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Space & Astronomy:

I. Space Missions and Astronautics:

Indian Astronaut's Safe Return from Axiom-4: Group Captain Shubhanshu Shukla, the first Indian astronaut to visit the International Space Station (ISS), safely returned to Earth on July 15, 2025, after an 18-day mission aboard the Axiom-4 (Ax-4) crewed flight. The SpaceX Dragon spacecraft splashed down in the Pacific Ocean. During his stay, Shukla conducted seven India-specific microgravity experiments to gather data for future planetary missions and long-duration space habitation. Space Minister Jitendra Singh hailed his return as a "moment of pride and glory for India."

Europa Clipper Mission Update: NASA's Europa Clipper spacecraft, launched on October 14, 2024, is on its way to Jupiter's moon Europa to investigate its potential for habitability. It successfully used a gravity assist from Mars on March 1, 2025, and is scheduled for another gravity assist from Earth on December 3, 2026, before its arrival at Europa in April 2030. The mission will involve numerous flybys of Europa while orbiting Jupiter.

Blue Origin's New Glenn Reaches Orbit on Maiden Flight: Blue Origin's heavy-lift launch vehicle, New Glenn, successfully reached its intended orbit during its inaugural NG-1 mission on January 16, 2025. The launch from Cape Canaveral Space Force Station saw the second stage successfully reach orbit, although the booster was lost during descent. This maiden flight carried the Blue Ring Pathfinder payload to test its core flight, ground systems, and operational capabilities. A second launch

aiming for Mars is already being planned for late 2025.

SpaceX Starship Orbital Test Flight 10 Delayed: The tenth flight test of a SpaceX Starship launch vehicle (Booster 16 and Ship 37) was initially expected no earlier than (NET) June 29, 2025. However, it has been significantly delayed due to the loss of Ship 36 in a testing anomaly. The current launch date is NET August 4, 2025.

China's Ambitious Space Plans for 2025: China is pursuing several ambitious space missions in 2025. This includes the planned launch of the Qingzhou cargo spacecraft in September 2025 to provide low-cost, high-performance cargo transportation services for its Tiangong space station. The maiden flight of the Long March-8A carrier rocket is also set for 2025. Furthermore, China's permanently crewed Tiangong space station is gearing up for astrophysics, with the Xuntian telescope (similar resolution to Hubble but 300 times larger field of view) planned for launch in mid-2025 to fly alongside Tiangong.

UAE Mars Mission (Hope Probe): The UAE's Hope Probe continues to study daily and seasonal weather cycles on Mars, along with atmospheric hydrogen and oxygen loss, to understand the planet's drastic climate changes. The probe, launched in 2020, is equipped with three scientific instruments (EXI, EMIRS, EMUS) to gather data on Mars' atmospheric layers.

II. Astronomical Observations and Discoveries:

James Webb Space Telescope's 3rd Anniversary Discoveries: To mark its third year of highly productive science, the James Webb Space Telescope (JWST) has unveiled stunning new observations:





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Cat's Paw Nebula: Webb "clawed" back thick, dusty layers of a section within the Cat's Paw Nebula (NGC 6334), a massive star-forming region, revealing mini "toe-bean" reminiscent structures with young stars shaping the surrounding gas and dust.

Evidence of Lightweight Planet: Webb captured compelling evidence of a planet with a mass similar to Saturn orbiting the young nearby star TWA 7. If confirmed, this would be Webb's first direct image discovery of a planet and the lightest ever seen with this technique.

Titan Cloud Convection: Combined data from Webb and the Keck II telescope showed evidence of cloud convection on Saturn's moon Titan's northern hemisphere for the first time, suggesting occasional methane showers replenish its lakes and seas.

Jupiter's Aurora Details: New details of Jupiter's auroras, hundreds of times brighter than Earth's, were captured, aiding in understanding Jupiter's magnetosphere.

Possible Hidden Supermassive Black Hole: Webb uncovered evidence suggesting a long-sought supermassive black hole in the nearby spiral galaxy M83's heart, revealed by highly ionized neon gas.

Hubble Space Telescope Observations: The Hubble Space Telescope continues to provide stunning images and data:

Galactic Time Capsule (NGC 1786): Hubble observed the globular cluster NGC 1786 in the Large Magellanic Cloud, a "galactic time capsule" used to compare old globular clusters in nearby dwarf galaxies with those in the Milky Way.

Galaxy Cluster Abell 209: Hubble captured a portrait of the massive, spacetime-warping galaxy cluster Abell 209, highlighting over a hundred galaxies and the elusive dark matter.

Young Stars of Taurus (GN 04.32.8): Hubble imaged a reflection nebula, GN 04.32.8, in the Taurus Molecular Cloud, illuminated by nearby young stars, providing insights into star formation.

Spiral Galaxy UGC 11397: Hubble observed the spiral galaxy UGC 11397, revealing a growing supermassive black hole at its center, with an activity of 174 million times the mass of the Sun.

III. Planetary Defense and Other Developments:

Asteroid 2022 YS5 Flyby: NASA confirmed that asteroid 2022 YS5 (approximately 120 feet in diameter) will pass Earth at a distance of about 4.15 million kilometers on July 17. While not considered hazardous, it's a reminder of ongoing asteroid monitoring.

ISRO's Planetary Defense Initiatives: The Indian Space Research Organisation (ISRO) is proactively enhancing its planetary defense infrastructure, focusing on future close encounters like asteroid Apophis in 2029. ISRO is exploring collaborations with international partners like NASA, ESA, and JAXA for asteroid observation and mitigation techniques.

DRDO's Stratospheric Airship Platform: India's Defence Research and Development Organisation (DRDO) successfully conducted the maiden flight-trials of its Stratospheric Airship Platform from Sheopur, Madhya Pradesh, on May 3, 2025. The airship carried an instrumental payload to an altitude of around





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17 km, aiming to enhance India's earth observation and Intelligence, Surveillance & Reconnaissance (ISR) capabilities. This positions India among a few countries with such indigenous capabilities.

MCQS

1. How long was Group Captain Shubhanshu Shukla's mission aboard the Axiom-4 (Ax-4) crewed flight to the International Space Station (ISS)?

- A) 10 days
- B) 15 days
- C) 18 days
- D) 21 days

Answer: C) 18 days

The text states, "...safely returned to Earth on July 15, 2025, after an 18-day mission aboard the Axiom-4 (Ax-4) crewed flight."

2. When did Blue Origin's New Glenn heavy-lift launch vehicle successfully reach orbit during its inaugural NG-1 mission?

- A) November 16, 2024
- B) January 16, 2025
- C) March 16, 2025
- D) May 16, 2025

Answer: B) January 16, 2025

The text indicates, "...successfully reached its intended orbit during its inaugural NG-1 mission on January 16, 2025."

3. What is the current projected launch date for the tenth flight test of a SpaceX Starship launch vehicle (Booster 16 and Ship 37)?

- A) June 29, 2025
- B) July 16, 2025
- C) August 4, 2025
- D) September 1, 2025

Answer: C) August 4, 2025

The text states, "The current launch date is NET August 4, 2025."

4. What is the primary purpose of China's Xuntian telescope, planned for launch in mid-2025?

- A) To study solar flares
- B) To monitor Earth's weather patterns
- C) To conduct astrophysics observations alongside the Tiangong space station
- D) To search for exoplanets

Answer: C) To conduct astrophysics observations alongside the Tiangong space station

The text mentions, "...China's permanently crewed Tiangong space station is gearing up for astrophysics, with the Xuntian telescope ... planned for launch in mid-2025 to fly alongside Tiangong."

5. Which of the following is NOT one of the instruments equipped on the UAE's Hope Probe for its Mars Mission?

- A) EXI
- B) EMIRS
- C) EMUS
- D) NIRSpec

Answer: D) NIRSpec

The text states, "The probe, launched in 2020, is equipped with three scientific instruments (EXI, EMIRS, EMUS)..." NIRSpec is a James Webb Space Telescope instrument, not on the Hope Probe.

6. What type of celestial object did the Hubble Space Telescope observe in the Large Magellanic Cloud, referring to it as a "galactic time capsule"?

- A) A spiral galaxy
- B) A reflection nebula





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- C) A globular cluster
D) A supermassive black hole

Answer: C) A globular cluster

The text says, "Hubble observed the globular cluster NGC 1786 in the Large Magellanic Cloud, a 'galactic time capsule'..."

7. On what date did India's Defence Research and Development Organisation (DRDO) successfully conduct the maiden flight-trials of its Stratospheric Airship Platform?

- A) April 3, 2025
B) May 3, 2025
C) June 3, 2025
D) July 3, 2025

Answer: B) May 3, 2025

The text states, "...successfully conducted the maiden flight-trials of its Stratospheric Airship Platform from Sheopur, Madhya Pradesh, on May 3, 2025."

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