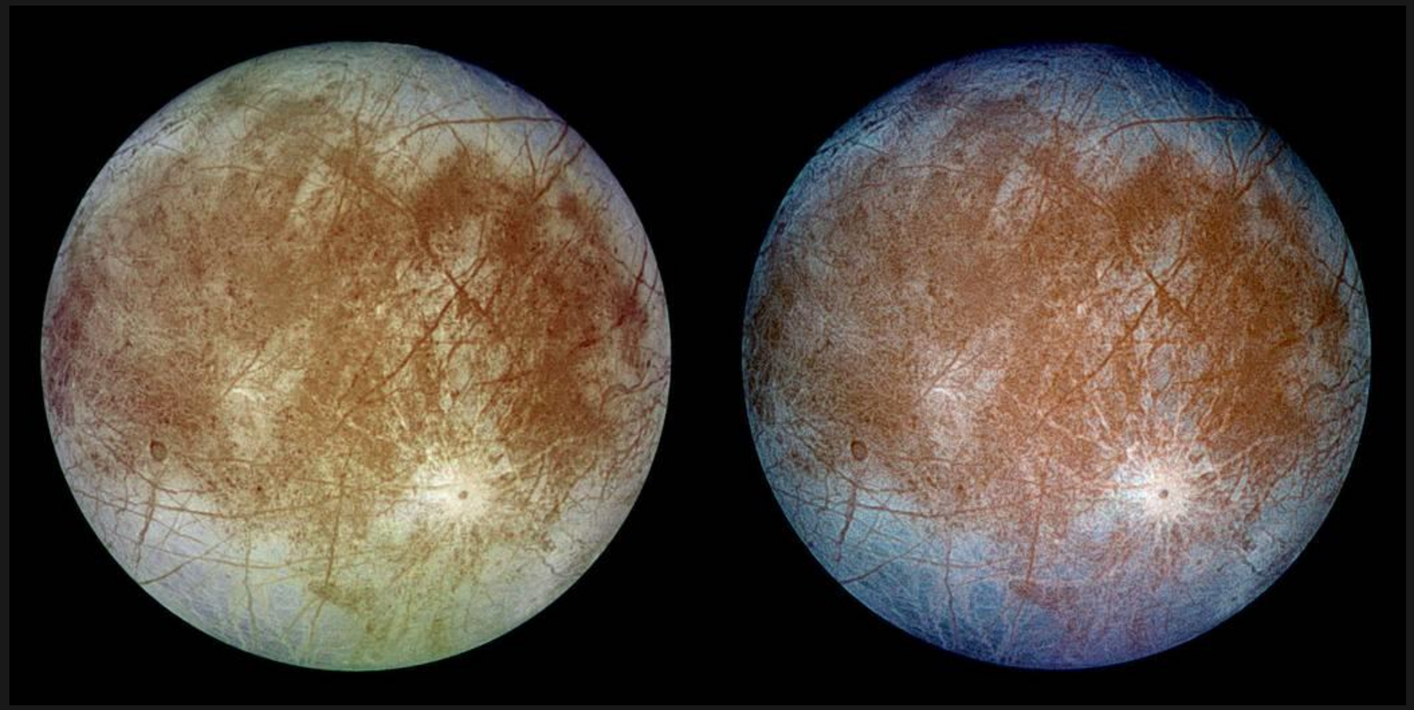
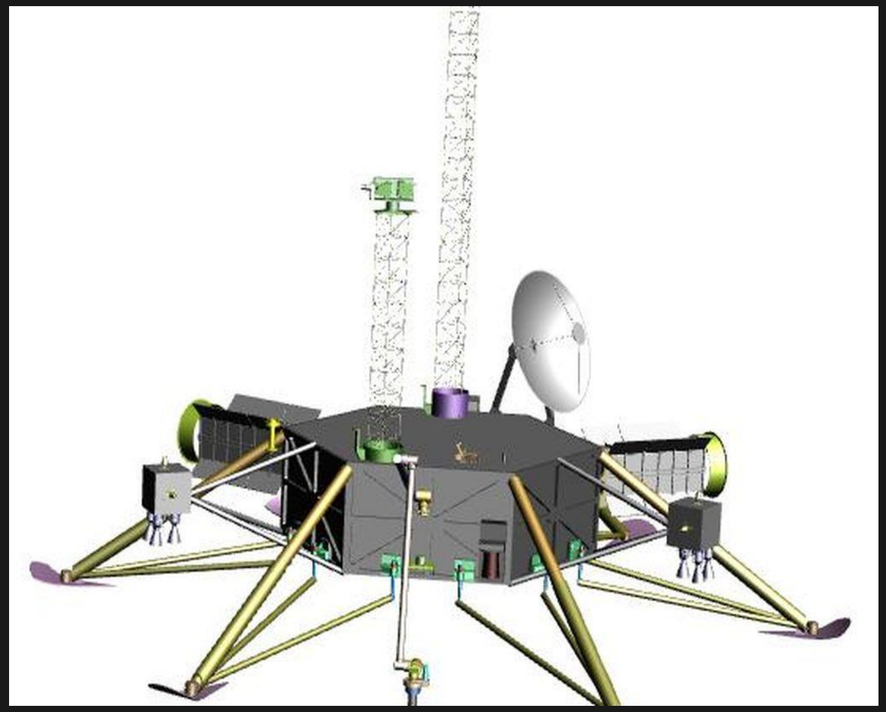
Jupiter’s moon Europa





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QUESTIONS

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