SPACE™
EMPOWERING LIFE

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Galactica

Astronomy and Space Science Magazine

What's Inside?
SPACE Insights
Highlights From December 2024
Moon Phases And Planet Visibility
What's Awaiting in January 2025
Tour De Universe
Astronomical Perception
Role of AI in Space
Student's Corner
Historical Events Happened In January
January Born Legends
Train Your Brain

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

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ABOUT SPACE

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

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

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

CMD's Message

Dr. Sachin Bahmba, CMD, SPACE

Space and Astronomy are the future for the young generation of our country. This is a great means to inculcate scientific temperament among the masses. Such astronomy sessions will provide a hands-on learning platform for students wherein they explore the real world of science, I wish for young students to let their ambitions soar and think big as they are the future of our country.

MD's Message

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

Mr. Shivam Gupta, MD, SPACE

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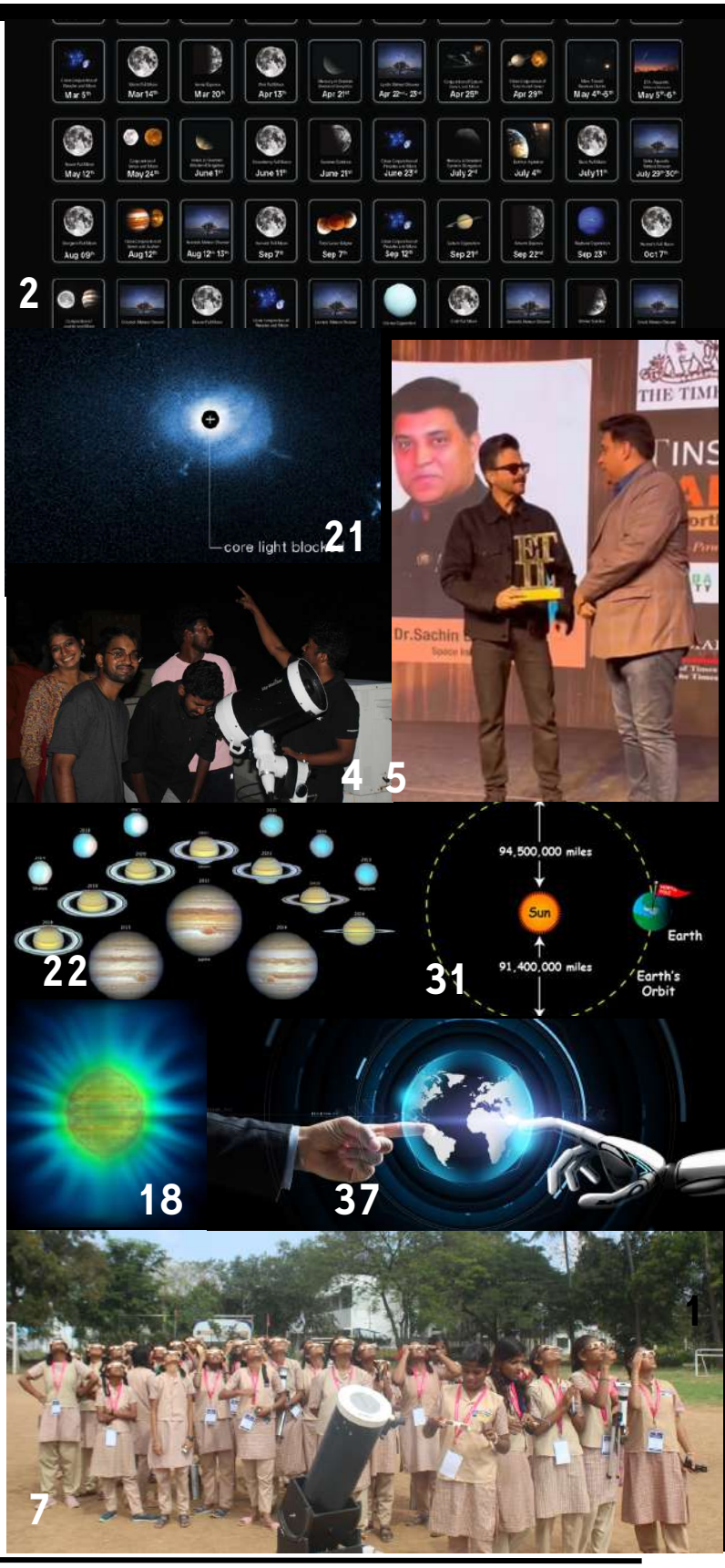
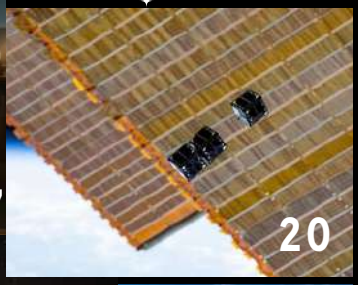
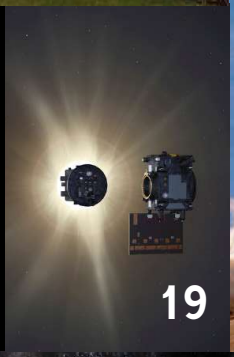


CONTENTS





SPACE ARCADE

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MAJOR ASTRONOMICAL EVENTS

Conjuction

When the Moon or a planet appears especiallyclose either to another planet or to a bright star. Also used when. Moon or Planetsometimes is close to bright Deep sky objects

Eclipse

An event that occurs when the shadow of a planet or moon falls upon a second body.

Elongation

The angular distance the Moon or a planet isfrom the Sun. The inner planets of Mercurv and Venus are best seen when at maximumElongation, and thus are highest above thehorizon before sunrise or after sunset.

Equinox

The two times each year, near March 20th and September 22nd, when the Sun is directly overhead at noon as seen fromEarth's equator. On an equinox date, day and night are of equal length.

Solstice

The two times each year, around June 20th and December 21 st, when the Sun is farthest north or south in the sky. At the summer solstice, the day is longest and the night is shortest, and vice versa at thewinter solstice.

Meteor Shower

An increase in meteor activity at certain times of the year due to Earth passing through a stream of particles along a comet's orbit around the Sun.

Occultation

When the Moon or a planet passes directly infront of a more distant planet or star.

Opposition

When a planet or asteroid is opposite the Sun in the sky. At such times, the object is visible all night - rising at sunset and setting at sunrise.

Full Moon

A Full Moon Occurs When The Entire Face Of The Moon Is Fully Illuminated By The Sun. Its Monthly Names, Like "Harvest Moon" Or "Wolf Moon," Come From Ancient Traditions Reflecting Seasonal Events Or Folklore.

Transit

A Transit Occurs When A Smaller Celestial Object Passes In Front Of A Larger One, Like Mercury Or Venus Crossing The Sun, Or A Moon Of Jupiter Transiting Jupiter, Revealing Details About Their Size And Orbit.

NOTES

- Elongation Dates Are Based On The Highest Altitude Of The Planet As Seen At Sunset or Sunrise
- Meteor Showers Are Best Observed From Late Evening Until The Early Morning Of The Following Day
- The Lunar Occultation Of Elnath On January 11 Can Be Seen Only In South India (Time: 8:45 PM IST - 10:01 PM IST)
- The Lunar Eclipse On September 7 Will Begin At 8:58 PM IST And End On September 8 At 2:25 AM IST. It Can Be Seen All Over India
- The Planetary Alignment Of The Moon, Venus, Mars, Jupiter, Saturn, Uranus, And Neptune Can Be Seen Throughout The First Half Of February
- Perihelion Is When Earth Is Closest To The Sun In Its Orbit Occurring Around Early January. Aphelion Is When Earth Is Farthest From The Sun In Its Orbit Happening Around Early July, Influencing The Planet's Speed And Seasonal Variations.

SPACE ARCADE

CELESTIAL CALENDAR 2025

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Quadrantids Meteor Shower
Jan 3rd - 4th

Earth at Perihelion
Jan 4th

Venus at Greatest Eastern Elongation
Jan 10th

Lunar Occultation of Eloath
Jan 11th

Wolf Full Moon
Jan 14th

Mars at Opposition
Jan 16th

Close Conjunction of Venus and Saturn
Jan 18th

Planetary Alignment of Moon, Venus, Mars, Jupiter, Saturn, Uranus, Neptune
Feb 1th - 13th

Close Conjunction of Mars and Moon
Feb 10th

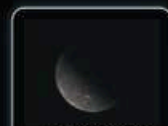
Snow Full Moon
Feb 12th

Close Conjunction of Pleiades and Moon
Mar 5th

Worm Full Moon
Mar 14th

Vernal Equinox
Mar 20th

Pink Full Moon
Apr 13th

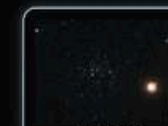


Mercury at Greatest Western Elongation
Apr 21st

Lyrids Meteor Shower
Apr 22nd - 23rd

Conjunction of Saturn, Venus and Moon
Apr 25th

Close Conjunction of Saturn and Venus
Apr 29th



Mars Transit Beehive Cluster
May 4th-6th

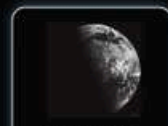
ETA- Aquarids Meteor Shower
May 5th-6th

Flower Full Moon
May 12th

Conjunction of Venus and Moon
May 24th

Venus at Greatest Western Elongation
June 1st

Strawberry Full Moon
June 11th



Summer Solstice
June 21st

Close Conjunction of Pleiades and Moon
June 23rd

Mercury at Greatest Eastern Elongation
July 2nd

Earth at Aphelion
July 4th

Buck Full Moon
July 11th

Delta Aquarids Meteor Shower
July 29th-30th

Sturgeon Full Moon
Aug 09th

Close Conjunction of Venus and Jupiter
Aug 12th

Perseids Meteor Shower
Aug 12th- 13th

Harvest Full Moon
Sep 7th

Total Lunar Eclipse
Sep 7th

Close Conjunction of Pleiades and Moon
Sep 12th

Saturn Opposition
Sep 21st

Autumn Equinox
Sep 22nd

Neptune Opposition
Sep 23th

Hunter's Full Moon
Oct 7th

Conjunction of Jupiter and Moon
Oct 13th

Orionids Meteor Shower
Oct 21st-22nd

Beaver Full Moon
Nov 5th

Close Conjunction of Pleiades and Moon
Nov 6th

Leonids Meteor Shower
Nov 17th - 18th

Uranus Opposition
Nov 21st

Cold Full Moon
Dec 5th

Geminids Meteor Shower
Dec 13th - 14th

Winter Solstice
Dec 21st

Ursids Meteor Shower
Dec 22nd - 23rd

ALL THE ABOVE EVENTS ARE AS PER INDIAN STANDARD TIME AND WILL BE VISIBLE FROM THE INDIAN SUBCONTINENT

GLIMPSE OF 2024

Japan Becomes Fifth Lunar Lander

Japan achieved a historic milestone by becoming the fifth country to successfully land a spacecraft on the Moon, showcasing advancements in space exploration and technology.

Gaganyaan Crew Unveiled by India

India introduced the crew members for its Gaganyaan mission, marking a significant step in its first human spaceflight program. A later flight featuring a humanoid robot is also planned.

India's Breakthrough in Rocket Tech

ISRO test-fired a new 3D-printed rocket engine, demonstrating India's growing capabilities in cutting-edge space technology and additive manufacturing. featuring a humanoid robot is also planned.

Agnibaan's 3D-Printed Engine Launch

Space startup Agnikul Cosmos successfully launched its Agnibaan rocket, powered by an indigenously developed 3D-printed engine, cementing India's private space sector growth.

Polaris Dawn Achieves Spacewalk Feat

SpaceX's Polaris Dawn mission marked the first-ever private spacewalk, showcasing the evolving role of commercial entities in advancing human space exploration.

ISRO Chief Wins Global Recognition

ISRO Chairman S. Somnath was honored with the prestigious IAF World Space Award for his outstanding contributions to space science and technology.

India Unveils MACE Telescope in Ladakh

India inaugurated the world's highest Imaging Atmospheric Cherenkov Telescope (MACE) in Ladakh, enhancing astrophysical research and gamma-ray studies.

SpaceX's Starship Lands with Style

SpaceX's Starship achieved a dramatic success on its fifth flight, with its "Chopsticks" booster-catching system working flawlessly, advancing reusable rocket technology.

Space Insights

EXPLORING THE COSMOS: SPACE ARCADE'S MONTHLY OBSERVATION

On December 7, 2024, SPACE ARCADE hosted its highly anticipated Monthly Telescopic Observation event, drawing astronomy enthusiasts in Delhi and Chennai for a captivating evening of celestial exploration. Over 80 participants gathered, equipped with telescopes, binoculars, and other astronomical tools, eager to unravel the wonders of the night sky.

Attendees were treated to breathtaking views of the Crescent Moon, Venus in its Gibbous phase, and Saturn accompanied by its largest moon, Titan. The highlight of the evening was Jupiter at Opposition, dazzling brightly with its Galilean moons and the iconic Great Red Spot clearly visible.

The SPACE ARCADE team guided participants through assembling and calibrating various telescopes, explained the features of different models, and answered an array of queries. They also introduced fundamental astrophotography techniques, inspiring many to document their cosmic discoveries.

A diverse range of telescopes was showcased during the event, including the Space Voyage 8" F/6 Dobsonian telescope, 200mm SCT on a Computerized EQ5 Mount, NexStar 8SE Computerized GoTo Telescope, Space Launcher 76mm, Space Voyage 150 EQ, Celestron Astromaster 70AZ, and Celestron Astromaster 130EQ. Each offered participants a unique perspective of the celestial wonders.

With a strong emphasis on interactive learning and shared discovery, the event left a lasting impression on all attendees. SPACE ARCADE eagerly anticipates hosting future sessions, inviting more enthusiasts to experience the magic and marvels of astronomy.

Follow SPACE ARCADE on Instagram (@SpaceArcadeInd) for updates about upcoming events!

Dr. Sachin Bahmba Recognized as a Visionary in Space Education and Tourism by The Times of India

New Delhi, December 18, 2024 – In a landmark recognition of his unwavering commitment to advancing space science and empowering youth, Dr. Sachin Bahmba, Founder of the SPACE Group, has been awarded the prestigious "Visionary Leader in Space Education and Space Tourism" title. The accolade was presented during the ET Inspiring Leaders North 2024 awards ceremony held at the Hyatt Regency, Delhi, hosted by The Times of India.

Under the visionary leadership of Dr. Bahmba, SPACE Group has redefined the boundaries of space education and tourism. His pioneering initiatives have inspired millions of young minds, fostering curiosity and innovation in the fields of science, technology, engineering, and mathematics (STEM). As an ISRO Registered Space Tutor, SPACE Group has been at the forefront of democratizing space knowledge, reaching over 1.5 million students across 1,000 schools.

The award celebrates Dr. Bahmba's legacy in revolutionizing space education through interactive programs, workshops, and global collaborations.

It also highlights his groundbreaking contributions to space tourism, positioning India as a hub for accessible and innovative space experiences.

Dr. Bahmba expressed his gratitude, saying, "This award is not just a recognition of my journey but a testament to the collective efforts of the SPACE India team and the students, educators, and enthusiasts who share our dream of making space exploration a reality for all. Together, we are charting new frontiers in space science and inspiring the next generation to reach for the stars."

The evening brought together industry leaders and innovators from diverse sectors, underscoring the role of visionary leadership in shaping India's future.

CALCULATING EARTH'S CIRCUMFERENCE WITH QUTUB MINAR

On 10th December 2024, Space India, in collaboration with the American Center and with the support of the Archaeological Survey of India (ASI), hosted a unique educational workshop titled 'Measuring Earth with Qutub Minar' which was held at the historic Qutub Minar Complex. 35 students from various prestigious schools across Delhi-NCR Region participated in the event where they got the chance to recreate the ancient experiment of Eratosthenes, who first measured Earth's circumference over 2,000 years ago. In the workshop, students learned how simple tools and careful observation can lead to groundbreaking scientific discoveries.

Participants applied the method in two ways:

1. Using Qutub Minar: They measured the shadow of the Minar at noon to determine the angle of the Sun's elevation.
2. Using a Gnomon Rod: A smaller vertical stick replicated the process on a manageable scale, helping students grasp the fundamentals of the experiment.

By combining their measurements with known distances and applying basic trigonometry, students successfully estimated Earth's circumference:

- Using Qutub Minar, Earth's polar circumference was calculated to be 41,200 km.
- Using a gnomon rod, Earth's polar circumference was calculated to be 39,960 km.

Both calculations were remarkably close to the actual polar circumference of Earth at 40,008 km. This shows the effectiveness of the ancient approach.
Students also learned about Sanderson's Sundial at the complex. This historical artifact sparked discussions on its significance and how ancient civilizations tracked time using the Sun's position. Later, participants used their own sundials to calculate the Indian Standard Time (IST), gaining hands-on experience in timekeeping methods.

The workshop was an immersive journey into history and logic, showcasing Space India's commitment to make science accessible to young minds. Students learned how ancient scholars relied on observation and reasoning to make groundbreaking discoveries, proving that advanced tools aren't always necessary for impactful science. At the same time, this workshop exemplifies how historical methods can inspire modern learning, fostering curiosity and critical thinking in students.

The success of Measuring Earth with Qutub Minar was made possible by the generous support of the American Center, Delhi, and the facilitation by the Archaeological Survey of India, which granted access to the Qutub Minar complex.

EMPOWERING YOUNG MINDS: WINTER CAMP BY SPACE INDIA & TAMIL NADU GOVERNMENT

In collaboration with the School of Excellence under the initiative of Department of Education, Tamil Nadu, SPACE India organized an inspiring five-day winter camp titled Young Science Explorers at the Pioneer College of Arts and Science, Coimbatore.

From across 28 districts of Tamil Nadu, 140 students and their teachers, totaling 170 attendees, came together to immerse themselves in the fascinating world of space science and astronomy. The camp commenced with an inaugural speech by the Coimbatore Chief Education Officer and the Deputy Director, who emphasized the importance of scientific learning and the wonders of space exploration. What followed was a series of unforgettable experiences packed with hands-on activities, educational tours, and celestial observations.

Day 1: Hands-On with Rocketry: Igniting the spirit of Exploration

The camp took off with an electrifying session on Hydro Rocketry. Students explored the basics of rocket science, understanding the principles of propulsion and aerodynamics. Each participant crafted their own hydro rockets using cool drink bottles and eagerly launched them, marking an exciting start to their space science journey. The energy and enthusiasm in the room were palpable as students' eyes lit up watching their rockets soar high. This hands-on activity not only kindled their interest in science but also taught them teamwork and creativity.

Day 2: The Sun's Science: Shedding Light on Our Cosmic Neighbor

The second day was dedicated to unraveling the mysteries of the Sun. In the first half, students learned why the Sun is called our daytime star, exploring its layers, features, and the phenomena it influences. The second half was even more engaging, as students assembled 50mm refractor telescopes and crafted solar filters. Using these instruments, they observed terrestrial objects and the Sun, spotting sunspots and experiencing solar observation firsthand. Additionally, students embarked on a virtual tour of the Palomar Observatory, diving into its history, groundbreaking discoveries, and the engineering marvel of its telescopes. The session underscored the significance of observatories and how they advance our understanding of the universe.

Day 3: Field Trip to the Regional Science Centre and Science Museum

Day three was a field trip to the **Regional Science Centre and Science Museum in Coimbatore**, where students delved into various scientific wonders. Highlights included:

- **Textile Museum:** Understanding the evolution of textiles from past to present.
- **Astronomy Gallery:** Tracing the history of the universe from the Big Bang to today.
- **Planetary Show:** A 30-minute visual journey showcasing the Earth's history, the age of dinosaurs, and the asteroid impact that caused their extinction.
- **3D Movie:** A 20 -minute visual journey showcasing the Dinosaur's and the natural world around.
- **Fun Science:** Here, students understanding the role of science in our Day-to-Day life from simple thinks like mirrors to Music.
- **How Things Work:** Here, students explored exhibits ranging from water pumps to rocket science and automobile mechanics.

This day-long excursion ignited curiosity and left both students and faculty brimming with excitement.

Day 4: Stars at the Door Step: Hands on Telescope

The fourth day brought students closer to the stars with a comprehensive Hands-on Telescope session. In the morning, they learned the history and evolution of telescopes and explored the sky simulation software Stellarium. The evening was a celestial delight as students assembled, handled their own 50mm refractor telescopes pointing it towards the Planets and observing Venus, Jupiter, Saturn, Mars and the Pleiades star cluster through 200mm Dobsonian telescopes. For many, this was their first glimpse of planets and star clusters, making it an unforgettable experience.

Day 5: The Wonders of Comets and Closing Ceremony

The final day began with an engaging session on comets. Students learned about their formation, history, and significance through missions to study these celestial bodies. They then created their own comet replicas using materials like mud, dry ice, and ammonia, marveling at the process. The afternoon brought cultural activities, where students showcased their talents through singing and dancing.

The camp concluded with a grand certificate distribution ceremony, where all participants received certificates for their efforts. Each of the 28 participating schools were given a 50mm refractor telescope and a solar filter crafted during the camp as a take away kit. The students' and faculty's heartfelt feedback highlighted the profound impact of this camp.

A Memorable Journey

The Young Science Explorers winter camp was a resounding success, leaving an indelible mark on the minds of all participants. Over five days, students were not only educated but also inspired to dream big and explore the cosmos. SPACE India's dedication to making astronomy accessible and engaging was widely appreciated, setting the stage for a brighter future in space education.

Reaching for the Stars: Space India's Winter Carnivals Spark Curiosity

This winter, Space India brought the wonders of the cosmos closer to earth with two spectacular astronomy-themed carnivals. Hosted at Rajinder Nagar and Shree Venkateshwar International School (SVIS), Dwarka, these events offered an engaging blend of fun and education, leaving attendees with a deeper appreciation for the universe.

At Rajinder Nagar, participants dived into a series of interactive activities. The "Cosmos in Jar" station allowed them to craft dazzling nebula jars, merging creativity with science. "Cosmic Ink" featured a tattoo station showcasing unique space-themed designs, while "Helio-adventure" provided an extraordinary opportunity to observe the Sun through a telescope. The "Planetary POP Art" corner inspired artistic expression with magnetic planet-themed creations. A crowd favorite, "Create, Craft, and Launch," saw students design and launch air rockets, sparking excitement and engineering curiosity. The evening concluded with mesmerizing telescope views of Jupiter and Saturn, leaving attendees spellbound.

The Dwarka carnival expanded on these activities with even more captivating offerings. In addition to the popular attractions from Rajinder Nagar, visitors explored a high-tech planetarium and immersed themselves in augmented and virtual reality experiences. "Light Painting" and the "Light Blocker Game" added a playful twist, illustrating the fascinating role of light in astronomical phenomena.

Space India's winter carnivals were a resounding success, igniting a passion for astronomy and leaving a lasting impression on all who attended. These events beautifully demonstrated how science can be both accessible and exhilarating.

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St. Mary's School Visits National Science Centre Museum

The National Science Centre, Pragati Maidan, New Delhi, is a premier institute dedicated to fostering scientific temperament among visitors. It stands as a beacon of innovation and discovery and is known for its state-of-the-art exhibits, engaging workshops, and immersive shows. The Centre is a hub for individuals who are eager to explore the marvels of science and technology.

On 14h December 2024, students of St. Mary School, Sector 19 Dwarka, guided by the educators of SPACE India, embarked on an educational journey to this iconic venue.

The visit was an exciting opportunity for students to delve into the fascinating realms of astronomy and space science. SPACE India educators interacted with the young minds, providing detailed insights into the exhibits. They explained complex astronomical phenomena in a simple and engaging manner, sparking curiosity and enthusiasm among the students.

National Science Centre, Delhi (Image Credit: indianholiday.com)

For students of classes 3 to 5, the highlight of the visit was a captivating 3D video about nature. The immersive experience brought the beauty and intricacies of the natural world to life, leaving the students awe-inspired and with a deeper appreciation for their environment.

Meanwhile, the students of classes 6 to 10 attended an engaging show on the Sphere, which featured cutting-edge technology to visualize scientific concepts. From dynamic weather patterns to celestial movements, the Sphere provided an interactive way to understand the complexities of the Earth and the universe beyond. The experience was both educational and entertaining, broadening the students' perspectives on the interconnectedness of scientific phenomena.

The visit was a perfect blend of learning and fun, as students explored the galleries of the National Science Centre, each filled with hands-on exhibits and experiments. They were encouraged to interact with the displays, fostering a sense of exploration and creativity.

In conclusion, the visit to the National Science Centre was an enriching experience for the students of St. Mary School. It not only enhanced their understanding of science but also inspired them to think critically and dream big. Events like these are a testament to the importance of experiential learning in shaping young minds and fostering a lifelong passion for discovery and innovation.

BEYOND THE HORIZON: EXPLORING THE UNIVERSE ACROSS UITS SCHOOLS

DPS Greater Faridabad: Adhyan Utsav – A Journey to Stellar Horizons

On December 7, 2024, DPS Greater Faridabad hosted Adhyan Utsav, an exhilarating celebration of innovation and astronomy, centered on its signature exhibit, Stellar Horizon: Where Imagination Meets the Infinite.

The event featured two key attractions:

- Open Stall: A vibrant display of cosmic props, including a UFO, Sun, and Moon, celebrating milestones like Chandrayaan-3 and Aditya L1.
- Space Tunnel: This dark, immersive walkthrough included a laser-light painting booth, VR stations for space exploration, and a replica of the school's future observatory, designed by students.

Historical and scientific figures came to life as students portrayed luminaries like Raja Jai Singh and Galileo, while others explored planetary gravity and differentiated astronomers from astrologers in engaging presentations.

A highlight of the event was Coffee with Vyomnauts, an informal session where students and visitors delved into the mysteries of space science through stimulating discussions. The immersive cosmic atmosphere, combined with the dedication of students and teachers, turned Adhyan Utsav into a milestone celebration of creativity, curiosity, and innovation.

Bal Bharati Public School: The Call of the Wild

Bal Bharati Public School, Pitampura, welcomed over 25,000 visitors during its annual fête, The Call of the Wild, held from December 10 to 15, 2024.

SPACE India's Planetarium and Virtual Reality (VR) Station were the star attractions, transporting attendees to distant galaxies and the International Space Station (ISS). The immersive experiences blended education with awe, leaving participants inspired by the universe's vastness.

The collaborative efforts of teachers, coordinators, and student volunteers ensured a seamless and engaging event, setting a benchmark for combining experiential learning with entertainment.

St. Martin's Diocesan School: Beyond the Horizon

On December 10, 2024, St. Martin's Diocesan School, Delhi Cantt., hosted "Beyond the Horizon: An Astronomical Journey,' bringing the cosmos to life with over 15 hands-on activities. Highlights included a vortex cannon, a 4-foot Moon surface for crater-making, and a working Pragyan rover model celebrating India's advancements in space. A robotics showcase added further excitement with futuristic projects like IoT-enabled smart systems.

The astro fancy dress competition brought celestial bodies and iconic figures to life, while an interactive Space Lab tour introduced creative activities like light painting. Stunning space-themed decorations and an astronaut-themed photo booth added immersive charm to the event. Powered by 70 dedicated volunteers, this celebration of space exploration left a lasting impression on all attendees.




Sri Venkateshwar International School: Cosmic Celebrations

Sri Venkateshwar International School (SVIS), Dwarka, hosted two cosmic events in December 2024.

- December 13 - Cosmic Carnival: An engaging space-themed showcase featuring telescopic observations, interactive exhibits, and an on-the-spot painting competition. Students actively participated as guides, making the event educational and interactive.
- December 18 - Tiny Travellers of the Cosmos: A delightful fancy dress activity for Grade 1 students, where little ones transformed into astronauts, planets, and celestial bodies, presenting confident speeches that charmed audiences.

Both events reflected SVIS's commitment to igniting curiosity and creativity in young minds, fostering a love for space exploration.



ASTRONOMY SHOWCASE AT BBPS

At Bal Bharati Public School, Pitampura, this academic year has been nothing short of extraordinary. The students have excelled in academics, while going above and beyond in volunteering, public speaking, and managing large-scale events. Their unwavering dedication and enthusiasm have made every event a memorable success, and it's time to celebrate their incredible efforts.

Global Astronomy Month: A Stellar Beginning

The year kicked off with a bang in April Through the celebration Global Astronomy Month. The month was celebrated through a series of events and activities. One of the many standout events was the Sun-DAY Celebration, held on 16th April 2024. Students from classes VI-VIII, with guidance from their Astronomy Educator, Ms. Saloni Verma, set up telescopes and solar viewers under the scorching sun, providing participants with a rare opportunity to observe the Sun safely.

Astro Cooking: Space Meets Creativity

On 15th April 2024, during another stellar celebration of Global Astronomy Month the students of primary classes demonstrated their culinary creativity in the Astro Cooking event. The event challenged students to prepare innovative and delicious food inspired by space themes. Their unique ideas and teamwork transformed this activity into a fun and delightful experience, blending science with creativity.

Astronomy Showcase: Engaging and Inspiring

On 30th April 2024, the students organized an Astronomy Showcase that transformed the school into a hub of interactive learning and fun. With activities designed for all age groups, this event captured the attention of students, parents, and even our esteemed chief guest, Mr. Himanshu Gupta (Secretary, CBSE).

National Space Day: Celebrating India's Space Milestones

On 23rd August 2024, the school commemorated National Space Day to honor India's remarkable achievements in space, especially Chandrayaan-3's success. Students from Grades II-VIII engaged in workshops and activities, celebrating India's position as the first nation to land on the Moon's southern polar region. Under the initiative 'Wall of Stellar Messages,' students also penned heartfelt notes to astronauts, expressing admiration and encouragement.

World Space Week: Shining Bright on a National Stage

In October, BBPS Pitampura students participated in multiple competitions during World Space Week organized by Space India. Competing at a national level, they brought laurels to the school:

- Nandini Jain (XI): First position in Astro Video Podcast category.
- Naksh Saluja (VI E): Second position in Graphic Novel Creation category.
- Vihaan (VIII F): Second position in Graphic Novel Creation category.
- Aishani Tiwari (VI E): Second position in Graphic Novel Creation category.
- Madhav Arora (IV): Third position in Graphic Novel Creation category.

Their achievements are a testament to their hard work, creativity, and passion for space science.

Annual Carnival: The Call of the Wild

From 10th to 15th December 2024, our school hosted its grand annual fête; The Call of the Wild. Two stellar attractions–a mesmerizing Planetarium and an immersive Virtual Reality (VR) Station–were brought in collaboration with SPACE India.

Role of Volunteers:

The successful conduction of the various events would not have been possible without the student volunteers. The students ensured that the attendees had a seemless and engaging experience through hands-on-activity and demonstration while explaining complex astronomy concepts. Their efforts ensured the success of this event, leaving participants in awe of celestial wonders and they deserve acknowledgement:

Pratham Goel, Khushi Mathur, Sansidh Garg, Shivansh Garg, Arjit, Vihaan Shri, Ansh Thakkar, Rohak Tayal, Divya Agarwal, Aarav Arora, Aadit Pansari, Atulya. Samriddhi Singh, Manya Sharma, , Tanay Motani, Arush Tayal, Sanvi Chopra, Akshaj Sharma, Yashvi Gupta, Grisha Samarwal.

Conclusion: A Year to Remember

This year has been a journey of learning, growth, and achievement. Students of BBPS Pitampura have set new benchmarks with their passion and dedication, making us immensely proud. Their efforts remind us of the limitless potential of young minds when given the right opportunities and guidance. As we look back on this remarkable year, we extend our heartfelt gratitude to our students, parents, teachers, and coordinators who made these achievements possible. Together, we continue to inspire curiosity and foster a love for learning, creating a brighter future for all.

Astroport: A New Frontier in Experiential Tourism in India

Astroport is transforming the tourism landscape in India, merging science, adventure, and exploration to offer a truly unique learning experience. Nestled in some of the country's most scenic and serene locations, Astroport destinations enchant visitors with celestial wonders, offering immersive activities that blend education with entertainment. From the lush, green expanse of Dwarasamudra in Karnataka to the tranquil surroundings of Dhela and Dhikuli in Uttarakhand, the rugged terrains near Sariska Tiger Reserve in Rajasthan, and the untouched beauty of the Neil Islands in the Andaman and Nicobar Islands –each destination promises an exceptional experience. Adding to the allure are the iconic sand dunes of Nubra and the crystalline waters of Pangong Lake in Ladakh, with the upcoming Astroport in Leh further enriching the offerings.

Each Astroport location is carefully selected based on its exceptional Bortle Class rating, positioning them as premier stargazing destinations in India. These handpicked settings provide a direct gateway to the cosmos, ensuring an awe-inspiring experience for astronomy enthusiasts, adventure seekers, and curious minds of all ages.

Astroport, Sariska.

Bridging the Cosmos with Culture

Astroport's reach extends far beyond stargazing. Each destination offers an array of experiences tailored to diverse interests. In Dwarasamudra, travelers can step back in time as they explore UNESCO World Heritage sites and ancient temples. The Andaman and Nicobar Islands offer a different kind of thrill with water sports like snorkeling, scuba diving, kayaking, and jet-skiing, all set against the backdrop of unforgettable stargazing sessions.

In Uttarakhand's Jim Corbett National Park and Rajasthan's Sariska Tiger Reserve, visitors can enjoy thrilling wildlife safaris during the day, followed by astronomy programs under the starlit sky.

Astroport's 7-day Ladakh road trip has been a standout offering, blending scenic travel, comfortable accommodation, and nightly astronomy workshops, set against the awe-inspiring Himalayan landscapes. The breathtaking star trails captured by guests at Pangong Lake serve as a lasting testament to the wonder that awaits those who seek the magic of the night sky.

A Record-Breaking Year and an Ambitious Future

2024 marked a milestone for the SPACE Group of Companies, with over 60,000 participants experiencing Astroport's offerings across its destinations. From solar eclipses to meteor showers, these events deepened participants' connection to the universe and sparked a sense of wonder and inspiration.

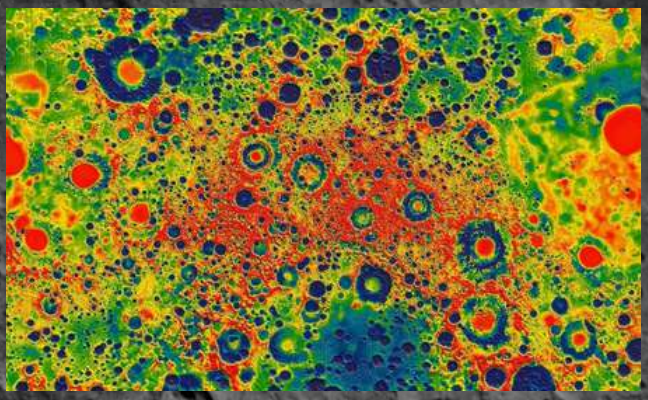
Looking ahead, Astroport's ambition for 2025 and beyond is bold. Plans are in place to expand to 30 locations across India and venture into global markets. This expansion will not only create new employment opportunities but also drive economic growth and promote sustainable tourism. By aligning these initiatives with broader goals of environmental conservation and scientific education, Astroport is committed to building a brighter and more inclusive future for all.

Book Your Astroport Adventure Today

Plan your visit to one of Astroport's mesmerizing locations and experience the magic of the stars in an entirely new way.

HIGHLIGHTS OF DECEMBER 2024

China Unveils Volcanic Secrets from the Moon's Far Side



A gravity map of the moon's surface, showing the far side of the moon at the center. (Image credit: NASA/ARC/MIT)

In a groundbreaking revelation, China's lunar mission has shed light on ancient volcanic activity on the far side of the moon. Analysis of rock samples brought back by the Chang'e 6 lander has revealed that active volcanoes were erupting on the moon's far side as recently as 2.8 billion years ago. The moon is tidally locked with Earth, meaning its near side is always visible, while the far side remains hidden. Due to this configuration, the far side has been less explored, with only two landers – both from China's Chang'e's program - landingon this enigmatic terrain. The Chang'e 6 mission, conducted in 2024, marked a milestone by collecting over 4 pounds (1.9 kilograms) of rock samples from the South Pole-Aitken Basin, one of the largest known impact craters in the solar system.

These samples were analyzed by Zexian Cui and colleagues at the Guangzhou Institute of Geochemistry, part of the Chinese Academy of Sciences. The team focused on the isotopes and chemical composition of the rocks to determine their age and origin. Isotopes, which are atoms of the same element with different numbers of neutrons, serve as a reliable clock for dating geological samples. The researchers' findings confirmed the samples' volcanic origins, dating them to a period when magma was still flowing on the moon's surface.

This discovery has profound implications for understanding the moon's geological history. While volcanic activity on the near side has been well-documented, the far side was previously thought to be less active due to its thinner crust and lack of maria – the dark basaltic plains formed by ancient lava flows. The new evidence of volcanic eruptions challenges these assumptions and provides insights into the thermal evolution of the moon.

An image of China's Chang'e 6 lander on the moon's far side, snapped by the mission's minirover. (Image credit: CNSA/CLEP)

China's achievements on the far side of the moon are not only scientific milestones but also demonstrate the country's growing leadership in lunar exploration. The samples from Chang'e 6 represent humanity's first direct look at this uncharted lunar terrain, enriching our understanding of the moon's complex history and geological diversity. The findings, published in Science on November 15, mark a significant step forward in unraveling the mysteries of our closest celestial neighbor.

SCIENTISTS CAPTURE FIRST-EVER IMAGE OF A PHOTON

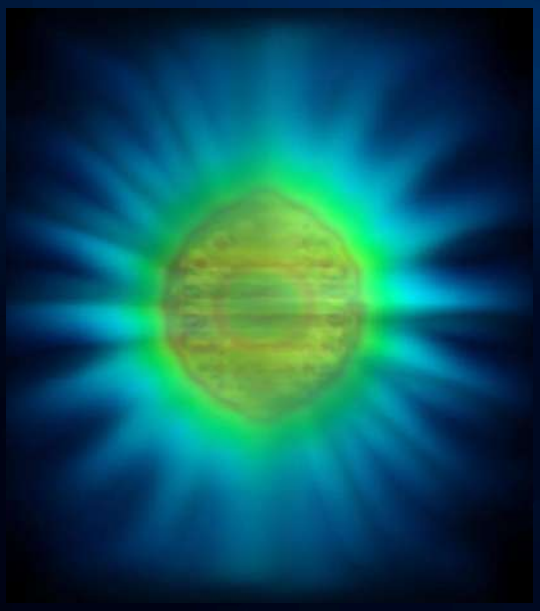


Image credit: Ben Yuen and Angela Demetriadou

In a landmark achievement, researchers at the University of Birmingham have unveiled the first detailed image of a photon, offering an unprecedented glimpse into the fundamental nature of light. The breakthrough, reported on November 14 in the journal Physical Review Letters, has significant implications for understanding the quantum behavior of photons and their interactions with matter. Photons are the fundamental particles of light, known for their dual nature—they can behave as both waves and particles. While this quantum behavior has been established for over a century, much about their intricate properties and interactions remains elusive. The Birmingham team's innovative technique has enabled the capture of a photon as a lemon-shaped particle of light, emitted from the surface of a nanoparticle. This first-of-its-kind visualization marks a major leap in quantum science.

The theoretical framework behind this discovery provides a powerful tool for calculating the complex properties of photons. "We want to be able to understand these processes to leverage that quantum side," said Ben Yuen, the study's lead author and a research fellow at the University of Birmingham. Yuen explained that photons can be considered fundamental excitations of an electromagnetic field, a concept that adds layers of complexity to their study. These fields span a continuum of frequencies, and any of them can potentially become excited, resulting in a virtually infinite number of possibilities.

This complexity creates significant mathematical challenges. "At first glance, we would have to write down and solve an infinite number of equations to reach an answer," Yuen explained. Despite these difficulties, the new technique allows researchers to isolate and analyze the properties of photons in specific environments.

The implications of this discovery are vast. By providing a clearer picture of how light interacts with matter at the quantum level, this research could pave the way for advancements in quantum computing, which relies on manipulating quantum particles like photons. It could also revolutionize technologies such as photovoltaic devices, used to convert sunlight into energy, and artificial photosynthesis, a process inspired by plants to generate clean energy.

Moreover, understanding the precise nature of photons could lead to more efficient optical systems, improved communication technologies, and even enhanced sensors for scientific exploration.

The visualization of a photon is not merely a scientific milestone; it represents a crucial step toward mastering quantum light's potential. This achievement deepens our understanding of the universe at its most fundamental level, opening doors to innovations that could transform technology and energy use in the decades to come.

This pioneering research underscores the boundless possibilities of quantum science and its potential to shape the future.

INDIA LAUNCHES PROBA-3 SATELLITES TO CREATE ARTIFICIAL SOLAR ECLIPSES

India successfully launched ESA's twin Proba-3 satellites on December 5 aboard a PSLV-XL rocket from the Satish Dhawan Space Centre. This groundbreaking mission aims to demonstrate precise formation flying and create artificial solar eclipses in space, revolutionizing solar observation and space engineering.

Proba-3 comprises two spacecraft designed to maintain a separation of 150 meters with millimeter-level accuracy. This precision allows one satellite to cast a shadow on the other, enabling extended observations of the Sun's corona, the faint outer atmosphere crucial to understanding solar wind and space weather.

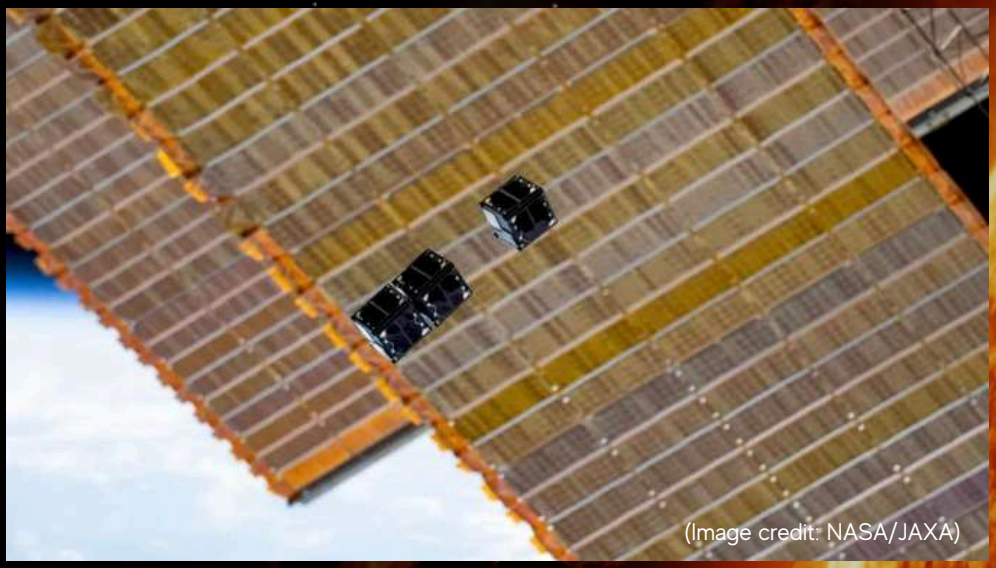
The mission was developed by 14 ESA Member States and Canada, showcasing advanced European technology. "Proba-3's achievement is not just a technological feat but also a scientific milestone," said ESA's Director of Technology, Dietmar Pilz. Mission manager Damien Galano highlighted the challenge of maintaining exact positioning despite the satellites being separated by 150 meters.Placed in a highly elliptical orbit extending over 60,500 kilometers from Earth, the satellites will soon begin their operational phase. Proba-3 will bridge a critical gap in solar imaging, observing the corona between 1.1 and 3 solar radii. This will allow scientists to track coronal mass ejections and solar wind acceleration with unprecedented detail.

ESA Director General Josef Aschbacher emphasized the mission's broader implications: "Proba-3 demonstrates the potential of formation flying to create virtual telescopes, opening new possibilities for future missions." Led by Sener in Spain, the mission involved contributions from Airbus Defence and Space, Redwire Space, and GMV. India's NewSpace India Limited (NSIL) ensured a precise launch, reflecting growing global collaboration in space exploration. This mission marks a significant step forward in solar science and autonomous satellite technology.

Proba-3 orbit (Image credit: ESA)

Proba-3 Occulter eclipsing Sun for Coronagraph spacecraft (Image credit: ESA)

Solar Maximum Knocks Three Satellites Out of Orbit: Why More May Follow



(Image credit: NASA/JAXA)

In early November, three CubeSats from Curtin University's Binar Space Program – Binar-2, 3, and 4 – unexpectedly burned up upon re-entry into Earth's atmosphere, cutting their missions short. These small satellites were expected to eventually burn up due to orbital decay, but their premature end highlights the dramatic impact of recent heightened solar activity on satellites in low Earth orbit (LEO).

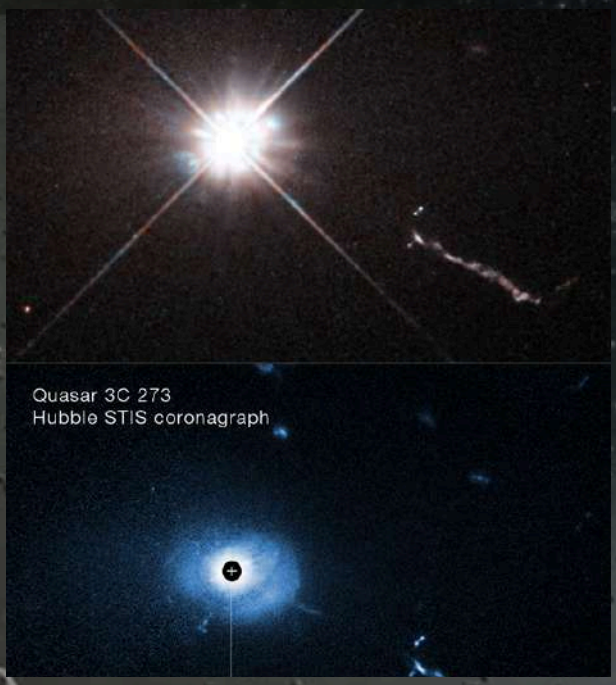
The Binar satellites, designed to operate for six months, only lasted two months. This was caused by an increase in solar activity, which has been wreaking havoc on satellite operations, particularly in LEO. Space weather, driven by solar phenomena like sunspots and solar flares, has been more intense than expected. Solar activity follows an 11-year cycle, with solar maximum occurring at its peak, which is now in progress.

One significant effect of heightened solar activity is the ballooning of Earth's outer atmosphere, which increases atmospheric drag on satellites in LEO. As the atmosphere expands due to additional solar energy, satellites below 1,000 km experience increased resistance, disrupting their orbits and causing them to descend toward Earth. This was evident with the Binar CubeSats, which lacked the ability to adjust their altitudes and were at the mercy of space weather.

The loss of Binar-2, 3, and 4 illustrates the challenges of operating small satellites in the current solar environment. While larger satellites, like the International Space Station and Starlink, can use thrusters to counteract the drag, CubeSats typically lack such capabilities. The premature end of these missions highlights the need for more accurate space weather forecasting to protect future satellites.
Solar activity is expected to decrease by 2026, with solar minimum anticipated by 2030. However, the experience of Binar-2, 3, and 4 has underscored the importance of preparing for the unpredictable nature of space weather, ensuring that future missions are designed to handle these challenges.

EYES IN SPACE-DECEMBER 2024

Hubble Takes the Closest-Ever Look at a Quasar



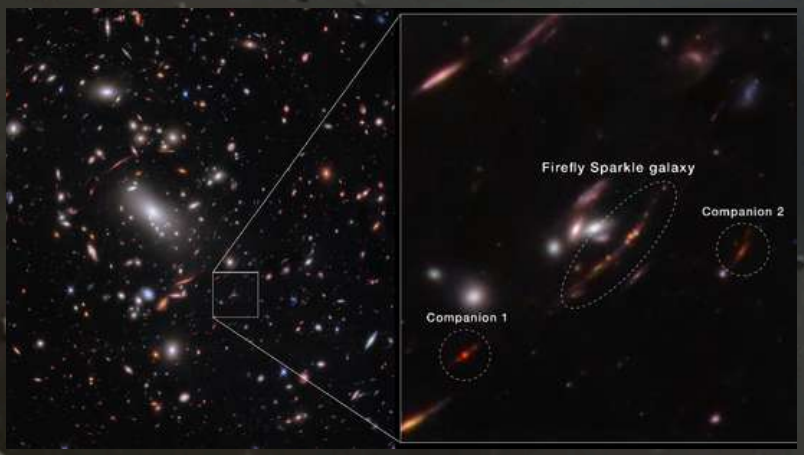
Astronomers using NASA's Hubble Space Telescope have obtained unprecedented views of quasar 3C 273, the first quasar ever identified. Located 2.5 billion light-years away, quasars are extraordinarily bright galactic centers powered by supermassive black holes consuming nearby material. Hubble's advanced imaging revealed unusual structures around the quasar, including filaments, lobes, and an L-shaped formation, likely remnants of small galaxies being devoured by the black hole.

These observations highlight galactic collisions and mergers that funnel material onto black holes, fueling the immense energy output of quasars.

Hubble's coronagraph allowed scientists to peer closer than ever, observing fine details and tracking the motion of the quasar's extragalactic jet, which spans 300,000 light-years and moves at near-light speed. This research bridges observational gaps, shedding light on quasar morphology and galactic interactions.

Future studies with the James Webb Space Telescope may reveal even more about these enigmatic cosmic phenomena.

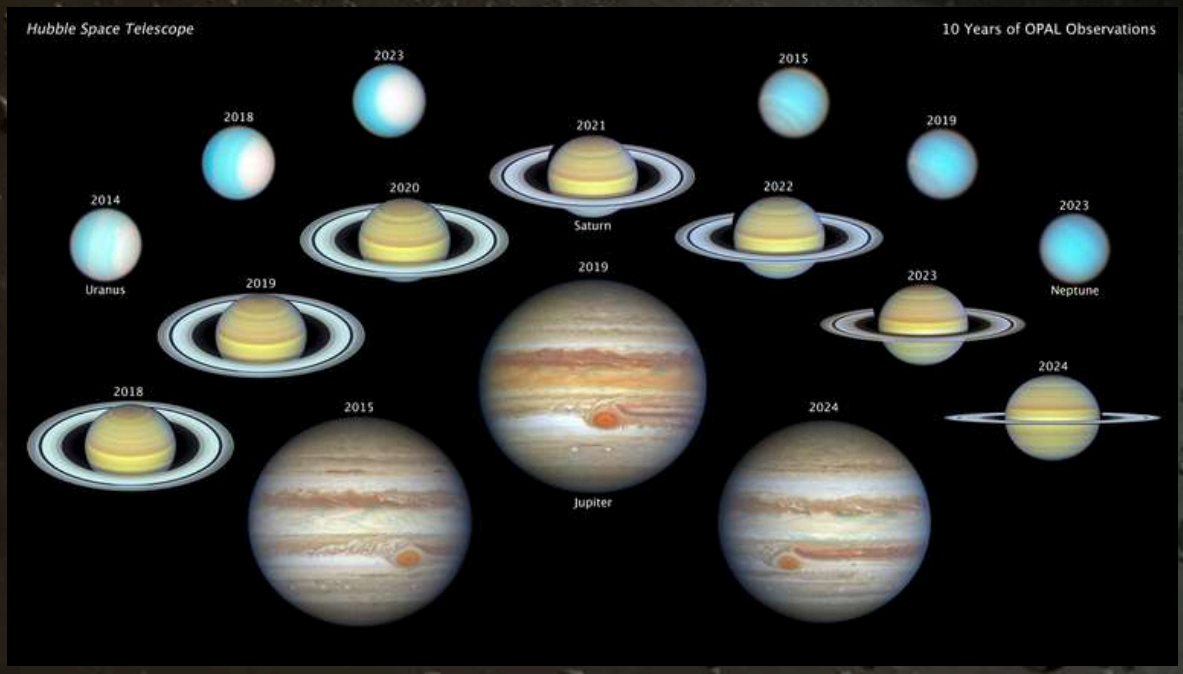
First Actively Forming Galaxy as Lightweight as the Early Milky Way



Astronomers using the James Webb Space Telescope have captured unprecedented detail of the "Firefly Sparkle" galaxy, a low-mass galaxy forming just a billion years after the Big Bang. Enhanced by gravitational lensing from the massive galaxy cluster MACS J1423, the galaxy's light was magnified and stretched, revealing its intricate structure. This early-stage galaxy resembles an elongated raindrop, with 10 distinct star clusters emitting most of its light in shades of pink, purple, and blue. These clusters represent various phases of star formation, demonstrating staggered growth rather than a uniform process.

The observations highlight the galaxy's dynamic assembly, with diffuse light from unresolved stars surrounding clumps of actively forming ones. Unlike mature galaxies, Firefly Sparkle lacks a central bulge or disk, signifying its early evolutionary stage. Researchers liken its appearance to a swarm of sparkling fireflies, offering a rare glimpse into how galaxies develop "brick by brick" in the young universe.

NASA's Hubble Celebrates Decade of Tracking Outer Planets



Hubble's OPAL (Outer Planet Atmospheres Legacy) program has observed the outer planets—Jupiter, Saturn, Uranus, and Neptune—annually from 2014 to 2024, capturing their atmospheric dynamics and evolution. The program reveals striking phenomena: Uranus's changing polar cap, Neptune's cloud variations, Saturn's ring tilt, and Jupiter's evolving cloud bands and Great Red Spot. OPAL builds on discoveries from NASA's Voyager missions, providing long-term, high-resolution data on these planets' deep atmospheres and weather systems. By tracking seasonal and solar influences, OPAL aids in understanding not only our solar system but also exoplanet climates, with data contributing to over 60 scientific publications and collaborations.

NASA's Chandra Reveals Black Hole Jet Colliding with Hidden Object

Astronomers using NASA's Chandra X-ray Observatory have discovered a unique X-ray feature in the galaxy Centaurus A (Cen A), located 12 million light-years away. The supermassive black hole at Cen A's center emits powerful jets of high-energy particles, one of which appears to have struck an unidentified object. This collision created a V-shaped X-ray emission, with arms spanning 700 light-years, visible in Chandra's deepest image of the galaxy. Scientists suggest the object may be a massive star or gas cloud, generating turbulence and X-rays upon impact. The unusual shape remains a mystery, distinguishing it from other jet collisions in Cen A.

SpaceX launches in January 2025

Transporter 12 (Dedicated SSO Rideshare)

Date: January 2025, Rocket: Falcon 9 Block 5, Agency: SpaceX Country: USA, Launch Site: Cape Canaveral Space Force Station, FL, USA.

The Transporter 12 mission is a dedicated Sun-Synchronous Orbit (SSO) rideshare launch by SpaceX, offering affordable access to space for small satellite operators. This mission will carry a variety of payloads, including ESPA-class satellites, to a precise SSO orbit, supporting advancements in Earth observation, communications, and scientific research.

SpaceX's rideshare program has revolutionized the accessibility of space, offering small satellite operators affordable rates starting at $300,000 for payloads up to 50 kg. By aggregating satellites from various customers into a single launch, Transporter 12 highlights the cost-efficiency and versatility of rideshare missions.

The Falcon 9 Block 5 rocket, renowned for its reusability and reliability, will play a central role in this mission. Featuring a two-stage design optimized for maximum efficiency, the rocket's first stage is expected to return to Earth for recovery, emphasizing SpaceX's commitment to sustainable spaceflight. (Image credit: Wikipedia)

SpainSat NG I

Date: January 2025, Rocket: Falcon 9 Block 5.
Agency: SpaceX, Country: Spain, Launch Site: SLC-40 or LC-39A, Florida, USA.

The SpainSat NG I mission is set to launch aboard SpaceX's Falcon 9 Block 5 rocket in January 2025. This mission will deliver the SpainSat NG I communications satellite, which is designed to provide secure communications services to Spain. It is part of Spain's efforts to enhance its satellite communications capabilities. The satellite will be positioned in geostationary orbit to support both civilian and military communications, offering reliable and secure service for Spain's communication needs.

The Falcon 9 Block 5, known for its reusability and reliability, will carry the Spain Sat NG I satellite to its designated orbit. The mission underscores the continued collaboration between SpaceX and global partners in advancing satellite communication technology. (Image credit: Wikipedia)

Blue Ghost Lunar Lander

Date: January 2025, Rocket: Blue Ghost Lunar Lander (Falcon 9 Block 5), Agency: SpaceX, Country: USA, Launch Site: Kennedy Space Center, FL, USA

The Blue Ghost Lunar Lander mission, developed by Firefly Aerospace under NASA's Commercial Lunar Payload Services (CLPS) program, will launch aboard SpaceX's Falcon 9 Block 5 rocket in January 2025. The mission aims to deliver a variety of scientific payloads to the Moon, including a lunar retroreflector and Stereo Camera for Lunar Plume-Surface Studies (SCALPSS). These experiments will provide valuable data on the lunar surface and contribute to NASA's long-term exploration goals.

The Blue Ghost lander, with a payload capacity of up to 155 kg, will touch down at Mare Crisium, a lunar basin, and operate for 14 days. SpaceX's Falcon 9 will deliver the lander to a precise lunar orbit, showcasing SpaceX's continued role in facilitating commercial lunar exploration.

This mission highlights the significance of commercial partnerships in expanding space exploration frontiers, with NASA leveraging commercial landers to accomplish scientific objectives on the Moon. (Image credit: Wikipedia)

Lunar Trailblazer & Nova-C IM-2 lunar mission

Rocket: Falcon 9 Block 5Agency: SpaceX, Country: USA
Launch Site: Kennedy Space Center, Launch Complex 39A, Florida, USA

The Nova-C IM-2 mission is the second lunar lander mission developed by Intuitive Machines under NASA's Commercial Lunar Payload Services (CLPS) program. Its primary goal is to test in-situ resource utilization (ISRU) on the Moon. The payload includes NASA's PRIME-1 (Polar Resources Ice Mining Experiment-1), which consists of two key instruments: TRIDENT drill: Designed to excavate lunar regolith. MSolo mass spectrometer: Analyzes the extracted material to detect water and other volatiles.

Additionally, the mission will deliver the Lunar Trailblazer, a small satellite tasked with mapping water ice and other volatile substances on the lunar surface. The data gathered will significantly advance our understanding of the Moon's potential for resource extraction and support future Artemis missions. (Image credit: Wikipedia)

****NOTE: LAUNCH DATES OF THE MISSIONS ARE SCHEDULED TO BE LAUNCHED IN JANUARY 2025 BUT MAY SUBJECT TO CHANGE.**

Rocket launches in January 2025

IRNSS-1K (NVS-02)

In January 2025, ISRO will launch the GSLV Mk II rocket carrying the IRNSS-1K (NVS-02) satellite, marking another milestone in India's journey toward self-reliant navigation systems. This launch, from the iconic Second Launch Pad at Sriharikota, is part of the Indian Regional Navigation Satellite System (IRNSS), also known as NavIC—a constellation designed to give India an independent and precise navigation platform, rivaling the global GPS systems.

India's quest for its own navigation system began after the Kargil War in 1999, when the lack of access to GPS data during critical military operations underscored the need for an indigenous system. Decades of perseverance followed, leading to the creation of NavIC. The IRNSS-1K satellite will replace an older satellite in the constellation, ensuring uninterrupted service to millions across India and its surrounding regions.

The GSLV Mk II, a three-stage powerhouse featuring an indigenously developed cryogenic upper stage, is a testament to ISRO's engineering ingenuity. With a history of successful missions, this rocket has consistently demonstrated its ability to place satellites into high orbits with precision.

This mission also reflects years of innovation and collaboration, showcasing India's drive to push the boundaries of space technology. By enhancing navigation capabilities critical for disaster management, transportation, and precise timing, IRNSS-1K promises to support both civilian and military applications.

As the launch date approaches, the world looks on with anticipation, celebrating not just a technological achievement but a story of determination and progress

(Image credit: Defenceforumindia.com)

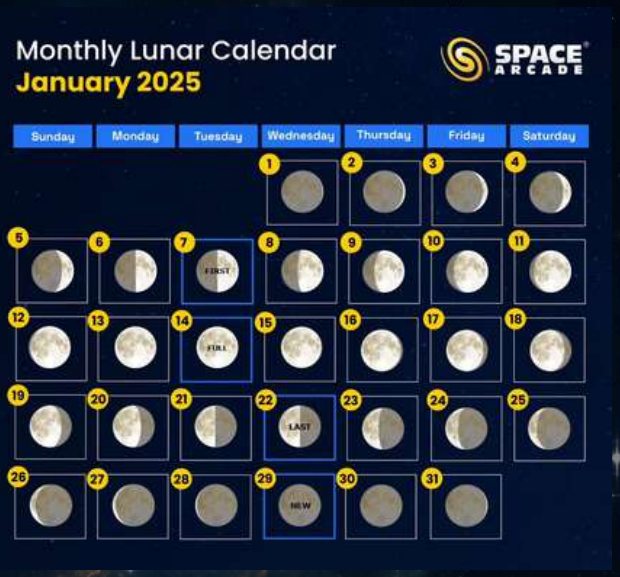
WHAT'S UP IN THE SKY - JANUARY 2025

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
Evening planet, Visible low in the dawn twilight, lost after 9 Jan

Venus
Evening planet, greatest elongation on 10 Jan, near Saturn on 18 Jan and Neptune on 31 Jan.

Mars
Reaches opposition 16 Jan, presents 14 arcsecond disc through the eyepiece.

Jupiter
Well placed evening planet in Taurus, reaching altitude of 59° when due south.

Saturn
Ringed planet, occulted by the Moon on 4 Jan, early evening.

Uranus
Evening planet in Aries, reaching peak altitude of 55° in darkness through the month.

Neptune
Deteriorating evening planet, west of south as darkness falls at the start of the month.

BRIGHT DEEP SKY OBJECTS

Omicron Velorum Cluster, IC 2391 or Caldwell 85, is an open cluster located in the constellation Vela. It has an apparent magnitude of 2.5 and is best observed from southern hemisphere. It contains about 30 stars and is about 50 million years old. You can use False cross asterism as a guide.

The Beehive Cluster also known as NGC 2632 or M44 is located in Cancer constellation with apparent magnitude of 3.1. With naked eyes it looks like a blurry patch of light, Binoculars can give a clear view. This cluster is about 600 years old and contains roughly 1000 stars

NGC 2422, Cr 152 or M47 is located in Puppis constellation with an apparent magnitude of 4.4. Discovered by Giovanni the cluster has about 500 stars and is78 million years old. The cluster can be observed by binocular and small telescope near Sirius.

Caldwell 7 also known as NGC 2403 , a spiral galaxy is best observed from the northern hemisphere. It has an apparent magnitude of 8.9 and can be observed through binoculars or a small telescope. It is a member of the M81 group of galaxies and is about 50,000 light - years in diameter.

ASTRONOMICAL EVENTS - JANUARY 2025

MARS OPPOSITION: THE RED PLANET SHINES BRIGHTEST

In January 2025, Mars will reach opposition. This offers a unique opportunity to observe the Red Planet at its brightest and most prominent. Here's an in-depth look at what Mars opposition is, why it happens, and how and where to observe it.

What is Mars Opposition?

Mars opposition occurs when Earth is between Mars and the Sun. During this alignment, Mars is fully illuminated by the Sun and appears opposite to it in our sky. This celestial event happens approximately every 26 months due to the differing orbital periods of Earth and Mars.

At opposition, Mars is not only opposite the Sun but also at a point in its orbit where it is closest to Earth, known as "perigee." This proximity enhances its visibility, making Mars appear larger and brighter in the night sky. In January 2025, Mars will reach opposition on the 16th, coming within about 0.642825 astronomical units (AU) of Earth, roughly 90.1 million kilometers away. This will make it a striking object for both casual observers and seasoned astronomers.

How to Observe Mars Opposition

To observe Mars at opposition:

1. Timing: Mars will rise in the eastern sky at sunset and remain visible all night, setting in the west around sunrise. This makes it accessible for observation regardless of your schedule.
2. Equipment: While Mars is visible to the naked eye as a bright reddish point, binoculars or a telescope can reveal surface details such as dark regions, polar ice caps, and even dust storms. A telescope with a magnification of at least 100x is recommended for a closer look.
3. Preparation: Set up your equipment in advance and allow your eyes to adapt to the dark. Use a star chart or an astronomy app to locate Mars in the constellation Gemini.

Where to Observe Mars Opposition

Mars will be visible from most locations around the world, including India. To maximize your viewing experience:

- Find a Dark-Sky Location: Areas with minimal light pollution, such as rural locations or designated dark-sky parks, offer the best visibility.
- Choose a Clear Night: Monitor weather forecasts for clear skies to ensure unobstructed views.
- Unobstructed Horizon: Ensure you have an open view of the eastern sky at sunset.

Why Observe Mars Opposition?

Mars opposition provides a rare chance to see the Red Planet at its brightest and largest in the night sky. This event is an excellent opportunity for both observation and photography, offering views that won't be available again for another two years. Mark your calendars and prepare for this celestial highlight!

VENUS AT GREATEST EASTERN ELONGATION

Venus at greatest elongation east is a fascinating celestial event where the planet reaches its maximum angular distance from the Sun in the evening sky. Here's an explanation of what this event is, how to observe it, and where to look.

What is Greatest Elongation East?

Greatest elongation east occurs when Venus appears farthest from the Sun in the evening sky. This happens due to the relative positions of Venus, Earth, and the Sun in their orbits. At this point, Venus is at its highest visibility in the evening, shining brightly after sunset.

As an inferior planet (orbiting closer to the Sun than Earth), Venus never strays far from the Sun in our sky. Its maximum elongation can vary but is usually around 47 degrees from the Sun. During this event, Venus appears as a brilliant "Evening Star," easily outshining all other celestial objects except the Moon.

How to Observe Venus at Greatest Elongation East

- Timing: Check local astronomical forecasts for the date and time of greatest elongation. Venus will be visible shortly after sunset and will set a few hours later.
- Location: Look towards the western sky after sunset. Venus will be the brightest object in that part of the sky.
- Equipment: While Venus is easily visible to the naked eye, binoculars or a telescope can enhance the view. With a telescope, you may notice Venus's phase, which appears similar to a crescent moon due to its position relative to the Sun.
- Preparation: Choose a location with an unobstructed view of the western horizon. Allow your eyes to adapt to the twilight for better visibility.

Where to Observe Venus at Greatest Elongation East

- Venus at greatest elongation can be observed from anywhere on Earth with a clear view of the western sky. To maximize your viewing experience:
- Dark-Sky Locations: Head to areas with minimal light pollution for the best view.
- Clear Horizon: Ensure there are no buildings, trees, or mountains blocking your view of the western horizon.

Weather Conditions: Check the weather forecast for clear skies on the evening of the event.

Why Observe Venus at Greatest Elongation East?

This event offers a stunning opportunity to see Venus at its best. Its brilliance and position make it a standout celestial object, perfect for both casual stargazing and detailed observation. Whether you're using a telescope, binoculars, or just your eyes, Venus at greatest elongation east is a sight not to be missed. Mark your calendars and enjoy this luminous celestial phenomenon!

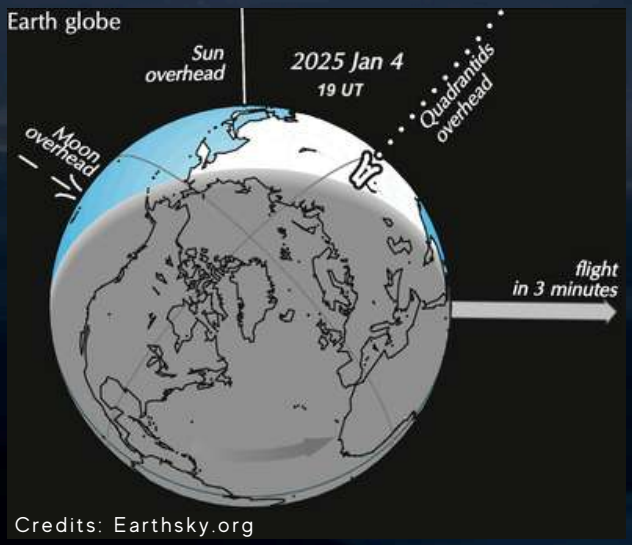
Quadrantid Meteor Shower: Ringing in the New Year with Celestial Fireworks

Kick off 2025 with a breathtaking celestial event as the Quadrantid meteor shower lights up the night sky. Known for its dazzling intensity, this meteor shower will peak between the night of January 3 and the early hours of January 4, promising an unforgettable experience for stargazers.

Active from December 12 to January 12, the Quadrantids are renowned for their short but intense peak, lasting just about six hours. During this brief window, viewers under ideal conditions—dark skies with minimal moonlight—can expect to see up to 120 meteors per hour. Fortunately, this year's event coincides with a waning crescent Moon at only 11% illumination, ensuring perfect visibility.

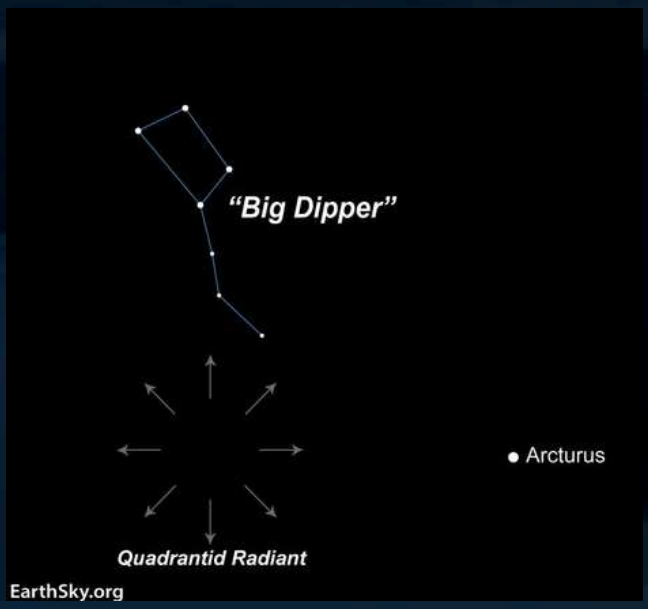
The Quadrantids are named after the now-defunct constellation Quadrans Muralis, located near the Big Dipper. Their radiant point lies in the constellation Bootes, rising in the northeast after midnight. In New Delhi, the shower becomes visible around 12:08 a.m., with the most spectacular displays occurring shortly before dawn, as the radiant reaches its peak altitude of 58° above the horizon. Meteors during this period will range from bright fireballs with short trails near the radiant to long streaks traversing the sky.

NASA ranks the Quadrantids among the best annual meteor showers due to their vivid fireballs, intense brightness, and frequency. For those in India, the Indira Gandhi Planetarium in Lucknow is hosting a public viewing of the shower through telescopes, adding to the excitement.



The radiant point for the Quadrantid meteor shower is far to the north in Earth's sky, so the shower is best seen from Earth's Northern Hemisphere. From mid-northern latitudes, the radiant point for the Quadrantid meteor shower climbs over the horizon after midnight and is highest in the sky before dawn.

Don't miss this stellar show, the first major meteor shower of the year, and a chance to start 2025 with a stunning natural phenomenon. Whether viewing from a city or under the vast open skies, the Quadrantids are sure to leave you mesmerized.



CELESTIAL SHOWCASE SATURN AND VENUS ALIGN

January 2025 offers a spectacular celestial event: the conjunction of Venus and Saturn. On January 18, these two planets will appear exceptionally close in the evening sky, separated by just 2.2 degrees. Here's how to observe this event, where to look, and why it occurs.

How to Observe?

To witness this conjunction, head outside during the first hour after sunset and direct your gaze towards the southwestern sky. Venus, often called the "Evening Star," will be the brighter of the two and easy to spot. Saturn, though dimmer, will appear nearby and can be located with the aid of Venus as a guide. For the best viewing experience:

- Find an unobstructed view of the southwestern horizon, especially in urban areas where buildings or trees might block the view.
- Minimize light pollution by traveling to a dark-sky location if possible.
- Use binoculars or a small telescope to enhance the view. With magnification, Saturn's iconic rings may become visible, adding an extra layer of wonder to the event.

Photographers aiming to capture the conjunction should use a camera with manual settings. Adjust exposure for twilight conditions, and stabilize the camera with a tripod for clear shots.

Where to Look?

The conjunction will be visible from most locations around the world. In the days leading up to January 18, Venus and Saturn will gradually converge in the sky, allowing observers to track their movement each evening. Check your local sunset time and begin observing as soon as the sky darkens. A clear southwestern horizon is crucial since the planets will appear low in the sky.

Why It Happens?

A conjunction occurs when two celestial bodies appear close together in the sky from our perspective on Earth. This alignment is a result of the planets' orbits around the Sun. While Venus and Saturn are separated by vast distances in space, their positions align when viewed from Earth, creating the illusion of proximity. Such events are predictable, occurring as a part of the natural movements of our solar system.

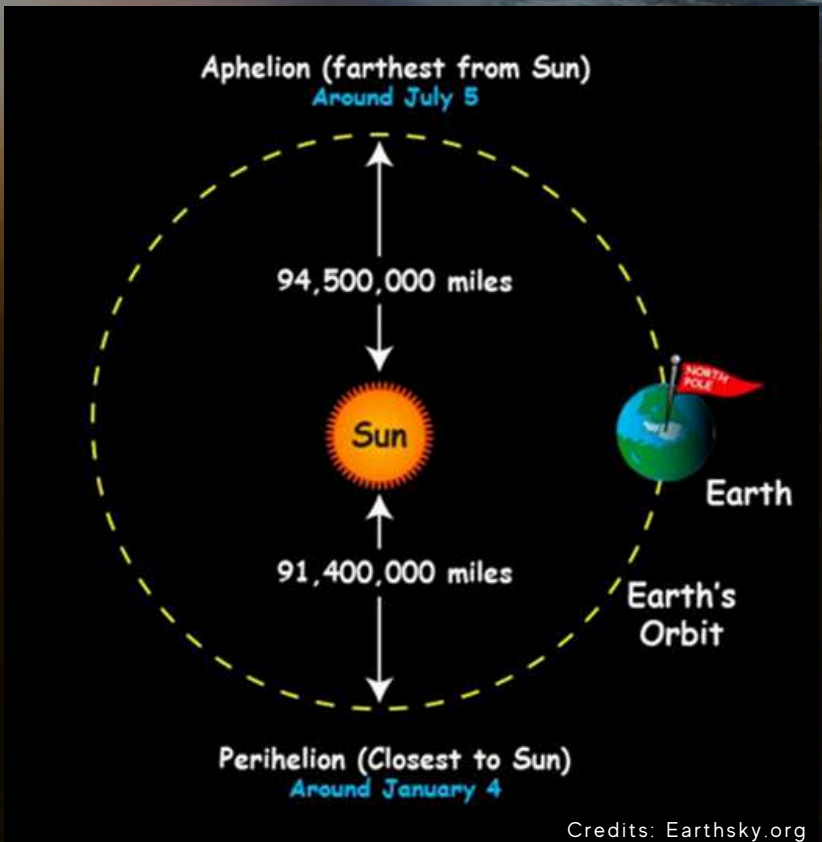
EARTH AT PERIHELION: CLOSEST TO THE SUN

Every January, Earth reaches its closest point to the Sun, a phenomenon known as perihelion. The term comes from the Greek words peri (near) and helios (Sun). Unlike a perfect circle, Earth's orbit is slightly elliptical, bringing it closer to the Sun at perihelion and farther away at aphelion in July.

In 2025, perihelion will occur on January 4 at 6:30 p.m., when Earth will be about 147.1 million kilometers (0.9833 AU) from the Sun. This is roughly 24,14,016 kilometers (1.5 million miles) closer than at aphelion. However, this 3% variation in distance has no significant impact on Earth's climate. Instead, seasonal changes result from the planet's axial tilt.

At perihelion, the Sun appears slightly larger in the sky, and Earth receives marginally more solar radiation, though these differences are imperceptible to the naked eye. Over millennia, gravitational influences from celestial bodies alter the shape of Earth's orbit, a process called orbital eccentricity, shifting it between nearly circular and more elliptical.

This annual celestial event highlights the intricate relationship between Earth and the Sun, offering a fascinating glimpse into the mechanics of our solar system and the Sun's vital role in sustaining life.



Credits: Earthsky.org

Earth is closest to the sun at perihelion and farthest at aphelion. But – for Earth – the difference in distance isn't much. Please note that the relative diameters of the sun and Earth are not to scale. Image via NASA.

CONJUNCTIONS FOR THE MONTH

A phenomenon grabs the imagination of scientists and stargazers alike in the vast panorama of the night sky, where stars shine like distant diamonds and planets roam over the cosmic canvas. Conjunctions, those ethereal moments in the heavens when heavenly bodies appear to collide, provide a mesmerizing sight that connects us to the beauty of the cosmos. The word "Conjunction" comes from Latin, meaning to join together.

From Earth's perspective, a conjunction occurs when two planets or a planet and the Moon or Sun align. Solar conjunctions are invisible to us. Moon-planet conjunctions occur throughout the month, every month, as the Moon passes past each planet. The planets in The Great Conjunction and when multiple align are rare and captivating conjunctions. Technically speaking, objects are said to be in conjunction in that instant when they have the same right ascension on our sky's dome. Practically speaking, objects in conjunction will likely be visible near each other for some days.

Place: New Delhi / Date: 4th January / Time: 06.30 p.m.

Conjunction of Moon and Saturn

On January 4th, the Ringed planet Saturn and the Moon will have the closest approach in the night sky & reaching an altitude of 5° above the south-western horizon. The Moon will be at magnitude -11.17, and Saturn at magnitude 1.10. And it will be visible around 06.30 p.m. till 10.15 p.m.

Conjunction of Moon and Jupiter

On January 10th, the Moon, and the Giant planet Jupiter will appear very close to each other in the night. They will be in the Eastern direction. Moon is at a magnitude of -12.59, the planets Jupiter is at a magnitude of -2.53. The Moon and Jupiter, together will be seen in the evening sky around 06.00 p.m.

Place: New Delhi / Date: 10th January / Time: 06.00 p.m.

Place: New Delhi / Date: 14th January / Time: 06.15 p.m.

Conjunction of Moon and Mars

On January 14th, the Red planet Mars and the Moon will have the closest approach in the night sky & reaching an altitude of 10° above the north-eastern horizon. The Moon will be at magnitude -12.64, and Mars at magnitude -1.38. And it will be visible around 06.15 p.m. in the night sky.

Tour de Universe: Exploring the Legends of Constellations

Embark on a celestial journey through the night sky with Tour de Universe, a captivating exploration of 12 iconic constellations. This guided adventure weaves together the science and mythology of the stars, blending ancient tales with their positions in the heavens. Each constellation introduces a unique story, originating from cultures around the world, showcasing their timeless significance.

With vivid imagery and engaging storytelling, Tour de Universe brings to life the myths, origins, and starry wonders of these constellations, inspiring awe and a deeper connection to the cosmos.
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"The Story of Beauty, Hubris, and Heroic Redemption in Greek Mythology"

In ancient Greek mythology, Andromeda was the beautiful daughter of king Cepheus and queen Cassiopeia. Like many stories from Greek mythology, the story of Andromeda (and Perseus) is one filled with betrayal, monsters, sacrifice, and of course, true love

Andromeda was the beautiful daughter of King Cepheus and Queen Cassiopeia. Legend has it that Cassiopeia regularly sang the praises of her daughter's beauty to anyone who would listen. But one day, Cassiopeia went too far and declared that Andromeda was even more beautiful than the Nereid sea nymphs – protectors of the sea's bounty, known for their unsurpassed beauty. Once Poseidon caught the wave of Cassiopeia's blasphemy, he decided that this act of hubris could not go unpunished, so he released the Kraken. His pet sea monster Cetus was sent to destroy Cepheus' kingdom.

To appease the god of the sea and to save their kingdom and people, King Cepheus and Queen Cassiopeia agreed to sacrifice Andromeda. Cepheus and Cassiopeia may have been a good king and queen, but good parents they were not; they chained their daughter to a rock by the sea so that Cetus could get her easily.

But it was Andromeda's lucky day; the hero Perseus just happened to be flying by on his winged horse Pegasus with Medusa's head in tow. The charming prince fell in love with Andromeda at first sight.

Now, the details get a little sketchy here. Some retellings indicate that Perseus slayed the monster with his sword, while others indicate that he turned Cetus to stone by flashing Medusa's head at him. Either way, Perseus killed the sea monster and married his true love.

Perseus and Andromeda had seven sons and two daughters, and the pair lived happily ever after.

ANDROMEDA

Andromeda is the 19th largest constellation in the sky and can be found in the first quadrant of the northern hemisphere. It was one of the 48 constellations listed by Ptolemy. Anfdromeda is best seen in the northern sky in autumn evenings. People staying between 90°N and 40°S can see the constellation. Andromeda Galaxy can be observed within the constellation. The brightest stars, Alpheratz, Mirach and Almach, can be spotted with the naked eye.

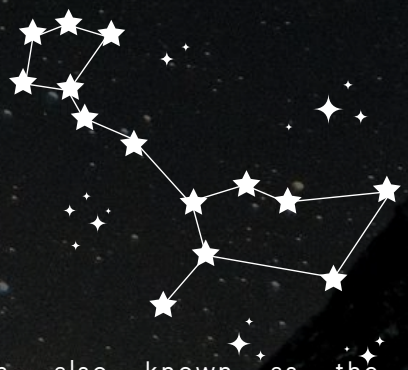
CASSIOPEIA

Cassiopeia is easily recognizable in the Northern sky for its prominent W asterism that is formed by its 5 brightest stars. Those who stay at latitudes beween 90°N and 20°S can observe the constellation, with prominent viewing time in November. A rich section of the Milky Way galaxy runs through Cassiopeia. The constellation has many notable deep sky objects such as Cassiopeia A, a supernova remnants. Its brightest star is Alpha Cassiopeiae, or Schedar.

CEPHEUS

The Cepheus constellation is found in the fourth quadrant of the northern hemisphere. Those who stay between 90°N and 10°S latitude can view the constellation and it is best visible during November. Some of the largest stars known, such as RW Cephei and. Mu Cephei are located in the constellation. Additionally, the largest known blackhole is found within the hyperluminous qusar S5 0014+81 in Cepheus. Addtionally, Delta Cephi is the prototype for Cephid stars.

CETUS



Cetus, also known as the whale constellation, is the fourth largest constellation in the night sky. One of the 15 equatorial constellations, it is situated in the first quadrant of the Southern hemisphere. The constellation is visibile to those who live on latitudes between 70°N and 90°S. Notable celestial objects that reside in the Cetus constellation are Messier 77, a barred spiral galaxy, Mira, a Mira variable star, and Earendel, the most distant star discovered till now.

EXPANDING TRUTH: HOW SCIENCE REWROTE THE UNIVERSE'S STORY

Millennia ago, humans looked at the sky and imagined a universe that was shaped by divine forces. Babylonian astronomers believed in a static, eternal cosmos, with Earth as a flat disk afloat on a vast ocean. The heavens, they thought, were a dome where celestial bodies moved according to divine will. Yet, even with this deeply spiritual worldview, Babylonian scholars meticulously tracked celestial patterns, laying the groundwork for astronomy.

By the 4th century BCE, Greek philosophers sought natural explanations for the cosmos. Famous philosopher, Aristotle proposed an eternal, unchanging universe with Earth at its center, surrounded by celestial spheres made of an incorruptible substance, "aether." His mentor Plato argued that the cosmos reflected perfect, unchanging forms. Though elegant, these ideas faced challenges. Heraclitus emphasized the inevitability of change, and Democritus envisioned an infinite cosmos filled with atoms and countless worlds—a concept too radical for the era.

In the 2nd century CE, Claudius Ptolemy refined Aristotle's model, creating a geocentric system that accurately predicted planetary motions. He introduced epicycles and deferents, to maintain the illusion of a perfect, eternal cosmos. This model dominated for over a millennium, even as observations hinted at inconsistencies.

From the 8th to the 13th centuries, Islamic scholars translated Greek texts and emphasized empirical observation. Figures like Al-Tusi and Al-Battani improved Ptolemy's models, while Alhazen's pioneering scientific method laid the foundation for to question eternalism. Their meticulous observations planted seeds of doubt about the static universe.

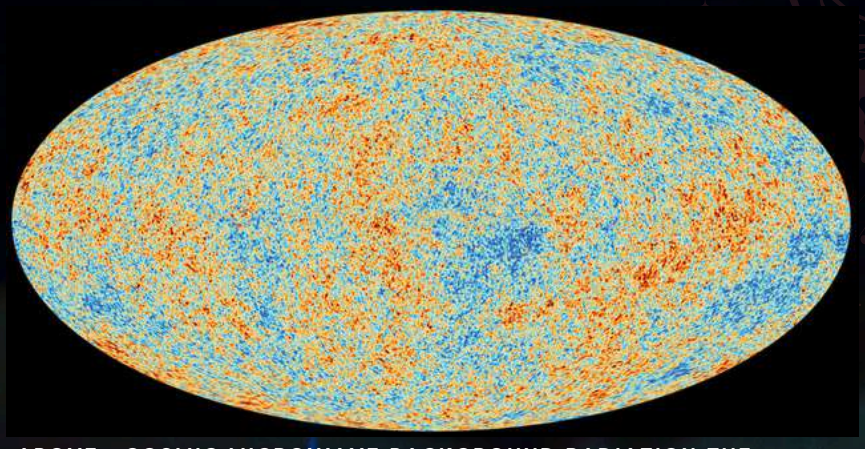
In the 16th century, Nicolaus Copernicus proposed a heliocentric model, placing the Sun at the center. Though initially framed as a mathematical convenience, his idea challenged the preconcieved notions. Tycho Brahe's precise observations, combined with Johannes Kepler's laws of planetary motion, confirmed that planets followed elliptical orbits around the Sun. Galileo's telescope revealed sunspots on the Sun and craters on the Moon, exposing the imperfections in the heavens. This further challenged the notion of an unchanging cosmos.

Over a century later, Isaac Newton's laws of motion and universal gravitation united the heavens and Earth under the same principles. He envisioned an infinite, eternal cosmos balanced by gravity. Yet, questions lingered: If gravity pulls everything together, why doesn't the universe collapse? Newton speculated that an infinite expanse of stars might counteract this pull, but the mystery of origins remained.

In the 20th Century, Albert Einstein's general relativity revolutionized space and time. Initially, Einstein introduced a "cosmological constant" to uphold a static, eternal universe. However, Georges Lemaitre proposed that the universe was expanding, originating from a "primeval atom." Eventually, Edwin Hubble proved Lemaitre correct with his discovery of galactic redshift - a phenomenon not possible in a static universe. In response, Einstein discarded his cosmological constant, calling it his "greatest blunder," and the concept of a static universe was replaced by an expanding cosmos.

Our understanding of the universe changed even more in 1965, when Arno Penzias and Robert Wilson discovered the cosmic microwave background radiation. This cemented the Big Bang theory while revealing a universe born 13.8 billion years ago. Unlike Aristotle's eternal cosmos, the Big Bang theory depicts a universe evolving over time, from a hot, dense state to its current expansive complexity. The discoveries of dark matter and dark energy have since deepened the mystery, showing that our understanding of the universe is far from complete.

From Babylon to the 21st century, humanity's understanding of the universe has transformed dramatically. Each breakthrough—from Aristotle's spheres to the Big Bang—reflects our relentless quest for knowledge. As new observations and ideas emerge, the story of the cosmos continues to unfold, reminding us that science, like the universe itself, is ever-expanding.



ABOVE : COSMIC MICROWAVE BACKGROUND RADIATION THE SIGNLE MOST GRATEST ACHIVEMENT OF HUMANITY,

ON THE RIGHT: HISTORY OF THE UNIVERSE FROM BIGBANG TO TODAY

PICTURE CREDITS: WIKIPEDIA

Role of AI in Space

Artificial Intelligence (AI) is revolutionizing space exploration, unlocking new possibilities for humanity's quest to understand the universe. With its ability to process immense amounts of data, adapt to changing conditions, and operate autonomously, AI has become an indispensable tool in space missions. From navigating distant planets to analyzing astronomical phenomena, AI is shaping the future of space exploration in profound ways.

Mission Planning and Strategy:

Spacecraft can be programmed to autonomously to execute commands according to specific functions, replan and detect both internal and external events, to take appropriate action so the ground-based decision-making doesn't affect the mission objectives.

Navigation and Guidance:

AI can assist space vehicles to determine the optimal routes, quickly adapt to environmental variables and minimize navigation errors and to manage and automate space missions, which enables space vehicles can operate more efficiently.

Robotics and Rovers:

AI-controlled robots can perform intricate tasks, such as analyzing the samples, servicing of satellites or spacecrafts without human intervention. It helps scientists to develop intelligent assistants to support astronauts in real space missions.

Space Debris Management:

AI can be used to monitor space debris, predict collision risks, and take preventive measures by analyzing data from radar, telescopes, and satellite sensors. It classifies debris by size, shape, and orbit, maintaining up-to-date databases for monitoring.

Satellite Operations:

AI is used to manage and automate space missions, enabling spacecraft and rovers to function efficiently and make complex decisions independent, to predict and prevent system failures and enables to adapt to changing mission requirements.

Space Observation and Data Analysis:

Spacecraft and satellites generate vast amounts of information, such as images, sensor readings, etc. AI process these data, assisting the scientists to identify celestial objects, map planetary surfaces and detect space debris, solar storms.

Satellite Maintenance and Repair:

AI enables satellites to autonomously reroute power, isolate faulty systems, or recalibrate instruments to maintain functionality. AI equipped robots can perform repairs on satellites in orbit, such as replacing parts or fixing mechanical issues.

Exoplanet Exploration:

AI can analyze space data to make new discoveries, predict unknown phenomena, and unravel mysteries in the depths of the universe. In the future, this allows humanity to gain more understanding and make new discoveries in the cosmos.

STUDENT'S CORNER

Beyond The Naked Eye

Varsha S K, iAstronomer

Imagine holding a device that lets you travel back in time, witnessing the birth of stars, the collision of galaxies, and the very beginnings of the universe. Sounds like a dream, right? But that's what telescopes allow us to do—they're not just tools, but our cosmic time machines, helping us unlock the secrets of space.

Let's go back to 1609. A young Galileo, with nothing but a simple homemade telescope, pointed it toward the night sky. What he saw—moons orbiting Jupiter, craters on the Moon, and countless stars—changed everything. With just two lenses, Galileo showed the world that the universe was far more complex than anyone had imagined. And telescopes didn't stop there.

Isaac Newton revolutionized the field by inventing the reflecting telescope, using mirrors instead of lenses. This breakthrough allowed telescopes to grow larger and more powerful. Today, observatories like the Keck Observatory in Hawaii are massive, capturing light from galaxies billions of light-years away. That's like looking at light that started its journey long before Earth even existed! Now, here's where things get really exciting.

Space telescopes like Hubble have taken us beyond Earth's atmosphere, revealing breathtaking images of nebulae, galaxies, and even exoplanets in incredible detail. And the James Webb Space Telescope is pushing the boundaries even further, peering back 13 billion years into the past to catch a glimpse of the universe's earliest stars and galaxies. Telescopes are more than just machines—they're our storytellers, offering up cosmic mysteries, like the enigma of black holes and the possibility of life on other worlds.

With the future of space exploration looking brighter than ever, observatories like the Extremely Large Telescope promise to unlock secrets we haven't even imagined yet.So next time you gaze up at the night sky, remember: every telescope is a gateway to endless discoveries, waiting for us to uncover. What will we find next? The adventure has only just begun

Journey To The Moon

Sourajit Mandal, Astronomy Club Student

Have you ever experienced loneliness in this vast world and recognized that there is something always showing us light, even in the darkest moments? This thing, is the moon.

Ancient civilizations imagined it as a divine force–a goddess, a god, or a mythical creature that controlled the night. The Greeks had Selene, the Romans had Luna, Japanese had Tsuki. These myths shaped how people saw the world, making the Moon something otherworldly.

When Galileo first pointed the looker at the sky, he finally began to uncover its mysteries- revealing its cratered landscape which eventually became a symbol of human achievement. What began as myths and legends evolved into science, setting it as the stage for an extraordinary journey to the Moon that would come centuries later. But as time went on, the Moon became not only a subject of myth but a target for scientific discovery. Early astronomers used the Moon as a starting point for unravelling the mysteries of the universe. Their findings laid the groundwork for the monumental steps humanity would take towards reaching the Moon in reality.

In the 20th century, the Cold War rivalry between the United States and the Soviet Union became the reason for the most intense period of space exploration - The Space Race. This turned the dream of exploring the Moon into a fierce competition between two superpowers: the United States and the Soviet Union.

The launch of Sputnik 1 in 1957 marked the beginning of humanity's quest to break free from Earth's gravity, setting the stage for an incredible race to the stars. Then, Yuri Gagarin became the first man, and Valentina Tereshkova became the first woman, both from the Soviet Union, to leave the Earth's gravity.

The U.S. were not far behind in the race and set a challenging goal to land an American on the Moon before the decade ends. It was a call to all of humanity to achieve the unthinkable. The Moon became the ultimate prize. As the two nations raced to develop rockets, space stations, and human spaceflight, the dream of sending someone to the Moon became more urgent. In Kennedy's words, the "United States would put a man on the Moon and return him safely to Earth, not because it was easy, but because it was hard."

The Apollo program, created by NASA was an answer to this challenge. It would take human space exploration to new heights, requiring new technology, new expertise, and the courage to venture into something unknown. The Apollo missions were daring, filled with risks, but also driven by the belief that everything is possible.

In December 1968, Apollo 8 made history as the first mission to orbit the Moon, paving the way for the ultimate goal. The crew–Frank Borman, James Lovell, and William Anders–saw Earth from a perspective no human had ever witnessed before. Their iconic "Earthrise" photograph captured the Earth as a fragile blue ball against the vastness of space, a stunning reminder of our place in the universe.

The moment the world had been waiting for, came on July 20, 1969. Apollo 11's lunar module, Eagle, touched down on the Moon's surface, carrying two astronauts–Neil Armstrong and Buzz Aldrin. Armstrong's words, "One small step for man, one giant leap for mankind," were heard all across the globe, signalling not just the success of a mission, but the redefinition of human capabilities.

Armstrong and Aldrin spent hours on the Moon, conducting experiments, collecting samples, and planting the American flag.

Their historic feat was followed by five more Apollo missions, each one pushing the boundaries of what was possible.

Apollo 12 landed near the Surveyor 3 spacecraft, Apollo 14 explored the Moon's Fra Mauro region, and Apollo 15, 16, and 17 took astronauts to more distant regions of the Moon. These missions returned with invaluable scientific data and showed that humanity was capable of surviving and thriving on other worlds.

However, not all missions are always smooth. Challenges keep cropping as they did during Apollo 13. The mission that was supposed to be a routine lunar landing, became a life-or-death struggle when an oxygen tank exploded. The crew, including Jim Lovell, Fred Haise, and Jack Swigert, were forced to abandon the Moon and return to Earth.

After Apollo 17 in 1972, the pace of lunar exploration slowed. The focus shifted to other space missions and challenges. Even though astronauts no longer walked on the Moon, the interest never changed. Robotic missions like NASA's Lunar Prospector, which mapped the Moon's surface, and China's Chang'e program, which made significant progress in lunar exploration, kept the Moon in our sights. India, with its Chandrayaan missions itself has tremendous contribution for the ongoing journey to the moon. The Chandrayaan 1 had an orbiter which orbited the moon 100 km above the surface, and an impactor which was deliberately crashed onto the surface for analysing the debris released from the surface. It carried Nasa's Moon Minerology Mapper which helped it confirm the presence of water below the surface of the Moon.

The mission was of great significance and showed humanity that India was not behind in the journey. The mission was followed by Chandrayaan 2 - India's first lander and rover mission, which unexpectedly crashed on the Moon. Not losing hope, India launched Chandrayaan 3 mission which became a massive success. It consisted of the Pragyan rover, Vikram lander and an Orbiter, but most of all, it landed on the South pole of the moon, which was not ventured before. It also showcased India's soft landing technology to the world.

With passing years, Moon remained a symbol of human achievement. But it also began to represent the next frontier, not just for scientific discovery but for human settlement. The Moon wasn't just a place to visit–it was a place to return to, a stepping stone to future missions to Mars and beyond.

In recent years, the Moon has once again become a focal point of human ambition. NASA's Artemis program, which aims to return astronauts to the lunar surface by 2025, has rekindled the dream of a sustained human presence on the Moon. This time, the goal isn't just to visit but to build a lasting base, use the Moon's resources, and prepare for the next giant leap: human exploration of Mars.

Other countries are also joining the effort. China's Chang'e missions have already brought back lunar samples, and India's Chandrayaan missions are uncovering new details about the Moon's surface. Private companies like SpaceX are getting involved too, with SpaceX's Starship chosen by NASA to land astronauts on the Moon as part of the Artemis program.

The Moon is no longer a distant dream–it is a tangible goal, a place where humanity can return, build, and expand our presence beyond Earth. The future of space exploration is being written with each new mission, and the Moon will play a central role in humanity's ongoing journey into the cosmos.

From ancient myths to the groundbreaking Apollo missions, and now with Artemis leading the way, humanity's connection to the Moon has always been one of curiosity and wonder. The journey to the Moon is far from over, and with every step we take, we move closer to realizing the dream of living and exploring beyond our home planet. The Moon is not just a distant world; it is a reminder of our potential and the endless possibilities that await us in the stars.

Lost In The Light: The Importance Of Preserving Natural Darkness

Deeksha Dinesh, Aspiring Astrophysicist

The night sky, with its breathtaking tapestry of stars and celestial wonders, has been a source of awe and inspiration for humanity for centuries. Words like "heavenly," "stellar," and "cosmic" are testament to its beauty and magnificence. Beyond its visual splendor, the night sky has served as a cultural keystone, shaping the hallmarks of civilization such as art, literature, mathematics, science, religion, language, poetry, and our very concepts of time.

However, the advent of artificial illumination, while significantly enriching the quality of life by creating luminous environments during the nighttime, has also given rise to a pressing environmental issue: light pollution. With the emergence of new lighting technologies, the negative impacts of improper illumination have become increasingly evident, affecting both urban and rural areas.

Light pollution, the excessive or misdirected artificial light produced by human activities, has detrimental effects on astronomical research and the ecological balance. It disrupts the natural rhythms of wildlife, leading to long-term damage to ecosystems. The International Dark Sky Association (IDA) has recognized light pollution as a significant environmental concern, affecting not only humans but also wildlife and the climate.

For astronomers, light pollution is a significant challenge. The glare from artificial lights washes out the faint glow of stars and other celestial objects, making it difficult to conduct observations and diminishing the night sky's splendor. The loss of our connection to the night sky is a profound cultural and scientific setback. As Vincent van Gogh, the legendary painter of 'The Starry Night' once wrote in a letter to his brother Theo, "I know nothing with any certainty, but the sight of the stars makes me dream." His generation enjoyed a night sky unmarred by artificial lights, a privilege that is becoming increasingly rare for us today.

Practical steps to reduce light pollution:

While excessive outdoor light pollution may appear uncontrollable for an individual, overlighting in the home can be easily reduced. Here are some practical steps to mitigate light pollution: Opting for amber or warm white lights with fewer short wavelengths, or using red light at night, which has zero short wavelengths; Using sensors, timers, or simply turning off unnecessary lights in the evening, particularly on balconies, in gardens, and on façades.

Public awareness and policy changes are crucial in addressing light pollution. Maps based on nighttime satellite data can be used in communication campaigns to highlight the extent and effects of light pollution. Citizen science projects like Globe at Night encourage individuals to measure and submit observations of night sky brightness, contributing to a global database that supports research and advocacy efforts.

Call to Action:

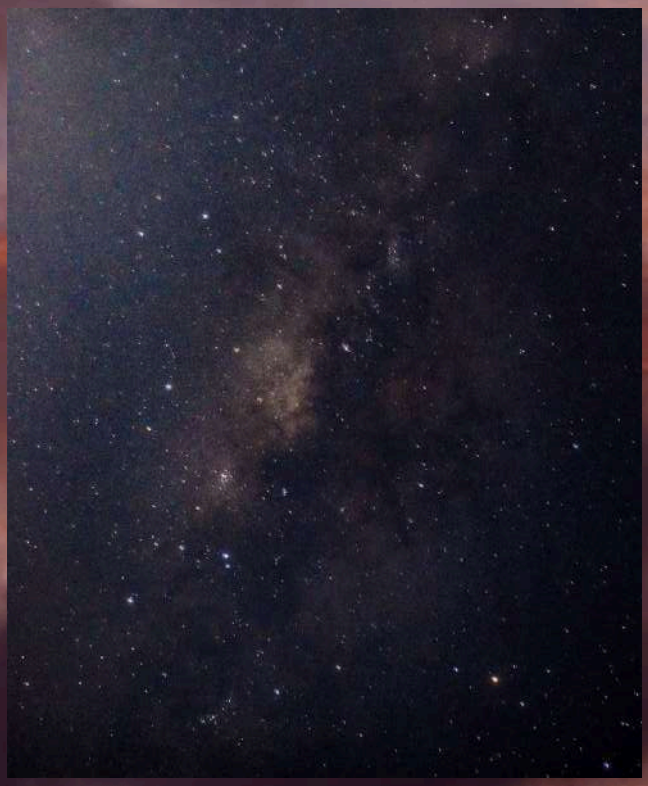
The night sky is an incredibly magnificent and deeply threatened natural asset. Its importance extends beyond its beauty and grandeur; it is integral to our cultural heritage and has a profound impact on our mental well-being. Some researchers suggest that reconnecting with the night sky can have positive effects on mental health, offering a sense of peace and inspiration. In conclusion, while space telescopes provide astronomers with the ability to observe celestial phenomena from beyond Earth's light-polluted atmosphere, we must also strive to preserve the beauty of the night sky for future generations. By taking action to reduce light pollution and raising awareness through outreach and citizen science, we can ensure that the awe-inspiring sight of the stars remains a source of dreams and wonder for all.

This article was published in Galactica's Volume III Issue XII with attribution to the wrong person. The correct author is Deeksha Dinesh, an aspiring astrophysicist.

ASTROPHOTOGRAPHS FROM SPACE ASSOCIATED ASTRONOMERS

Pleiades Star Cluster captured by Shaurya Salunkhe

Jupiter Opposition captured by KS Riththika



Milky Way Galaxy captured by Prem Sahana

Happy Birthday


January 1, 1894

Satyendra Nath Bose

Satyendra Nath Bose (1 January 1894 – 4 February 1974) was an Indian physicist renowned for his contributions to statistical mechanics and theoretical physics. He is best known for developing Bose-Einstein statistics in collaboration with Albert Einstein, which explains the behavior of bosons, a class of subatomic particles. This work laid the foundation for the discovery of Bose-Einstein condensate, a unique state of matter. Bose's research extended to the theory of light and electromagnetic waves, earning him global recognition. His groundbreaking work continues to influence modern physics, and his legacy remains pivotal in the fields of quantum mechanics and cosmology.

Stephen Hawking


January 8, 1942

Stephen Hawking (8 January 1942 – 14 March 2018) was a pioneering theoretical physicist whose work revolutionized our understanding of the universe. He is best known for discovering "Hawking Radiation," which revealed that black holes emit energy and can eventually evaporate. Despite being diagnosed with ALS at 21 and losing nearly all physical mobility, Hawking continued his groundbreaking research and became a global icon of resilience. His book, 'A Brief History of Time,' brought complex scientific ideas to the public, inspiring millions. Hawking's legacy endures as a symbol of human determination, brilliance, and the quest to unlock the mysteries of the cosmos.


January 13, 1949

Rakesh Sharma

Rakesh Sharma (born on 13 January 1949) is celebrated as India's first astronaut. He is an icon of national pride and scientific achievement. A Wing Commander in the Indian Air Force, Sharma flew aboard the Soviet spacecraft Soyuz T-11 as part of the Intercosmos program. During his eight-day mission, he conducted scientific experiments and famously described India from space as "Saare Jahan Se Achha" (Better than the entire world). His historic journey marked India's entry into human space exploration. Awarded the Ashoka Chakra for his achievements, Sharma remains a national hero, inspiring generations to dream beyond the horizon and explore the cosmos.

Happy Birthday

January 20, 1930

Edwin Buzz Aldrin

Buzz Aldrin (20th January 1930) is an American astronaut, engineer, and Air Force pilot. He is best known for being the second person to walk on the Moon in 1969 during NASA's Apollo 11 mission. Alongside Neil Armstrong, he made history with humanity's first lunar landing, spending over two hours exploring the Moon's surface. Before his NASA career, Aldrin served in the Korean War, flying 66 combat missions. He earned a doctorate from MIT, pioneering orbital rendezvous techniques critical for spaceflight. After retiring from NASA, Aldrin became a passionate advocate for space exploration, authoring books and promoting missions to Mars, solidifying his legacy in space history.

Pierre Gassendi

January 22, 1592

Pierre Gassendi (22 January 1592 – 24 October 1655) was an astronomer, mathematician, French Philosopher, and Catholic Priest. From an early age, he displayed academic potential and was considered a prodigy. He was an observational scientist and regularly observed the night sky. In 1631, Gassendi, following Kepler's prediction, observed and documented Mercury's transit of the sun, becoming the first person to witness the phenomenon. Throughout his lifetime, he wrote several philosophical works. He is one of the first people who formulated the moderm "scientific outlook" and defended the Copernican view that clashed with the Church's teachings. The lunar crater 'Gassendi' is named after him.

January 28, 1611

Johannes Hevelius

Johannes Hevelius (28 January 1611 – 28 January 1687) was a Polish astronomer. He is celebrated as the "Founder of Lunar Topography" for his detailed Moon maps in 'Selenographia ' (1647). He also compiled the extensive 'Catalogus Stellarum Fixarum', while introducing 16 constellations of which, seven are still recognized. Operating from his Danzig observatory, Hevelius studied sunspots, solar rotation, and planetary details, significantly contributing to astronomy. Despite losing much of his work to a 1679 fire, his published studies endured. Honored with a lunar crater and celestial namesakes, he bridged traditional and modern astronomy.

HISTORICAL EVENTS HAPPENED IN JANUARY

THE DISCOVERY OF GALAXIES BEYOND THE MILKY WAY

At the dawn of the 20th century, astronomers believed the Milky Way comprised the entirety of the universe. This view changed forever in 1924 when Edwin Hubble made a groundbreaking discovery: the existence of galaxies beyond the Milky Way. Using the powerful Hooker Telescope at Mount Wilson Observatory, Hubble observed the Andromeda "nebula" and demonstrated that it was not part of the Milky Way but an entirely separate galaxy.

Hubble's breakthrough came through his use of Cepheid variable stars, which serve as reliable distance indicators due to their predictable brightness patterns. By measuring the distance to these stars in Andromeda, Hubble confirmed it lay far outside the Milky Way—a revelation that redefined our understanding of the cosmos.

This discovery proved that the universe is vastly larger and more complex than previously imagined. It marked the beginning of extragalactic astronomy and reshaped scientific thought, transitioning from a single-galaxy universe to one teeming with billions of galaxies, each harboring billions of stars.

Hubble's work also provided crucial evidence for the theory of an expanding universe, which became the foundation of modern cosmology. His observations highlighted the profound scale of the universe and humanity's small but significant place within it.

Today, telescopes like the James Webb Space Telescope continue to explore the farthest reaches of the universe, building on Hubble's legacy. These instruments not only unveil the secrets of distant galaxies but also deepen our understanding of cosmic origins and evolution.

The discovery of galaxies beyond the Milky Way remains a cornerstone of astronomical progress. It exemplifies the power of human curiosity and ingenuity, reminding us of our potential to transcend boundaries and uncover the profound mysteries of the cosmos.

CHANG'E 4: A HISTORIC FIRST LANDING ON THE FAR SIDE OF THE MOON

On January 3, 2019, China achieved a major milestone in space exploration with the successful landing of the Chang'e 4 spacecraft on the Moon. This historic event marked the first time a spacecraft had landed on the far side of the Moon, an area that had previously been unexplored by any mission.

Chang'e 4 is part of China's ambitious lunar exploration program, named after the ancient Chinese moon goddess, Chang'e. The spacecraft included a lander and a rover, the Yutu-2 (Jade Rabbit 2), which was designed to conduct a range of scientific experiments. The far side of the Moon, also referred to as the "dark side," is the hemisphere that is always facing away from Earth due to the Moon's synchronous rotation. Due to this, it had never been directly observed from Earth, making it an intriguing target for exploration.

The mission's primary objectives were to study the Moon's geological properties, its mineral composition, and to investigate the impact of the space environment on biological matter. Chang'e 4 also carried a payload of experiments to study deep space radio emissions and conduct a range of technological tests. One of the most fascinating aspects of the mission was its ability to successfully land and operate in an area where communication with Earth is more challenging due to the Moon's surface blocking direct line-of-sight signals. China had launched a relay satellite, Queqiao, to facilitate communication between the spacecraft and mission control on Earth.

The success of Chang'e 4 was a significant achievement for China, showcasing its growing capabilities in space exploration. It not only advanced scientific knowledge about the Moon but also positioned China as a leading player in space exploration, with plans for further lunar missions and even future human exploration of the Moon.

This landmark event marked a key step in humanity's continued exploration of the Moon, with Chang'e 4 paving the way for future missions to explore other parts of our solar system and beyond.

DISCOVERY OF THE GALILEAN MOONS

In January 1610, Galileo Galilei used his telescope to observe Jupiter and made a discovery that transformed our understanding of the cosmos. He identified four luminous objects orbiting the planet, now known as the Galilean moons: Io, Europa, Ganymede, and Callisto. This groundbreaking observation provided the first direct evidence of celestial bodies orbiting something other than Earth, challenging the geocentric model that had dominated Western thought for centuries.

Galileo's telescope revealed the moons as small points of light shifting nightly around Jupiter. Initially naming them the "Medicean stars" to honor his patrons, the Medici family, their modern names were later suggested by the German astronomer Simon Marius, inspired by Greek mythology's Zeus (Jupiter's counterpart).

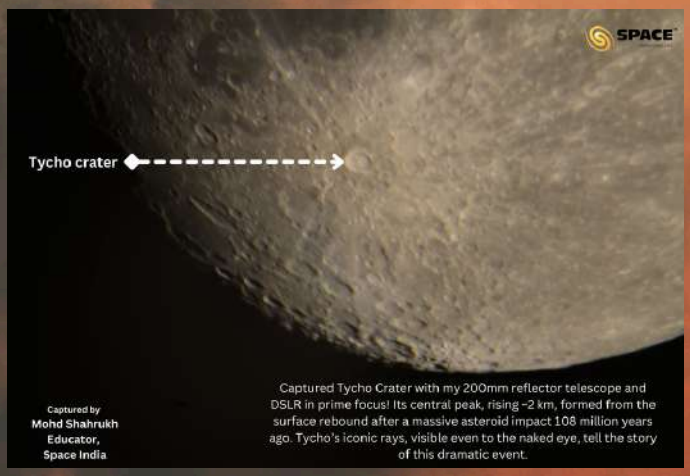
This discovery had profound implications. It supported the heliocentric model proposed by Copernicus, which posited that the planets, including Earth, revolve around the Sun. By proving that not all celestial bodies orbit Earth, Galileo's work fueled the scientific revolution and changed humanity's perspective of its place in the universe.

Each of the Galilean moons is a world of scientific intrigue. Io, the most volcanically active body in the solar system, features dynamic lava flows and sulfurous landscapes. Europa, with its icy crust and hidden subsurface ocean, is a prime candidate for extraterrestrial life. Ganymede, the largest moon in the solar system, possesses a magnetic field and a diverse geological history. Callisto, heavily cratered and ancient, offers a glimpse into the solar system's early past.

Even today, these moons captivate scientists. Upcoming missions like NASA's Europa Clipper and the European Space Agency's JUICE aim to explore these enigmatic worlds, seeking clues about their potential for life and their formation.
Galileo's discovery of the Galilean moons stands as a testament to curiosity and innovation. It revolutionized astronomy and inspired generations to look beyond Earth, fueling humanity's quest to unravel the mysteries of the universe.

ASTROPHOTOGRAPHS FROM SPACE TEAM

Jupiter, Io and Europa at Opposition Captured by Shiril - Senior Technical Executive - GAPL.jpeg



Tycho Crater captured by Mr. Mohd. Shahrukh, Educator, STEPL

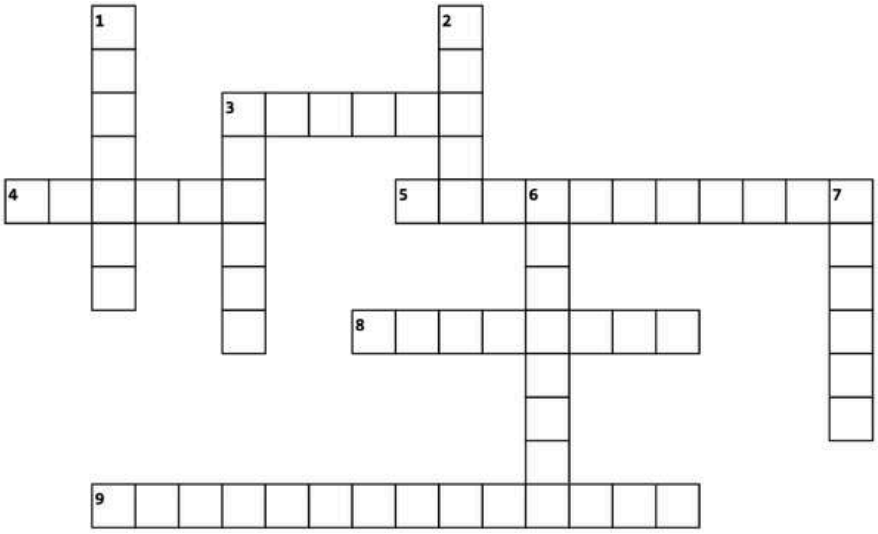
Comet C3/2023 Tsuchinshan Captured by SHIRIL - Senior Technical Executive - GAPL

Venus in a Bloody Sky captured by Ms. Anjusha AJ, Educator, STEPL

Moon and Venus captured by Ms. Sunita Chauhan, Educator, STEPL

TRAIN YOUR BRAIN

CROSSWORD



Across

3. Who developed the laws of planetary motion?
4. What is the name of South Korea's lunar orbiter?
5. Which type of satellite is typically used for low-budget, educational projects?
8. What is the name of the world's first wooden satellite?
9. Who introduced liquid propulsion technology in India's space program?

Down

1. Which meteor shower is associated with asteroid 3200 Phaethon?
2. In which constellation is the Sombrero galaxy located?
3. Who is regarded as the father of modern planetary science?
6. What type of explosion occurs when two neutron stars merge?
7. Which company launched the GSAT-N2 satellite for ISRO?

Astronomy Word Puzzle

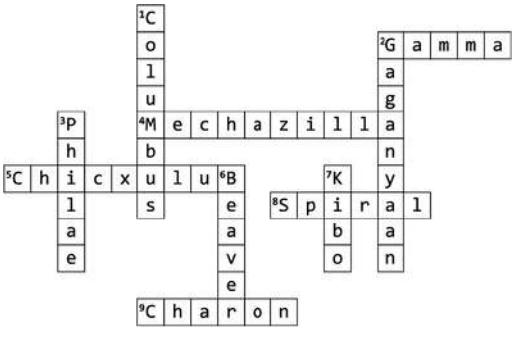
Seek the sun gods hidden in every direction!

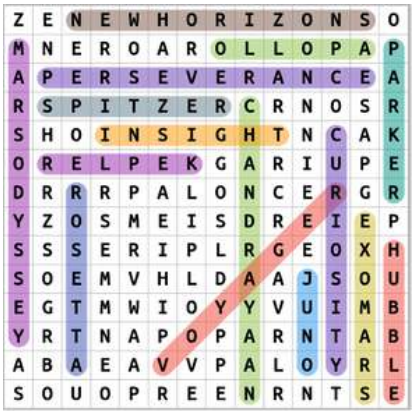
Mythological Sun Gods

R	A	R	A	D	A	A	M	H	V	Y	U	A	H
A	H	H	R	A	I	I	A	I	A	A	H	S	E
G	Y	I	S	T	N	V	G	T	T	Y	S	I	L
B	I	R	A	T	S	O	A	S	J	H	R	T	I
H	O	A	I	D	B	H	N	K	I	Z	R	U	O
A	A	N	O	H	I	R	A	A	A	A	A	A	S
S	A	Y	Z	B	S	H	S	P	Y	R	V	K	O
K	N	A	D	M	A	A	A	S	A	A	N	M	L
A	D	G	R	S	Y	H	O	U	A	S	R	S	A
R	S	A	A	Z	H	A	U	R	V	E	H	H	R
R	S	R	V	S	H	A	M	A	S	H	P	H	I
A	S	B	I	R	L	U	A	J	O	H	J	D	S
T	R	H	A	Y	T	I	D	A	A	R	M	U	T
H	I	A	Y	R	M	A	R	T	A	N	D	A	D

HELIOS
SHAPASH
SURAJ
DAZHBOG
BHASKAR
MITHRA
SHAMASH
ADITYA
HIRANYAGARBHA
MARTANDA
SOLARIS
DIVAKAR
INTI
RAVI
SURYA

Answers for last month puzzles.





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

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