Floods on Mars

Why in News?

China’s Zhurong rover that landed on Mars in 2021 has found evidence of major floods that took place billions of years ago by studying underground layers.

- The rover **studied its landing site - Utopia Planitia** - vast plains in Mars’s northern hemisphere.
- These are the **rover’s first results** of the radar imager. Radio waves from the radar bounce off **underground materials to reveal** their **grain size and ability to hold an electric charge**. Stronger signals typically indicate larger objects.

What are the Findings?

- The radar did not find any evidence of liquid water down to 80 metres, but it did detect **two horizontal layers with interesting patterns.**
  - In a layer between 10 and 30 metres deep, the reflection signals strengthened with increasing depth.
  - An older, thicker layer between 30 and 80 metres down showed a similar pattern.
- The **older layers** (30 and 80 metres) are probably the result of rapid flooding that carried sediments to the region more than **three billion years ago**, when there was a lot of water activity on Mars.
- The **upper layer** (between 10 and 30 metres deep) could have been created by another flood **some 1.6 billion years ago**, when there was lots of glacial activity.
- Radar data is not enough to discern if the underground materials were sediments or volcanic remnants.

What is Zhurong Rover?

- Zhurong named after a Chinese mythical fire god, is **China's first Mars** rover carried by **China's Tianwen-1 spacecraft** in 2021.
- During the mission, Zhurong will explore the colossal basin of **Utopia Planitia** on Mars' northern hemisphere, which was probably formed by an impact early in the planet's history.
- Weighing about 240 kilograms, the ‘Zhurong’ rover is **slightly heavier than NASA’s Spirit and Opportunity rovers**, but only one-fourth the weight of Perseverance **and Curiosity (NASA).**
- It is powered by **retractable solar panels and fitted with seven primary** instruments — cameras, ground-penetrating radar, a magnetic field detector and a weather station.
- The purpose of the radar is **to look for signs of ancient life as well as subsurface water.**

What are the Key Points Related to Mars?

- **Size and Distance:**
  - It is the **fourth planet from the Sun** and the second-smallest planet in the Solar System.
  - Mars is about half the size of Earth.
- **Similarity to the Earth (Orbit and Rotation):**
  - As Mars orbits the Sun, it completes one rotation every 24.6 hours, which is very similar to one day on Earth (23.9 hours).
  - Mars' axis of **rotation is tilted 25 degrees** with respect to the plane of its orbit around

the Sun. This is similar to Earth, which has an axial tilt of 23.4 degrees.
    - Mars has distinct seasons like Earth, but they last longer than seasons on Earth.
        - Martian days are called **sols—short for 'solar day'.**
- **Other Features:**
    - The reason Mars looks reddish is due to oxidation or rusting of iron in the rocks, and dust of Mars. Hence it is also called the Red Planet.
    - It has the largest volcano in the solar system i.e., Olympus Mons.
    - It has two small moons, **Phobos and Deimos.**

What are the Various Mars Missions?

- **ExoMars rover (2021) (European Space Agency)**
- **Tianwen-1: China's Mars Mission (2021)**
- **UAE's Hope Mars Mission (UAE's first-ever interplanetary mission) (2021)**
- **India's Mars Orbiter Mission (MOM) or Mangalyaan (2013)**
- **Mars 2 and Mars 3 (1971) (Soviet Union)**

UPSC Civil Services Examination Previous Year Question (PYQ)

Q. "The experiment will employ a trio of spacecraft flying in formation in the shape of an equilateral triangle that has sides one million kilometres long, with lasers shining between the craft." The experiment in question refers to (2020)

(a) Voyager-2
(b) New Horizons
(c) LISA Pathfinder
(d) Evolved LISA

Ans: (d)

- Evolved Laser Interferometer Space Antenna (eLISA) is a spectacular plan of setting into space three spacecrafts, a mother and two daughter spacecrafts, which will fly in a triangular formation, trailing the earth in its orbit around the sun at a distance of over 50 million km. Each arm of the imaginary triangle, from the mother to each daughter spacecraft, will measure about a million km.
- eLISA seeks to measure gravitational waves in the frequency range from 0.1 mHz to about 100 mHz. To achieve this, it is necessary for the interferometers to have an arm length of a million kilometres and that is impossible to achieve with an earth based setup.
- **Therefore, option (d) is the correct answer.**

Q. Consider the following statements: (2016)

The Mangalyaan launched by ISRO

1. is also called the Mars Orbiter Mission
2. made India the second country to have a spacecraft orbit the Mars after USA
3. made India the only country to be successful in making its spacecraft orbit the Mars in its very first attempt

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

Ans: (c)

Source: DTE