



Internal Structure of Mars

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Why in News?

According to a pair of recent studies published in Nature, [Mars's](#) liquid iron core is likely to be surrounded by a fully molten silicate layer.

- Data from three years of quakes in Mars, including two seismic events caused by meteorite impacts, were used for the study.
- NASA's [InSight Mars Lander](#) used an instrument called the **Seismic Experiment for Interior Structure (SEIS)** to record seismic waves passing through Mars's interior.

What are the Key Findings of the Study?

- **Mars's Core Composition:**
 - In 2021, measurements from NASA's InSight lander's SEIS project indicated the presence of a **large, low-density core in Mars, comprising liquid iron and lighter elements like sulphur, carbon, oxygen, and hydrogen.**
 - However, two recent studies challenge this finding. They found that the **Martian core is surrounded by a 150 km-thick layer of near-molten silicate rock**, indicating a **higher core density** than previously thought.
- **Misinterpretation of Core Surface:**
 - The studies reveal that the top of this silicate layer **was initially misinterpreted as the core's surface.** This reinterpretation implies that Mars's core is more compact than earlier estimates, aligning better with existing knowledge of chemical abundances on Mars.
 - This revised understanding suggests that **Mars may have had a turbulent interior following its formation, with temperatures reaching at least 2,000 Kelvin**, rather than a calmer, heat-shedding process into interplanetary space.
- **Impact on Mars's Geological History:**
 - The findings have significant implications for Mars's geological history, **hinting at a more dynamic and energetic early phase.** The presence of a molten silicate layer implies a vigorous and turbulent interior, possibly affecting Mars's geological evolution and the distribution of elements within the planet.

What is InSights Mars Lander?

- **About:**
 - **InSight** (Interior Exploration using Seismic Investigations, Geodesy and Heat Transport) was sent on a **24-month mission in 2018.**
 - InSight will study the **interior of Mars.**
 - The landing site is **Elysium Planitia** (a flat-smooth plain just north of the equator considered to be the perfect location from which to study the deep Martian interior), where InSight can stay still and quiet all through.
- **Functions:**
 - Mars InSight's goal is to **listen for quakes and tremors** as a way to unveil the Red Planet's inner mysteries.

- The mission seeks to **answer critical questions about rocky planet formation** in the early days of the solar system.

What are the Various Mars Missions?

- **NASA has a [lander \(Mars Insight\)](#), [two rovers \(Curiosity and Perseverance\)](#), and **three orbiters (Mars Reconnaissance Orbiter, Mars Odyssey, MAVEN)****
- **[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 Questions (PYQs)

Q1. "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)

Q2. 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 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