



Risk of Interplanetary Contamination on Mars

Why in News

Recently, astrobiologists have **expressed concerns** about possible '**interplanetary contamination**' on Mars as ambitious space missions are proliferating the space along with advances in commercial flight.

- Interplanetary contamination refers to **biological contamination of a planetary body** by a space probe or spacecraft, either deliberate or unintentional.

Key Points

- **Context:** In the past several missions have launched to Mars e.g. [China's Tianwen-1](#) which aims to land on the Red Planet's surface, and the [UAE's Al Amal \(Hope\)](#) which does not involve a landing, but an orbital mission that will study the Martian atmosphere.
 - The USA will soon launch its **Perseverance mission**, which would be the [National Aeronautics and Space Administration's \(NASA\) 10th](#) successful Mars landing since 1975.
 - The Perseverance is a **rover name for NASA's Mars 2020 mission**.
 - It will seek signs of ancient life and collect rock and soil samples from the planet.
 - In the past, **space missions have established physical contact** with astronomical bodies such as [comets and asteroids](#), and crewed missions have landed on the Moon.
 - However, since these **bodies are known to be hostile to life**, the possibility of their contamination has not been a pressing issue.
- **Type of Contamination:** There are two types of contamination i.e. forward and backward contamination.
 - **Forward Contamination:** It means the **transport of Earth-based microbes** to other celestial bodies.
 - Since, **presence of liquid water** was already discovered on Mars there is a [chance that Mars has life](#) and it is an ethical obligation on humanity to ensure that microbes from **Earth do not disturb a possible Martian biosphere**, allowing it to evolve in its own way.
 - Secondly, **Earth-based organisms could spoil the integrity of the Red Planet's samples** that rovers want to study - a highly disruptive concept for scientists who are looking for signs of native Martian life.
 - **Back Contamination:** It is the **transfer of extraterrestrial organisms** (if they exist) into the Earth's biosphere.
 - The **scientists rule out back contamination** with respect to **Mars sample-return mission** as their **biochemistry would be markedly different from that on Earth**.
- **Planetary Protection:**
 - **United Nations Outer Space Treaty of 1967:** It [serves as a defence mechanism](#)

against the militarisation of space and also requires nations to worry about contamination risks.

- Its 110 state parties include the **USA, Russia, China, and India.**
- To ensure compliance with the **Treaty, the Committee on Space Research (COSPAR)** lays down a '**planetary protection policy**' that aims to limit the number of microbes sent to other planets, as well as ensuring that alien life does not cause havoc on Earth.
- **Impact of the Policy:** The guidelines have had far-reaching implications on human spacecraft design, operational procedures, and overall mission structure.
 - Both NASA and the **European Space Agency** (ESA) have also appointed Planetary Protection Officers.
- **Solutions:**
 - **Spacecraft Sterilisation:** To prevent forward contamination, space missions take care to ensure that spacecraft are sterilised.
 - Previous Mars missions, such as **NASA's Viking landers of the 1970s**, were all sterilised before being launched into space.
 - **NASA's Perseverance mission** was also postponed for a second time to resolve a potential contamination issue.
 - **Containment:** In the case of back contamination, sterilisation would not be an option—as this would ruin the extraterrestrial samples.
 - **Containment** would be the only option to break the **chain of contact between possible alien microbes** and life on Earth.

Way Forward

- In the present times nations have been fighting a race to get a strategic edge and **compromising the ethical aspects** of space technology. Therefore, it is important to acknowledge that space may not become **purely a military domain** due to weaponisation of the space.
- Space must be used only for peaceful purposes and any violation of Outer Space must not be tolerated.
- The natural biosphere of earth and other planetary bodies must be ensured through international cooperation.

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