

# Galactica

Astronomy and Space Science Magazine



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Galactica is a monthly magazine about astronomy & space science published by SPACE India targeting amateur astronomers. Each monthly issue includes astronomy news, space launches, what's up in the sky every month, events and announcements done by the space team, Astrophotographs and articles on astronomy & astrophysics submitted by the readers for the general audience, and the article about historical missions & events of astronomy and more. All of this comes in an easy-to-understand user-friendly style that's perfect for astronomers at any level.

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# ABOUT SPACE



Legacy of 24 years



Pioneer Organization



10000+ Activities Developed



1000+ Schools Associated



1.5M+ Students Engaged



10K+ Outreach Events



10+ Cities Presence

**SPACE is the pioneer organization working towards the development of science and astronomy in India. It aims to create a scientifically aware society and contribute to the technological and social development of the country, SPACE organization belongs to an astronomical league. Diligently working towards development in astronomy and space science through astronomical tutorials, modules, and curriculum for education requirements of schools & students in India. We constantly engage in offering introductory astronomy, science about space, astrophysics, telescopes, and internet astronomy to the masses.**

**Vision:** To popularize hands-on space science & STEM Education through various fun-filled pioneering concepts, services, and programs.

**Mission:** To develop and popularize space science & STEM Education In India and establish a global association with national & international space science agencies, societies, amateur, and professional organizations, government agencies, and space observatories.

## CMD's Message



**Dr. Sachin Bahmba,  
CMD, SPACE**

Space and Astronomy are the future for the young generation of our country. This is a great means to inculcate scientific temperament among the masses. Such astronomy sessions will provide

a hands-on learning platform for students wherein they explore the real world of science, I wish for young students to let their ambitions soar and think big as they are the future of our country.

## MD's Message

Education is integral to humankind growth and it strongly contributes towards innovation and developments. Space is transforming India to provide better learning opportunities through Experiential and Hands-on learning in the very niche field of Astronomy and Space Science. Our mission to build from the grassroots level is what drives us stronger and to inculcate scientific temperament so the next generation can be entrepreneurs, scientists, and astronauts!

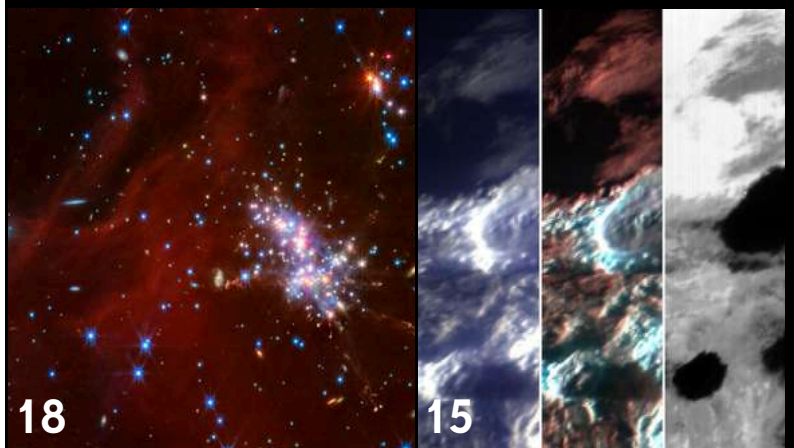


**Mr. Shivam Gupta,  
MD, SPACE**



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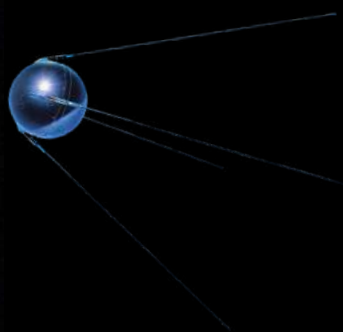
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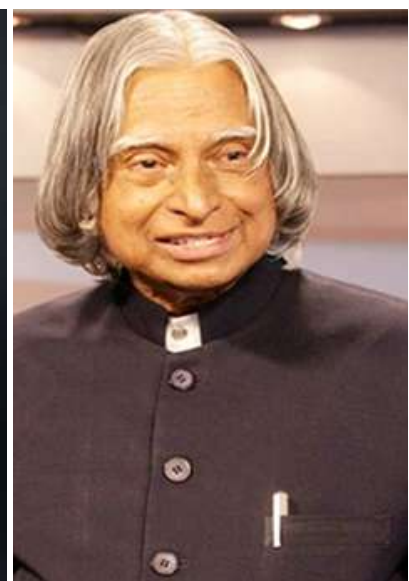
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As an annual tradition, World Space Week Association (WSWA) Board of Directors select a theme that encapsulates the essence and goals for the upcoming World Space Week (WSW), celebrated globally from October 4-10. For World Space Week (WSW) 2024, the chosen theme is "Space & Climate Change." This theme celebrates the transformative impact of space technology in our ongoing battle against climate change, emphasizing the proactive role space exploration plays in enhancing our understanding and management of Earth's climate.

#### **A Week of Discovery and Action**

World Space Week 2024 is set to educate, inspire and connect the global community, focusing on the powerful alliance between space technology and climate science. This significant week of space celebration will highlight the critical role of satellites and space technology in monitoring environmental shifts and formulating strategies to mitigate the impacts of climate change.

#### **Collaboration for a Sustainable Tomorrow: Joining Forces for Change**

WSW 2024 stands as a connecting platform for global collaboration, uniting experts, students, and enthusiasts from diverse fields to discuss and craft strategies utilizing space technology for ecological sustainability and resilience against climate change. If this mission resonates with you, we invite collaboration in various forms. We are open to co-organizing webinars, sharing educational materials provided by partners through our platform, and exploring other avenues of cooperation. This is an opportunity to join a collective effort, where your knowledge, resources, and initiatives can contribute significantly to our shared goals of environmental stewardship and space exploration.

#### **Engaging Activities: Learning and Leading**

Event organizers worldwide are encouraged to integrate the theme "Space & Climate Change" into their World Space Week events. Activities may range from educational workshops and interactive sessions to panel discussions and collaborative projects, all aimed at fostering innovative environmental solutions.

#### **Join the Journey: Celebrate World Space Week**

WSWA extends an open invitation for worldwide involvement in World Space Week 2024. Through organizing events, participating in educational programs, donating to the Association or spreading awareness, each person can play a part in enhancing our collective understanding of the crucial role space technology plays in the fight against climate change. Let's unite to make WSW 2024 a landmark event in our ongoing journey towards a sustainable and informed future.



# AN INTRODUCTION TO DSLR ASTROPHOTOGRAPHY: SPACE INDIA & AMERICAN CENTER'S 5TH WORKSHOP

On September 30, 2024, SPACE India, in collaboration with the American Center, hosted their fifth educational workshop, "Cosmic Clicks – An Introduction to DSLR Astrophotography." This hands-on workshop brought together 36 enthusiastic students from schools across Delhi, giving them a chance to dive into the world of astrophotography and space science. The event aimed to foster curiosity and spark excitement about capturing the cosmos using advanced photography techniques.

The American Center, buzzing with its vibrant space-themed decorations, set the perfect backdrop for this thrilling exploration into astrophotography. Students from schools like, K.R. Mangalam World School, Vaishali, Bal Bharati Public School, Pitampura, Queen's Valley School, Hansraj model school, Punjabi bagh new delhi etc, joining forces to uncover the science behind photographing celestial objects.

Ms. Adelle Gillen, the Public Diplomacy Officer at the American Embassy, shared her insights on the workshop's impact. She emphasized the strong relationship between India and the US, highlighting their shared interests in various fields, including space science. She underscored the significance of collaboration between the two nations in advancing technological solutions and scientific endeavors. This partnership, she noted, paves the way for mutual growth and innovation in space exploration.

The workshop started with an icebreaker, where students played cosmic charades imitating different celestial objects. This allowed the participants to get comfortable while working together.

The main focus of the workshop was astrophotography. Students were introduced to different types of astrophotography, such as wide-field and deep-sky photography, and the equipment essential to this practice. Using DSLR cameras, they learned how to adjust camera settings like aperture, shutter speed, and ISO to capture celestial wonders. The live demonstrations, including using a globe to simulate celestial bodies, allowed the young explorers to get hands-on experience.

Interactive activities added an element of excitement, with students experimenting with pinhole cameras and lenses to project real images onto screens. Their sense of wonder grew as they compared DSLR shutter speeds with their own response times in a fun stopwatch activity.

The workshop wrapped up with a feedback session, where students shared their learnings and expressed enthusiasm for future endeavors in space exploration. As the day concluded, each student left with newfound knowledge and a sense of inspiration, empowered to explore the universe through the lens of astrophotography.

This collaboration between SPACE India and the American Center continues to spark curiosity and foster a passion for science among young minds, helping them discover the wonders of the universe and nurturing the next generation of space explorers.

Interested in diving deeper into astrophotography and space science? Explore more with us!

- Get expert training from ISRO-registered Space Tutors!
- Explore our comprehensive space education programs for schools and learn everything from astrophotography to cutting-edge space science.
- Encourage your school to integrate these programs into their curriculum to inspire the next generation of space explorers.





# graVITas'2024

In a remarkable collaboration, SPACE India and VIT Vellore's once again joined hands for the 3rd time at the annual graVITas 2024 event which took participants on an awe-inspiring journey through the cosmos with Celestial Dive 3.0. Held on the night of September 28, 2024, the prestigious graVITas 2024 tech fest at VIT Vellore once again emerged as a hub of innovation, drawing in students and enthusiasts from across the country. Under the theme "Innovate. Sustain. Transform," the event provided a platform for participants to engage in cutting-edge technological activities, workshops, and competitions. One of the most captivating attractions this year was Celestial Dive 3.0, a groundbreaking astronomy workshop organized by SPACE India. The event drew in over 320 attendees, including students, professors, assistant professors, supporting staff, and graVITas organizers, creating a truly immersive and unforgettable experience. Running from 9 PM until 3 AM, the event showcased the perfect blend of education and exploration, giving everyone a rare chance to witness celestial wonders firsthand. Despite the late hours, the enthusiasm of the students and faculty never wavered, as they seized the opportunity to engage with space science in a hands-on and thrilling way.

SPACE India, a leader in space education and outreach, has long been at the forefront of making space science accessible to students. At graVITas, they brought this mission to life through an immersive, hands-on workshop designed to introduce participants to the wonders of the night sky. The event began with students assembling and using a 50mm refractor telescope, where they learned the basics of telescope operation. For many, this was their first encounter with a professional-grade instrument, and the moment they trained their lenses on Saturn, with its iconic rings, was one of awe and excitement. This experience, however, was only the beginning.







The workshop continued with even more powerful equipment, including three 200mm Dobsonian telescopes, a 76mm alt-azimuth telescope, and a 150mm equatorial mount telescope. These tools allowed students to observe celestial marvels such as Saturn, Jupiter with its four largest moons, Mars, and distant star clusters like M6, M7, and the Pleiades. Some attendees were fortunate enough to catch a glimpse of the Andromeda Galaxy, a sight that left them mesmerized. The highlight of the night, however, was the breathtaking sight of the Great Orion Nebula, which left a lasting impression on all who witnessed its ethereal beauty. The sheer thrill of gazing at these distant worlds and galaxies through professional-grade telescopes transformed the evening into an unforgettable journey through the cosmos, inspiring a sense of wonder and exploration.

Celestial Dive 3.0 was more than just an observation session—it was a transformative educational experience. By empowering students to assemble and operate the telescopes themselves, SPACE India not only ignited a passion for astronomy but also underscored the importance of hands-on learning in science. For many, this was a once-in-a-lifetime opportunity to engage with the universe in a profound and personal way, turning their gaze from the classroom to the stars and encouraging them to dream of what lies beyond. This collaboration between SPACE India and gravITas was more than just a stargazing event; it was a celebration of science, curiosity, and the boundless possibilities that space exploration brings.



# Cosmic Mind Forum at K. R. Mangalam World School, Vikaspuri

On September 24, 2024, Space India organized the "Cosmic Mind Forum" at K. R. Mangalam World School, Vikaspuri. This event, a significant highlight of World Space Week, aimed to inspire students to delve deeper into the wonders of space science. It featured esteemed guest Dr. Ugur Guven, a distinguished aerospace engineering professor and Member of the UN CSSTEAP Advisory Council. The event underscored the importance of dreaming big and pursuing careers in space science, aligning with the broader goals of World Space Week. The forum session commenced at 11:45 PM and concluded at 01:45 pm, offering an engaging platform for discussions on space science and exploration. The guest had a wonderful interaction with the students on the topic of Unlocking Cosmic Curiosity, he also guided students to explore space science through Critical thinking and scientific inquiry. Following the session, the guest and principal also watched the Hydro-Rocket launch in the end. Overall, the Cosmic Mind Forum effectively combined education and inspiration, making space science accessible and exciting for young learners.





# Cosmic Mind Forum at Matrikiran School, Gurugram

On September 27, 2024, Space India hosted the "Cosmic Mind Forum," in Matrikiran School, Gurugram, featuring a captivating keynote address by Dr. Rintu Nath, Scientist F at the Department of Science & Technology, Ministry of Science and Technology, Government of India. Dr. Nath delved into the latest advancements in space exploration, exploring the intersection of cosmic curiosity and scientific innovation. His speech highlighted the pivotal role of cutting-edge technologies in unraveling the universe's mysteries and reshaping our understanding of space. The event was attended by enthusiastic students, faculty, and the school principal, who emphasized the importance of nurturing curiosity and scientific inquiry. Dr. Nath's interactive session inspired students to dream big and embrace the spirit of exploration, leaving a lasting impression on all.





# SOLAR SPECTRA OBSERVATION “CELEBRATING ADITYA L1”

On 2nd September 2024, Delhi Public School Greater Faridabad, in collaboration with Space India, commemorated the first anniversary of Aditya L1 with an engaging event titled Solar Spectra Observation: Aditya L1 Anniversary. This event was specially curated for the students of Grade 9, who actively participated in a series of hands-on activities aimed at enhancing their understanding of solar science.

The event began with an interactive workshop where students crafted their own solar viewing goggles. This activity provided them with a safe and practical tool for solar observation. Following this, the students were guided in aligning telescopes for terrestrial observation, honing their skills in precise instrument handling.

The highlight of the event was the opportunity to observe the Sun. Using the solar goggles they had created and telescopes set up for the occasion, students marveled at the Sun's radiant surface, gaining firsthand experience of solar observation techniques.

This educational and memorable experience deepened their appreciation for Aditya L1's mission and the study of our closest star.

The Solar Spectra Observation event not only celebrated the achievements of Aditya L1 but also fostered a spirit of scientific inquiry and exploration among young minds, marking another milestone in DPS Greater, Faridabad's commitment to space education.





# MONTHLY TELESCOPIC OBSERVATION BY SPACE ARCADE

The SPACE ARCADE team hosted its Monthly Telescopic Observation on the 14th of September, 2024, in Chennai and Delhi. This gathering brought together astronomy enthusiasts from various locations, equipped with telescopes, binoculars, and other astronomical tools, to experience the night sky.

The session featured breathtaking views of the Moon, Venus, and Saturn, offering participants a chance to observe these celestial objects in detail. Along with the views, attendees gained insights into the different types of telescopes available. The SPACE ARCADE team guided participants through telescope alignment, answering questions and assisting with the setup. To cap off the experience, the team introduced basic astrophotography techniques, allowing everyone to capture the wonders they observed.

A range of telescopes was on display, including Space Voyage 8" F/6 Dobsonian, 200mm F/10 Schmidt - Cassegrain with Computerized Eq GoTo mount, Space Voyage 150 EQ, Space Launcher 114 AZ, Celestron Astromaster 70AZ and more models. Each offered a unique perspective of the Moon's craters, Phase of Venus, and Saturn with its beautiful rings leaving participants mesmerized.

Here's what attendees had to say:

"Good initiative, please keep doing the good work. Much appreciated." - Balachandar

"Had a great experience, looking forward to attending more such sessions." - Soban Babu

"Very nice initiative, beyond fascinated." - Sreenidhi

The event was a great success, encouraging curiosity and hands-on learning in the field of astronomy. The SPACE ARCADE team plans to continue offering these monthly observations, helping more people engage with the wonders of the universe.





## FROM STARGAZING TO ROYAL PALACES: BASAVA INTERNATIONAL SCHOOL'S JOURNEY THROUGH SARISKA AND JAIPUR

The students of Basava International School, Dwarka set out on an exhilarating three-day, two-night adventure that took them from the starry skies of Sariska to the cultural heart of Jaipur, Rajasthan. Their journey began with a lively departure from school, followed by a stop at the renowned Old Rao Hotel, where they enjoyed a delightful meal that fueled their excitement for the experiences ahead.

Upon reaching Astroport Sariska, the students participated in various team-building activities, fostering collaboration and problem-solving skills. The highlight of the day was an engaging astronomy session, where they used telescopes to observe constellations, planets, and celestial wonders. This hands-on stargazing experience left the students in awe of the universe's vastness. As night fell, they were treated to a vibrant Rajasthani folk dance performance under the stars, followed by a lavish dinner and a restful night's stay.



The second day marked the students' journey to Jaipur, where they explored the grandeur of the City Palace. Here, they were captivated by the intricate architecture, rich history, and royal artifacts that offered a glimpse into the lives of Rajasthan's royalty. The tour was both educational and awe-inspiring, as the students learned about the significance of the palace in Jaipur's cultural heritage.

Later, the students visited Chokhi Dhani, a traditional Rajasthani village resort that provided an immersive experience of the region's customs. They delighted in authentic Rajasthani cuisine, marveled at local crafts, and enjoyed cultural performances, deepening their connection with Rajasthan's vibrant traditions.

On the third day, the adventure continued with a visit to the historic Amber Fort, where the students explored the fort's impressive architecture and learned about its strategic importance in Rajput history. After a fulfilling lunch, the students returned to school, enriched by their exploration of Jaipur's majestic culture, architecture, and history, leaving them with cherished memories of their journey.



**CONTACT: [INFO@SPACE-GLOBAL.COM](mailto:INFO@SPACE-GLOBAL.COM) TO TRAVEL WITH US**



## STARS, SAFARIS, AND ROCKETS: AN UNFORGETTABLE EXPEDITION TO SARISKA BY VENKATESHWAR INTERNATIONAL SCHOOL

The students of Venkateshwar International School, Dwarka embarked on an exciting two-day, one-night adventure, immersing themselves in the wonders of the night sky and the untamed beauty of Sariska, Rajasthan. This memorable journey created lasting memories that will remain in their hearts forever.

The expedition began at their school and included a refreshing stop at the Old Rao Hotel, where the students enjoyed delightful meals, fueling their excitement for the upcoming adventure. Upon arrival at Astroport Sariska, the students engaged in various team-building activities, followed by an enthralling astronomy session that deepened their appreciation for the cosmic wonders overhead. Adding a cultural touch, the evening was filled with vibrant Rajasthani dance performances under the starry sky.

The day's highlight was a sumptuous feast that fostered connections among the students, followed by a peaceful night at the hotel. The next morning began with a refreshing jungle safari as the first light of dawn touched the horizon, along with a hearty breakfast in the hotel's welcoming atmosphere. The students then ventured deeper into the wilderness, experiencing the thrill of Rajasthan's wildlife.



The adventure took an educational turn with an engaging rocketry session, where students crafted and launched their own water rockets, adding a sense of achievement and excitement. The session concluded with an award ceremony celebrating the students' efforts and achievements, followed by a group photo capturing the essence of the shared experiences.

As they bid farewell to Astroport Sariska and enjoyed one last meal before returning to school, the students carried with them not just fond memories but also a newfound sense of accomplishment and camaraderie. This unforgettable celestial adventure showcased the school's commitment to offering enriching experiences beyond the classroom, leaving a lasting impact on the hearts and minds of all who participated.

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# HIGHLIGHTS OF SEPTEMBER 2024

## MYSTERY OF DWARF PLANET CERES' ORIGIN MAY FINALLY BE SOLVED.

Scientists have used data from a NASA Dawn spacecraft to investigate the origins of the dwarf planet Ceres. Ceres, currently located in the main asteroid belt between Mars and Jupiter, has unique characteristics that set it apart from other asteroid belt objects. Some scientists speculate that Ceres may have originated at the outer edge of the solar system and migrated inwards to its current home. The presence of frozen ammonia on Ceres, found by the Dawn spacecraft between 2015 and 2018, suggests that Ceres could have formed far from its current home.

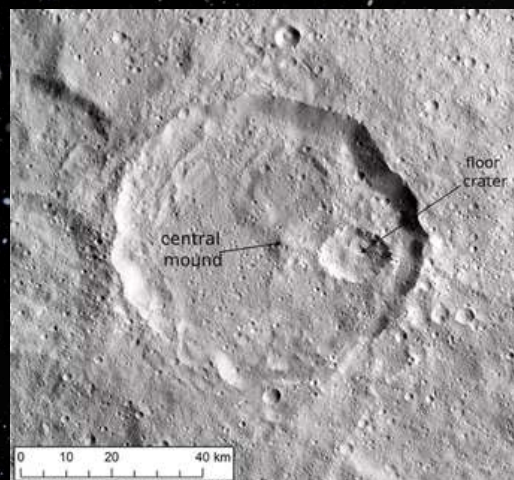
Data collected from one of the oldest impact craters on Ceres, the 40-mile (64 km) wide Conus crater, could dispel the migration theory and show the dwarf planet indeed formed in the main asteroid belt.

The Conus Crater, one of Ceres' smaller impact craters, revealed remnants of a brine that has risen to the dwarf planet's surface from its interior over billions of years. The material in isolated spots of the Conus Crater is more yellowish in hue and appears to be rich in ammonium, a type of ammonia with an extra hydrogen ion.

These findings are the first to connect ammonium with salty brine from Ceres' interior, supporting the idea that Ceres is an asteroid belt native. The team assumed that the building blocks of ammonium were part of the material that originally formed Ceres, and that a thick layer of ammonium would have accumulated in the brine between the mantle and the dwarf planet's surface or crust.

Over billions of years, Ceres's cryovolcanoes would have brought this brine and its ammonium content to the crust, where it would have seeped into layered crystalline structures called phyllosilicates.

Outside of the Conus Crater, conspicuous patches of the yellowish-bright material investigated by the team are found in deep craters of Ceres, suggesting concentrations of ammonium are greater deeper in the core of the dwarf planet. The speckles of this yellowish ammonium-rich material to the east of the Conus Crater are thought to have been exposed by an asteroid collision around 280 million years ago.



Images of the Conus Crater with the bright yellow ammonium containing material marked yBM (Image credit: MPS)



# SPACE X POLARIS DAWN ASTRONAUTS PERFORM HISTORIC 1ST PRIVATE SPACEWALK

SpaceX's private crew of four astronauts, including Jared Isaacman, performed the world's first commercial spacewalk during a five-day trip to Earth orbit on September 12. The mission, Polaris Dawn, was launched on September 10 from NASA's Kennedy Space Center, the same launch pad that hosted Apollo 11. The crew reached an altitude of 870 miles (1,400.7 kilometers), higher than any other crewed mission since the Apollo program a half-century ago. After reaching the record-high altitude, the Crew Dragon Resilience spacecraft lowered to 458 miles (737 km) at its highest point. Once there, Resilience was depressurized, and Isaacman and Sarah Gillis exited into the void one at a time.

The spacewalk began at 6:12 a.m. EDT (1012 GMT), nearly four hours later than initially announced, and was expected to last about two hours. During the spacewalk, both Isaacman and Gillis performed a series of spacesuit mobility checks as SpaceX captured stunning live views of the two astronauts standing up, most of their bodies outside the spacecraft.

The spacewalk was made possible thanks to several specialized pieces of hardware developed for Polaris Dawn. The crew wore new SpaceX-designed EVA suits that were lightweight and flexible while still offering protection against the harsh, unforgiving environment in Earth's orbit.

One of Polaris Dawn's main goals was to test the suits, which SpaceX aims to use on a variety of future missions both in Earth's orbit and farther into space.

In addition to testing the new SpaceX hardware and spacesuits, the four Polaris Dawn astronauts have been conducting 36 different science experiments provided by 31 separate institutions. These experiments will be conducted throughout the mission, including some that will contribute data to NASA's Human Research Program, helping scientists better understand how the human body reacts to spaceflight.

Polaris Dawn is scheduled to return to Earth on its sixth day, splashing down under parachutes into one of several potential ocean landing zones off the coast of Florida. A recovery ship will then retrieve the Resilience spacecraft and crew, bringing to a close one of the most ambitious human spaceflight missions in decades.



The Polaris Dawn crew prior to launch on Sept. 10, 2024.  
(Image credit: SpaceX)



Private astronaut Jared Isaacman stands partially outside SpaceX's Dragon spacecraft during the first-ever commercial spacewalk on Sept. 12, 2024.  
(Image credit: SpaceX)



# THE 1ST ANALYSIS OF CHINA'S CHANG'E 6 LUNAR FAR SIDE SAMPLES REVEALED

China's Chang'e 6 lunar probe has collected the first samples from the far side of the moon, providing fresh insights into the moon's evolution. The 53-day-long mission, launched in early May, involved a robotic scoop and drilling for samples inside Apollo crater before sending them into lunar orbit. The samples were then transferred to a waiting moon orbiting craft, which delivered 4,935.3 grams of lunar material to Earth in late June.

A new study published in *National Science Review* has given researchers the first insight into the precious material. Researchers found that the far side samples had a lower density compared to previous lunar samples, indicating a looser and more porous structure.

The soil also contained more light-colored particles like feldspar and glass compared to samples collected by the 2020 Chang'e 5 near side mission. This suggests a higher presence of materials delivered to the sampling area from afar, such as when impact events lead to ejecta spraying upward and outward from the impact area.

The samples also held a lower concentration of KREEP, a rock signature short for potassium (K) enriched rock, rare-earth elements (REE) and phosphorus (P), which is more abundant on the near side. This asymmetry could partially explain why the far side is so different from the near side of the moon.

The Chang'e 6 samples are expected to yield these new insights as the material is made available to Chinese researchers in the near future. International researchers are expected to be able to apply for samples after a period of two years.



Technicians remove the samples collected on the moon's far side from the return capsule of the Chang'e 6 lunar mission. (Image credit: CCTV)



# INDIA'S FIRST VENUS MISSION SET FOR 2028 – SHUKRAYAAN-1

Recently, the Union Cabinet had approved India's first mission to Venus, which ISRO plans to launch in March 2028. This will be India's second interplanetary mission, following the 2013 Mars Orbiter Mission. The mission, "Shukrayaan-1," will use advanced scientific instruments to study the planet's surface, sub-surface, atmosphere, and ionosphere from orbit, as well as investigate Venus's interaction with the Sun. It will also carry scientific instruments from India and other countries for exploration.

This mission is expected to carry around 100 kg of scientific payloads, which will conduct experiments on the flow of interplanetary dust particles, high-energy particles entering the Venusian atmosphere, and the composition, structure, variability, and thermal state of Venus's atmosphere. The satellite will gain speed in Earth's orbit, sling-shot towards Venus, and reach its orbit in about 140 days.

India's Venus mission marks India's first attempt at aero-braking, a technique to slow the spacecraft using atmospheric drag. The satellite will initially be placed in a highly elliptical orbit of 500 km x 60,000 km around Venus to save fuel. However, this orbit is too high for scientific experiments, so the satellite will be lowered to a more suitable orbit of either 300 x 300 km or 200 x 600 km using aero-braking.

Venus is known as Earth's twin due to its similar mass, density, and size, making it an important subject for studying Earth's evolution. Scientists believe that it once had water but is now dry and dusty. The surface temperature of Venus is around 462°C, hotter than Mercury, due to a runaway greenhouse effect. Comparing Venus's climate with Earth's can provide insights into climate change, atmospheric dynamics, and planetary evolution.

Technology development capabilities and scientific prowess are crucial for studying Venus, as it is notoriously difficult to study due to its extreme temperatures and dense atmosphere. NASA, the ESA, and Russia have announced Venus missions, especially after the 2020 discovery of phosphine gas, a potential biomarker, in Venus's atmosphere.

The race to Venus fosters international collaboration and highlights space capabilities, with India's planned mission advancing its global space ambitions alongside the U.S., Russia, and China.



# ESA'S JUICE SPACECRAFT CONFIRMED EARTH IS HABITABLE

ESA's Jupiter Icy Moons Explorer (JUICE) has successfully identified water in Earth's atmosphere and the CHNOPS elements (carbon, hydrogen, nitrogen, oxygen, phosphorous, and sulfur) as potential habitats for life on Earth. But, uh, don't we know that already? Yes – but the JUICE team had a good reason to run the tests anyway.

The probe, launched in April 2023, is currently exploring Jupiter and three of its moons Ganymede, Callisto, and Europa, all of which are believed to have liquid-water oceans beneath their icy shells.

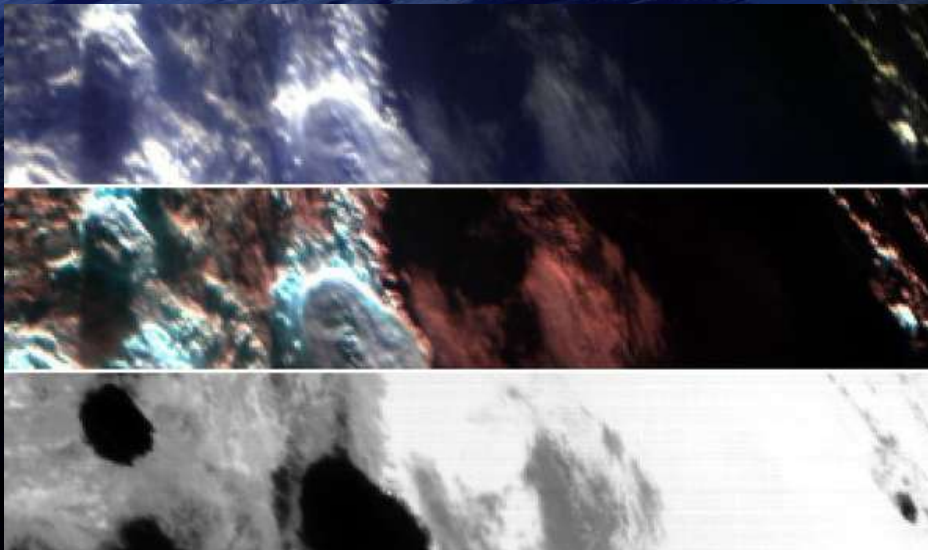
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During a flyby of Earth on August 20, JUICE successfully identified water, carbon, hydrogen, nitrogen, oxygen, phosphorous, and sulfur (CHNOPS) elements, confirming the potential for life on Earth.

JUICE tested two of its instruments during its flyby of Earth, the Moons and Jupiter Imaging Spectrometer (MAJIS) and the Submillimeter Wave Instrument (SWI), which detected signs of habitability. The team is not surprised by these results, as it would have been concerning to find out that Earth was not habitable.

When JUICE arrives at Jupiter, it will perform the same tests on the planet's icy moons to determine if they could possibly support life. During its Earth flyby, JUICE collected data about the composition of the atmosphere, including oxygen, ozone, and carbon dioxide.

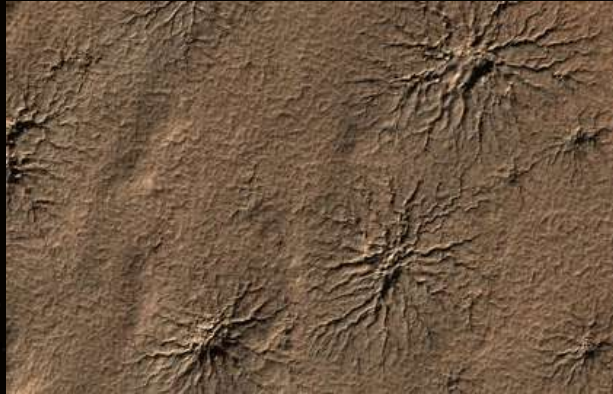
Scientists plan to study the concentration of oxygen, in particular, as a point of comparison for the Jovian system, to determine if the oxygen levels could support Earth's current biological activity. So while it might not be news that the Earth is habitable, JUICE's study of our planet is important in its own right. Now, on toward Jupiter!



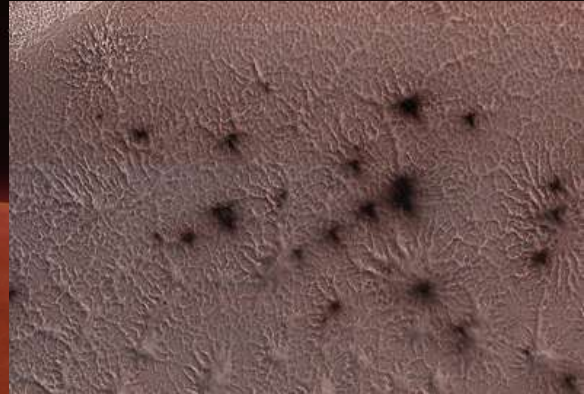
The Pacific Ocean seen by ESA's Jupiter Icy Moons Explorer's MAJIS instrument during the probe's Earth flyby on Aug. 20, 2024 from a distance of 5,405 miles (8,700 km) in three different wavelengths. (Image credit: ESA/Juice/MAJIS)



# NASA scientists solve mystery of curious 'Spiders' on Mars'



"Spiders" in the southern hemisphere of Mars seen by NASA's Mars Reconnaissance Orbiter in 2009. (Image credit: NASA/JPL-Caltech/University of Arizona)



"Spiders" seen by NASA's Mars Reconnaissance Orbiter in 2018. (Image credit: NASA/JPL-Caltech/University of Arizona)

Mars spiders have arrived on Earth. But fear not, arachnophobes – these "spiders" aren't actual arachnids, but spider-like geological formations on the Martian surface. And NASA has just recreated them in a lab.

Scientists first discovered these spider-like features, or araneiform terrain, on Mars in 2003 while studying images from orbiters. They're much, much larger than spiders, though; they can stretch more than half a mile (1 kilometer) end-to-end, and they can have hundreds of "legs."

As it goes with many things on Mars, scientists had no idea how araneiform terrain formed, but a leading theory suggested it might have something to do with carbon dioxide ice. And that theory has recently been proven by researchers at NASA's Jet Propulsion Laboratory (JPL), who have spent five years attempting to recreate araneiform terrain.

Using a liquid-nitrogen-cooled test chamber at JPL called the Dirty Under-vacuum Simulation Testbed for Icy Environments, or DUSTIE, the researchers created a simulated Mars environment.

After setting DUSTIE to the correct temperature and air pressure found at the Martian poles, they cooled and condensed carbon dioxide gas into carbon dioxide ice in a Martian soil simulant. Then they heated the ice up until it cracked, releasing a plume of carbon dioxide gas and leaving behind araneiform terrain. What happened next surprised them.

The process by which the carbon dioxide ice created the spider-like cracks in this experiment is called the Kieffer model. Over the cold winter, carbon dioxide ice forms in the Martian soil.

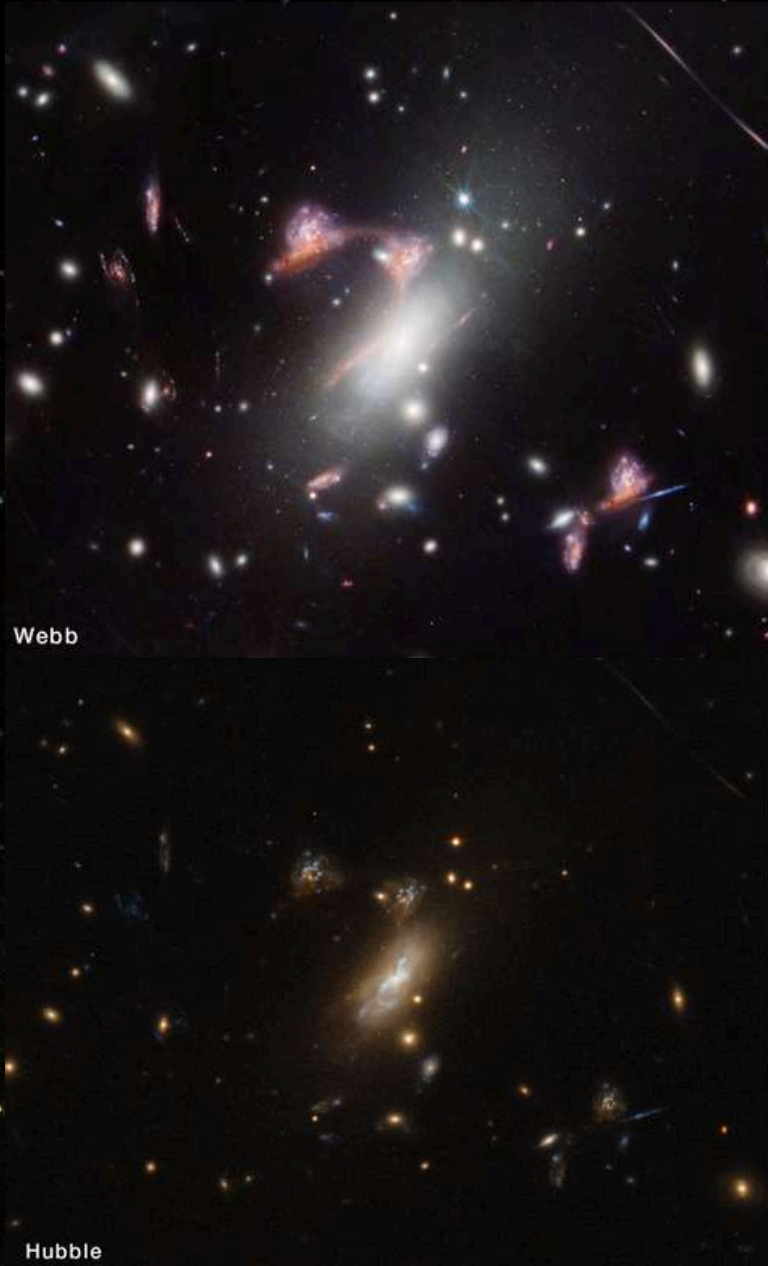
Then in spring, the sunlight heats that icy soil. The heat is absorbed by the soil, and the ice touching this soil skips the melting-into-liquid phase and simply "poofs" into carbon dioxide gas. (Per NASA, this is the same mechanism that causes dry ice to "smoke.") The gas builds up and eventually erupts out of the soil, leaving behind spider-like scars in the Martian surface.

While we now know how araneiform terrain might form, researchers will continue their experiments to answer further questions about the Martian geologic formation. For instance, araneiform terrain isn't found everywhere on Mars, so they want to investigate why it only happens in certain areas. So for now, it's back to DUSTIE they go.



# FROM THE EYES OF WEBB – SEPTEMBER 2024

## NASA's Webb Reveals Distorted Galaxy Forming Cosmic Question Mark



Astronomers were astonished by a rare cosmic alignment captured by NASA's James Webb Space Telescope, which revealed star-forming regions in distant galaxies magnified by a gravitational lens. The lens distorted a red galaxy into the shape of a question mark, with a spiral galaxy interacting with it.

This rare phenomenon, called a hyperbolic umbilic gravitational lens, occurs when a massive object warps space-time, bending and magnifying light from galaxies behind it. The Webb telescope's infrared capabilities allowed astronomers to see these distant galaxies, which were previously hidden by cosmic dust, in unprecedented detail.

While NASA's Hubble Space Telescope had observed the region before, Webb's enhanced view pinpointed active star formation within the galaxies.

The cosmic question mark is particularly exciting due to the rarity of such gravitational lensing events, with only a few similar cases known in the universe.

### Galaxy cluster MACS-J0417.5-1154

These observations also provide insights into galaxy evolution, showing what our Milky Way might have looked like 7 billion years ago, when star formation was at its peak. The discovery opens new opportunities for understanding how galaxies form and evolve, thanks to Webb's powerful ability to capture distant, hidden objects in the cosmos.



# JWST Findings Offer Fresh Perspective on the Hubble Tension in Cosmology

Astronomers using NASA's James Webb Space Telescope have focused on the Extreme Outer Galaxy, a region over 58,000 light-years from the Galactic Center, to study star formation in unprecedented detail. This area, much farther from the center than Earth's 26,000 light-year distance, hosts the Digel Clouds 1 and 2, which contain clusters of young stars. Using Webb's NIRCам (Near-Infrared Camera) and MIRI (Mid-Infrared Instrument), scientists imaged these clouds, revealing intricate details of star clusters undergoing active star formation.

The Webb observations, led by Mike Ressler from NASA's Jet Propulsion Laboratory and studied by Natsuko Izumi of Gifu University, have provided scientists with their first detailed look at these regions. The data revealed very young (Class 0) protostars, star outflows, jets, and nebular structures that were previously unknown or unclear. According to Izumi, this level of detail builds upon prior observations from other telescopes, enabling astronomers to study star formation in the outer regions of the Milky Way just as closely as they have done in our solar neighborhood.

One of the key findings came from Cloud 2S, where Webb captured a main cluster of newly formed stars. These stars are actively emitting jets of material along their poles, with some appearing like a firework display of jets shooting in various directions. The telescope also confirmed the existence of a previously suspected sub-cluster within Cloud 2S.



The observations are significant as the Digel Clouds are rich in hydrogen and helium but relatively poor in heavier elements, resembling the composition of the early Milky Way and dwarf galaxies. By studying the star-forming regions in these clouds, scientists hope to gain insights into the formation and evolution of stars in different environments.

The research team plans to continue studying these clusters to answer unresolved questions, such as the short lifespan of circumstellar disks in the Extreme Outer Galaxy and the dynamics of the jets observed.

With the help of the James Webb Telescope, astronomers are unraveling the mysteries of star formation and its complex processes in the outer reaches of our galaxy.



# NASA's Webb Provides Another Look Into Galactic Collisions

Arp 107 is a pair of interacting galaxies located 465 million light-years away in the constellation Leo Minor. The larger galaxy, a spiral Seyfert galaxy, shows a bright white core surrounded by red and orange gaseous filaments, while the smaller galaxy appears as a hazy cloud of gas and dust. NASA's James Webb Space Telescope has captured a high-resolution image of these galaxies merging, providing a detailed view of the star-forming regions and the supermassive black hole in the spiral galaxy's nucleus.



The image combines data from Webb's NIRCam and MIRI instruments, highlighting a bridge of stars and gas linking the two galaxies. The collision between the galaxies, though disruptive, compresses gas, triggering star formation. However, it also disperses gas, which could hinder future star formation. Unlike a direct hit, this off-center collision has only disturbed the spiral galaxy's arms, leaving its structure relatively intact. Over time, the two galaxies will continue to merge, eventually forming a new, unified galaxy.

## In Odd Galaxy, NASA's Webb Finds Potential Missing Link to First Stars

NASA's James Webb Space Telescope has uncovered a galaxy with an unusual light signature, GS-NDG-9422, from roughly one billion years after the Big Bang. The galaxy's gas shines brighter than its stars, a phenomenon not commonly seen. Researchers believe this could be a "missing-link" phase in galactic evolution, offering insight into the transition between the first stars and more familiar galaxies.



Lead researcher Alex Cameron of the University of Oxford described the discovery as "weird" but in line with Webb's mission to reveal new phenomena in the early universe. Working with theorist Harley Katz, the team found that the bright gas could be due to extremely hot, massive stars—hotter than those typically seen today.

Though these stars are not the elusive Population III stars, which were the first stars in the universe, they are significantly hotter and more massive than modern stars, suggesting they belong to an intense star-forming phase. This discovery could provide clues to how galaxies evolved from the primordial universe.



# WHAT'S UP IN THE SKY - OCTOBER 2024

## LUNAR CALENDAR

### IMPORTANCE OF MOON PHASES FOR STARGAZERS

One might wonder why it is important to refer to moon phases for star gazing. The reason is that the phases of the Moon reflect a great deal of illumination, and because the Moon is so close to us, it overrides the brightness of other celestial objects.

So, What Moon phase is best for stargazing? "The New Moon and the days immediately before and after the new moon (Crescent phases)" are among the best times for stargazing. Whereas the Remaining phases like Full Moon, waxing or waning gibbous, the first or third quarter Moon offers a time to zoom in and witness the features of the Moon.

### Monthly Lunar Calendar October 2024

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2 NEW	3	4	5
6	7	8	9	10 FIRST	11	12
13	14	15	16	17 FULL	18	19
20	21	22	23	24 LAST	25	26
27	28	29	30	31		

## PLANETS VISIBILITY

### Mercury

Evening planet, Unlikely to be seen this month.



### Venus

Evening planet, setting 90 minutes after the Sun at the end of the month.



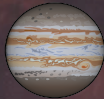
### Mars

Well-presented morning planet currently in Gemini.



### Jupiter

Superbly placed planet, best at the end of October when it's able to reach its highest altitude of nearly 60° when due south, under dark skies.



### Saturn

Well-presented evening planet, reaching nearly 30° altitude when due south.



### Uranus

Well-positioned planet, able to reach peak altitude, due south, in darkness all month.



### Neptune

Well-presented evening planet in Pisces, visible at peak altitude under dark skies all month.



## BRIGHT DEEP SKY OBJECTS

Messier 25 (M25) is a bright, prominent open cluster located in Sagittarius constellation. The cluster lies at a distance of 2,000 light years from Earth and has an apparent magnitude of 4.6. Its designation in the Index Catalogue is IC 4725. It lies 6.5 degrees north and a little east of Lambda Sagittarii, the star that marks the top of the Teapot asterism in Sagittarius.



Lagoon Nebula (M8) was discovered in 1654 by the Italian astronomer Giovanni, sought to catalog nebulous objects in the night sky so they would not be mistaken for comets. This star-forming cloud of interstellar gas is located in the constellation Sagittarius and its apparent magnitude of 6 makes it faintly visible to the naked eye in dark skies.



This Hubble image of M92's core is a composite made using observations at visible and infrared wavelengths. Located 27,000 light-years from Earth in the constellation Hercules, this globular cluster – a ball of stars that orbits our galaxy's core like a satellite – was first discovered by the German astronomer Johann Elert Bode in 1777.



The Andromeda Galaxy is a barred spiral galaxy and is the nearest major galaxy to the Milky Way. It was originally named the Andromeda Nebula and is cataloged as Messier 31, M31, and NGC 224. Andromeda has a diameter of about 152,000 light-years and is approximately 2.5 million light-years from Earth.





## ASTRONOMICAL EVENTS - OCTOBER 2024

# Orionids Meteor Shower

The Orionid meteor shower is one of the year's most spectacular celestial events, peaking in mid-October. This year, the shower will be active from **October 2 to November 7**, with the peak occurring around **October 21**. The best viewing times are after midnight through the wee hours before dawn on October 20 and 21.

Renowned for their brightness and speed, the Orionids are a breathtaking sight to behold. These meteors enter Earth's atmosphere at a staggering 66 kilometres per second or 148,000 miles per hour, often leaving behind persistent trails and occasionally producing dazzling fireballs. However, the waning gibbous moon on October 17 will pose a challenge to optimal viewing, as its brightness may obscure some of the fainter meteors.

The radiant point of the shower is in the **constellation Orion**, giving them the name Orionids, and the best viewing conditions are when the radiant point is highest in the sky. From New Delhi, the radiant point rises above the eastern horizon around **10:00 p.m.** and remains active until dawn breaks around **06:00 a.m.** The shower is expected to reach peak activity at around **12:00 a.m. on October 21**, and the best displays might be seen before dawn on that day.



HMC 68 Image Composite  
Comet Halley 14th March 1986



The Orionids are produced from the particles of **Halley's Comet**, which orbits the Sun every 76 years. The comet's nucleus sheds ice and rocky dust into space, which eventually becomes the Orionids in October and the Eta Aquarids in May. Halley's Comet was last seen by casual observers in 1986 and will not return until 2061.

To maximize your chances of witnessing this celestial phenomenon, it's advisable to find a dark location away from city lights. While the Orionid meteor shower is not as intense as some others, it offers a unique and captivating experience for astronomy enthusiasts.



# Draconids Meteor Shower

The Draconid meteor shower, a unique astronomical phenomenon, occurs when Earth passes through a stream of debris left behind by comet 21P/Giacobini-Zinner. Unlike most meteor showers, the Draconids are most active in the evening hours, as their radiant point stands highest in the sky as darkness falls.

The shower is typically a low-key event, producing only a handful of meteors per hour in most years. However, there have been occasional outbursts with hundreds or even thousands of meteors per hour. These outbursts are unpredictable and can occur without warning.

The Draconid meteor shower will be active from October 6 to October 10, with its peak rate of meteors expected around October 8. During this period, there will be a chance of seeing Draconids whenever the shower's radiant point, located in the constellation Draco, is above the horizon.

For observers in New Delhi, the shower will be visible each day from dusk until around 2:00 a.m., when the radiant point sets below the western horizon.

The best viewing conditions will be shortly after dusk, when the radiant point is still as high as possible. The Draconid meteor shower is a fascinating celestial event that offers a unique opportunity to observe the night sky. While the shower is typically modest, the possibility of a sudden outburst adds an element of excitement and unpredictability.



# Biggest Supermoon of the year!

October will bring a celestial treat with the Hunter's Moon, a supermoon that will illuminate the night sky. This full moon, occurring on Thursday, October 17, 2024, is the closest supermoon of the year.

A supermoon happens when a full moon coincides with the Moon's perigee, its closest approach to Earth. This alignment results in a slightly larger and brighter moon than usual, though the difference is often subtle to the naked eye.

The Hunter's Moon gets its name from its association with the autumn season, a time traditionally dedicated to hunting and storing up food for the winter. The name is believed to have originated from the Algonquin Native American tribe, who recognized the importance of this moon for providing additional light for hunting activities.

The Hunter's Moon, like the Harvest Moon, provided crucial light for hunters and farmers during a time of year when food was scarce. The extra moonlight aided in hunting and gathering activities, while the cleared fields made it easier to spot animals.





## COMET C/2023 A3, CLOSER TO THE EARTH

Comet C/2023 A3 (Tsuchinshan-ATLAS) will make its closest approach to Earth on **October 12**, at a distance of **0.6 AU**. This comet is expected to be quite bright, potentially visible to the naked eye, though its exact brightness will depend on its activity. As C/2023 A3 gets closer to the Sun, it is likely to develop a striking tail, formed by the evaporation of its ice and dust particles due to solar heat. Best viewed from the Northern Hemisphere, the comet will be too close to the Sun for easy observation in October. While it will pass closest to Earth on October 12, it may still be visible until October 19.

Comet C/2023 A3 is one of the most anticipated celestial events of October 2024, as it is expected to reach naked-eye brightness during this period. After making its closest approach to the Sun (perihelion) on September 27, when it came within 58.6 million kilometers (a distance comparable to Mercury's orbit), the comet will continue to be visible in October, showing the effects of its solar encounter.

This is the comet's first close pass by the Sun, after traveling from the distant Oort Cloud, a theorized region located 2,000–200,000 AU (0.03–3.2 lightyears) away from the Sun. Despite its long journey toward the inner Solar System, what will happen around its perihelion is still uncertain.

In early 2024, C/2023 A3 exhibited significant dust activity, which could result in a spectacular tail. Although the comet will be too close to the Sun for observation around October 9–10, its separation from the Sun will increase rapidly thereafter. By October 11, it may become visible near the horizon under optimal conditions, but it will be very low and difficult to spot.

On **October 12**, the comet will make its closest approach to Earth at a distance of **43.9 million kilometers**. It will become observable from India at **12:30 a.m.** on **October 13**, with better visibility at the same time on October 14 and 15, provided skies are clear and the horizon is unobstructed.

## LUNAR OCCULTATION OF SATURN

On **October 15, 2024**, lunar occultation will occur in the night sky, where the moon occults the star, Antares. The term "occultation" originates from the Latin "occultare," meaning "to hide." It refers to the complete obscuration of light from one astronomical body, such as a star, by another, like a planet or satellite. For instance, a total solar eclipse occurs when the Moon occults the Sun. Astronomers utilize occultations to measure the angular diameters of stars and identify binary star systems by analyzing their light intensity as they pass behind the Moon. These events also enable precise measurements of planet sizes, asteroid shapes, and the temperatures of planetary atmospheres.

The Moon is set to pass in front of Saturn, resulting in a lunar occultation that will be visible from parts of Asia and Africa. Due to the Moon's proximity to Earth, its position in the sky can vary by as much as two degrees across different locations, meaning the occultation will only be visible in certain regions. However, a close conjunction between the Moon and Saturn will be observable more widely.

In **New Delhi**, the occultation will be visible, beginning with Saturn disappearing behind the Moon at **12:23 a.m.** in the southwestern sky, at an altitude of 37 degrees. Saturn will reappear at **01:31 a.m.**, when the Moon is at an altitude of 24 degrees.

Lunar occultations are geographically limited, visible only from specific locations due to the Moon's proximity to Earth causing significant parallax. These occurrences provide astronomers with crucial insights into celestial objects, enhancing our comprehension of the universe's dynamics and diversity.



On 15th October at 12.23a.m.



# CONJUNCTIONS FOR THE MONTH

A phenomenon grabs the imagination of scientists and stargazers alike in the vast panorama of the night sky, where stars shine like distant diamonds and planets roam over the cosmic canvas. Conjunctions, those ethereal moments in the heavens when heavenly bodies appear to collide, provide a mesmerizing sight that connects us to the beauty of the cosmos. The word "Conjunction" comes from Latin, meaning to join together. From Earth's perspective, a conjunction occurs when two planets or a planet and the Moon or Sun align. Solar conjunctions are invisible to us. Moon-planet conjunctions occur throughout the month, every month, as the Moon passes past each planet. The planets in The Great Conjunction and when multiple align are rare and captivating conjunctions. Technically speaking, objects are said to be in conjunction in that instant when they have the same right ascension on our sky's dome. Practically speaking, objects in conjunction will likely be visible near each other for some days.



Place: New Delhi/ Date: 14th October / Time: 12.15 a.m.

## Conjunction of Moon and Saturn

On October 14th, the Ringed planet Saturn and the Moon will have the closest approach in the night sky & reaching an altitude of  $36^\circ$  above the south-western horizon. The Moon will be at magnitude  $-12.67$ , and Saturn at magnitude  $0.73$ . And it will be visible around 12.15 a.m. at midnight.

## Conjunction of Moon and Jupiter

On October 21st, the Moon, and the Giant planet Jupiter will appear very close to each other in the night. They will be in the North-eastern direction. Moon is at a magnitude of  $-12.41$ , the planets Jupiter is at a magnitude of  $-2.47$ . The Moon, Mars and Jupiter, together will be seen in the night sky around 09.00 p.m.



Place: New Delhi / Date: 21st October / Time: 09.30 p.m.



Place: New Delhi/ Date: 24th October / Time: 02.00 a.m.

## Conjunction of Moon and Mars

On October 24th, the Red planet Mars and the Moon will have the closest approach in the night sky & reaching an altitude of  $36^\circ$  above the eastern horizon. The Moon will be at magnitude  $-11.98$ , and Mars at magnitude  $0.22$ . And it will be visible around 02.00a.m, past midnight.



# WORSHIPPING THE SUN

The sun breaks through the horizon and rises over the sea. Turn east to see the beauty, and a chariot seemingly emerges from the sea depths, carrying the sun on it.

Situated on the shores of the Bay of Bengal, Konark Sun Temple is the pinnacle of Oriya architecture. Constructed in 1250 CE by King Narasimhadeva, the temple's design is a colossal chariot, with twelve pairs of wheels that are pulled by seven horses and transporting Surya across the heavens.

Konark Temple is famous for its 24 sundials, which are the chariot's wheels. Various theories have been proposed for the significance of the number of wheels, with the debate still ongoing. While the size and general architecture of all 24 wheels are the same, each has different carvings.

Each wheel has 16 spokes, of which 8 are wide and 8 are thin. Between each wide spoke, there are 60 beads. Each bead represents 3 minutes, and time can be accurately read by looking at where the shadow lands with respect to the bead. The 12 o'clock position on the wheel is equivalent to midnight and time is to be read anti-clockwise. As with all sundials, the Konark Wheel can be used as a sundial between sunrise and sunset.

Currently, the temple is not an active place of worship. Due to this, and its status as a UNESCO World Heritage site, it is visited daily by thousands of tourists. The wheel of Konark temple is depicted on the old 20 rupee note and the new 10 rupee note.



*One of the wheels at Konark Sun Temple. . Credits: thehistoryhub*



*A conjectura restoration of the temple. Credits: insightsonindia*



# "CELESTIAL OMENS: THE CULTURAL AND MYTHOLOGICAL SIGNIFICANCE OF COMETS"

Comets are icy bodies from the outer reaches of the solar system, often described as "cosmic time capsules." Their composition, which includes dust, ice, and organic compounds, offers clues about the early solar system's formation. By studying comets, scientists gain insights into the conditions that existed when planets were forming. Some researchers even suggest that comets may have brought water and organic materials to Earth, possibly contributing to the origins of life.

In various cultures, comets have been viewed as supernatural or divine signs, often interpreted as omens of change, disaster, or celestial messages. Civilizations from the Ancient Chinese to the Romans and Medieval Europeans have attached deep symbolic meaning to comet appearances, seeing them as harbingers of major historical events, such as wars, plagues, or the fall of rulers.

**Hindu Mythology: Comets were linked to cosmic events and the god Rahu.**

**Ancient China: Comets were viewed as celestial dragons or "broom stars," symbolizing change.**

**Ancient Greece: Comets were harbingers of disaster, linked to wars and the death of rulers.**

**Mesoamerican Civilizations: The Aztecs and Maya saw comets as ominous, foretelling doom.**

**European Middle Ages: Comets symbolized divine judgment, like Halley's Comet in 1066.**

**Inuit Mythology: Comets were spirits of the dead, reflecting the soul's journey.**

**Ancient Rome: A comet in 44 BCE was seen as Julius Caesar's soul ascending to the heavens.**

**Japanese Folklore: Called "broom stars," comets could sweep away evil or bring disaster.**

**Zulu Mythology: Comets were sky serpents bringing messages from ancestors.**



Painting of an ancient Comet (Credit: Wiki Commons)

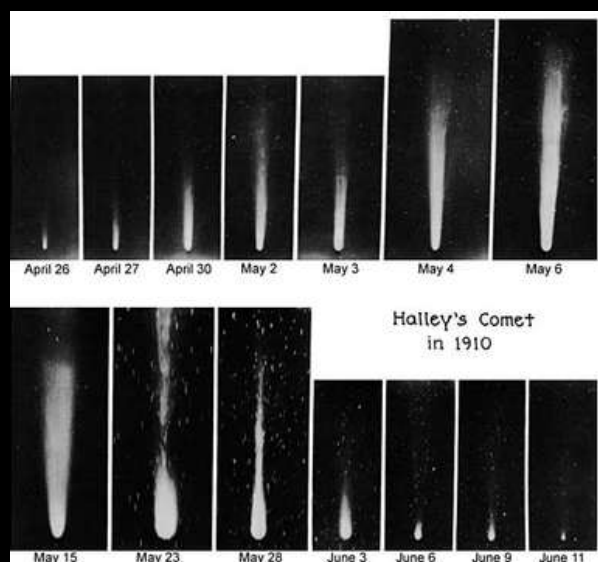


Mythologies from across the globe—whether in Aztec, Greek, Hindu, or Inuit cultures—often ascribe supernatural powers to comets. They are viewed as manifestations of gods, spirits, or mythical creatures, highlighting humanity's deep sense of wonder and mystery about these celestial objects.

In summary, comets hold profound significance as both scientific artifacts that help us understand the universe and cultural symbols that reflect human hopes, fears, and beliefs.



Comet with dust and gas tail



Halley's appearance in 1910 provided astronomers with the first opportunity to photograph the comet. Credit: Mt. Wilson Observatory.



# ROCKET LAUNCHES IN OCTOBER 2024

## HERA

Date: October 7, 2024, Rocket: Falcon 9 Block 5

Agency: SpaceX, Country: USA, Launch Site: Space Launch Complex 40, Cape Canaveral, FL, USA

The Hera mission is a key component of the European Space Agency's (ESA) Planetary Defense strategy, developed in coordination with NASA. Hera's primary goal is to study the results of the DART mission (Double Asteroid Redirection Test), which successfully demonstrated asteroid deflection by impacting the smaller moonlet, Dimorphos, of the double asteroid system Didymos in 2022. Hera will arrive at the asteroid system in 2026 to analyze the crater caused by DART's impact and precisely measure the change in Dimorphos' orbit.

Equipped with advanced instruments, Hera will conduct high-resolution mapping of Dimorphos and Didymos. It will analyze the surface properties, structure, and composition of the asteroids. Hera will assess the efficiency of the kinetic impact technique used by DART to help develop future asteroid deflection strategies in the event of a real asteroid threat to Earth. Hera's mission marks a significant collaboration between NASA and ESA, showcasing the growing efforts for planetary defense against asteroids. This will be the first time humans visit a binary asteroid system, providing a wealth of data on planetary defense technologies.



The Hera mission (Image credit: ESA - Science Office )



# EUROPA CLIPPER

Date: October 10, 2024, Rocket: Falcon Heavy, Agency: NASA (via SpaceX), Country: USA, Launch Site: Launch Complex 39A, Kennedy Space Center, FL, USA.

The Europa Clipper mission is a NASA's planetary exploration efforts, aimed at investigating the habitability of Jupiter's moon Europa—a world that may harbor a subsurface ocean beneath its icy crust. This mission will take approximately six years to reach Europa, arriving by 2030. Over the course of the mission, Europa Clipper will conduct more than 40 close flybys of the moon, capturing detailed images and data. The spacecraft is equipped with a suite of sophisticated scientific instruments, including ice-penetrating radar, spectrometers, and magnetometers, designed to probe the moon's icy shell and investigate the properties of the ocean beneath.

Europa is believed to have more water than Earth's oceans combined, and the mission's goal is to determine whether the moon's internal ocean contains the right chemical ingredients for life as we know it. This mission is the first dedicated effort to study Europa in such detail, making it crucial for future missions aimed at exploring the outer solar system. It represents a key step in understanding whether icy moons like Europa could be habitable for microbial life, and it will also lay the groundwork for future lander missions that might search directly for signs of life.



(Europa Clipper Image credit: NASA)



# SPACEX LAUNCHES IN OCTOBER 2024

## DRAGON CRS-2 SpX-31

Date: October 2024, Rocket: Falcon 9 Block 5, Agency: SpaceX  
 Country: USA, Launch Site: Launch Complex 39A, Kennedy Space Center, FL, USA

The Dragon CRS-2 SpX-31 mission, part of NASA's second Commercial Resupply Services contract with SpaceX, will launch a Cargo Dragon spacecraft to the International Space Station (ISS).



(Image credits: NASA)

The mission will deliver supplies and research materials critical for ongoing scientific investigations in the microgravity environment of the ISS. This includes hardware for scientific experiments, food, and equipment needed to maintain the station. This will be the 31st commercial resupply mission to the ISS conducted by SpaceX.

In addition to supplies, the mission may carry science experiments for long-duration space exploration and technology demonstrations aimed at improving spaceflight safety and efficiency. Some of these experiments could include investigations into protein crystal growth, which could help in drug development, or biological studies to understand how living organisms adapt to space.

## SIRIUS SXM-9

Date: October 31, 2024, Rocket: Falcon 9 Block 5, Agency: SpaceX  
 Country: USA, Launch Site: Cape Canaveral Space Force Station, FL, USA.

The Sirius SXM-9 mission is a communications satellite launch by SpaceX for SiriusXM. The SXM-9 satellite, built by Maxar Technologies using the 1300-class platform, will enhance SiriusXM's satellite radio services, reaching vehicles and other radios across North America.

It features a large mesh reflector nearly 10 meters in diameter to transmit high-powered digital audio signals. The satellite will be placed into Geostationary Transfer Orbit (GTO), enabling it to serve its role in delivering satellite radio to millions of users. The rocket is capable of lifting payloads up to 8,300 kg into GTO and features a two-stage design for optimal performance.



(Image credits: Istockphoto)



# DSN 3 (KIRAMEKI 3)

Date: October 20, 2024, Rocket: H3-22, Agency: Mitsubishi Heavy Industries (MHI), Country: Japan, Launch Site: Yoshinobu Launch Complex LP-2, Tanegashima Space Center, Japan.

This mission is a key communication satellite launch for Japan, supporting the country's military communications through its X-band payload. Kirameki 3 is set to enter geostationary orbit and will enhance Japan's satellite communications capabilities, particularly for military applications. The satellite is operated by DSN Corporation, a subsidiary of the SKY Perfect JSAT Group. This launch represents the fourth mission for the H3 rocket and is part of ongoing efforts by Japan to expand its presence in space, particularly in secure communication domains.



(Image credits: wikipedia.org)

# CERTIFICATION FLIGHT 2

Date: October 4, 2024, Rocket: Vulcan Centaur  
 Agency: ULA (United Launch Alliance), Country: USA  
 Launch Site: Space Launch Complex 41, Cape Canaveral Space Force Station, FL, USA.

The Certification Flight 2 (Cert-2) is part of the U.S. Space Force's certification process for ULA's new Vulcan Centaur rocket. This is the second of two certification missions aimed at validating the rocket's capability for national security launches. The mission will include a mass simulator and various proprietary experiments, with the goal of testing the Centaur V upper stage's full capabilities. Vulcan is designed to carry out high-energy missions, continuing the legacy of Atlas rockets, and is a critical part of future national security and commercial launch operations. The flight will pave the way for Vulcan's future operations, as it will be crucial in fulfilling the growing demands for both government and commercial space launches.



(Image credits: returns.com)

# STARLINK GROUP

The Starlink Group 10-10 mission is scheduled to launch on October 2, 2024, using a Falcon 9 Block 5 rocket from Space Launch Complex 40 at Cape Canaveral Space Force Station, Florida. This launch will deploy a new batch of Starlink satellites into Low Earth Orbit as part of SpaceX's ongoing efforts to expand its global internet service network.

These satellites are designed to enhance internet connectivity, particularly in underserved and remote areas around the world. The mission's total launch cost is estimated at \$52 million. As is typical for SpaceX's reusable rocket system, the first stage of the Falcon 9 will attempt a landing on one of the Autonomous Spaceport Drone Ships (ASDS) stationed in the Atlantic Ocean, ensuring a continued focus on cost-effective launches. SpaceX has had a busy launch schedule in 2024, with this being one of many Starlink missions contributing to the ever-expanding mega-constellation.

**\*\*Note: Launch dates of the missions are scheduled to be launched in October 2024 but may subject to change.**



# Light Pollution-Disturbing the Dark

Amit Kumar Sharma, Astronomer, New Delhi

When was the last time you experienced a night sky filled with stars? Where was it? How did it make you feel? "For my part I know nothing with any certainty, but the sight of the stars makes me dream." says Vincent Gogh

While there is growing research supporting the important role night plays in preserving critical wildlife habitats and safeguarding human health, some aspects of the night, such as the awe it inspires, are harder to quantify.

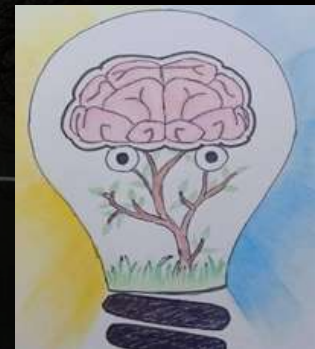
## LIGHT POLLUTION???

Light pollution, a global issue, emerged in the 1970s when astronomers observed the impact of artificial light on their work. The sky became brighter by 3% to 6% annually. This pollution, caused by poorly implemented lighting sources, disrupts wildlife patterns, increases carbon dioxide levels, disrupts human sleep, and obscures night sky stars.

It is most common in large cities and Metro Cities, where streetlights, billboards, shopping malls, and exterior lights are produced. Astronomers are particularly concerned about light pollution, as it prevents them from observing the night sky. Environmentalists, health workers, and economists also urge reducing light pollution.

### 💡 Types of LIGHT POLLUTION

- 💡 Sky glow - yellow or orange halo in the night sky.
- 💡 Glares - Bright light from passing cars or street lamps.
- 💡 Light trespass - Street light shining into your room.
- 💡 Satellite glow - Brightening of the sky by artificial satellites.



Light pollution is a growing concern that affects not only astronomers but also most living creatures and the environment. It disrupts our day-night cycle, which is controlled by the amount of light around us, leading to sleep disorders, depression, and weakening of the immune system. Excessive artificial light can also negatively affect animals' behavior, such as reproduction, sleep, and protection from predators.

Light pollution also leads to energy waste, with 35% of all outdoor lighting wasted due to poorly-designed fixtures. This total cost amounts to around three billion dollars in the United States annually, and millions of tons of carbon dioxide are emitted to power this lighting, causing immense damage to the environment.

To reduce light pollution, local authorities can adjust street lighting and improve the design of light fixtures. Three main steps should be taken: using warm yellow light instead of blue light, dimming all unnecessarily bright light sources, and shielding light fixtures to prevent light from escaping into the sky.

Personal actions to minimize light pollution include turning off lights when not needed, using warm-colored light bulbs, switching to LEDs for less electricity consumption, replacing outdoor lights with shielded fixtures, and installing motion sensors on outdoor lamps. By taking these steps, we can help protect our planet and the lives of those who live in areas with high levels of light pollution.



# The Hidden Rings of our Solar System

Sourajit Mandal, Astronomy Club

Do you remember when we used to study about the solar system in our schools in junior school? Do you remember the pictures of the planets in those thin picture books? Have you also not wondered why only Saturn had those beautiful rings? Is it even the only planet with rings? Planet... can only planets have rings?? Is there no moon with rings? Why doesn't our Earth have rings? Did the Earth ever have rings too??

Quiet surprisingly, Saturn isn't the only planet with rings. In fact, Jupiter and Uranus also have ring systems, though they are much fainter and less visible than Saturn's prominent rings. For instance, Saturn has seven main wide rings, which are named A to G in the order they were discovered. However, Jupiter on the other hand has 4 rings. Uranus has 13 known rings and 11 of them are visible in the most famous James Webb Image of Uranus. Some of these rings are so bright in the image taken by Webb that when they are close together, they appear to merge into a larger ring.

Saturn's rings are special due to the fact that they are made of bright, reflective ice particles which makes them more visible compared to the darker dust and rock rings around the other gas giants. But... are rings exclusive to planets? Can moons and other celestial objects not have rings? Interestingly, while rings are a common feature for larger planets, no moon has been found with rings.

They typically form from debris that either originates from a destroyed moon or is left over from the planet's formation, and this debris tends to gather around large bodies like planets rather than smaller moons. BUT there is an exception! Rhea, which is the second largest moon of Saturn is often speculated to have rings! Cassini spacecraft which went to Saturn found clues which suggest that Rhea could possibly have its own ring system! Imagine a planet with a ring and numerous moons out of which one moon itself has its own ring!

Now, why doesn't Earth have rings? Well, our planet simply lacks the amount of debris that's needed to form a ring system. However, scientists speculate that Earth could have had rings at one point in its history. Billions of years ago, after a massive collision with a Mars-sized body named Thea, it is often believed that a ring of debris formed around Earth...debris that eventually formed into the Moon we see today. So, in a way, Earth might have had its own ring system in the very distant past.

While the ring system of different planets and moon still remain as a celestial spectacle for night observers, it is also a fascinating prompt of the dynamic and ever-changing nature of our universe. The discovery of rings around other planets and moons, and the tantalizing possibility of Rhea's own ring system, reminds us of the universe's endless surprises and the mysteries that still await exploration.



# ISRO's Bold Leap: The Venus Orbital Mission Approved

Shivangi Doshi, iAstronomer

In a monumental decision that has stirred excitement across the scientific community, the Indian Space Research Organization (ISRO) has officially received approval for its much-anticipated Venus Orbital Mission. Set to further extend India's space exploration prowess, this mission will propel the nation into uncharted territory by aiming to study the mysteries of Earth's "sister planet," Venus.

## Why Venus?

Venus, often referred to as the Earth's twin due to its similar size and proximity, has long fascinated astronomers. Its thick, toxic atmosphere, composed mainly of carbon dioxide, traps heat and creates surface temperatures hot enough to melt lead. This makes Venus the hottest planet in the solar system, even though it is not the closest to the Sun.

ISRO's mission to Venus is crucial because it promises to shed light on one of the most hostile yet intriguing worlds, helping us understand atmospheric dynamics, surface processes, and the planet's geologic history. Venus could offer critical insights into the long-term impacts of climate change, making this mission not only scientifically important but also relevant to global environmental concerns.

## The Vision Behind ISRO's Mission

The Venus Orbital Mission, often referred to as "Shukrayaan-1" (from the Sanskrit name for Venus), will carry an array of scientific instruments designed to study the planet's atmosphere, surface, and subsurface.

## What Instruments Are Onboard?

The Shukrayaan-1 mission is expected to carry a suite of advanced scientific instruments designed to study Venus' atmosphere, surface, and subsurface. While ISRO has not yet finalized the full payload list, the following key instruments are proposed to be onboard:

- Synthetic Aperture Radar (SAR) - To map the surface of Venus through its thick clouds.
- Ultraviolet (UV) Imaging Spectrometer - To analyze the composition of Venus' upper atmosphere.
- Infrared (IR) Camera / Spectrometer - To study surface and atmospheric features in the infrared spectrum.
- Mass Spectrometer - To study the composition of Venus' atmosphere, particularly its lower layers.
- Radio Science Experiment (RSE) - To study Venus' ionosphere and atmospheric structure using radio waves.
- Plasma Analyzer - To study the interaction of Venus' atmosphere with solar wind.
- GPR (Ground-Penetrating Radar) - To investigate the subsurface structure of Venus.

## When Will It Launch?

The launch of ISRO's Venus Orbital Mission, also known as Shukrayaan-1, is tentatively planned for 2026. The new target launch window in 2026 is chosen to coincide with optimal planetary alignment, allowing for a more efficient trajectory to Venus. This launch will likely occur during the period when Venus is at its closest approach to Earth, minimizing travel time and fuel requirements, similar to the strategies used for other interplanetary missions. However, the final date might still depend on technical readiness, further approvals, and external factors like international collaboration.

## Pioneering Space Exploration

This mission marks ISRO's continued ascent in the realm of planetary science, following the successes of its Mars Orbiter Mission (Mangalyaan) and its Chandrayaan missions to the Moon. While global heavyweights like NASA and ESA have conducted missions to Venus, ISRO's exploration is a bold statement of intent for India's ambitions to become a leader in space exploration.



# Chandrayaan 2 - Lander Failure Analysis

Abdul rehman yaqub khanche, iAstronomer

## Personal Opinion:

- The lander's failure may be attributed to issues with its orientation and alignment during the descent phase.
- In the vacuum of space, the lander needed to slow down by firing thrusters opposite to its orbital direction.
- The lander's trajectory went awry due to improper alignment, causing it to spin and lose control.
- Proper alignment and thruster control are crucial for a successful landing, as seen in SpaceX's reusable rockets.
- The lander's spin and loss of control may have been caused by a malfunction in the thruster system or a software error.

## Possible Causes:

- Thruster malfunction or failure
- Software error or glitch
- Communication loss or delay
- Inaccurate altitude or velocity measurements \_

## Conclusion:

- It's essential to wait for the scientific analysis of the data received from the lander to determine the exact cause of the failure.
- ISRO can learn from this experience and apply it to future missions, such as Chandrayaan-3.
- The failure of the Chandrayaan-2 lander highlights the complexity and challenges of space exploration.

## New Idea:

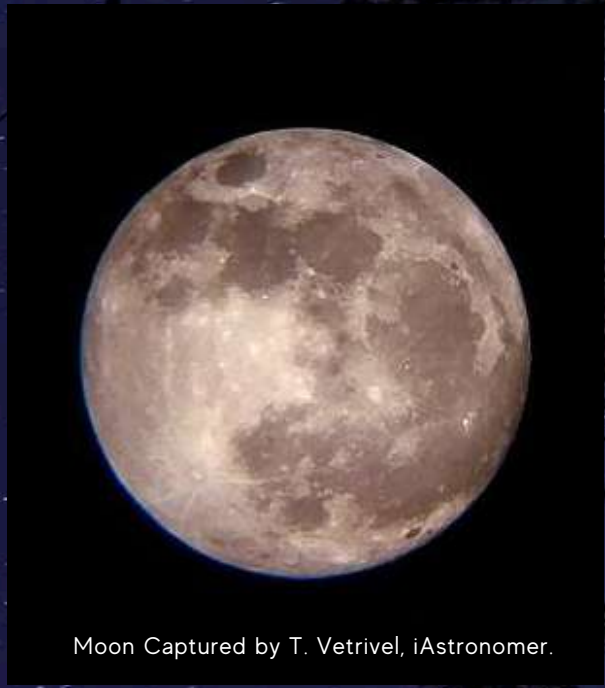
- Consideration of backup systems and redundancy in critical components could enhance the reliability of future missions.
- Implementing AI-powered real-time monitoring and adaptive control systems might help mitigate similar failure



# ASTROPHOTOGRAPHS FROM SPACE ASSOCIATED ASTRONOMERS



Nebula Captured by Yash Dabholkar.



Moon Captured by T. Vetrivel, iAstronomer.

# ASTROPHOTOGRAPHS FROM SPACE TEAM



Comet C/2023 A3 Tsuchinshan - ATLAS Captured by Mr. Ranjith Kumar E, Regional Product Manager-South India.



Omega Centauri captured by Mr. Shirilmon S, Senior Executive, GAPL.



Trifid Nebula (M20) captured by Mr. Shirilmon S, Senior Executive, GAPL.



# Happy Birthday

## Neil deGrasse Tyson

Neil deGrasse Tyson, born on October 5, 1958, is an American astrophysicist, author, and science communicator. He studied physics at Harvard University and earned his Ph.D. in astrophysics from Columbia University. He is the director of the Hayden Planetarium in New York City and is widely known for making complex topics in astronomy and astrophysics accessible to the general public. He has hosted several science-themed TV shows and documentaries, including *Cosmos: A Spacetime Odyssey*, which was a continuation of Carl Sagan's famous *Cosmos: A Personal Voyage*. He is known for his engaging speaking style and his advocacy for science education and literacy.



October 5, 1958



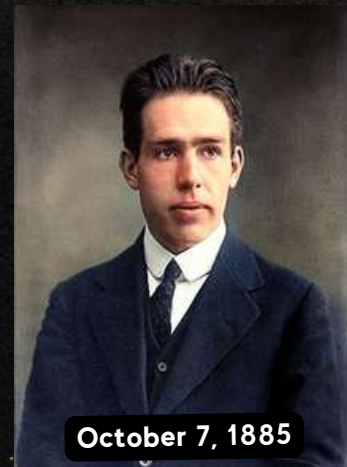
October 6, 1893

## Meghnad Saha

Meghnad Saha (6 October 1893 – 16 February 1956) was an eminent Indian astrophysicist, best known for his development of the Saha Ionization Equation, which played a crucial role in understanding stellar atmospheres and the physical properties of stars. This equation is crucial for explaining the physical and chemical conditions of stellar atmospheres, particularly how different elements ionize at different temperatures in stars. Beyond theoretical work, Saha was passionate about the practical applications of science for national development. He advocated for large-scale public works, particularly river valley projects for flood control, irrigation, and power generation.

## Neils Bohr

Niels Henrik David Bohr (7 October 1885 – 18 November 1962) was a Danish physicist who made foundational contributions to understanding atomic structure and quantum mechanics. He is best known for his development of the Bohr model of the atom, which revolutionized the way scientists understood atomic structure and electron behavior. Bohr's work earned him the Nobel Prize in Physics in 1922, and became a key figure in the development of modern physics, influencing the understanding of atomic theory, quantum mechanics and the nature of scientific inquiry. He made significant contributions to nuclear physics, particularly with the liquid drop model of the nucleus.



October 7, 1885



# Happy Birthday



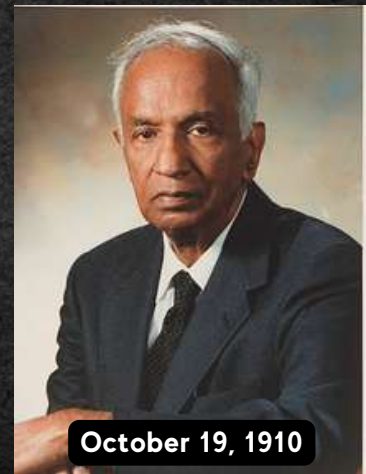
October 15, 1931

## APJ Abdul Kalam

Dr. A.P.J. Abdul Kalam (15 October 1931 – 27 July 2015) was a renowned Indian aerospace scientist and the 11th President of India (2002–2007). Known as the "Missile Man of India," he played a pivotal role in developing India's missile and space technology. Starting his career at the Defense Research and Development Organisation (DRDO), he later moved to ISRO, where he directed India's first satellite launch vehicle (SLV-III). Under his leadership, key missile systems like Agni and Prithvi were developed. Kalam's life exemplifies hard work, resilience, and visionary leadership, inspiring many in India and beyond.

## S. Chandrasekhar

Subrahmanyan Chandrasekhar (19 October 1910 – 21 August 1995) was an influential Indian-American astrophysicist known for his groundbreaking work on stellar structure and evolution. He won the Nobel Prize in Physics in 1983 for his theoretical studies, particularly the Chandrasekhar Limit, which defines the maximum mass of a stable white dwarf star. Above this limit, a star cannot resist gravitational collapse, leading to supernovae. He authored key works like "An Introduction to the Study of Stellar Structure" and "The Mathematical Theory of Black Holes," significantly advancing modern astrophysics. Chandrasekhar's contributions continue to inspire future generations of scientists.



October 19, 1910



October 30, 1909

## Homi J. Bhabha

Homi Jehangir Bhabha (30 October 1909 – 24 January 1966) was a pioneering Indian nuclear physicist, often called the "father of the Indian nuclear program." He played a crucial role in establishing India's nuclear capabilities for both peaceful and defense purposes. Bhabha made significant contributions to quantum theory, particularly in cosmic ray showers and electron-positron scattering, known as Bhabha scattering. He founded the Tata Institute of Fundamental Research (TIFR) in 1945, which became a leading center for scientific research in India. Bhabha envisioned a future of scientific self-reliance and technological advancement in India, particularly in atomic energy, leaving a lasting legacy in the field.



# HISTORICAL EVENTS HAPPENED IN OCTOBER

## SPUTNIK 1: THE DAWN OF SPACE EXPLORATION

### 1\_A Groundbreaking Achievement:

On October 4, 1957, Sputnik 1 became the first man-made object to orbit the Earth. Weighing 83.6 kg and moving at 29,000 km/h, it took about 96 minutes to complete one orbit. This achievement marked the start of the space age, showcasing the Soviet Union's scientific and technological prowess during the Cold War era.

**Speciality:** It was the first artificial satellite ever launched into space, a pioneering step that demonstrated humanity's ability to venture beyond Earth.

**Advantage:** The successful orbit proved that space exploration was possible, inspiring further research and the development of more advanced space missions.

### 2. Technological Innovation:

Sputnik 1's simple yet effective design included a polished aluminum sphere with four long antennas. These antennas transmitted radio pulses on two frequencies (20.005 MHz and 40.002 MHz), which could be picked up by radio operators across the globe.

**Speciality:** Sputnik 1's radio transmissions were audible worldwide, providing valuable data on atmospheric density and the ionosphere.

**Advantage:** The satellite's design set a foundation for future satellite communication systems, revolutionizing how we use satellites today for weather forecasting, GPS, and global communications.

### 3. Impact on the Space Race:

Sputnik 1's launch stunned the world, particularly the United States. The event kicked off the space race, a competition between the US and the USSR to achieve dominance in space exploration. This led to the establishment of NASA in 1958 and pushed the US to invest heavily in space technology.

**Speciality:** Sputnik 1's success symbolized Soviet dominance in space during the early years of the Cold War.

**Advantage:** It spurred rapid advancements in space technology and space policy, culminating in the moon landing by the US in 1969.

### 4. Advancing Satellite Technology:

Sputnik 1 was a simple satellite, but it inspired innovations in satellite technology that have shaped modern science and technology. Its mission provided the basis for the development of more sophisticated satellites for various purposes, such as communications, weather monitoring, and global positioning.

**Speciality:** It was the forerunner of modern satellite systems used for communication and Earth observation.

**Advantage:** The success of Sputnik 1 laid the groundwork for satellite networks that support a wide range of applications, including television, internet, and global navigation systems.

### 5. Lasting Legacy:

Though Sputnik 1's mission lasted only 21 days, its legacy has endured for decades. It inspired a new generation of scientists, engineers, and astronauts, and fueled public interest in space exploration. It also paved the way for future manned space missions, space probes, and space stations.

**Speciality:** Sputnik 1's launch is considered the symbolic beginning of humanity's journey into space.

**Advantage:** It catalyzed technological progress and international cooperation in space exploration, eventually leading to achievements such as the International Space Station and deep-space missions like Voyager.



# CRASHING ON THE MOON

## 1. Historic Achievement:

On October 7, 1959, the Soviet Union's Luna 3 spacecraft made history by capturing the first images of the Moon's far side, a region never visible from Earth. This groundbreaking mission offered humanity its first glimpse of the unseen half of the Moon and marked a major milestone in space exploration.

**Speciality:** Luna 3 was the first to photograph the Moon's far side, uncovering hidden details.

**Advantage:** These images provided invaluable data about a region never observed before.

## 2. Technological Innovation:

Luna 3 featured advanced technology, including a camera, a film processor, and a transmitter. The spacecraft captured and developed images onboard, transmitting them back to Earth. Despite the limitations of 1950s technology, Luna 3 successfully photographed about 70% of the Moon's far side.

**Speciality:** Its imaging and transmission system were cutting-edge for its time.

**Advantage:** The mission set new standards for space imaging and data transmission.

## 3. Unveiling the Unknown:

Luna 3's images revealed a rugged, cratered far side, starkly different from the near side. This sparked new insights into the Moon's geological evolution.

**Speciality:** Luna 3 revealed the Moon's far side for the first time.

**Advantage:** It enhanced scientific understanding of lunar geology.

## 4. Impact on the Space Race:

The success of Luna 3 solidified the Soviet Union's dominance in early space exploration and heightened competition during the Cold War.

**Speciality:** It showcased Soviet leadership in space.

**Advantage:** The mission accelerated U.S. efforts in lunar exploration.

## 5. Lasting Legacy:

Though grainy by modern standards, Luna 3's images laid the groundwork for future lunar missions, influencing the course of space exploration.

**Speciality:** Luna 3 pioneered lunar mapping.

**Advantage:** It inspired advancements in imaging technology and lunar studies.



# WILLIAM LASSELL DISCOVERS \*TRITON: NEPTUNE'S LARGEST MOON

## 1. Historic Discovery:

On October 10, 1846, British astronomer William Lassell made a groundbreaking discovery—Triton, Neptune's largest moon. This happened just weeks after Neptune itself was found. Lassell's work added Triton to the list of significant celestial bodies in the solar system.

**Speciality:** Triton is Neptune's largest moon and one of the coldest known objects in the solar system.

**Advantage:** Its discovery expanded our knowledge of Neptune's moons and enhanced the study of distant planets.

## 2. Retrograde Orbit:

Triton stands out as the only large moon in the solar system with a retrograde orbit, meaning it orbits Neptune in the opposite direction of the planet's rotation. This unusual trait suggests that Triton was likely captured from elsewhere in the solar system, possibly from the Kuiper Belt.

**Speciality:** Triton's retrograde orbit is unique among large moons.

**Advantage:** It provides insights into planetary capture processes and moon formation theories.

## 3. Triton's Surface:

Triton has an icy surface, featuring cryovolcanoes that eject nitrogen gas, creating a thin atmosphere. This gives the moon an active, dynamic surface, rare for celestial bodies at such extreme distances.

**Speciality:** Triton has a geologically active surface with ice volcanoes.

**Advantage:** Studying its surface helps scientists understand the activity on icy moons.

## 4. Impact on Astronomy:

Lassell's discovery opened the door to studying moons around planets in the outer solar system, beyond Jupiter and Saturn.

**Speciality:** Triton was the first moon discovered around Neptune.

**Advantage:** This discovery promoted further exploration of Neptune's system.

## 5. Future Exploration:

Triton remains a key target for future missions, especially given its potential subsurface ocean.

**Speciality:** Triton may have a subsurface ocean beneath its icy crust.

**Advantage:** It could offer clues to habitability on icy moons in the solar system.



# VENERA 9: UNVEILING VENUS'S SECRETS

## 1. Historic Achievement:

On October 22, 1975, the Soviet spacecraft Venera 9 made history by becoming the first spacecraft to orbit Venus and successfully transmit images of its surface back to Earth. This monumental achievement marked a significant milestone in planetary exploration and expanded our understanding of our neighboring planet.

**Speciality:** Venera 9 was the first spacecraft to send back images from the surface of another planet.

**Advantage:** The mission provided unprecedented data about Venus, including its atmospheric conditions and geological features.

## 2. Groundbreaking Technology:

Venera 9 was equipped with advanced imaging technology designed to withstand the harsh conditions of Venus's surface, including high temperatures and crushing atmospheric pressure. The spacecraft utilized a panoramic camera to capture detailed images of the landscape.

**Speciality:** Its robust design allowed for successful imaging despite Venus's extreme environment.

**Advantage:** The technology developed for Venera 9 paved the way for future planetary missions.

## 3. Stunning Imagery:

Upon arrival, Venera 9 transmitted the first images of Venus's surface, revealing a rocky landscape dotted with boulders and a thick, cloudy atmosphere. The photos showed a stark, desolate terrain, providing insights into Venus's geology.

**Speciality:** The images captured showed clear details of the surface, a breakthrough for planetary imaging.

**Advantage:** These visuals offered vital clues about Venus's history and geological processes.

## 4. Impact on Planetary Science:

The success of Venera 9 greatly influenced the field of planetary science, establishing a new benchmark for future exploration missions to Venus and other planets.

**Speciality:** Venera 9 laid the groundwork for subsequent missions to Venus.

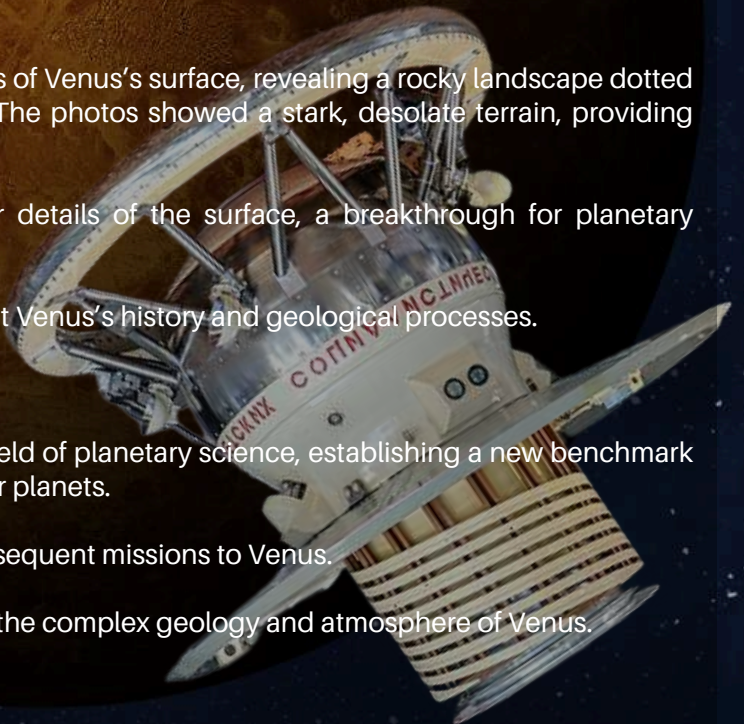
**Advantage:** It sparked interest in understanding the complex geology and atmosphere of Venus.

## 5. Legacy of Exploration:

Venera 9's mission left a lasting legacy in space exploration. Its successful operation demonstrated the feasibility of sending spacecraft to other planets and returning valuable data.

**Speciality:** Venera 9 is remembered as a pioneering mission in planetary exploration.

**Advantage:** It inspired further exploration of Venus and contributed to advancements in space technology and planetary science.





# LIFE AT SPACE

## Celebrating Teachers' Day in the Office: A Tribute to Our Educators

Teachers' Day is a special occasion that transcends schools and classrooms; it's a day to honour all educators, including those who contribute their knowledge and expertise in professional settings. This year, we celebrated Teachers' Day in our offices at Dwarka as well as Janakpuri with a delightful lunch, heartfelt appreciation tokens, a cake-cutting ceremony and a tree plantation drive, creating an atmosphere of gratitude and camaraderie.



The Venue was beautifully decorated with ballons, ribbons and banner. The educators were dressed in gorgeous sarees and formals. The Chennai team and out stationed educators joined us through the online platform. We kicked off our celebration with everyone to share their favourite memories or experiences with teachers, whether from their school days or within the office. These stories brought back nostalgia and showcased the profound impact educators have had on our lives. It was heartwarming to hear how some of our colleagues had transitioned from students to mentors, continuing the cycle of learning and growth.



Next, we played a fun guessing game that encouraged everyone to think about their colleagues' personalities in a light-hearted way. For each participant a tag was been written down, It was a joy to see how well we knew one another, as some guesses surprised us all! As truly said "What the teacher is, is more important than what he teaches." – Karl Menninger

After a tasty lunch, appreciation tokens were presented to our mentors in the office. These tokens ranged from personalized thank-you notes to small gifts that showed our gratitude. Each note included specific anecdotes or lessons learned from the individuals we honoured, making the moment even more special. Witnessing the smiles on their faces was a reminder of how meaningful recognition can be.

At Janakpuri office the day was celebrated with the Astro port and PDT team. It started with a brief gathering where we acknowledged the importance of both education and the environment. Then all took turns to plant tree saplings. It went on with sharing tokens of gratitude's and gifts.



As No celebration is complete without cake! All gathered around a beautifully decorated cake that read, "Celebrating Teachers' Day!" The cake-cutting ceremony was filled with laughter and cheer as we sang songs and shared sweet treats. This simple act of sharing cake symbolized our unity and collective appreciation for the educators who inspire us daily. Later, the educators also showcased their hidden talents of singing with melodious songs and dancing on the beats.



As we concluded our celebration, it was clear that our Teachers' Day gathering had strengthened our office community. The appreciation shown to our educators reminded us all of the importance of acknowledging the hard work and dedication that goes into teaching, mentoring, and leading.



## A DAY OF FUN AND TEAM SPIRIT

The Delhi Education Team recently enjoyed a rejuvenating one-day outing that fostered camaraderie and team spirit. Set against the serene backdrop of a picturesque farmhouse, the day began with a delicious vegetarian lunch, allowing colleagues to relax and recharge. Post-lunch, engaging team-building games brought everyone together, emphasizing collaboration and unity.

The highlight of the day came with an exuberant rain dance, where the team let loose, laughed, and danced together, shedding all stress. Poolside water games followed, adding to the playful atmosphere, as colleagues enjoyed moments of shared joy and connection.

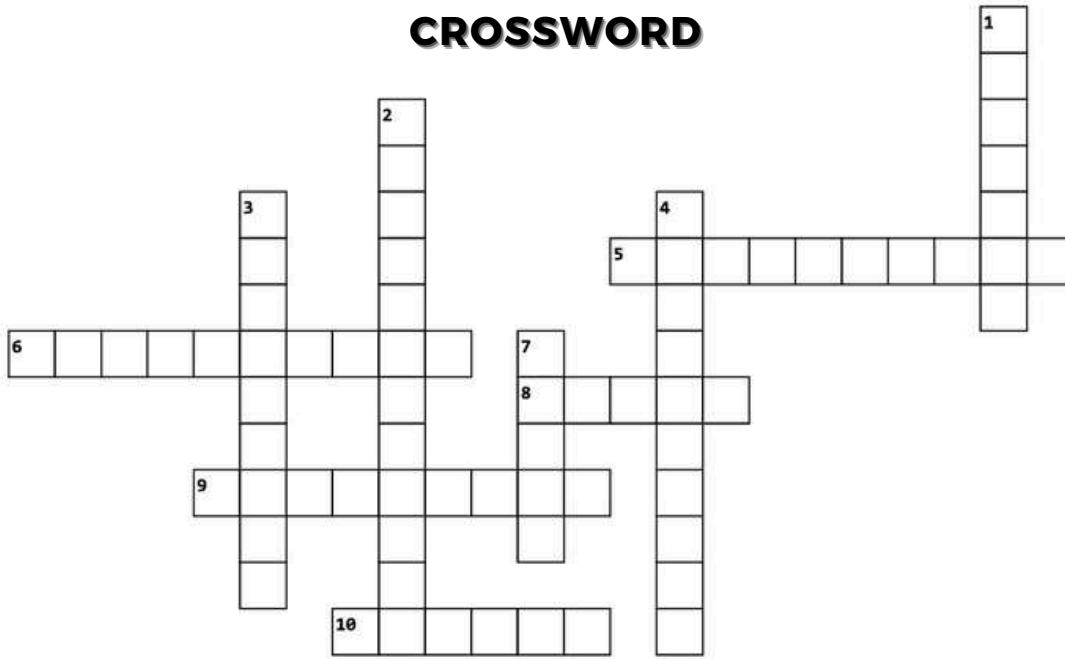
As night fell, an impromptu DJ party continued the fun, with dancing and late-night conversations deepening friendships. The outing concluded with a morning of reflection over breakfast, leaving the team not only refreshed but with strengthened bonds that will enhance future collaboration and teamwork. This memorable day was a true celebration of unity and joy beyond the office.





# TRAIN YOUR BRAIN

## CROSSWORD



**Across**

- 5. Who is the American astronaut holding the record for most consecutive days in space?
- 6. What is the special theory that explains time dilation?
- 8. What is the name of Uranus's moon that might have an underground ocean?
- 9. What is the other name for T Coronae Borealis?
- 10. What is the name of Neptune's largest moon?

**Down**

- 1. What program aims to send humans on long-duration missions to the moon?
- 2. What instrument measures magnetic fields on the lunar surface?
- 3. What type of calendar did the ancient Chinese use that was derived from their astronomical observations?
- 4. What phenomenon involves Earth's slow wobble affecting equinox timing?
- 7. Which country launched the SLIM lunar mission?

## Astronomy Word Puzzle

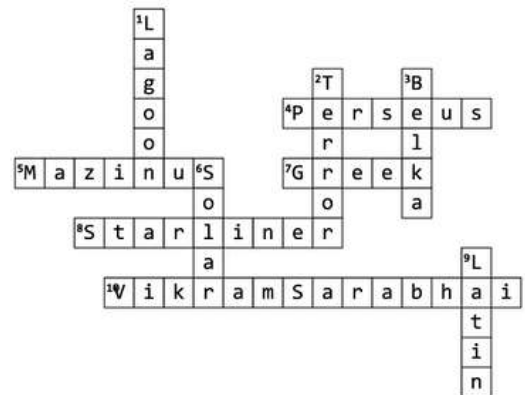
Find the Craters from the mixed letters and mark them.

### Lunar craters

A	N	U	O	T	A	L	P	P	T	N	A	C	G
R	I	K	E	P	L	E	R	G	R	A	A	R	A
C	S	E	N	E	H	T	S	O	T	A	R	E	S
O	Y	T	A	P	H	A	S	A	A	U	T	G	S
P	A	H	E	T	O	L	S	R	I	M	Y	N	E
E	R	E	C	O	S	O	R	I	D	A	C	I	N
R	C	O	L	L	U	A	N	S	L	R	H	D	D
N	H	P	A	E	N	E	O	T	A	C	O	O	I
I	I	H	V	M	E	F	R	A	M	A	U	R	O
C	M	I	I	A	R	H	L	R	I	A	E	H	O
U	E	L	U	E	G	O	Y	C	R	R	F	C	N
S	D	U	S	U	N	Y	I	H	G	N	A	S	H
R	E	S	G	S	A	A	H	U	D	I	H	A	A
A	S	I	A	E	L	S	I	S	F	A	L	S	R

- PLATO
- FRA MAURO
- KEPLER
- LANGRENUS
- TYCHO
- ERATOSTHENES
- GASSENDI
- ARISTARCHUS
- CLAVIUS
- COPERNICUS
- GRIMALDI
- THEOPHILUS
- PTOLEMAEUS
- ARCHIMEDES
- SCHRODINGER

Answers for last month puzzles.



\*\*Answers for this month puzzles will be shared in next magazine.



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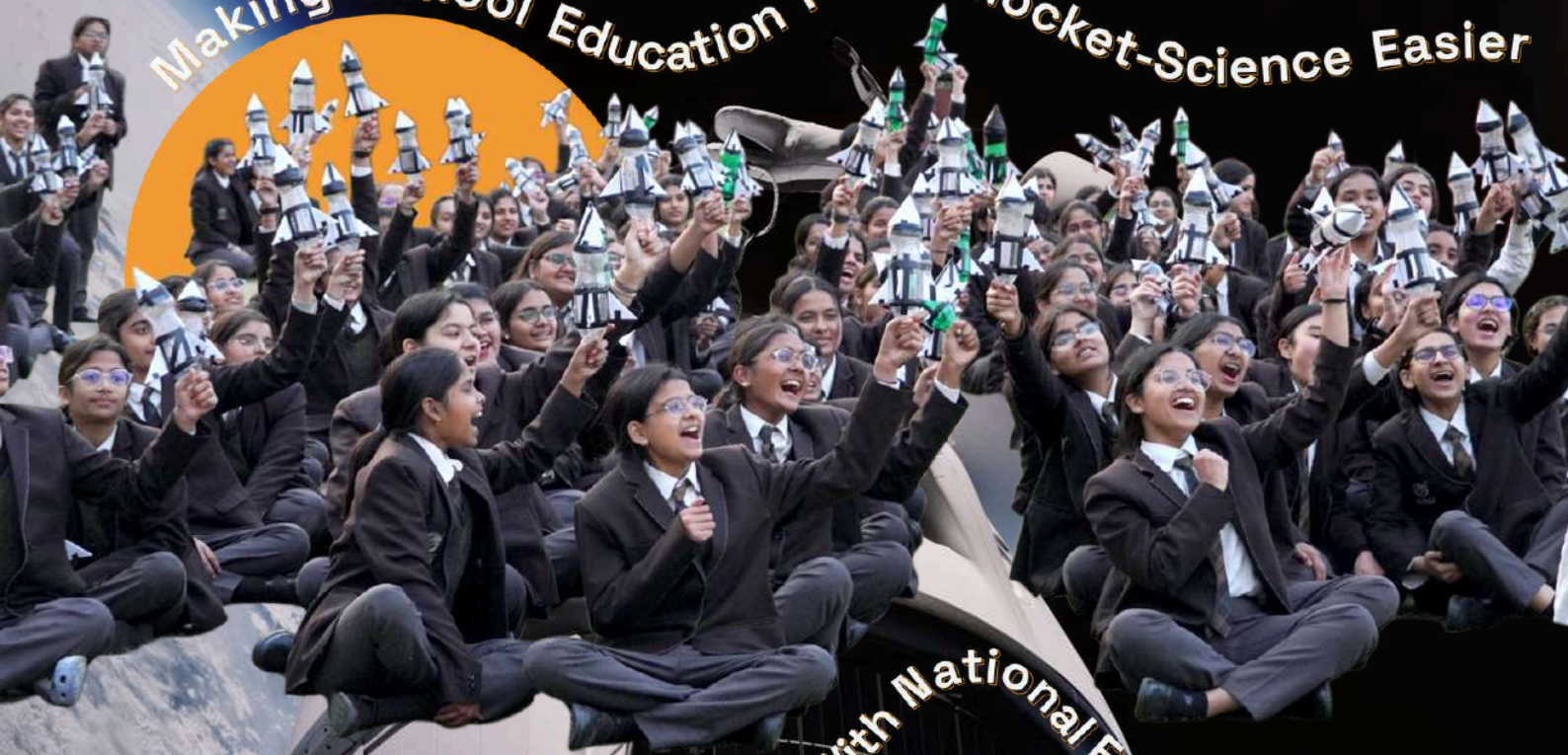




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