SPACE™
EMPOWERING LIFE

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Galactica

Astronomy and Space Science Magazine

What's Inside?

www.space-global.com

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.

Team

Cover Photo: Space India's Khagolshala (Astronomy and SPACE Lab) at Nagpur.
For more details: Khagolshala-astronomy-space-science-lab

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.

Co-founder's Message

Ms. Shalini Bahmba, Co-founder, SPACE

Astronomy education is important as it builds curiosity, critical thinking, and problem-solving skills, helping young minds prepare for the future. It encourages innovation, exploration, and a scientific mindset. Young learners build creativity and confidence through hands-on, experiential learning, preparing them for careers in space science and technology. We aim to cultivate future innovators who will lead progress, discovery, and global advancement.

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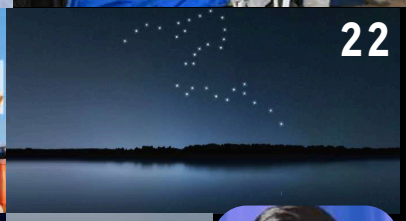

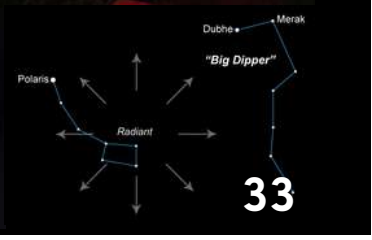

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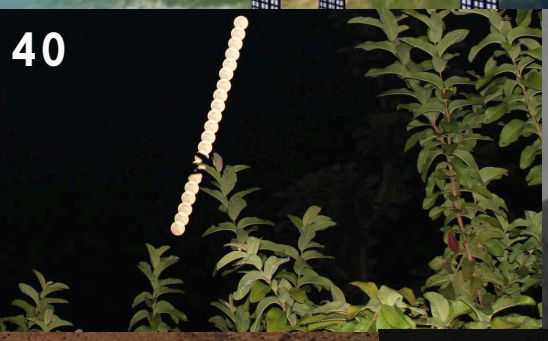
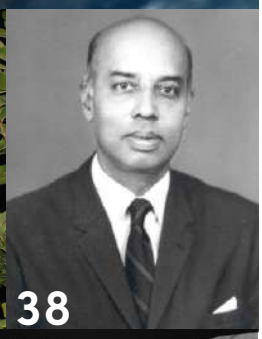
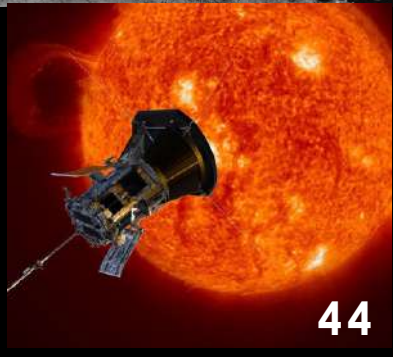






SPACE INSIGHTS

Redefining STEM Learning: SPACE India Opens Maharashtra's First Space Lab

St. Ursula Girls' High School and Junior College, Nagpur, created history with the inauguration of Khagolshala – The Space Lab, established in collaboration with SPACE India. With this landmark achievement, St. Ursula proudly becomes the first school in Maharashtra to host a SPACE India-supported space lab, joining the ranks of Delhi and Chennai where the program has already flourished. The launch marked a transformative moment for the institution and the state, signalling a deep commitment to nurturing scientific temperament among young learners.

The ceremony welcomed distinguished guests, including the chief guest, Most Rev. Dr. Paritosh Canning, Moderator of the Church of North India, accompanied by Bishops, Pastors, and dignitaries. Their presence highlighted the visionary leadership of Manager Mrs. Rachna Singh and Principal Mrs. Sheetal Vishal Peter, who have continuously championed innovative and experiential learning for Ursulites.

As the dignitaries arrived, they were greeted by a vibrant rocket-themed rangoli and a striking Khagolshala poster that immediately set the tone for the event. These artistic elements beautifully captured the excitement and spirit of space exploration. The ceremony commenced with the National Anthem and an invocation, creating a meaningful and respectful atmosphere. This was followed by the unveiling of a commemorative plaque, officially introducing Maharashtra's first school-based space lab. A ribbon-cutting ceremony then marked not just the opening of a room, but the beginning of a transformative chapter in scientific learning at St. Ursula Girls' High School and Junior College.

Inside the newly inaugurated lab, the Chief Guest offered a heartfelt blessing, invoking inspiration, discovery, and the spirit of curiosity for all the students who would soon engage with this unique learning environment. Guests explored the lab with visible enthusiasm, observing meticulously arranged astronomy models, telescopes, celestial globes, sensors, and other scientific instruments–many thoughtfully set up by the students themselves. The presence of four SPACE educators enriched the academic atmosphere, symbolizing the strength of the collaboration and the shared mission to promote astronomy education across India.

A significant moment of the event was the formal introduction of Dr. Sachin Bhamba, Founder of SPACE India. Addressing the gathering, Dr. Bhamba eloquently shared SPACE India's vision of making astronomy and space science accessible to every child in the country. He highlighted the importance of hands-on, inquiry-based learning and explained how Khagolshala aims to empower students with exposure to real scientific tools, experimental methods, and opportunities for research-driven activities. He emphasised that the establishment of this lab in Maharashtra represents a major milestone in expanding the initiative's national footprint and inspiring young minds toward STEM careers.

The program reached an exhilarating high point with a live model rocket demonstration outside the lab. As the rocket soared into the sky, attendees responded with delight, applause, and awe–celebrating both the symbolic and literal launch of a new scientific era at the school.

The inauguration of Khagolshala stands as a moment of immense pride for St. Ursula. More than a physical facility, the space lab represents a gateway to exploration, inviting students to think boldly, question deeply, and embrace the boundless possibilities of space science. It is not just the beginning of an educational journey but the spark that will ignite the imagination of countless young explorers for years to come.

Capital Under the Cosmos: Astro Carnival 2025 Transforms GMR Aerocity

New Delhi witnessed an astronomical spectacle as **Astro Carnival 2025**, organized by **SPACE India in collaboration with GMR Aerocity**, transformed **The Square, Aerocity** into a vibrant hub of celestial excitement on **8th–9th November 2025**. Across two extraordinary days, an estimated **5,000–6,000 visitors**—including families, students, educators, aviation professionals, and international travellers—immersed themselves in a universe of science, imagination, and hands-on discovery.

From the moment the event opened, the atmosphere was electric, buzzing with anticipation and awe. Few moments in public outreach events compare to the thrill of **watching long queues curve around the venue for live telescope viewing**—a testament to how powerful and magnetic real scientific experience can be. For many first-time sky watchers, seeing the **Sun through solar filters, revealing dramatic sunspots**, and later, witnessing **Saturn and its iconic rings** through Meade, Dobsonian, and Celestron telescopes, was nothing short of life-changing. The audible gasps, applause, and emotional reactions from children and adults alike turned this viewing into the undeniable highlight of the carnival.

Around the venue, bursts of excitement echoed from the Air Rocketry zone, where children designed and launched paper rockets that soared high above the crowd. Each launch was followed by cheers, laughter and a sense of shared triumph—STEM learning disguised as joy. The Virtual Reality Space Experience transported visitors aboard the International Space Station in a gripping 3D journey that stayed packed throughout the event, proving how immersive technology fuels curiosity. Meanwhile, the 360° Planetarium Dome created a miniature universe indoors, guiding audiences through constellations and celestial motion in breathtaking detail.

The carnival blended education and wonder with hands-on science activities such as **Comet-Making demonstrations**, allowing children to learn about the structure of real comets, and the **Weigh Yourself on Other Planets** zone, where participants discovered firsthand how gravity differs across celestial bodies—an instant favourite for all age groups.

What made Astro Carnival 2025 remarkable was not just the scale of participation, but the impact: curiosity sparked, scientific thinking strengthened, and the universe brought within reach of everyday people. Even without physical branding, SPACE India's educator-led engagement and authentic scientific experiences spoke loudly enough, reinforcing its leadership in astronomy education and public science outreach.

As the telescopes closed and the sky turned quiet once more, one message remained glowing above Aerocity:

"The universe is not far. All you have to do is look up".

UITS IGNITES CURIOSITY: A SEASON OF ASTRONOMY AND INNOVATION ACROSS ALL SCHOOLS

This season, schools across the country transformed their campuses into hubs of scientific wonder, hands-on exploration and creative experimentation under the UITS program of SPACE. From parachute engineering challenges to immersive astronomy showcases and inspiring guest interactions, students stepped boldly into the world of science, questioning, experimenting, and discovering. Together, these events highlighted the power of experiential learning and the rising passion for space science among young learners.

WHEN DREAMS TAKE FLIGHT: DPS FARIDABAD STUDENTS MEET A SPACE PIONEER

At **SPACE India,** we believe that inspiration is the spark that lights the path to scientific discovery. On **November 17, 2025**, that spark illuminated the auditorium of **Delhi Public School, Faridabad**, as students gathered for a remarkable UITS Guest Interaction titled "**The Journey of a Scientist.**" The session featured **Dr. Arun Bhardwaj, Scientist/Engineer-SG, ISRO** – a distinguished mind behind some of India's most celebrated space achievements.

The atmosphere was filled with anticipation as students from Grades VI to XII prepared to meet someone who has contributed to missions that have shaped India's global identity in space. Opening with the words, "Great minds inspire us, kind hearts guide us, and true leaders light the path of our dreams," the event set a tone of reflection and aspiration.

Dr. Bhardwaj took students on a compelling journey through India's space milestones – Chandrayaan, Mangalyaan, Aditya-L1, and the human-spaceflight mission Gaganyaan. He shared stories of challenges, breakthroughs, and the relentless dedication behind every mission, reminding students that scientific success is built on perseverance and purpose.






The interactive Q&A became the highlight of the session. Students posed thoughtful questions on propulsion, astronaut survival, satellite systems and the search for life beyond Earth. Each response ignited deeper curiosity.
The interaction reaffirmed SPACE India's mission through UITS – to nurture young minds by connecting them with the real heroes of science.

The session concluded with a standing ovation – **a moment that echoed the belief that the sky is not the limit; it is only the beginning.**

KRM Vikaspuri Hosts a Stellar Cosmic Mind Forum in Collaboration with SPACE India

The Cosmic Mind Forum at KRM Vikaspuri was an intellectually enriching event that seamlessly blended scientific heritage, modern innovation, and future-focused aspirations. Organized in collaboration with SPACE India, the forum created a dynamic platform for students to engage deeply with advanced ideas in astronomy, engineering, and space science.

The program began with a meaningful lamp-lighting ceremony, symbolizing the pursuit and spread of knowledge. This was followed by a spirited rendition of Vande Mataram, which set an inspiring and patriotic tone for the day. The presence of the esteemed chief guest, Dr. Sujit Bannerjee, Scientist at the Ministry of Science and Technology, added immense academic value and motivated the students with his expertise and guidance.

The school presented a comprehensive overview of its scientific accomplishments through an impressive showcase of research-driven projects and student-led innovations. The exhibition featured satellite prototypes, Mars rover concepts, sustainable rocket models, observational research posters, and several independent experiments reflecting creativity and technical understanding.

A standout exhibit was the student-built demonstration of Einstein's Space-Time Curvature. Using simple materials, students effectively illustrated how massive celestial bodies distort the fabric of space-time—making one of physics' most complex theories accessible, visual, and engaging for all viewers.

Dr. Bannerjee's keynote session, titled "Indian Space Missions: From Aryabhatta to Aditya L1," offered a sweeping overview of India's remarkable progress in space exploration. His insights on ISRO's milestones and emerging missions inspired students to imagine themselves as future contributors to India's growing space endeavors.

The event concluded with an enthusiastic interactive Q&A, where students raised thoughtful queries about space travel, research opportunities, lunar missions, and the future of human exploration. A warm vote of thanks wrapped up the day, leaving behind a sense of motivation, curiosity, and scientific excitement among all participants.

From Comets to Cosmos: KRM Vaishali and KRM Gurugram Celebrate Astronomy in Style

The Astronomy Showcase at KRM Vaishali and KRM Gurugram unfolded as a vibrant celebration of interdisciplinary learning. Firstly, it was the Innovista Astronomy Showcase at KRM Vaishali offered two dynamic days of scientific learning infused with creativity and fun. Each session brought together students, teachers, and parents to explore the wonders of astronomy using real-world techniques and hands-on demonstrations.

On 8th November, the event began with an engaging Comet Kitchen Demonstration, where students created model comets and explained their structure- nuclei, icy surfaces, dust tails, and the effects of solar radiation. Parents were fascinated by how accurately the students related household materials to actual astronomical phenomena.

The excitement continued with the Light Up the Game, which demonstrated reflection through playful interactions. Children guided parents through challenges that required aligning mirrors, bouncing light, and understanding the behaviour of reflective surfaces. A standout feature across both days was the enchanting Light Painting exhibit. Using DSLR long-exposure settings, students illustrated how light can be manipulated to create artistic patterns. This segment helped families appreciate the intersection of art, technology, and physics in a memorable way.

On **15th November**, the showcase expanded further. The **VR Spacewalk** transported visitors into orbit, offering a close-up look at the ISS and Earth's curvature. Meanwhile, stations such as **Science of Light** and **Cosmic Fireworks** explained reflection, refraction, and the chemistry of meteor colours. Students also presented working models of **reflector and refractor telescopes**, demonstrating how astronomers view distant objects.





Parents were deeply appreciative of the confidence, clarity, and scientific understanding shown by students. The event reinforced how effective interactive learning can be- turning concepts into experiences and curiosity into lasting interest.

Then the Kaleidoscope event in KRM Gurgaon that became the centerpiece of excitement and curiosity. Set under the overarching theme "Elements of Life," the space pavilion allowed families to discover the wonders of astronomy through experiences that blended play, imagination, and scientific insight.

From the moment parents entered, they were greeted by the enthusiasm of young student ambassadors, who confidently guided them through four thoughtfully curated stations. Each station not only demonstrated a scientific concept but transformed it into a memorable, sensory-rich experience.

At the **Comet Kitchen**, families worked with dust, water, and dry ice to create mini comets, mirroring the icy wanderers that journey through the solar system. Children explained the role of sublimation, ice composition, and comet tails with surprising precision. It became an unforgettable moment of hands-on exploration that deepened everyone's appreciation for celestial bodies.

The **Flame Test** station dazzled visitors with its colourful displays of burning elements. As hues shifted from red to green to orange, students explained how this phenomenon is connected to meteor burns in Earth's atmosphere. The scientific connection between chemistry and space ignited awe among parents, who enjoyed the visual spectacle as much as the children.

The most immersive experience awaited at the **Virtual Reality Spacewalk Zone**. Equipped with headsets, visitors found themselves transported beyond Earth, floating around the International Space Station in a stunning 360° environment. Many parents described the experience as "surreal" and "once in a lifetime," especially as they viewed Earth as astronauts do-from orbit.

Adding a joyful twist, the **Ring the Planet** game encouraged players to toss hula hoops around colourful planet models. Between laughter and friendly competition, parents learned about planetary rings, orbital motion, and the physical attributes of different planets.

Throughout the event, student presenters demonstrated confidence, clarity, and genuine enthusiasm. Their ability to simplify complex scientific concepts showcased how effectively experiential learning has taken root at the school.

These Astronomy Showcase events not only sparked curiosity but also strengthened the connection between students, parents, and the exciting world of space science.

Adhyan Utsav 2.0: A Cosmic Celebration of India's Astronomical Heritage at DPS Greater Faridabad

Adhyan Utsav 2.0 at Delhi Public School, Greater Faridabad emerged as a spectacular and immersive festival that celebrated India's astronomical heritage while showcasing the nation's modern achievements in space science. With over 30 enthusiastic student volunteers managing stations, performances, and interactive zones, the event offered visitors a full-day journey through centuries of Indian astronomical understanding and innovation.

The Ancient Astronomy Corner became a major favourite, featuring working models of sundials, gnomons, star charts, and Nakshatra wheels. Students narrated stories of legendary astronomers–Aryabhatta, Bhaskara and Sawai Raja Jai Singh–while a live portrayal of Jai Singh added dramatic charm and brought history to life. Characters representing astrologers and early sky-watchers helped connect traditional celestial observations to the scientific evolution that shaped Indian astronomy.

The Modern India in Space pavilion highlighted missions such as Aditya-L1, Chandrayaan, Mangalyaan, solar research advancements, and India's long-term lunar and Martian exploration plans. The "Future of India in Space" exhibit further sparked curiosity with futuristic models, concept designs, and projections, impressively presented by student leader Shubhanshu Shukla.

The Hands-On Activity Zone buzzed with excitement throughout the day. Families compared their weights on different planets, constructed comets and craters, navigated moon rovers across rugged lunar terrain, and explored India's future spaceflight dreams at the lively Be a Gaganyatri station.

The Rocketry Pavilion showcased acrylic, hydro, air, and stomp rockets–each launched amid cheers as students explained thrust, pressure, and aerodynamics. The Vortex Cannon continued to draw large crowds with its hypnotic smoke rings shooting across the room.

One of the biggest attractions was the VR Spacewalk Zone. With VR headsets on, visitors floated inside the ISS, observed Earth's curvature, and toured spacecraft interiors–creating unforgettable, immersive memories for students and parents alike.

Live musical performances, friendly alien and astronaut mascots, and the vibrant energy of the student volunteers added a celebratory rhythm to the scientific environment.

Adhyan Utsav 2.0 successfully transformed the school into a mini-universe–bridging ancient wisdom with modern innovation, inspiring curiosity, and strengthening students' connection to India's rich and evolving scientific journey.

SPACE India & Casagrand International School Unite for a Heartwarming Community Engagement Programme

Casagrand International School's Thiruvanmiyur and Kelambakkam campuses hosted a unique and heartwarming Community Engagement Programme on 28th November 2025, in collaboration with SPACE India.

The initiative stood out not only for its scientific value but also for its profound social impact, as students stepped into the role of educators to share their knowledge with the school's housekeeping staff. With 28 enthusiastic student volunteers leading the experience across both campuses, the event beautifully demonstrated how science can become a bridge for inclusivity, respect, and shared learning.

The programme featured six thoughtfully designed, student-led activity stations that blended space science with hands-on exploration. At the Stomp Rocket station, participants launched paper rockets powered by air pressure, experiencing the excitement of basic propulsion. The Fun with DSLR zone introduced the fundamentals of astrophotography, where students explained exposure, framing, and techniques used in capturing celestial objects.

Safe Solar Observation became a highlight, as attendees observed the Sun through certified solar filters, learning about sunspots and solar activity while ensuring absolute safety. The Astronaut - Can You Be One? station sparked curiosity about life in space, astronaut training, physical fitness, and the skills essential for space missions.

Another engaging highlight was the types of telescopes zone, where participants explored how refractor and reflector telescopes work and learned how astronomers use them to observe distant celestial objects. The Science of Light station added depth with interactive demonstrations of reflection, refraction, and dispersion, helping participants understand fundamental optical principles. The programme concluded with Lift Off!!, a fun yet educational rocket simulation that blended teamwork, imagination, and the basics of propulsion.

What made the event truly special was the heartfelt role reversal–students confidently stepped into the role of teachers, while the housekeeping staff participated with genuine curiosity. This exchange fostered empathy, strengthened communication, and showed that learning is a shared journey. The Community Engagement Programme beautifully combined scientific curiosity with social connection, creating an experience rooted in collaboration, respect and a shared love for space.

BBPS Partners with SPACE to Deliver an Unforgettable Dual Challenge in Rocketry and Descent Engineering

Bal Bharati Public School in collaboration with SPACE organized the **Rocketry Quest Challenge 2025** in inspired excitement and innovation as students designed, built, and launched their own hydro rockets. The school grounds transformed into a lively launch zone where teams from Vivekananda, Gurunanak, Dayanand, and Kabir Houses competed with energy and creativity.

Participants spent considerable time refining their designs-experimenting with bottle shapes, fin sizes, nose-cone structures, and water-to-air ratios to optimise thrust. The process blended physics, artistry, and teamwork, illustrating how engineering emerges through repeated testing and iteration.

During the launch phase, the energy was electric. Rockets soared across the field, leaving trails of mist behind as students celebrated successful flights and learned from misfires. Judges assessed each team on creativity, structural design, stability in flight, and the distance achieved.

In a closely contested competition, **Dayanand House** emerged victorious, demonstrating outstanding engineering sense and teamwork.

The event reinforced vital STEM skills-problem-solving, collaboration, and real-world application of physics. For many students, seeing their rockets take flight became a powerful reminder that science can be both educational and exhilarating.

Descent Dynamics 2025 in Bal Bharati Public School and SPACE turned students into inventive aerospace designers as they created parachutes capable of delivering payloads safely to the ground. The challenge required participants to apply principles of drag, material strength, canopy size, and deployment mechanisms.

Over several days, students experimented with materials like plastic sheets, cloth, strings, and lightweight supports, tweaking designs during practice trials. A prior training session equipped them with knowledge about airflow, drag force, vortex shedding, and the physics behind a stable descent.

On competition day, anticipation ran high as parachutes were launched from a fixed height. Spectators watched with excitement as parachutes deployed-some floating gracefully, others spinning dramatically or drifting due to wind. It was a live demonstration of experimentation in action.

After multiple rounds, Kabir House secured first place with a design that balanced aesthetics, durability, and impressive hang-time.

The event was more than a contest; it taught students the essence of engineering-testing, refining, failing, and trying again. It deepened respect for the science behind real-world technologies such as landers, drones, and rescue equipment.

A Universe of Ideas: Young Minds Blend Astronomy and Robotics at St. Martin 2025

St. Martin Diocesan School, Delhi Cantt., hosted an inspiring Science Exhibition on 10th November 2025, bringing together a remarkable display of student-led innovations in astronomy and robotics. The event reflected the school's strong emphasis on experiential learning and showcased how young learners are embracing the future of science and technology.

The astronomy section featured two standout projects that demonstrated both creativity and technical understanding. Students presented a functional telescope model that illustrated the principles of light gathering and magnification, helping visitors understand how astronomers observe distant celestial bodies. Alongside it, a custom-built photography box allowed students to capture steady, clear images of celestial objects, highlighting their grasp of optical design, exposure control, and the essentials of observational astronomy.

The robotics section added an exciting technological dimension to the exhibition. One of the most engaging projects was Air Painting using MediaPipe in Python, where students created a gesture-controlled virtual canvas. Through computer vision tracking of hand landmarks, participants could draw in the air without any physical tools, offering a glimpse into the possibilities of intuitive, touchless interfaces. Another impressive project was the IoT-enabled Rover, equipped with a temperature sensor and an MQ3 gas sensor. Designed to collect and wirelessly transmit real-time environmental data, the rover demonstrated practical applications in climate studies, safety inspections, and monitoring hazardous areas.

Together, these projects showcased the students' ability to integrate software, electronics, engineering, and scientific concepts with confidence and creativity. The exhibition served as a vibrant platform for young innovators, celebrating their curiosity and encouraging them to continue exploring the limitless world of science and technology.



A SHARED VISION FOR THE FUTURE OF LEARNING

Across all these events under the UITS program, a common theme shines brightly - **When students are invited to explore, experiment and lead, learning becomes a powerful journey rather than a task.**

Whether building parachutes, crafting comets, engaging with scientists, or stepping into space through VR, students embraced the joy of discovery. These initiatives highlight how schools are cultivating a new generation of thinkers- curious, confident, and ready to push boundaries.

Together, these experiences show how schools are shaping a new generation of thinkers–curious, capable, and unafraid to push boundaries. As these young explorers look to the skies with wonder, one message stands clear: the future of science is in imaginative and promising hands.

HIGHLIGHTS OF NOVEMBER 2025

WHAT'S HAPPENING ON THE ISS WHILE THE GOVERNMENT IS SHUT DOWN?

When government offices on Earth grind to a halt, many people wonder what happens to operations in space especially on the International Space Station (ISS), one of humanity's most complex and cooperative scientific ventures. Surprisingly, even during a government shutdown, life aboard the ISS doesn't skip a beat. Orbiting Earth at 28,000 km/h, the station is designed to operate continuously, and the crew's safety remains the world's top priority.

During a shutdown, U.S. government agencies reduce or freeze activities that are considered "non-essential." However, the ISS does not fall into this category. NASA designates ISS operations, mission control activities, and astronaut safety as essential services. This means that highly trained flight controllers, engineers, and medical teams still report to duty at NASA's Johnson Space Center in Houston. While some administrative staff stay home, mission-critical personnel continue supporting the astronauts 24/7, ensuring that the station's systems, communications, and scientific operations remain stable.

Onboard, astronauts experience almost no change to their daily routine. They still wake up to a carefully planned schedule that includes scientific experiments, technology demonstrations, spacecraft maintenance, physical workouts, and Earth-observation tasks. Many ongoing experiments such as protein crystal studies for new medicines, flame behavior in microgravity, plant growth for future space farming, and fluid dynamics continue without interruption. Since the ISS is an international partnership that includes space agencies from Europe, Japan, Canada, and Russia, many of these experiments are supported by teams worldwide, further protecting them from disruptions caused by a shutdown in one country.

That said, the ripple effects are still felt on Earth. Some research teams who normally analyze ISS experiment data may be on pause. Public outreach, educational live calls, and some upcoming mission planning may slow down due to staff unavailability. Resupply launches, controlled by NASA and private companies, are reviewed carefully only those deemed essential for crew survival, station maintenance, or urgent science are guaranteed to proceed. Minor scheduling adjustments can occur, but the continuity of the ISS is never compromised.

From the astronauts' perspective, the shutdown is a distant issue. Their environment demands constant vigilance and teamwork, and the international partners work together to ensure nothing disrupts the station's rhythm. Even when political debates unfold far below, the ISS remains a symbol of unity where nations collaborate seamlessly to push the boundaries of science and exploration.

In the end, the message is clear: space doesn't shut down. While budget negotiations continue on Earth, the ISS keeps orbiting, reminding us that innovation and global cooperation can rise above the pauses in political life.

STRANDED IN ORBIT: THE CHINESE ASTRONAUTS' ORDEAL AND SAFE RETURN

IIn a striking reminder of the escalating threat posed by orbital debris, three Chinese taikonauts aboard the Tiangong space station were forced to delay their journey home after their Shenzhou-20 return capsule was compromised by a tiny–but dangerous–piece of space junk.

A Microscopic Impact With Major Consequences

Commander Jing Haipeng and taikonauts Zhu Yangzhu and Gui Haichao had been on their mission since April 25, 2025. Just before their scheduled return on November 5, CMSA detected sub-millimeter "micro-cracks" in a capsule window–likely caused by an untracked micrometeoroid or fragment of orbital debris traveling at extreme speed. The capsule was deemed unsafe for re-entry.

A Lifeboat Solution

Fortunately, the newly arrived Shenzhou-21 spacecraft provided a backup return vehicle. In a quick-response plan, the Shenzhou-20 crew used this capsule as a lifeboat, undocking and landing safely in the Gobi Desert on November 14–nine days later than planned. All crew members were in excellent condition.

Restoring Redundancy

To ensure the station remained equipped with an emergency escape craft, China launched the uncrewed Shenzhou-22 on November 25, restoring full safety coverage for the Shenzhou-21 crew.

A Growing Warning

The article highlights a sobering truth: even millimeter-sized debris can disrupt human spaceflight. As Earth's orbital environment becomes increasingly crowded, the need for vigilance and global debris mitigation grows more urgent than ever.

Photo released by Xinhua News Agency, Wang Jie, a Shenzhou-20 astronaut, returns on the Shenzhou-21 spaceship's return capsule after it touched down on Earth at the Dongfeng landing site in north China's Inner Mongolia Autonomous Region, Friday, Nov. 14, 2025.

SOLAR FIREWORKS LIGHT UP EARTH AS POWERFUL NOVEMBER STORM HITS

The Sun delivered a dramatic burst of activity in mid-November 2025, showcasing the intensity of the current solar maximum. On 11 November, an X-class solar flare erupted from NOAA Active Region 14274, peaking at 10:04 UTC. Less than an hour later, a fast moving coronal mass ejection (CME) initially clocked at 1500 km/s was launched toward Earth. The CME struck our planet by 18:50 UTC on 12 November, sparking a strong six-hour geomagnetic storm.

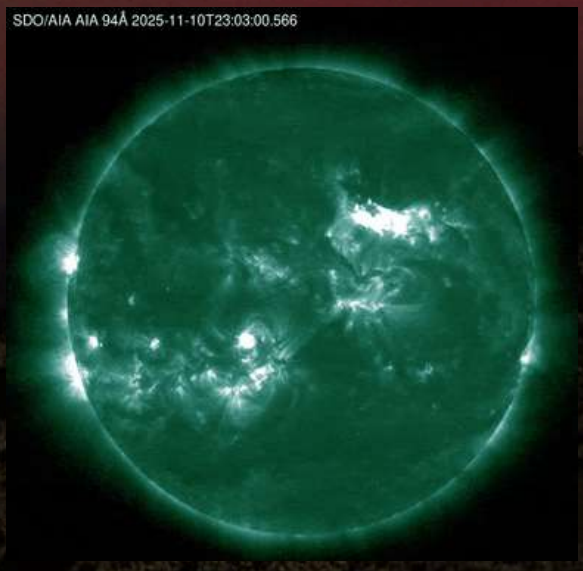
The flare triggered a major radio blackout across Europe, Africa and Asia, lasting from 30 minutes to nearly an hour. A rare Ground Level Enhancement (GLE) only the 77th recorded since the 1940s was also detected as high-energy particles penetrated Earth's magnetic shield, posing risks to astronauts and spacecraft electronics. Despite the intensity, critical infrastructure on Earth remained unaffected.

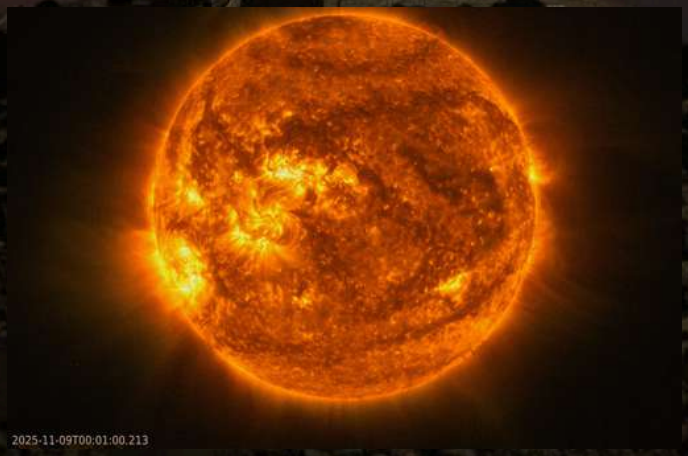
ESA spacecraft provided vital real-time observations. SMOS detected a large solar radio burst 14 hours before the storm, while Swarm satellites recorded magnetic fluctuations ten times higher than normal and observed faint "proton auroras" at lower than usual latitudes. Beyond Earth's protective magnetosphere, missions such as SOHO, Solar Orbiter, and BepiColombo measured the event in detail. BepiColombo reported several transient memory errors but recovered quickly due to its robust systems.

Aurora near Mallorca, Spain, November 2025. Image Crdits: ESA,

The November events highlighted the ongoing challenge of protecting astronauts and satellites from intense space radiation. ESA continues to enhance shielding technologies and apply ALARA principles delaying spacewalks or moving astronauts to safer areas during severe storms.

Looking ahead, ESA's Vigil mission, launching in 2031 to the Sun-Earth L5 point, will provide earlier warnings of solar eruptions. Another proposed mission, SHIELD, could extend warning time to over two hours, significantly improving global preparedness for future solar storms.





Observation of the Sun in extreme ultraviolet by the Solar Dynamics Observatory's AIA instrument on 11 November 2025 provided by the Royal Observatory of Belgium / SIDC.

GAGANYAAN MILESTONE: ISRO SUCCESSFULLY CONDUCTS CRUCIAL PARACHUTE AIRDROP TEST

India's Gaganyaan programme achieved another major step toward human spaceflight with the successful Integrated Main Parachute Airdrop Test (IMAT) conducted on 3 November 2025 at the Babina Field Firing Range in Jhansi, Uttar Pradesh. The test validated a crucial component of the recovery system that will ensure astronauts return safely to Earth.

Simulating a Tough Descent: For the trial, ISRO and DRDO dropped a full-scale crew module mock-up—matching the real capsule's size, shape, and mass—from an Indian Air Force IL-76 aircraft. This recreated the intense forces the capsule would face during atmospheric descent.
The specific purpose of this IMAT was to test an extreme, off-nominal scenario: what happens if one of the main parachutes deploys later than expected?

Redundancy Put to the Test: Developed by DRDO's Aerial Delivery Research and Development Establishment (ADRDE), the parachute system uses pilot chutes, drogue chutes, and three main parachutes to slow and stabilise the crew module. During the test, engineers intentionally delayed one main parachute to assess whether the system could still perform safely with only two.
The results were highly successful. The drogue parachutes stabilised the module immediately, and the two main parachutes inflated properly and reduced the descent to safe landing speed—proving that the system can withstand asymmetrical deployment conditions.

Strengthening India's Human Spaceflight Readiness: IMAT is part of a comprehensive series of tests leading up to Gaganyaan's uncrewed missions. It follows earlier drop tests, wind tunnel studies, and successful Crew Escape System demonstrations in 2023 and 2024.
Gaganyaan aims to send Indian astronauts into low Earth orbit for a three-day mission, positioning India as the fourth nation with independent human spaceflight capability.

With each validated test, the programme moves closer to its historic goal—showcasing India's growing engineering expertise and its long-term ambition to establish a human presence in space.

IS THIS THE FIRST DIRECT EVIDENCE OF DARK MATTER?

In November 2025, the scientific world was shaken by a discovery that could bring humanity closer than ever to solving one of the universe's most enduring mysteries: the true nature of dark matter. A team led by Professor Tomonori Totani of the University of Tokyo reported the detection of a curious gamma-ray signal from the center of the Milky Way one that matches precisely what theorists have long predicted dark matter should produce. Though not yet confirmed, the finding has reignited optimism in a field that has faced decades of false starts.

Using data from NASA's Fermi Gamma-ray Space Telescope, researchers identified a faint, halo-shaped glow surrounding the galactic core. What makes this glow extraordinary is not merely its location an area believed to contain the densest concentration of dark matter in our galaxy but its energy. The gamma rays measure around 20 gigaelectronvolts (GeV), exactly the level expected if WIMPs, or Weakly Interacting Massive Particles, collided and annihilated each other. WIMPs have long been considered one of the strongest theoretical candidates for dark matter, but until now, direct evidence has remained elusive.

The spatial distribution of the signal also aligns remarkably well with models of dark-matter annihilation. For scientists, this is a rare and promising coincidence. If the interpretation holds, then for the first time, humanity may be observing more than just the gravitational fingerprints of dark matter we may be witnessing its particle interactions directly. Such a discovery would mark a transformative moment in modern astrophysics, confirming the existence of a substance that makes up roughly 85% of the universe's mass.

Yet, as with all potentially groundbreaking scientific claims, caution prevails. The astronomy community remembers previous moments of excitement signals that later turned out to originate from conventional astrophysical processes such as millisecond pulsars. Other possibilities, including atomic transitions or even subtle instrumental errors, still need to be ruled out. The phrase "extraordinary claims require extraordinary evidence" applies more than ever.

The next steps involve independent verification using Fermi data, observations of other cosmic regions, and future experiments. Instruments like the upcoming Cherenkov Telescope Array Observatory, expected to begin delivering data by 2027, may provide the crucial confirmation scientists seek.

For now, the discovery stands as one of the strongest hints yet that we may finally be closing in on dark matter. The universe, it seems, is beginning to give up one of its deepest secrets.

WHAT'S UP IN THE SKY - DECEMBER 2025

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.

PLANETS VISIBILITY

Mercury
Best morning appearance of the year in the first half of December, visible low to the east-southeast just before sunrise.

Venus
Currently positioned behind the sun (superior conjunction) and will not be visible until February 2026.

Mars
Lost in the sun's glare and will remain hidden until early spring 2026.

Jupiter
The undisputed star of the December night sky, appearing very bright and dominating the eastern sky as the evening progresses.

Saturn
A yellowish planet, visible high up in the western sky in the early evening.

Uranus
Well-placed in the constellation Taurus near the Pleiades star cluster, and is visible for most of the night.

Neptune
It is located in the constellation Pisces and is best viewed in the early evening, following Saturn across the sky

BRIGHT DEEP SKY OBJECTS

Messier 29 (M29) is an open star cluster in Cygnus with a magnitude of around 7.1, visible through binoculars or a small telescope. Formed about 10 million years ago, it contains several hot, young blue stars and lies within the rich star fields of the Milky Way, making it a beautiful deep-sky target.

The Lagoon Nebula (M8) glows at magnitude 6, making it one of the brightest nebulae visible even with binoculars. Located in Sagittarius, it is a vast stellar nursery where new stars are actively forming. Its famous Hourglass Region showcases intense star-birth activity, making M8 a favourite target for astrophotographers.

Messier 27 (Dumbbell Nebula) shines at magnitude 7.4 and lies in the constellation Vulpecula. About 1,360 light-years away, it is one of the brightest and easiest planetary nebulae to observe. Formed from a dying Sun-like star, M27 was the first planetary nebula ever discovered by by Charles Messier in 1764.

The Andromeda Galaxy (M31) shines at magnitude 3.4, making it the brightest and closest major galaxy visible to the naked eye. Located about 2.5 million light-years away, it is home to trillions of stars and is on a slow collision course with the Milky Way. Discovered long before telescopes, it was once called the "Great Andromeda Nebula.

EYES IN SPACE -NOVEMBER 2025

NASA's Solar-System-Wide Campaign to Track Interstellar Comet 3I/ATLAS

Comet 3I/ATLAS

NASA is conducting a historic observing campaign to track comet 3I/ATLAS, only the third confirmed interstellar visitor to enter our solar system. Since its discovery on July 1, twelve NASA missions have gathered images, offering rare insight into how objects from other star systems differ from local comets.

The closest observations came from Mars, where the Mars Reconnaissance Orbiter captured detailed images, MAVEN recorded ultraviolet data, and Perseverance spotted a faint glimpse from the surface.

NASA's heliophysics missions—including STEREO, SOHO (Oct. 15–26), and the new PUNCH mission—tracked the comet as it passed behind the Sun, a time when Earth-based telescopes could not observe it.

Deep-space missions Psyche and Lucy also photographed the comet in September, helping refine its path.

3I/ATLAS will make its closest approach to Earth on Dec. 19, and NASA spacecraft will continue monitoring it as it heads toward Jupiter in 2026.

Webb's MIRI Reveals Stunning Detail in Sgr B2

Sagittarius B2 (Sgr B2) Molecular Cloud

The Mid-Infrared Instrument (MIRI) on NASA's James Webb Space Telescope captured glowing cosmic dust heated by very young massive stars in unprecedented detail in this image of the Sagittarius B2 (Sgr B2) molecular cloud released on Sept. 24, 2025.

Sgr B2 is the most massive, and active star-forming region in our galaxy, located only a few hundred light years from our central supermassive black hole. While Sgr B2 has only 10% of the galactic center's gas, it produces 50% of its stars. Astronomers want to figure out why it is so much more active than the rest of the galactic center.

MIRI has both a camera and a spectrograph that sees light in the mid-infrared region of the electromagnetic spectrum. MIRI's view reveals colorful stars punctuated occasionally by bright clouds of gas and dust. Further research into these stars will reveal details of their masses and ages, which will help astronomers better understand the process of star formation in this dense, active galactic center region.

Webb Reveals Four Serpentine Dust Shells Around Apep

Four coiled shells of dust around a pair of Wolf-Rayet stars known as Apep

NASA's James Webb Space Telescope has captured the first clear mid-infrared image of Apep, revealing four expanding spirals of dust—far more than the single shell previously detected. These structures, released over 700 years, were created by two aging Wolf-Rayet stars, whose powerful winds form dust whenever they pass close during their 190-year orbit.

Webb also confirmed a third star in the system, a massive supergiant that slices "V-shaped" gaps into each dust shell. By combining Webb's image with years of VLT data, scientists refined the stars' motions and uncovered Apep's unusually long orbital period.

The dust, made mostly of amorphous carbon, glows faintly in mid-infrared light—detectable only by Webb's sensitive MIRI instrument. Apep remains the only known system in the Milky Way with two such Wolf-Rayet stars, each destined to end in a spectacular supernova or even a gamma-ray burst.

JWST May Have Spotted the Universe's First Stars using Cosmic Lens

Galaxy LAP1-B

Astronomers may have found the universe's first stars, thanks to the James Webb Space Telescope and a powerful cosmic magnifier. JWST observed galaxy LAP1-B, whose light has traveled 13 billion years, revealing stars that may belong to the elusive Population III the first generation born after the Big Bang. Detecting them required both JWST's extraordinary sensitivity and a 100× boost from gravitational lensing, caused by the massive galaxy cluster MACS J0416 bending and amplifying LAP1-B's light. If confirmed, these ancient stars offer a rare glimpse into the universe's earliest era and the first steps of galaxy formation.

Tour de Universe

Eridanus: The Celestial River of Myth, Mystery and Cosmic Depths

Among the great constellations that wind across the southern sky, Eridanus - the River, stands out as both ancient in legend and rich in astronomical wonders. Stretching over 1138 square degrees, it is the sixth largest constellation and one of the most serpentine, flowing from the feet of Orion all the way deep into the southern celestial hemisphere. Visible to observers between +32° and -90° latitude, Eridanus offers a magnificent view especially to southern-sky watchers, who can trace its long stellar current down to its brilliant final star, Achernar.

Eridanus has been part of the sky since antiquity, but its identity has shifted across cultures. To the ancient Greeks, the constellation was closely tied to the dramatic tale of Phaëton, the tragic son of the Sun god Helios. According to myth, Phaëton begged his father to let him drive the Sun's fiery chariot across the sky for a single day. Though warned of the danger, he persisted, and Helios reluctantly agreed. Unable to control the divine horses, Phaëton veered too close to Earth, scorching lands and drying seas. To prevent catastrophe, Zeus struck him down with a thunderbolt. Phaëton plunged into a great river–forever remembered in the stars as Eridanus.

For the Greeks, Eridanus was sometimes identified with the Nile, the only major river they knew that flowed from south to north. The poet Eratosthenes supported this interpretation, as did the Roman writer Hyginus, who even linked the star Canopus (now part of Carina) to the river's distant mouth. Later authors associated the constellation with the Po River of Italy, while a different theory suggests its origin may lie even deeper in time: from the Babylonian Star of Eridu, a celestial symbol of the sacred city of Eridu and its water-god Enki-Ea, ruler of the cosmic freshwater abyss. Thus, Eridanus has long carried the symbolism of water, creation, destruction, and celestial flow.

Witch Head Nebula

NGC 1300

NGC-1531-and-NGC-1532

NGC 1232

In the sky, Eridanus belongs to the Heavenly Waters family of constellations, joining puppis, Vela, Columba and others that evoke oceans and rivers. Though vast, it contains no Messier objects, yet it is remarkably rich in stars–19 of them carry official IAU names, including Cursa, Zaurak, Acamar, Rana, Ran, Beid, and Keid. Its brightest star, Achernar, shines between magnitude 0.40 and 0.46 and is one of the hottest blue stars visible to the naked eye. Achernar is also extraordinarily distorted due to its rapid rotation, bulging at the equator by more than 56% compared to its polar diameter.

Eridanus is also home to several notable nearby stars. Epsilon Eridani, only 10.5 light-years away, hosts at least one Jupiter-like exoplanet and two asteroid belts, making it a favourite target for SETI studies and science fiction authors alike. The star Keid (40 Eridani) contains the first white dwarf ever discovered and plays host to cultural icons–it is famously the fictional sun of Mr. Spock's home planet, Vulcan, in Star Trek.

Beyond stars, Eridanus hides some of the most intriguing deep-space structures known. These include the eerie Witch Head Nebula (IC 2118), a pale blue reflection nebula lit by nearby Rigel. The constellation also contains the Eridanus Group of galaxies, a sprawling collection of about 200 galaxies dominated by spirals. Among its most beautiful members are NGC 1300, a grand barred spiral with a "spiral-within-a-spiral" core, and NGC 1232, a vast star-forming galaxy with a distorted companion.

Yet the most mysterious feature of all is the Eridanus Supervoid, also known as the CMB Cold Spot. At nearly one billion light years across, it is one of the largest known structures–or absences–in the universe. Its origin remains uncertain, provoking ideas ranging from unusual quantum fluctuations to the possibility of a cosmic imprint from a parallel universe.

From mythic river to astronomical enigma, Eridanus remains a constellation overflowing with stories ancient, scientific, and cosmic. Let its long, meandering path invite every stargazer to trace the flow of history and mystery written across the southern sky.

Rocket launches in December 2025

Michibiki 5 (QZS-5)


H3-22S Rocket
(Credit: Mitsuru Obe)

Japan's H3 (Flight H3-22S) will deploy Michibiki 5 (QZS-5), the newest addition to the Quasi Zenith Satellite System. The satellite will enhance GPS interoperability and provide high elevation navigation signals, improving positioning accuracy and reliability in urban canyons, mountainous terrain, and across Japan and the Asia Oceania region.


Proton M Rocket
(Credit: Flickr)

Elektro-L No.5

2025, Khrunichev's Proton-M/DM-03 will deploy Russia's Elektro-L No.5 from Baikonur. The satellite will provide continuous geostationary weather monitoring with multispectral visible and infrared imaging. Joining the existing constellation, it will enhance real time forecasting, storm tracking, climate observation, space weather monitoring, and support the COSPAS-SARSAT emergency alert system.

Leidos-3


HASTE Rocket
(Credit: Rocket Lab)

Rocket Lab will fly the Leidos-3 mission from its Launch Complex 2 at Wallops Island, Virginia, USA.This campaign part of the broader MACH-TB (Multi-Service Advanced Capability Hypersonic Test Bed) programme will use Rocket Lab's sub orbital HASTE/Electron derived launcher to support hypersonic payload testing and technology maturation for defense applications under contract to Leidos.The Leidos-3 flight underscores the growing role of commercial launch providers in enabling rapid, cost effective access to space for military and government test programmes.


Electron Rocket
(Credit: Murielle Baker)

6x HawkEye 360

Rocket Lab's 6x HawkEye 360 mission will lift off aboard an Electron rocket from Wallops Island, Virginia, USA. The flight will deploy six small satellites (part of HawkEye 360's RF-geolocation constellation) into low Earth orbit. These satellites are designed to detect, geolocate, and map radio frequency signals worldwide, enabling global monitoring of communications, maritime and air traffic, and other RF activity for civil and security intelligence application. HawkEye 360 will improve global signal intelligence furthering its role in real time RF monitoring,

BlueBird Block 2 #1

ISRO's LVM-3 will deploy BlueBird Block 2 #1 from the Satish Dhawan Space Centre. The satellite, built by AST SpaceMobile, features an advanced large aperture array to deliver direct to mobile broadband from orbit. It will enhance global connectivity by supporting high speed data, voice, and messaging services directly to standard smartphones.


LVM 3 Rocket
(Credit: ISRO)


PSLV Rocket
(Credit: ISRO)

EOS-N1 and others

ISRO's PSLV-C62 will deploy EOS-N1 from the Satish Dhawan Space Centre. While mission details remain undisclosed, EOS-N1 is expected to strengthen India's Earth observation capabilities for environmental and resource monitoring. The launch also includes rideshare payloads, highlighting ISRO's growing support for small satellite missions and expanding commercial and scientific applications.

H3-30 Test Flight

Japan's Mitsubishi Heavy Industries H3-30 will lift off from the Tanegashima Space Center. The test flight will carry a Vehicle Evaluation Payload (VEP-5) along with several small rideshare satellites, including PETREL, STARS-X, BRO-19, VERTECS, and HORN-L/R. H3-30 is a liquid engine only configuration of the H3 rocket, designed to simplify operations and reduce launch costs. The mission will validate the rocket's performance, demonstrating reliability, operational flexibility, and readiness for future commercial and government payloads.


H3 Rocket
(Credit: Asahi Shimbun)


Soyuz 2.1a Rocket
(Credit: Reuters)

Obzor-R No.1

ROSCOSMOS will deploy Obzor-R No.1 aboard a Soyuz 2.1a rocket from the Plesetsk Cosmodrome, Russia. The satellite will provide all weather, day and night Earth observation using its X-band synthetic aperture radar (SAR). Obzor-R No.1 will join Russia's radar imaging constellation to support high resolution surface monitoring, disaster response, environmental surveillance, and land use mapping. The mission strengthens Russia's remote sensing capabilities and ensures long term continuity in geospatial and strategic Earth observation from space.

****Note: Launch dates of the missions are scheduled to be launched in December 2025, but may be subject to change.**

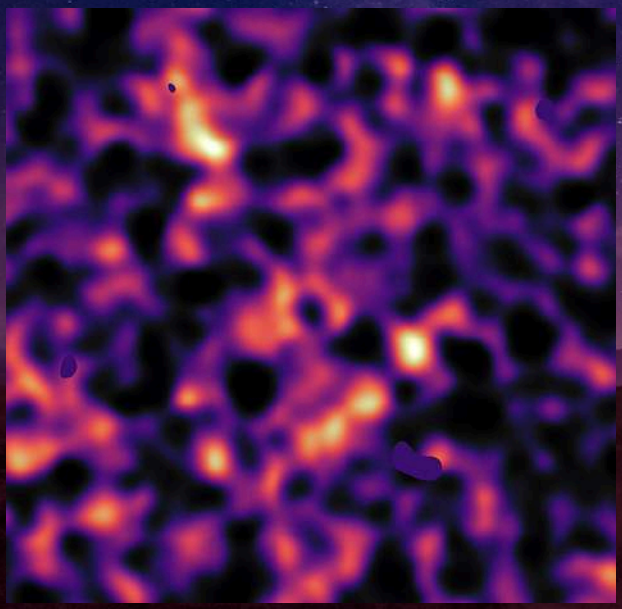
Astronomical Perception

THE COSMIC SHADOW: CHASING THE GHOSTS OF THE UNIVERSE

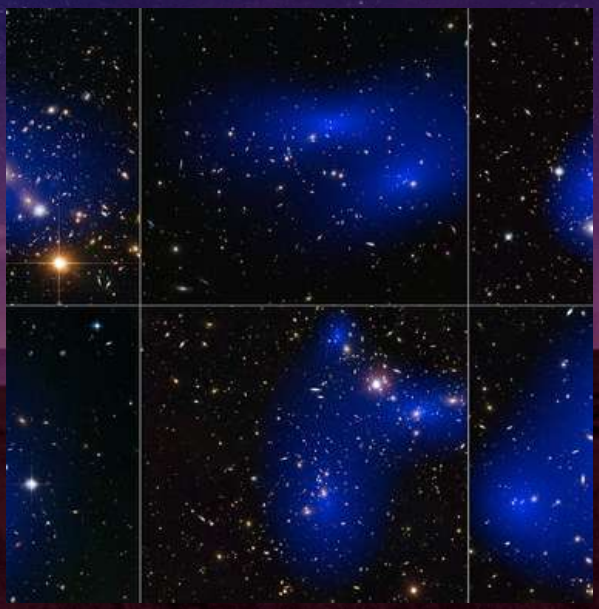
The Whispers of Darkness: The story begins not with a theory, but with a whisper in the data. In the 1930s, an astronomer named Fritz Zwicky was watching a swarm of galaxies, known as the Coma Cluster. He saw them whirling around each other at ferocious speeds. He did the math. The gravity from all the stars and gas he could see was insufficient to hold the cluster together. So, he said, there must be something else there, which we cannot see. He called it Dark Matter. As always scientific community mostly shrugged.

Decades later, Vera Rubin heard the whisper again. She was measuring how spiral galaxies spin. Common sense suggests that stars on the outer edge should orbit more slowly than those at the core. But the stars of this galaxy raced around at the same speed, from the center to the very edge. The only explanation for this was a gravitational ghost must be holding them in its sway. The whisper was a conversation whether we were listening or not.

The Universe's Ultimate Plot Twist: Just as we were coming to terms with this invisible cosmic whisper. In the 1990s, two teams of astronomers were using supernovae to measure how the expansion from the Big Bang was slowing down. Instead, they found the universe wasn't just expanding,it was accelerating. Something was fighting gravity itself,and pushing galaxies apart they called it Dark Energy.



Dark matter map for a patch of sky based on gravitational lensing analysis of a Kilo Degree Survey. (Credit:H. Hildebrandt & B. Giblin)



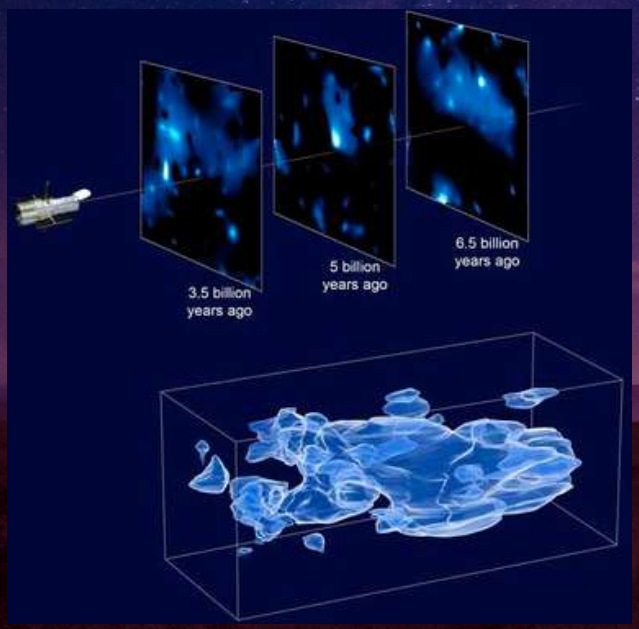
Collage of six cluster collisions with dark matter maps. (Credits:NASA, ESA, D. Harvey)

Mapping the Unseeable: The cosmic recipe is both stunning and humbling. The atoms that constitute every star, planet, and every one of us is mere 5% of the cosmos. A staggering 27% is dark matter, the invisible gravitational cosmic web that binds galaxies together. Dominating it all is dark energy, a mysterious force woven into the fabric of space itself, accounting for 68% of the universe and driving its accelerated expansion.

The Great Cosmic Hunt: So here we are, the curious descendants of apes, who have built cathedrals of science.Such as the Vera C. Rubin Observatory, which is scanning the sky every night, tracing the subtle warping of spacetime by dark matter. We have sent Euclid space telescope to map the dark universe in three dimensions, listening the faintest ping of a dark matter particle in deep underground laboratories, and we are smashing matter together at near light speed in the Large Hadron Collider, trying to create the very stuff that holds the galaxies together. The quest for the dark universe is not a side project. It is the main event. It is the fundamental quest to understand what the cosmos is made of, and in doing so, to understand the very laws of physics at their most profound level.

A Humbling and Exhilarating Truth

The story of dark matter and dark energy is the greatest detective story ever told. It is a tale where the clues are the motions of galaxies and the dimming of stellar explosions. It's a humbling story which tells us we are not the center of anything, that what we know is a tiny island in a sea of unknown. But it is also an exhilarating one. It means the universe is still strange, still wild, still filled with mysteries begging to be solved by the next generation of dreamers and explorers.



DM map by the Cosmic Evolution Survey (COSMOS) using the Hubble Space Telescope. (Credit: Cosmic Evolution Survey)

Vera C. Rubin Observatory and the Milky Way Galaxy. (Credits: Rubin Observatory/NSF/AURA/B. Quint)

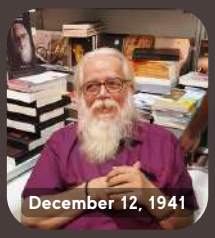
Happy Birthday

Roberta Bondar

Roberta Lynn Bondar (born December 4, 1945) is Canada's first female astronaut and the first neurologist in space. She flew on STS-42 in 1992, studying microgravity's effects on the nervous system. A scientist, educator, and photographer, Bondar has earned the Order of Canada and inspired generations in science and space exploration.

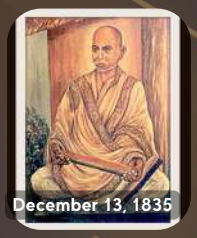
W.K.Heisenberg

Werner Karl Heisenberg (born December 5, 1901) was a German physicist and one of the key pioneers of quantum mechanics. He is best known for formulating the Heisenberg Uncertainty Principle, which fundamentally changed our understanding of particle behavior. Heisenberg received the Nobel Prize in Physics in 1932 and remains a towering figure in modern physics.



Nambi Narayanan

Nambi Narayanan (born December 12, 1941) is an Indian aerospace scientist and former ISRO official. His key role was in developing India's cryogenic engine technology and satellite launch capabilities. Falsely accused in 1994, he was later exonerated, earning national recognition. Narayanan has inspired generations in science, space research, and perseverance against adversity.



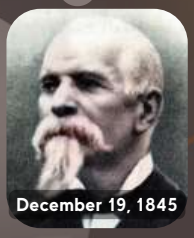
Pathani Samanta

Pathani Samanta (born December 31, 1835) was an Indian astronomer and known for his remarkable observational skills. Using traditional instruments, he made accurate calculations of planetary positions, eclipses, and celestial events and authored the influential book Rashidanka, contributing to Indian astronomy. His work earned him the title of "Mahamahopadhyaya", inspiring generations in science and astronomy.

Tycho Brahe

Tycho Brahe (born December 14, 1546) was a pioneering Danish astronomer known for his exceptionally precise observations before the invention of the telescope. His measurements of planetary motion transformed astronomy and later enabled Kepler's laws. A bold thinker and meticulous observer, Tycho reshaped humanity's understanding of the cosmos.

Happy Birthday



Henri Perrotin

Henri Joseph Anastase Perrotin (born December 19, 1845) was a French astronomer known for his precision observations of asteroids, comets, and double stars. As director of the Nice Observatory, he made several planetary measurements and discovered multiple minor planets.Perrotin's work strengthened 19th-century astronomy and scientific accuracy and dedication

A.A.Michelson

Albert A. Michelson (born December 19, 1852) was an American physicist and the first American Nobel Prize winner in science. Renowned for the Michelson-Morley experiment, he made groundbreaking measurements of the speed of light, shaping modern physics and paving the way for Einstein's relativity. His precision and innovation transformed experimental science.

S.Ramanujan

Srinivasa Ramanujan (born December 22, 1887) was an Indian mathematical genius whose intuitive mastery of numbers transformed fields . Like number theory, infinite series, and partitions. Despite limited formal training, he produced groundbreaking formulas still studied today. His collaboration with G.H. Hardy and his extraordinary legacy continue to inspire mathematicians worldwide.

John Michell

John Michell (born December 25, 1724) was an English scientist and one of the most visionary thinkers of his time. He first proposed the idea"dark stars," an early concept of black holes and made key contributions to seismology, magnetism, and astronomy. Michell's groundbreaking insights continue to inspire modern physics and cosmology.

Johannes Kepler

Johannes Kepler (born December 27, 1571) was a German astronomer and mathematician whose laws of planetary motion transformed our understanding of the cosmos. He revealed that planets orbit the Sun in ellipses, laying the foundation for modern astronomy. Kepler's work revolutionized celestial mechanics and continues to inspire scientific discovery today.

Role Of AI in Space

Virtual Observatories: The Future of Astronomy is Artificially Intelligent

The SDSS map of the Universe. Each dot is a galaxy; the colour bar shows the local density. (Credits: www.sdss4.org)

Astronomy has always been about looking up at the night sky, but today, much of space exploration is happening on computer screens. With powerful digital tools and smart technologies, scientists no longer need to travel to a mountaintop observatory to study the universe. Instead, Virtual Astronomical Observatories (VAOs) and Artificial Intelligence (AI) bring the cosmos directly to our fingertips.

A Virtual Astronomical Observatory is an online space where astronomical data from various telescopes and missions are collected and organised. Instead of visiting a physical observatory, astronomers can now access star maps, planetary data, and deep-space images from anywhere in the world. These observatories store information about galaxies, nebulae, black holes, comets, and countless other cosmic objects in digital libraries that are open to researchers, students, and enthusiasts.

However, the amount of data collected is far too large for humans to analyse alone. This is where AI steps in. AI systems are trained to recognise patterns in the data, which helps in identifying new stars, classifying galaxies, and spotting unusual objects in space. AI can also predict cosmic events, simulate the formation of galaxies, and recommend locations in the sky that require further observation. Tasks that once took scientists years to complete can now be done in hours with the help of AI-powered models.

Several major astronomical projects already use AI in their virtual observatory systems. The Sloan Digital Sky Survey (SDSS) applies machine learning to classify galaxies and identify quasars among millions of cosmic objects. NASA's Exoplanet Archive utilises AI to analyse light curves from the Kepler and TESS missions, enabling the detection of planets orbiting distant stars. The European Space Agency's Gaia Archive uses advanced algorithms to map and classify over a billion stars in the Milky Way with incredible precision. Zooniverse's Galaxy Zoo, a citizen science project, combines human observation with AI to analyse galaxy shapes. In India, the Virtual Observatory India (VOI) supports research and education by integrating intelligent tools for data access and learning.

Together, AI and Virtual Astronomical Observatories are revolutionizing space research. One of the greatest advantages of combining AI with VAOs is accessibility. Students, teachers, and amateur astronomers can now explore real astronomical data without expensive equipment. As technology evolves, the partnership between AI and Virtual Astronomical Observatories will continue to deepen our understanding of the universe and our place within it.

ASTRONOMICAL EVENTS - DECEMBER 2025

WAKE UP TO MERCURY: MERCURY GLOWS AT GREATEST WESTERN ELONGATION

On 7 December 2025, Mercury offers one of its best sky shows of the year. On this morning, the tiny planet reaches its greatest western elongation, its farthest apparent distance from the Sun in our sky. At this point, Mercury sits about 20.7° west of the Sun, shines brightly at −0.4 to −0.5 magnitude, and appears through a telescope as a 61% illuminated gibbous disk about 6.6–6.7 arcseconds wide.

Why is this special?

Mercury is notoriously difficult to spot. As the innermost planet, it stays close to the Sun and is often hidden in its glare. Greatest elongation is the rare moment when Mercury moves far enough away to be seen clearly. This particular event is especially favorable because:

- Mercury never travels far from the Sun, so this separation is significant.
- At western elongation, it rises before the Sun, becoming a beautiful morning object.
- For the Northern Hemisphere, this is considered Mercury's best morning appearance of 2025 due to the favorable tilt of the ecliptic.

How to see it:

Look 30 minutes before sunrise toward the east or east-southeast with an unobstructed horizon. Although Mercury lies over 20° from the Sun, its actual height varies by location; observers near 37°N can expect it around 18° above the horizon at sunrise. A clear view is essential, binoculars help, but never point them near the rising Sun.

What to expect:

Mercury will appear as a bright, star-like point in the dawn glow. With a small telescope, you might glimpse its gibbous phase. In the days around December 7, the planet will climb higher each morning before sinking back into the Sun's glare later in the month.

So set an early alarm for 7 December 2025! Anyone in India with a clear eastern horizon around sunrise has an excellent chance of catching Mercury at its brightest and most viewable for the year. It's a short-lived but beautiful moment, perfect for astronomy lovers and early risers alike.

GEMINIDS METEOR SHOWER: THE SKY'S BRIGHTEST DECEMBER SPECTACLE

Every December, the night sky comes alive with one of the most stunning meteor showers of the year, the Geminids. Active from 4 to 20 December, this shower never disappoints, and 2025 is shaping up to be an especially beautiful year to watch it unfold. With little moonlight and perfect placement of the radiant point in the constellation Gemini, sky watchers can look forward to a truly dazzling display.

Unlike most meteor showers that originate from comets, the Geminids come from an unusual source, the asteroid 3200 Phaethon. Discovered in 1983 using the IRAS satellite, this rocky body behaves a bit like a comet, shedding dust that Earth encounters every December. When our planet passes through this trail of debris, the particles burn up in the atmosphere at around 35 km/s, creating bright, slow-moving meteors that streak gracefully across the sky.

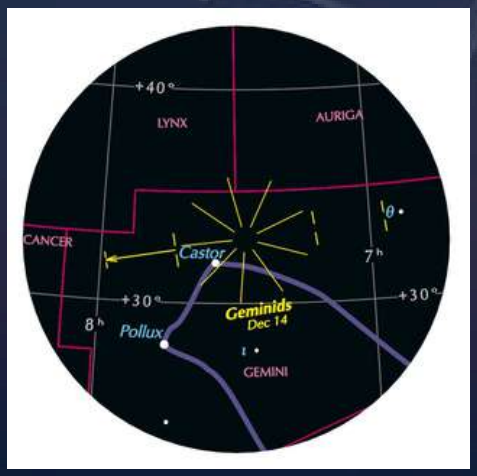
The best time to catch the Geminids is during the late night and early morning hours of 13–14 December. Under dark skies, observers can expect to see 120–150 meteors per hour, according to the International Meteor Organization. With the Moon in a thin waning crescent phase, its light won't interfere, giving us a clear, dark canvas for the show.

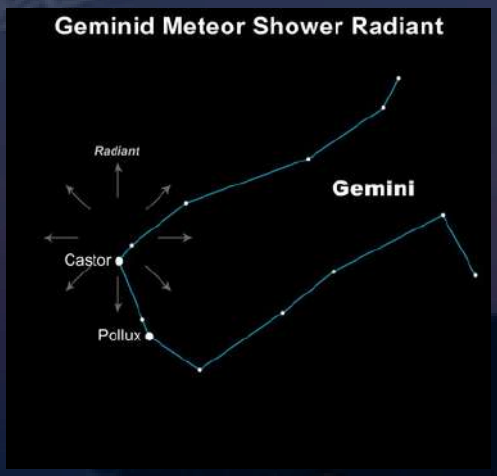
Where and How to Watch:

- Look for the radiant near Castor and Pollux in the constellation Gemini.
- Best viewing time: After midnight, especially around 2 a.m. when the radiant is highest.
- Visible from both hemispheres, though Northern Hemisphere observers get an earlier view.

Don't stare directly at Gemini, meteors will appear across the sky. Look about 30–40° away from the radiant for the longest, brightest streaks.

Choose a dark spot away from city lights, lie back comfortably, and give your eyes about 30 minutes to adjust. Avoid phone screens, or use only red light to protect your night vision.





The Geminids are known for being bright, colourful, and frequent, with many fireballs. Their unusual origin and dense debris stream make them one of the most reliable and breathtaking meteor showers of the year.

So mark your calendar, grab a blanket, and enjoy one of nature's grandest light shows this December!

URSIDS METEOR SHOWER: A SOLSTICE SYMPHONY IN THE SKY

December may be best known for the bright and busy Geminids, but just as the month winds down, another gentle meteor shower steals the stage – the Ursids. They don't boast huge meteor counts, and they often slip under the radar during the festive season, but for those who take a little time to look up, the Ursids offer a peaceful, almost meditative skywatching experience. And in 2025, all the conditions line up perfectly to give this quiet shower its moment to shine.

When and Where to Watch:

The Ursids make their annual appearance from December 17 to 26, peaking on the night of December 21-22. This year, the sky gets an extra gift: a new moon on December 20, meaning the nights around the peak will be wonderfully dark. Under ideal skies, you can expect 5-10 meteors per hour, with the rare chance of an unexpected burst.

The radiant – the point from which these meteors appear to originate, lies in Ursa Minor, the Little Bear. For skywatchers across the Northern Hemisphere, including India, this radiant stays above the horizon all night, giving you plenty of opportunities to spot meteors. In places like New Delhi, the best views come just before dawn, when the radiant is highest in the sky.

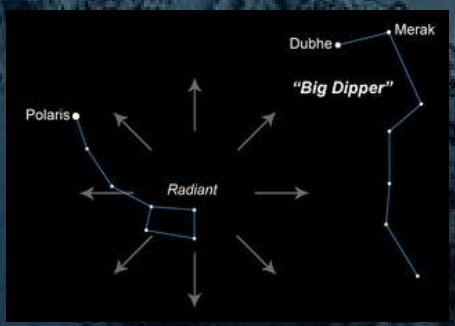
Unlike many meteor showers tied to well-known comets, the Ursids originate from Comet 8P/Tuttle, discovered in 1790 and rediscovered decades later, earning it dual credit. This comet travels a long, stretched-out path around the Sun every 13.5 years, leaving a trail of dust behind. When Earth passes through this trail each December, tiny particles hit our atmosphere and burn up, creating the streaks we call meteors.

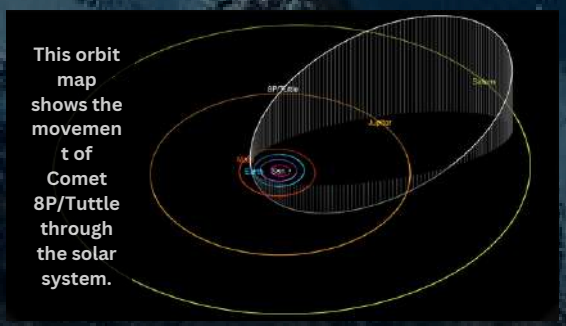
URSA MINOR

How to watch:

You don't need telescopes or fancy gear, just a bit of patience and a comfortable spot under an open sky.

- Find a dark location away from city lights.
- Give your eyes 20-30 minutes to adjust.
- Dress warmly and lie back with a blanket or reclining chair.
- Look anywhere in the sky, not just at Ursa Minor.





This orbit map shows the movement of Comet 8P/Tuttle through the solar system.

The Ursids may be subtle, but that's part of their charm. With 2025 offering perfect moonless nights, this is an ideal year to step outside, breathe in the winter air, and let the quiet beauty of the Ursids bring a calm, celestial touch to your holiday season.

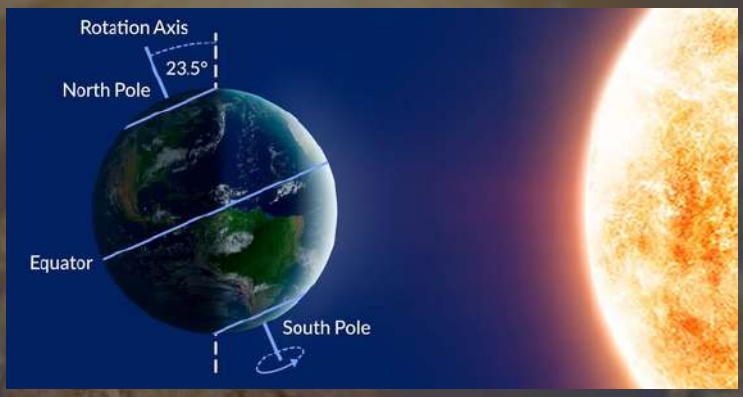
WHEN THE SUN STANDS STILL: DECEMBER SOLSTICE 2025

Every year around December 21, Earth reaches a quiet but powerful milestone, the December Solstice. It's the moment when the Sun seems to pause in the sky, giving the Northern Hemisphere its shortest day and longest night, while the Southern Hemisphere enjoys its longest day of the year. In 2025, this celestial turning point arrives on December 21, inviting us to slow down and reflect on the dance of light and shadow that shapes our seasons.

What Exactly Happens at the Solstice?

The solstice occurs because Earth's axis is tilted at 23.5°. On this day, the Northern Hemisphere leans farthest away from the Sun, making the Sun's path low and short across our sky. At the same time, the Southern Hemisphere tilts toward it, experiencing peak summer.

On this date, the Sun shines directly overhead at noon along the Tropic of Capricorn, and regions north of the Arctic Circle slip into polar night, while parts of Antarctica remain lit by the Midnight Sun.



For thousands of years, cultures around the world have honoured this moment as a symbol of renewal, the turning of darkness toward light.

Ancient monuments echo this reverence where Stonehenge, England, aligns with the solstice sunrise. To many early civilizations, this was the rebirth of the Sun.
In astronomy, the December Solstice marks the start of winter in the Northern Hemisphere and summer in the Southern. The word "solstice" comes from Latin, sol (Sun) and sistere (to stand still), because the Sun's noontime position barely changes for a few days before and after.

Interestingly, the earliest sunset and latest sunrise don't fall on the solstice itself, thanks to Earth's slightly elliptical orbit.

The solstice can occur between December 20 and 23. Our calendar doesn't perfectly match Earth's orbital period, so leap years help realign the dates.

As the Sun reaches its lowest arc on December 21, 2025, the solstice reminds us that even Earth has moments of pause. Whether it brings winter chill or summer warmth, this celestial event invites us to look up, breathe, and appreciate the cosmic rhythm that guides our year.

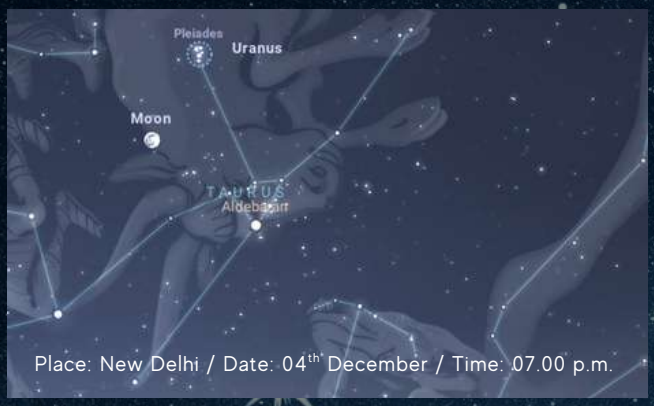
CONJUNCTIONS FOR THE MONTH

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.

Conjunction of Pleiades and Moon

On December 4th, the Pleiades star cluster will meet the Moon in the Eastern sky. The Pleiades is at a magnitude of 1.59 and the Moon has a magnitude of -12.81.



Place: New Delhi / Date: 04th December / Time: 07.00 p.m.

Conjunction of Moon and Jupiter

On December 7th, the gaseous giant Jupiter will meet the Moon in the Eastern direction near the constellation Gemini. Jupiter is at a magnitude of -2.42 and the Moon has a magnitude of -12.63.

Place: New Delhi / Date: 07th December / Time: 09.00 p.m.

Conjunction of Moon and Saturn

On December 27th, the ringed planet Saturn will meet the Moon in the South-western direction near the constellation Pisces. Saturn is at a magnitude of 1.15 and the Moon has a magnitude of -12.62.

Place: New Delhi / Date: 27th December / Time: 06.20 p.m..

Conjunction of Pleiades and Moon

On December 31st, again the Pleiades star cluster will meet the Moon in the Eastern sky in the constellation Taurus. Pleiades is at a magnitude of 1.59 and Moon has a magnitude of -12.61.

Place: New Delhi / Date: 31st December / Time: 06.40 p.m.

STUDENT'S CORNER

Gaganyaan: India's First Human Spaceflight Mission

Nikhilesh, iAstronomer

Gaganyaan is one of the most ambitious and historic space missions undertaken by India. Launched by the Indian Space Research Organisation (ISRO), it aims to send Indian astronauts, known as Vyomnauts, into space on an Indian-made spacecraft. This mission represents a major leap forward for India's scientific and technological capabilities and marks the nation's entry into the elite group of countries capable of human spaceflight. The idea for Gaganyaan was formally announced by the Government of India in 2018.

The mission's primary objective is to demonstrate India's ability to launch a crew into low Earth orbit, keep them safe in space for several days, and bring them back safely to Earth. The spacecraft consists of two major parts: the Crew Module, which will house the astronauts, and the Service Module, which provides essential support systems such as power, propulsion, and life support. Before sending humans into space, ISRO has carried out multiple test missions to ensure safety and reliability.

These include the Pad Abort Test, which verifies the emergency escape system, and the Gaganyaan Test Vehicle missions, which check the performance of the crew escape system during flight. Furthermore, ISRO has been training selected Indian Air Force pilots to prepare them physically and mentally for the challenges of space travel. The astronauts will orbit Earth at an altitude of about 400 kilometers for nearly three days.

During this time, they will conduct scientific experiments and study the effects of space conditions on the human body. After completing the mission, the crew module will re-enter Earth's atmosphere and land safely in the sea. Gaganyaan is not just a scientific mission; it is a symbol of national pride. It inspires young students, showcases India's growing space capabilities, and strengthens international cooperation.

The technologies developed for this mission will also benefit future programs, including space stations, deep space exploration, and advanced satellite missions. In conclusion, Gaganyaan is a landmark mission that reflects India's determination to explore space with courage and innovation.

It stands as a testament to the skill and dedication of ISRO scientists and takes India one step closer to becoming a global leader in space science.

India's Plan to Build a Space Station

Nikhilesh, iAstronomer

India, a rapidly rising space power, has set its sights on an ambitious new goal: building its own space station. After the success of missions like Chandrayaan-3, Aditya-L1, and the ongoing preparations for the Gaganyaan human spaceflight mission, the Indian Space Research Organisation (ISRO) is now preparing to take the next leap by creating an independent orbital laboratory known as the Bharatiya Antariksha Station. ISRO has announced that the space station is expected to be built and launched by 2035, with humans living and working on it by 2040.

This project is a natural extension of India's human spaceflight programme. The first step toward this dream is the Gaganyaan mission, which will test human-rated engines, crew escape systems, life-support systems, and orbital maneuvering technologies.

Once India proves it can send astronauts safely to space and bring them back, the same technologies will support the space station. The Indian space station is expected to weigh around 20 tonnes and will orbit Earth at an altitude of roughly 400 km. Although smaller than the International Space Station (ISS), it will be large enough to host astronauts for missions lasting up to 15–20 days. Over time, ISRO may add more modules to expand its capacity for scientific research.

The station will allow Indian scientists to conduct experiments in microgravity, study space medicine, test new materials, and develop advanced space technologies that can benefit both science and industry. One of the main motivations behind the project is self-reliance. With the ISS expected to retire by 2030, India wants to ensure it has an independent platform for human spaceflight and research. The space station will also strengthen India's global position, enabling collaborations with friendly countries and opening up new opportunities in the growing space economy.

Building a space station is a complex and expensive task, but India has a history of achieving big dreams with limited resources. With its scientific talent, technological expertise, and long-term vision, India is steadily preparing to join the elite group of nations capable of operating their own space stations. This project represents not just a technological milestone, but a symbol of India's confidence and future aspirations in space exploration.

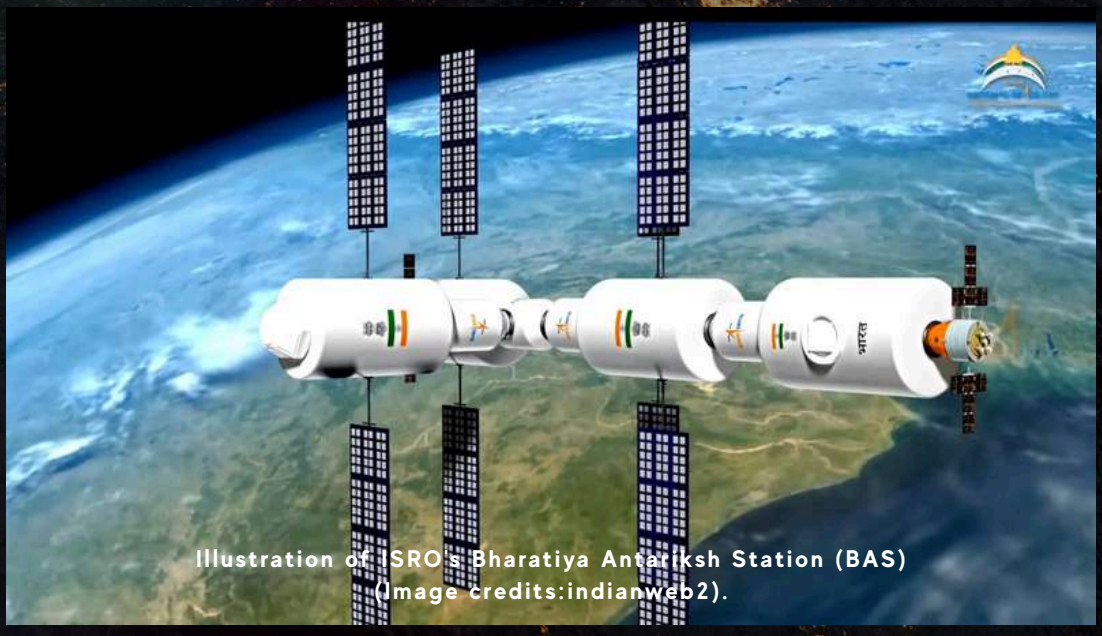


Illustration of ISRO's Bharatiya Antariksh Station (BAS) (Image credits:indianweb2).

Dr. Manali Kallat Vainu Bappu
Father of Modern Indian Astronomy

Sourajit Mandal, Astronomy Camp

Imagine working diligently every night, looking at the sky and working in an observatory, when your country is still struggling for freedom. Imagine wishing every night for a better future of the country, and the advancements of space science. And then, in 1927, your son is born, a child destined to work for those two exact wishes. That, was the life of Manali Kukuzhi Bappu- the father of legendary Vainu Bappu.

But who is Vainu Bappu? Born in Chennai in 1927, Vainu was nothing short of a genius. He wasn't just curious… he was relentless. His unstoppable curiosity made him a young man who would not just look at the stars… but also put India firmly on the map of global astronomy.

By the time he was just 19, he did things that seasoned scientists dream of doing. He built his own spectrometer in his house without any formal training and published papers that caught international attention; not once but TWICE. But in all this genius, his life truly changed when he met Harlow Shapley, a legend from Harvard, who was so impressed by Bappu, he helped him get a scholarship from the Hyderabadi Government to study in Harvard. In Harvard, while others preferred not to do the night duty in the observatory, he volunteered to do so. He spotted a strange white streak on a photo plate. What he had found, was a comet that visits our planet only once in 60,000 years. At just 22 years old, he became the first Indian to have a comet named after him, the Bappu-Bok-Newkirk comet, and the world celebrated him.

The world clapped for him… but during this time, his own country pulled him down. The Hyderabad government sent him a letter, telling him to stop wasting time on comets and sticking to the syllabus, otherwise they would cancel his scholarship. But the astronomy community at Harvard was not ready to accept this threat. Fred Whipple, a legendary astronomer at Harvard, who is famous for his dirty snowball theory of comets, wrote a furious letter back to India, telling the officials that their education at Harvard emphasized on the freedom to explore. This incident ignited a fire in Vainu. He promised himself he would go back home and change this broken system.

Dr. Manali Kallat Vainu Bappu
(1927 – 82) Credits: iiap.res.in.

After his PhD, Vainu discovered the famous Wilson-Bappu effect, stating that brighter stars have wider emission lines, allowing astronomers to determine a star's distance or absolute magnitude based on the width of this specific spectral line. This was a phenomenal discovery. But Bappu, was not done yet. He returned to India to build India's astronomy from scratch. He modernized many old observatories like the Kodaikanal Solar Observatory and the Uttar Pradesh State Observatory. Then, he started building a world-class observatory, in a remote village with no electricity or roads. He lived on-site, laying bricks himself and teaching Indian engineers how to build advanced telescope components that the West said we couldn't build. He eventually built the then Asia's largest telescope, now known as the Vainu Bappu Telescope.

He was elected the President of the International Astronomical Union in 1979, the highest possible honour for an astronomer. At 55 years old, he passed out from a heart attack. But even today, he lives in the heart of every Indian astronomer and the pages of history- as the father of modern Indian astronomy.

Hearing the Universe for the First Time: The Moment Scientists Pressed 'Play' on Space

Varsha S K, iAstronomer

Have you ever wondered what space really sounds like? Not the dramatic explosions movies show, but the real voice of the universe – the one we were never supposed to hear. Because here's the strange part: space is silent… yet the universe never stops speaking.

I know that sounds impossible. How can something be silent and loud at the same time? But that's the magic of it. When you step into space, your ears would hear nothing – no air, no vibrations, nothing to carry sound. But if you could listen with the right kind of "cosmic ears," you'd realize that stars, black holes, galaxies, and even the leftovers of the Big Bang are constantly sending out waves. Not sound waves, but energy waves. And hidden inside those waves are stories. Drama. Explosions. Whispers from billions of years ago.

Scientists figured out something brilliant. They thought:
"What if we could turn these invisible waves into sound?"
" What if we could literally hear the universe?"

That's where sonification comes in – the art of converting cosmic waves into audio. Telescopes don't record sound, but they do record data. When scientists "translate" that data into tones, pitches, and rhythms, suddenly the universe gains a voice. Light becomes melody. Radiation becomes rhythm. Gravity becomes deep, trembling notes from the edge of time.
And the sounds? They're nothing like what you expect.

Black holes produce deep, eerie hums – so low and ancient that scientists have to raise the pitch millions of times just to make them audible. When you hear them, it feels like something enormous is breathing somewhere in the dark.

Then there are pulsars – the leftover hearts of dead stars. They spin incredibly fast and send out beams of energy. When their signals are converted to sound, they tick and beat like perfectly timed cosmic clocks. Some pulse so steadily it feels like the universe is keeping rhythm.

Even our own Sun, which looks calm and golden from Earth, becomes wild in sound. When its waves are translated, it crackles, roars, and pops like a giant bonfire mixed with electrical storms. It's only when you "hear" it that you realize how alive it truly is. And galaxies? They don't just sit quietly in space. When their light and energy are turned into sound, they create sweeping, atmospheric tones – like a slow cosmic orchestra playing across millions of light-years.

The surprising part is that listening to the universe isn't just cool – it helps science. Sometimes our ears pick up patterns our eyes would miss. A tiny shift in a wave. A strange rhythm in a star's pulse. A hidden structure inside a cluster of galaxies. Sound reveals details that visuals alone can't. So the next time you look up at the night sky, remember this: the darkness is not empty, and the silence is not real. You are standing under an invisible symphony that has been playing for billions of years. Every star, every nebula, every hidden black hole is sending out waves – humming, vibrating, whispering across space.

The universe has always been talking. We just finally learned how to listen.

ASTROPHOTOGRAPHS FROM SPACE TEAM

Moon Portrait Captured by Ms. Diksha Rathore, Senior executive - Outreach, STEPL.

Full Moon Trail Captured by Mr. Ranjith Kumar E, Regional Product Manager, STEPL.

Cold Full Moon Captured by Ms. Sadaf Iqbal Ansari, Educator, STEPL.

Sun Captured by Ms. Pallavi Rajendra Baitule, Educator, STEPL.

HISTORICAL EVENTS OF DECEMBER

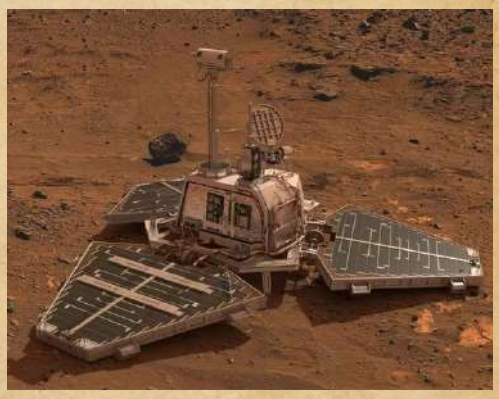
STS-61: Endeavour's Mission to Service Hubble

On December 2, 1993, Space Shuttle Endeavour launched on mission STS-61, a critical flight to service and upgrade the Hubble Space Telescope. Over 11 days, astronauts conducted five spacewalks to install corrective optics, replace instruments, and enhance Hubble's capabilities. The successful repairs transformed Hubble into a premier observatory, enabling groundbreaking discoveries across astronomy. STS-61 demonstrated NASA's ability to conduct complex orbital servicing and reaffirmed the value of human spaceflight in maintaining scientific infrastructure. Endeavour's mission remains a landmark in space operations and telescope history. (Image credits: www.space.com)

Pioneer 10's Historic Encounter with Jupiter

On December 4, 1973, NASA's Pioneer 10 spacecraft made its closest approach to Jupiter, becoming the first human-made object to explore the gas giant up close. Passing within 132,000 kilomeˆters of the planet's cloud tops, it transmitted unprecedented images and data on Jupiter's atmosphere, magnetic field, and radiation belts. This encounter revolutionized planetary science and paved the way for future missions to the outer solar system. Pioneer 10's success marked a turning point in deep space exploration, extending humanity's reach beyond the asteroid belt. (Image credits: nimareja.fr)

Mars Pathfinder Launches Toward the Red Planet



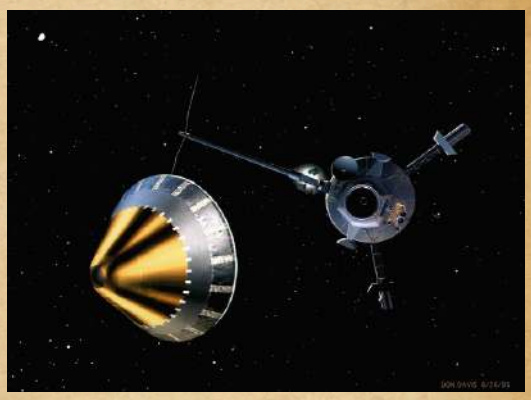
On December 4, 1996, NASA launched Mars Pathfinder, a pioneering mission aimed at demonstrating innovative technologies for future Mars exploration. The spacecraft carried a lander and the Sojourner rover, designed to analyze Martian geology and atmosphere. Pathfinder's successful deployment marked the first rover operation on another planet, showcasing cost-effective engineering and remote robotic mobility. Its data enriched understanding of Mars' surface conditions and validated entry, descent, and landing techniques. This mission laid the groundwork for subsequent robotic explorers and revitalized public interest in planetary science. (Image credits: cosmoscience.in)

Simon Marius Observes the Andromeda Galaxy

On December 6, 1612, German astronomer Simon Marius became the first recorded person to observe the Andromeda Galaxy through a telescope. Although the galaxy had been known since antiquity as a faint, nebulous patch, Marius's telescopic observation revealed its extended structure more clearly. He described it as a "small cloud," contributing to early telescopic astronomy. While unaware of its true nature as a galaxy, his work marked a significant step in deep-sky observation and complemented the era's growing interest in celestial phenomena beyond the Solar System. (Image credits: www.sciencephoto.com)

HISTORICAL EVENTS OF DECEMBER

Galileo Probe Enters Jupiter's Atmosphere

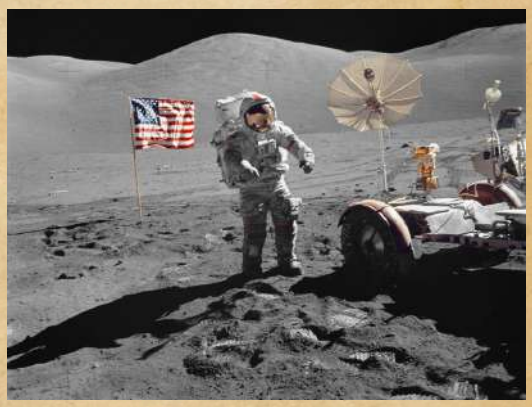


On December 7, 1995, NASA's Galileo spacecraft released its atmospheric entry probe into Jupiter, marking the first direct exploration of a gas giant's atmosphere. The probe descended for 57 minutes, transmitting data on temperature, pressure, wind speeds, and chemical composition before succumbing to extreme conditions. Its findings challenged existing models, revealing lower-than-expected water content and complex cloud structures. This mission provided unprecedented insights into Jupiter's dynamic atmosphere and laid the groundwork for future studies of giant planets and their formation. (Image credits: www.planetary.org)

XMM-Newton: Europe's X-ray Observatory

On December 10, 1999, the European Space Agency (ESA) launched the XMM-Newton X-ray observatory aboard an Ariane 5 rocket from French Guiana. Designed to study high-energy phenomena, XMM-Newton carries three advanced X-ray telescopes and an optical monitor, enabling unprecedented sensitivity and spectral resolution. Its observations have illuminated the physics of black holes, neutron stars, galaxy clusters, and the cosmic X-ray background. XMM-Newton remains one of ESA's longest-serving missions, providing vital data that continues to shape astrophysics and deepen our understanding of the energetic universe. (Image credits: www.esa.int)

Apollo 17: Final Lunar Landing of the Apollo Era



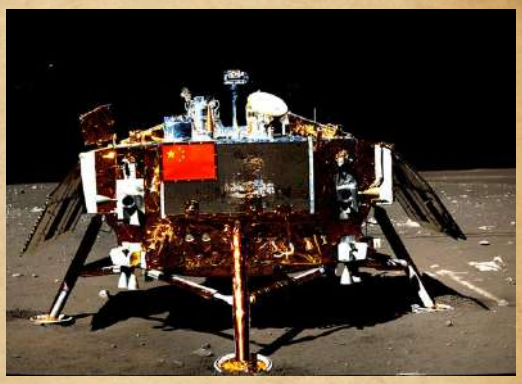
On December 11, 1972, Apollo 17's Lunar Module Challenger touched down in the Taurus–Littrow valley, marking NASA's sixth and final crewed Moon landing. Astronauts Eugene Cernan and Harrison Schmitt conducted three extravehicular activities, collecting over 110 kilograms of lunar samples and deploying scientific instruments. Schmitt, the first scientist-astronaut on the Moon, contributed valuable geological observations. Meanwhile, Ronald Evans orbited in the Command Module America. Apollo 17 concluded the Apollo program's exploration of the Moon, leaving a legacy of scientific achievement and human endeavor. (Image credits: www.drairatxediaz.com)

Mariner 2: First Successful Planetary Flyby

On December 14, 1962, NASA's Mariner 2 spacecraft completed the first successful flyby of another planet, passing within 34,773 kilometers of Venus. Launched on August 27, it transmitted vital data on Venus's atmosphere, confirming extreme surface temperatures and high-pressure conditions. Mariner 2 also measured solar wind and cosmic dust, contributing to heliophysics. This landmark mission validated interplanetary navigation and remote sensing, establishing the feasibility of robotic planetary exploration and marking a major achievement in the early era of space science. (Image credits: www.space.com)

HISTORICAL EVENTS OF DECEMBER

Chang'e 3: China's Lunar Landing Achievement

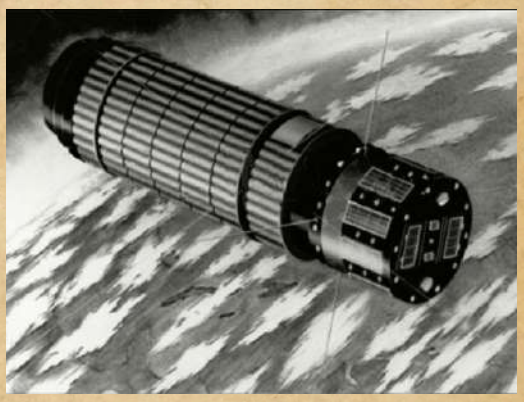


On December 14, 2013, China's Chang'e 3 mission successfully landed on the Moon, marking the nation's first soft lunar landing and the first globally since 1976. The lander deployed the Yutu ("Jade Rabbit") rover, which conducted surface exploration and transmitted valuable data on lunar geology and soil composition. This achievement demonstrated China's growing capabilities in space technology and positioned it as a key player in lunar exploration. Chang'e 3 laid the foundation for subsequent missions in China's ambitious lunar program. (Image credits: www.space.com)

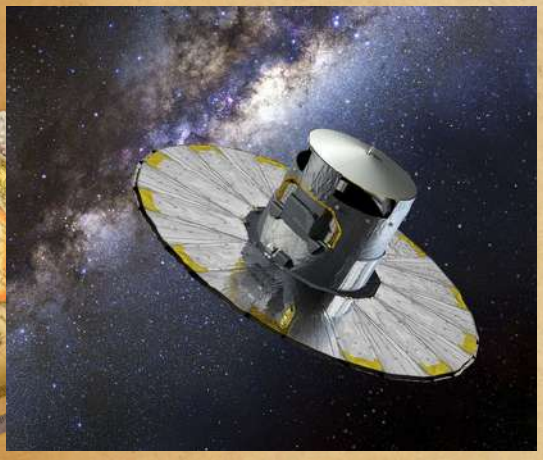
Janus: A New Moon of Saturn

On December 15, 1966, French astronomer Audouin Dollfus discovered Janus, a small inner moon of Saturn, using ground-based telescopic observations. Initially confused with another nearby object, Janus was later confirmed to share a unique co-orbital relationship with Saturn's moon Epimetheus —both moons swap orbits every four years without colliding. Janus measures approximately 180 kilometers across and orbits just outside Saturn's rings. Its discovery expanded understanding of orbital dynamics and contributed to the study of Saturn's complex satellite system and gravitational interactions. (Image credits: theplanets.org)

Explorer 16: Advancing Micrometeoroid Research



On December 16, 1962, NASA launched Explorer 16, a satellite dedicated to studying micrometeoroid impacts in near-Earth space. As part of the Explorer program, it carried detectors to measure the frequency, size, and penetration of micrometeoroids—critical data for designing spacecraft shielding. Operating in low Earth orbit, Explorer 16 provided valuable insights into the space environment, contributing to safer mission planning for crewed and uncrewed vehicles. Its findings supported the development of protective technologies essential for long-duration spaceflight and orbital operations. (Image credits: digiato.com)

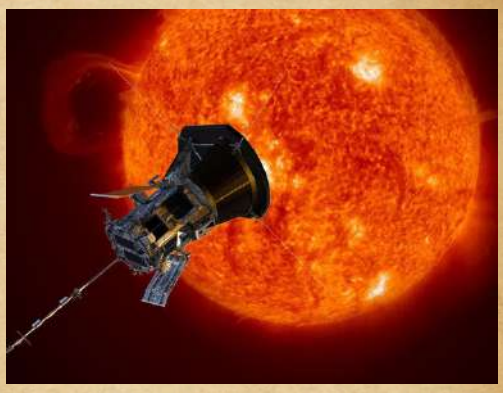


Gaia Launches to Map the Milky Way

On December 19, 2013, the European Space Agency (ESA) launched the Gaia satellite aboard a Soyuz rocket from French Guiana. Designed to chart a precise three-dimensional map of the Milky Way, Gaia aims to catalog over one billion stars, tracking their positions, motions, and physical properties. Its unprecedented astrometric accuracy enables studies of stellar evolution, galactic dynamics, and dark matter distribution. Gaia's data revolutionizes our understanding of the galaxy's structure and origin, establishing a foundational resource for modern astrophysics and cosmology. (Image credits: www.space.com)

HISTORICAL EVENTS OF DECEMBER

Parker Solar Probe's Record-Breaking Encounter



On December 24, 2024, NASA's Parker Solar Probe achieved its closest-ever approach to the Sun, skimming just 3.8 million miles (6.1 million kilometers) above the solar surface. Traveling at an astonishing 430,000 miles per hour, it became the fastest human-made object in history. This daring maneuver allowed the probe to penetrate deeper into the Sun's corona, collecting high-resolution data on solar wind, magnetic fields, and energetic particles. The successful pass, confirmed by a beacon signal on December 26, marked a major milestone in heliophysics, promising transformative insights into solar dynamics and space weather. (Image credits: science.nasa.gov)

Launch of James Webb Space Telescope

On December 25, 2021, the James Webb Space Telescope (JWST) launched aboard an Ariane 5 rocket from French Guiana, marking a transformative moment in astronomy. As the most advanced space observatory ever built, JWST was designed to study the universe's earliest galaxies, stellar formation, and exoplanet atmospheres. Its infrared capabilities surpass those of its predecessor, Hubble, enabling unprecedented observations of cosmic origins. The successful deployment and alignment of its segmented mirror system signaled a new era in deep space exploration and astrophysical discovery. (Image credits: www.esa.int)

Apollo 8 Returns: Humanity's First Lunar Voyage

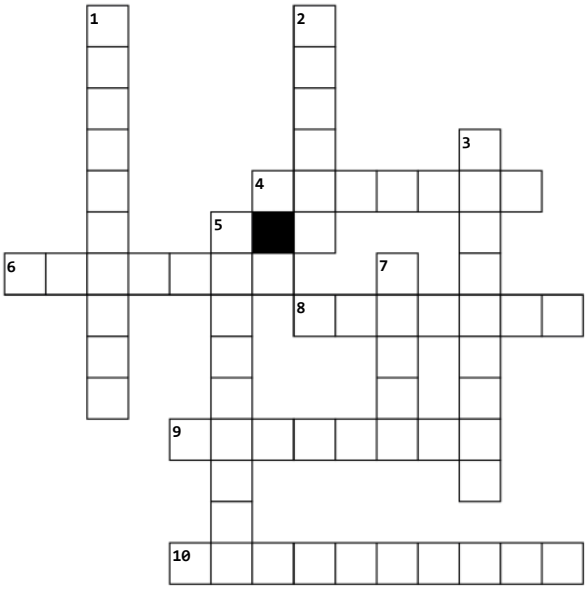
On December 27, 1968, Apollo 8 safely returned to Earth, concluding the first crewed mission to orbit the Moon. Astronauts Frank Borman, James Lovell, and William Anders splashed down in the Pacific Ocean after a six-day journey that included ten lunar orbits. The mission demonstrated critical navigation, communication, and life-support capabilities for future lunar landings. Apollo 8's iconic "Earthrise" photograph and Christmas Eve broadcast profoundly impacted global perspectives, symbolizing unity and the promise of space exploration during a turbulent era. (Image credits: www.spacevoyaging.com)

CoRoT Launches: Pioneering Exoplanet Discovery

On December 27, 2006, the French-led CoRoT (Convection, Rotation and Planetary Transits) satellite was launched aboard a Soyuz rocket from Baikonur Cosmodrome, becoming the first spacecraft dedicated to detecting exoplanets. CoRoT employed the transit method to identify planetary candidates by monitoring stellar brightness variations. It also contributed to asteroseismology by studying stellar interiors. Over its operational life, CoRoT discovered dozens of exoplanets and provided critical data on stellar behavior, laying the foundation for future missions like Kepler and TESS in the search for distant worlds. (Image credits: www.esa.int)

TRAIN YOUR BRAIN

CROSSWORD



Across

4. Neutron stars that flash beams of radiation visible from Earth are called _____.
6. Who discovered the first Fast Radio Bursts in 2007?
8. Which university's research team observed the unusual twisting gullies on Mars in October 2025?
9. Which Italian astronomer discovered the Lagoon Nebula (M8) in 1654?
10. What is the name of the early molten version of our planet before the giant collision changed it?

Down

1. Which direction does Comet Lemmon move relative to planetary motion due to its orbital nature?
2. William Herschel discovered which planet?
3. The major book written by Newton is called _____ Mathematica.
5. NGC 6537 is also known by what nickname reflecting its intricate glowing gas structure?
7. Rayleigh co-discovered which noble gas?

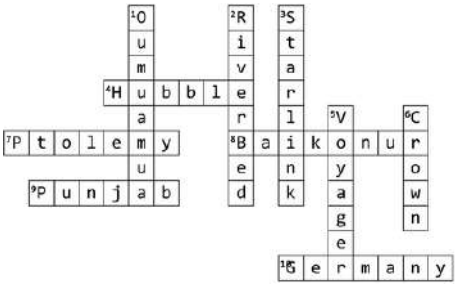
Astronomy Word Puzzle

Rocket / Launch Vehicle

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

SOYUZ
ATLAS
VOSTOK
DELTA
ARIANE
PSLV
FALCON
GSLV
ELECTRON
VEGA
ANTARES
MINOTAUR
SATURNV
TITAN
LONGMARCH

Answers for last month puzzles.



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

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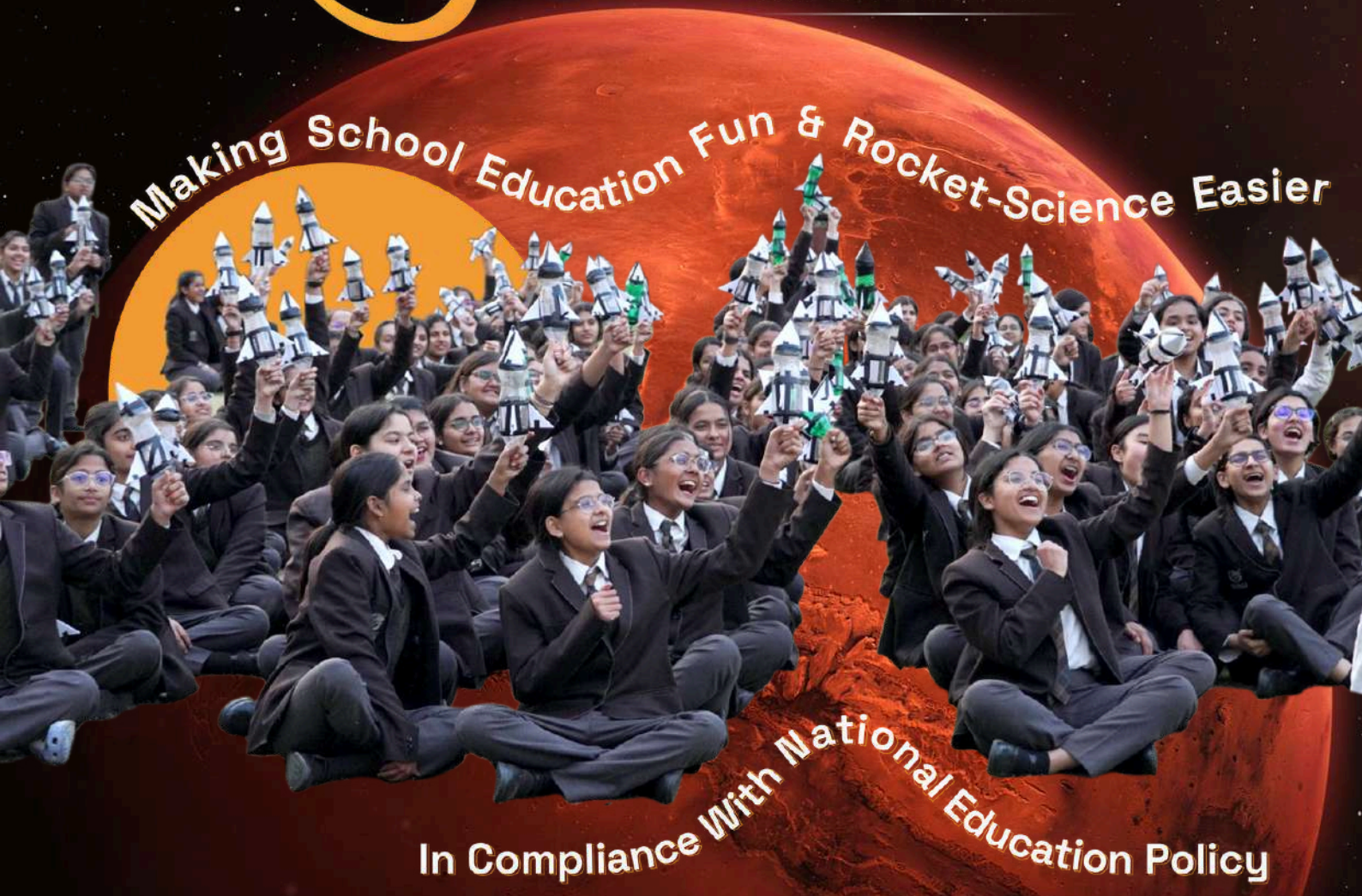

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