



Caves on the Moon

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Why in News?

Recently, scientists have confirmed the existence of a **cave on the moon**, located near the site where the **Apollo 11 mission** landed 55 years ago.

- This discovery has significant implications for **future lunar exploration** and the establishment of a **sustainable human presence** on the moon.

What are the Key Findings Related to the Moon?

▪ Key Findings:

- An Italian-led team of researchers found evidence of a cave located in the **Sea of Tranquility**, just 400 kilometres from the **Apollo 11** landing site.
 - The pit, like more than 200 others discovered on the lunar surface, was created by the **collapse of a lava tube**.
- Analysis of **radar** measurements by **NASA's Lunar Reconnaissance Orbiter** revealed that the cave is at least **40 meters wide and tens of meters long**, and likely even larger.

▪ Significance/Implications:

- **Potential Shelter for Future Astronauts:** Lunar caves offer natural protection against cosmic rays, solar radiation, and micrometeorites, reducing the need for constructing habitats from scratch.
- **Understanding Lunar Geology and Volcanic Activity:** The rocks and materials inside these caves, which have remained largely unaltered by the surface conditions over the eons.
 - It can help scientists better understand the evolution of the moon, particularly its volcanic activity
- **Potential Water and Fuel Sources:** Permanently shadowed craters near the lunar south pole likely contain frozen water, a crucial resource for drinking and rocket fuel.
- **Advancing Lunar Exploration:** Discovering lunar caves is a major step in understanding the moon's geology and resources, aiding future mission planning and the sustainability of human presence on the moon.

Moon Exploration

- In **1959**, the [Soviet Union's Luna 1](#) and 2 were the first robotic missions to visit the Moon.
- The **USA** sent 3 classes of robotic missions to the Moon between **1961** and **1968** before the **Apollo 11** mission.
- From 1969 to 1972, 12 American astronauts walked on the Moon's surface.
- In the 1990s, the USA resumed lunar exploration with robotic missions like Clementine and Lunar Prospector.
- In 2009, the USA launched the [Lunar Reconnaissance Orbiter \(LRO\)](#) and the [Lunar Crater Observation and Sensing Satellite \(LCROSS\)](#) for lunar missions.

- In 2011, NASA began the **ARTEMIS mission** for lunar exploration.
- The **Gravity Recovery and Interior Laboratory (GRAIL)** spacecraft studied the Moon's gravity in 2012.
- **China** landed two rovers on the Moon's surface, including the first-ever landing on the far side of the Moon in **2019**.

India's (ISRO) Moon Mission

- **Chandrayaan 1**: The Chandrayaan project started in 2007 through a collaboration between ISRO and Russia's ROSCOSMOS. The mission was initially postponed to 2016 due to delays in developing the lander by Russia.
 - **Findings**: The **confirmed presence of lunar water**, evidence of lunar caves, and past tectonic activity on the lunar surface.
- **Chandrayaan-2** is India's second moon mission, consisting of an **Orbiter, Lander (Vikram)**, and **Rover (Pragyan)**. The Rover Pragyan is housed inside the Vikram lander.
- **Chandrayaan-3**: Through this India made history by becoming the **first country** to land near the **lunar south pole** and ISRO became the **fourth** space agency to successfully land on the Moon, following **Roscosmos, NASA**, and the **CNSA**.

UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims:

Q. Consider the following statements: (2016)

1. The Mangalyaan launched by ISRO
2. is also called the Mars Orbiter Mission
3. made India the second country to have a spacecraft orbit the Mars after USA
4. 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

Mains:

Q. Discuss India's achievements in the field of Space Science and Technology. How the application of this technology helped India in its socio-economic development? (2016)