



# Lunar Science Workshop 2021: ISRO

## Why in News

Recently, the Lunar Science Workshop 2021, was conducted by [Indian Space Research Organisation \(ISRO\)](#) to commemorate the **completion of two years of operation of Chandrayaan-2 orbiter** in lunar orbit.

- According to the ISRO, the observations of the Chandrayaan-2 orbiter payloads have yielded **discovery-class findings**.
- The [Chandrayaan-3 mission](#) is likely to be launched late next year.

## Key Points

### ▪ About the Chandrayaan-2:

- **Lunar Exploration:** It is the second spacecraft in the Indian series of Lunar exploration satellites.
  - It comprised an **orbiter, lander named Vikram and rover named Pragyan** to explore the unexplored **South Polar region** of the Moon.
- **Launch:** It was launched on **22<sup>nd</sup> July, 2019** from the Sriharikota spaceport by [GSLV Mk-III](#).
  - It was inserted into a lunar orbit in August, 2019.
  - The orbiter and lander modules were separated as two independent satellites in September, 2019.
- **Failure of Lander:** Vikram lander's descent was as planned and normal performance was observed up to an altitude of 2.1 km from Lunar surface in September, 2019.
  - Subsequently, [communication from the lander](#) was lost and the lander had a hard landing on the lunar surface.
    - The **six-wheeled Pragyan rover** was accommodated inside the Vikram lander.
    - A successful soft-landing would have made India the fourth country after the erstwhile Soviet Union, the United States, and China to do so.
- **Role of Orbiter:** The orbiter, placed in its intended orbit around the Moon, provided the understanding of the Moon's evolution and mapping of minerals and water molecules in polar regions, using its eight advanced scientific instruments.
  - The precise launch and optimised mission management have ensured **a long life of almost seven years for the orbiter** instead of the planned one year.

### ▪ Findings of Chandrayaan-2 Orbiter:

- **Detection of Argon-40:** The **mass spectrometer CHandra's Atmospheric Compositional Explorer 2 (CHACE 2)** conducted first-ever in-situ study of the composition of the lunar neutral exosphere from a polar orbital platform.

- It detected and studied the **variability of the Argon-40** at the middle and higher latitudes of the Moon, **depicting the radiogenic activities** in the mid and higher latitudes of the Lunar interior.
- **Detection of Chromium and Manganese:** [Chandrayaan-2 Large Area Soft X-ray Spectrometer \(CLASS\)](#) payload has detected minor elements of chromium and manganese through remote sensing.
- **Observations of Microflares of the Sun:** The observations of microflares of the Sun, during the [quiet-Sun period](#), which provide important clues on the [coronal heating](#) problem of the Sun, were made by the Solar **X-ray Monitor (XSM) payload**.
- **Detection of the Hydration Features:** The first-ever unambiguous detection of the hydration features of the Moon was achieved by Chandrayaan-2 with its **Imaging Infra-Red Spectrometer (IIRS) payload**, which captured clear signatures of **Hydroxyl** and **water-ice** on the lunar surface.
- **Detection of the Subsurface Water-ice:** The **Dual Frequency Synthetic Aperture Radar (DFSAR)** instrument detected signatures of the subsurface water-ice, and achieved high resolution mapping of the lunar morphological features in the polar regions.
- **Imaging the Moon:** Imaging the moon from 100 km lunar orbit with "best-ever" achieved resolution of 25 cm with its **Orbiter High Resolution Camera (OHRC)**.
- **Geological Findings:** The **Terrain Mapping Camera (TMC 2)** of Chandrayaan-2, which is conducting imaging of the Moon at a global scale, has found interesting geologic signatures of **lunar crustal shortening, and identification of volcanic domes**.
- **Study of Moon's Ionosphere:** The **Dual Frequency Radio Science (DFRS)** experiment onboard Chandrayaan-2 has studied the ionosphere of the Moon, which is generated by the solar photo-ionisation of the neutral species of the lunar exosphere.

**Note:**

- The '**PRADAN**' portal is hosted by **Indian Space Science Data Centre (ISSDC)**, the nodal centre of data archive for ISRO missions.
- The data from the Chandrayaan-2 mission is being released for the wider public use through the PRADAN portal.

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