SPACE™
EMPOWERING LIFE

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Galactica

Astronomy and Space Science Magazine

What's Inside?

www.space-global.com

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

Team

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.

Co-founder's Message

Astronomy education is important as it builds curiosity, critical thinking, and problem-solving skills, helping young minds prepare for the future. It encourages innovation, exploration, and a scientific mindset.

Ms. Shalini Bahmba, Co-founder, SPACE

Young learners build creativity and confidence through hands-on, experiential learning, preparing them for careers in space science and technology. We aim to cultivate future innovators who will lead progress, discovery, and global advancement.

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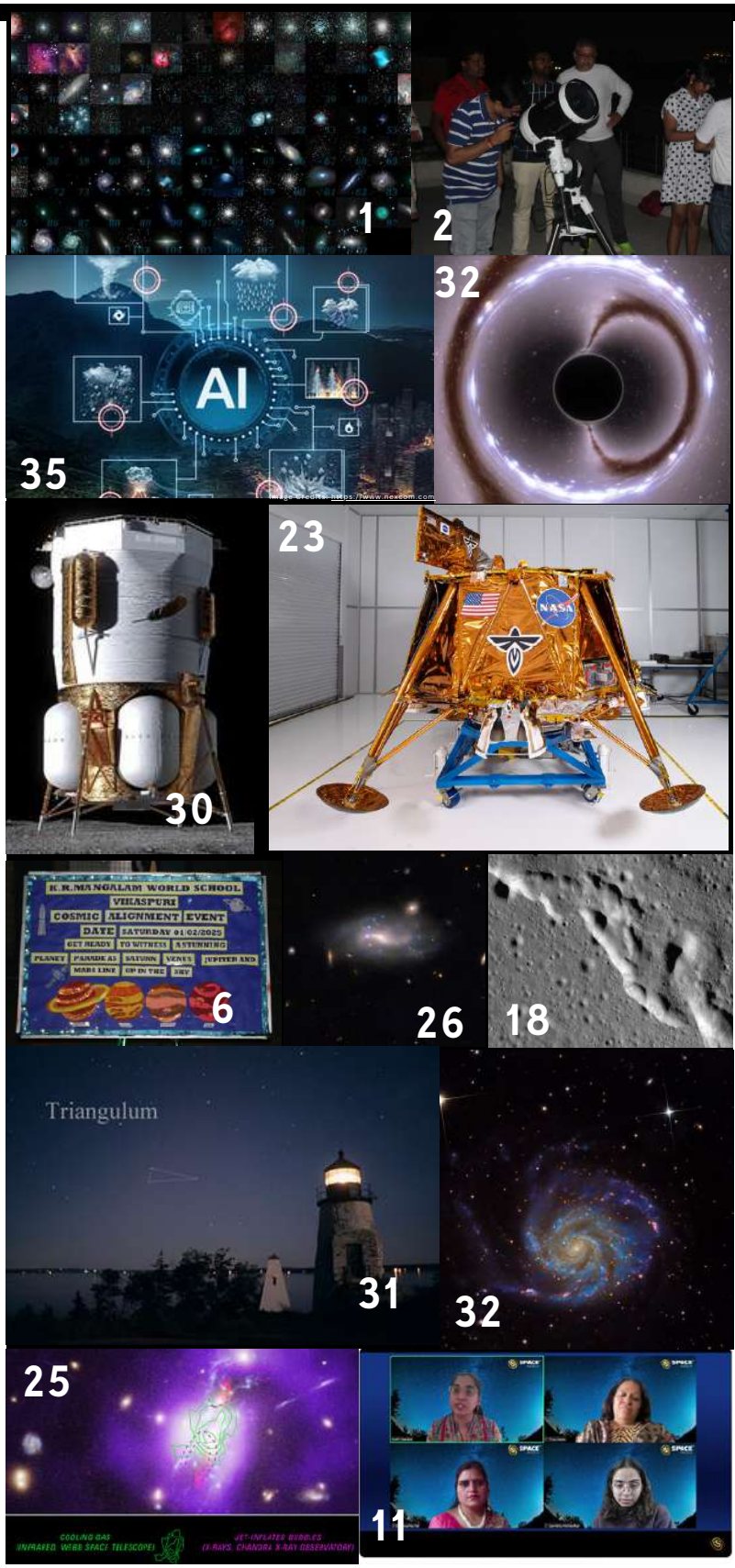
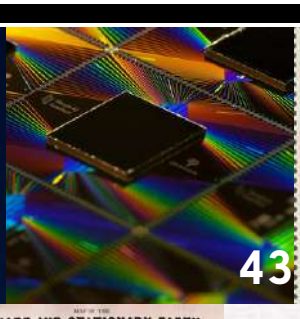
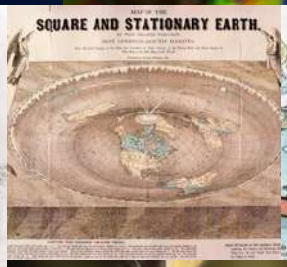
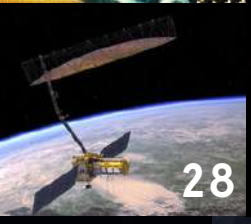
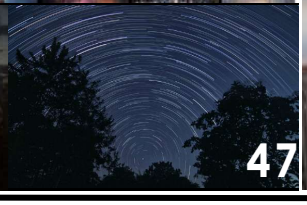


CONTENTS









MESSIER MARATHON: THE ULTIMATE ASTRONOMY CHALLENGE

For astronomy enthusiasts and stargazers, the Messier Marathon is an exhilarating challenge that tests patience, skill, and knowledge of the night sky. It is a one-night celestial race where observers attempt to spot all 110 deep-sky objects cataloged by French astronomer Charles Messier in the 18th century.


Image Credit: Wikipedia

What is the Messier Marathon?

The Messier Marathon is an astronomical challenge where skywatchers try to spot all 110 objects in the Messier Catalog in a single night. These objects include galaxies, nebulae, and star clusters cataloged by Charles Messier, a French astronomer, in the 18th century.

When does it happen?

It's typically held in mid to late March every year, during the new moon phase. This is the perfect time because the entire objects in the Messier Catalog is visible in one night – right after sunset until dawn.

Who can do the Observation?

The Messier Marathon is open to everyone–from beginners to seasoned astronomers. With the right equipment, such as a Dobsonian telescope, binoculars, and sky maps, anyone can take part in this exciting adventure. It's a mix of treasure hunt and endurance race, but in the sky!


By Michael A. Phillips

What makes the Messier Catalog special?

Charles Messier compiled this list to avoid confusing deep-sky objects with comets. What started as a "list of things to ignore" became one of the most famous catalogs in astronomy – filled with some of the brightest and most beautiful cosmic objects.

The Messier Marathon is not just an observation challenge–it's a celebration of the night sky, bringing together astronomy lovers to explore the wonders of the universe. Whether you complete all 110 objects or just a handful, the experience of navigating the cosmos is truly unforgettable.

Space Insights

EXPLORING THE COSMOS: SPACE ARCADE'S MONTHLY OBSERVATION

On February 8, 2025, SPACE ARCADE hosted another spectacular Monthly Telescopic Observation, bringing together over 60 astronomy enthusiasts across Chennai and Delhi for an unforgettable night under the stars. With telescopes, binoculars, and an insatiable curiosity, participants gathered to witness the stunning celestial display of the month's planetary alignment.

The event offered breathtaking views of Saturn with its largest moon, Titan, Crescent Venus, Jupiter alongside its Galilean moons, and Mars showcasing its polar ice caps and the striking El Niño feature. Complementing the planetary showcase, the bright Gibbous Moon illuminated the night sky, providing an awe-inspiring experience for all attendees.

Guided by the SPACE ARCADE team, participants learned the assembly, calibration, and operation of various telescopes, gaining hands-on experience with different models. The session also introduced foundational astrophotography techniques, encouraging attendees to capture and document their celestial observations.

A variety of advanced telescopes were used 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 provided unique perspectives and enhanced the exploration of the night sky's wonders.

With a focus on interactive learning and shared discovery, the event left participants inspired and eager for future observations. SPACE ARCADE looks forward to hosting more sessions, continuing to spark curiosity and wonder about the vast universe.

Stay updated on upcoming events by following SPACE ARCADE on Instagram: @SpaceArcadeInd!

DPS Greater Faridabad Hosts 3 Day Evening Astronomy Workshop

Delhi Public School Greater Faridabad, in collaboration with Space India, organized an enriching three-day evening astronomy session from February 5 to 7, 2025. The event provided students and parents with a unique opportunity to explore celestial wonders through interactive workshops and telescope observations.

February 5, 2025: Workshop - Destination Moon and Planet Watch.

The first evening was dedicated to Grade VI and VII students, who embarked on an astronomical journey through an engaging PowerPoint presentation. They explored the characteristics of the Moon, Mars, Jupiter, Venus, and Saturn, deepening their understanding of celestial bodies. The excitement peaked when students and their parents moved outdoors for a hands-on telescope observation session. Witnessing these celestial marvels firsthand ignited a sense of wonder and curiosity, making the session an unforgettable learning experience.

February 6, 2025: DSLR and Astronomy Photography Workshop.

On the second day, students delved into the fundamentals of DSLR photography. They learned about the basic components and functions of DSLR cameras through an insightful presentation. In the classroom, they practiced capturing low-light images and experimented with creative photography techniques such as light painting with laser pointers and low-exposure ghost photography. The learning continued on the ground, where students and parents used DSLR cameras to capture stunning images of the Moon while also engaging in celestial observations through telescopes. The session blended science and art, fostering an appreciation for both astronomy and photography.

February 7, 2025: Grand Celestial Observation Event

The final day witnessed an overwhelming participation of over 800 attendees, including parents of Grade I to V students. The event was graced by the esteemed presence of Dr. Rohit Jainendra Jain, Pro-Vice Chairman of DPS Greater Faridabad, and Smt. Shail Bala, Patron. The highlight of the evening was the breathtaking observation of Saturn and its rings, Venus, Jupiter with its moons, and Mars through high-powered telescopes. The celestial spectacle left students and parents spellbound, reinforcing their enthusiasm for space science.

The three-day event was a resounding success, fostering a deep-seated curiosity for astronomy and photography among students and their families. DPS Greater Faridabad continues to inspire young minds, nurturing a passion for scientific exploration and discovery.

Planet Parade 2025: A Celestial Celebration at SPACE India

The month of February 2025 will be remembered as a time of astronomical wonder for students, parents, and the SPACE India team. On the 1st, 2nd, and 15th of February, the Dwarka Sector 11 office transformed into a cosmic playground, hosting an awe-inspiring Planet Parade that left everyone mesmerized!

An Unforgettable Cosmic Adventure

Excitement filled the air as students from various schools gathered, eager to embark on an astronomical journey. The Planet Parade was designed as an immersive learning experience, where participants could observe and explore the wonders of our solar system. Telescopes were set up, and young space enthusiasts eagerly lined up to witness celestial marvels up close.

A Journey Through the Cosmos

Through the telescopes, students were treated to breathtaking views of Venus, Saturn, Mars, Jupiter, and the Moon. Each observation came with insightful explanations from the SPACE India educators, who shared fascinating facts and cosmic stories that sparked curiosity and excitement. To make the experience even more enriching, students received a "Home Take-Away Kit," filled with interactive materials and activities to continue their space exploration at home.

A Family Affair: Parents Join the Exploration

The Planet Parade was not just for students—it became a family bonding experience! Parents actively participated, discovering the wonders of the universe alongside their children. A special Planetarium Show was conducted exclusively for parents, followed by a Planetary Observation and Sky Tour, making it a memorable evening for all.

The event received overwhelmingly positive feedback, with parents and students alike expressing their gratitude for the unique and engaging experience. Many eagerly requested more such events in the future!

Blending Fun with Learning

The Planet Parade of February 2025 was a testament to how education can be made exciting. By combining hands-on activities, interactive discussions, and advanced technology, SPACE India successfully ignited a passion for astronomy and space exploration in young minds.

As we continue to gaze up at the stars, events like the Planet Parade remind us of the infinite possibilities that lie beyond our world. This experience has undoubtedly inspired a new generation of astronomers, scientists, and space enthusiasts.






National Science Day 2025: Engineering a Better Tomorrow!

Imagine a young student looking up at the night sky, dreaming of unravelling its mysteries. Or an aspiring scientist working late into the night, experimenting, failing, and trying again–just like Sir C.V. Raman did when he discovered the Raman Effect in 1928. National Science Day is more than just a celebration; it's a tribute to the spirit of curiosity and innovation that drives human progress.

Sir C.V. Raman

In 2025, the theme "Empowering Indian Youth for Global Leadership in Science and Innovation for Viksit Bharat" highlights the important role of young minds in creating India's future as a scientific powerhouse. Space India hosted a prestigious National Science Webinar with distinguished scientists and thought leaders who discussed their views and experiences on the progress of scientific knowledge and inspiring the younger generation.

Sir Chandrasekhara Venkata Raman was a pioneer in light scattering, famously demonstrating that light changes wavelength when passing through transparent materials–a phenomenon now known as the Raman Effect. His discovery revolutionized the field of optics and photonics, influencing generations of scientists. National Science Day is celebrated in his honour.

On 28th February 2025, Space India hosted a live webinar to discuss burning issues, new-age technologies, and revolutionary innovations that can propel national advancement. The webinar included renowned scientists and researchers presenting insightful views across different domains, ranging from space science to material sciences and gender equality in STEM.

The panelists of the webinar were Ms. Shaguna Gahilote, Dr. Parveen Saini and Dr. Santosh Vadawale. Each panelist brought a unique view to the webinar and highlighted various areas the future scientists can focus on.

One of the most important topics was how to inspire young students to study STEM. The panellists urged:
Inquiry-based learning to foster curiosity and problem-solving.
Hands-on experiments and practical applications to make science interesting.
Mentorship programs that pair students with veteran researchers.
Understanding that failure is not the end but a stepping stone.

A Future Led by Scientific Superiority National Science Day 2025 acted as a trigger for galvanizing the minds of youth, reaffirming India's commitment to advancing science and world leadership.
With its adoption of innovation, cross-disciplinary interaction, and access to STEM in inclusivity, India is gearing towards empowering the youth and becoming an even greater science leader on the world map. As we keep venturing into new horizons, let us not forget that science is not merely about finding the unknown but also about unleashing our own boundless potential.

Let's keep reaching for the stars!

COSMIC ALIGNMENT: A NIGHT OF CELESTIAL WONDERS

On **1st February 2025**, the **Football Court of K.R. Mangalam World School, Vikaspuri,** transformed into a gateway to the cosmos as students of **Grades 6 and 7**, along with their parents, gathered for an extraordinary **Cosmic Alignment Event**.

The evening began with a sense of anticipation as the sky remained overcast. However, the spirit of curiosity and excitement kept everyone engaged. Students showcased their creativity by presenting **handcrafted planet models illuminated with small lights**, explaining fascinating facts about their celestial counterparts. Some students also took the stage to share intriguing facts about the **universe**, adding depth to the astronomical experience.

As the night progressed, patience paid off—the clouds drifted away, unveiling a spectacular view of **Jupiter, Venus, Mars**, and **the Moon**. Through telescopes, families marveled at the brilliance of these celestial bodies, making the wait worthwhile. The event not only provided a rare observational experience but also fostered a sense of wonder and scientific curiosity among the attendees.

The **overwhelmingly positive feedback from students and parents** reaffirmed the success of the event. It was a night of learning, discovery, and shared awe—one that will be remembered as a stepping stone toward inspiring future astronomers and space enthusiasts.

Bringing Space Closer: GD Goenka Public School's Astronomy Extravaganza

The wonders of the universe came alive at GD Goenka Public School, Model Town, through two remarkable astronomy events: **Cosmos Night - The Star Party** and **Planetary Parade - An Evening Observation**. Organized under the Universe in the School (UITS), a program of Space India program, these events provided young learners with hands-on experiences that sparked curiosity and deepened their understanding of the celestial world.

Cosmos Night: The Star Party

Held on February 12, 2025, Cosmos Night was an extraordinary platform where students from Classes IV and V demonstrated their growing knowledge of astronomy. Parents and guests joined in, making the event a collaborative learning experience. The evening featured telescope observations, where students and parents marveled at celestial objects under expert guidance. A virtual reality space walk experience took participants beyond our planet, immersing them in the cosmos. Exciting rocketry activities, including hydro rocketry, air rocketry, and pop rocketry, demonstrated the principles of propulsion in an engaging manner.

Interactive activities further enriched the experience. Participants explored gravity differences by weighing themselves on simulated planetary scales, created impact craters to understand celestial formations, and built comet models in an exciting hands-on experiment. The mysterious moon model session allowed students to understand lunar surfaces in depth, while the Save the Earth and Directions activity promoted environmental awareness. The event successfully blended fun with learning, fostering scientific curiosity and inspiring a love for space exploration among young minds.

Planetary Parade: An Evening Observation

On February 7, 2025, young astronomers from Classes II and III, along with their families, embarked on a journey through the night sky during the Planetary Parade event. Designed to merge scientific inquiry with enjoyment, this event provided a captivating introduction to observational astronomy. Guided telescope observations enabled students to witness planets, the Moon, and distant stars firsthand. Astronomy educators led a compelling sky tour, where they shared fascinating stories about constellations and celestial bodies.

Students also displayed creative space-themed models, demonstrating their understanding of planetary science. Engaging hands-on activities included constellation storytelling, where participants explored the myths and science behind constellations. A crater formation experiment allowed students to understand how impacts shape planetary surfaces, while the meteor attack activity introduced them to various types of space rocks.

Rocketry fun sessions saw students building and launching hydro and stomp rockets, learning about propulsion in an interactive way. The event also featured lunar puzzles and a space-themed tattoo station, adding a playful yet educational dimension to the evening. The enthusiastic participation of students and parents made this a night to remember, leaving everyone with a sense of wonder and excitement about the cosmos.

A Cosmic Impact

Both events successfully cultivated scientific curiosity among students, providing them with immersive and educational experiences. The enthusiasm of parents, the dedication of educators, and the eager participation of students made these astronomy events unforgettable. The interactive activities, telescope observations, and hands-on experiments ensured that learning was not just theoretical but deeply experiential.

In an era where STEM education is more important than ever, initiatives like Cosmos Night and Planetary Parade play a crucial role in inspiring the next generation of scientists and space enthusiasts. As the young minds gazed at the stars, they not only learned about the universe but also took their first steps toward becoming future explorers of the cosmos. The success of these events is a testament to the power of experiential learning and the magic of looking up at the night sky with wonder and curiosity. With such initiatives, GD Goenka Public School continues to nurture young astronomers, ensuring that the stars are not just distant lights but beacons of knowledge and inspiration.

Space Camp at Delhi Public School, Faridabad

On February 22, 2025, a grand Space Camp was organized exclusively for 300 Class IV students of Delhi Public School, Faridabad, providing them with an evening filled with hands-on astronomical activities. The camp featured eight interactive stations, each designed to offer a unique and engaging learning experience about space and celestial bodies. The event took place from 6:30 PM to 8:00 PM and concluded with a mesmerizing full-sky tour, highlighting the Winter Hexagon and prominent constellations such as Orion, Taurus, and Gemini, along with their bright stars–Betelgeuse, Rigel, Aldebaran, Castor, and Pollux.

- Station 1: Jupiter Observation, students observed the gas giant through two 200mm Dobsonian Reflector Telescopes, spotting its cloud bands and Galilean moons.

- Station 2: Mars Observation allowed students to view the Red Planet through two 200mm Dobsonian Reflector Telescopes, understanding its surface features and significance in space exploration.

- Station 3: Weigh Yourself on Different Planets was a fascinating activity where students measured their weight on various celestial bodies, helping them understand how gravity varies across planets.

- Station 4: Smell the Planet, two setups allowed students to experience scents replicating the chemical compositions of different planetary atmospheres, making the learning process more immersive and exciting.

- The Tattoo Station (Station 5), with two setups, was a favorite among students, where they received space-themed temporary tattoos, adding a fun and artistic element to the camp.
- Station 6: Moon Phase Model, with three setups, helped students understand the changing phases of the Moon through interactive models, strengthening their grasp of lunar cycles.

- A visual treat awaited students at Station 7: 3D Viewing, where they explored celestial bodies and space missions through 3D imagery, making astronomical concepts more vivid and engaging.
- At Station 8: Ring the Planet, students took part in an interactive quiz. The educator asked questions about different planets, and upon answering correctly, the student tossed a ring onto the corresponding planet model. This fun and engaging activity helped reinforce their knowledge of planetary characteristics in an exciting way.

Each station was led by an educator, who explained the science behind the activities, making the experience both educational and enjoyable. The Class IV students were full of enthusiasm and curiosity, actively participating in all the activities. School Principal Ms. Sangeeta Chakravarthy, Chief Guest Mr. Anil Kumar, and all the staff members attended the event, thoroughly enjoying the activities and appreciating the efforts put into making learning interactive and fun.

Each station was led by an educator, who explained the science behind the activities, making the experience both educational and enjoyable. The Class IV students were full of enthusiasm and curiosity, actively participating in all the activities. School Principal Ms. Sangeeta Chakravarthy, Chief Guest Mr. Anil Kumar, and all the staff members attended the event, thoroughly enjoying the activities and appreciating the efforts put into making learning interactive and fun.

The event concluded with a Full Sky Tour, where students observed the Winter Hexagon and identified prominent constellations like Orion, Taurus, and Gemini. They also learned about the bright stars Betelgeuse, Rigel, Aldebaran, Castor, and Pollux. The spectacular night sky observation left everyone in awe, making the Space Camp at Delhi Public School, Faridabad, an unforgettable experience filled with exploration, discovery, and celestial wonders.

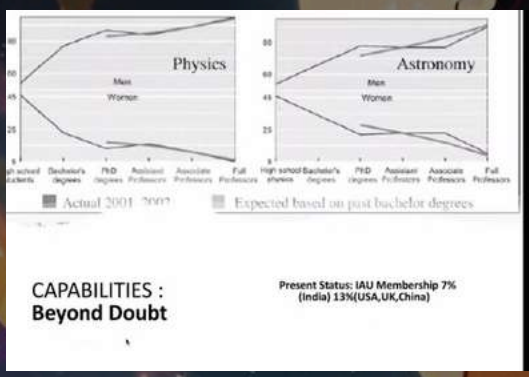
INTERNATIONAL DAY OF WOMEN AND GIRLS IN STEM

CHARTING PROGRESS FOR A BRIGHTER FUTURE

SPACE India conducted a webinar to celebrate The International Day of Women and Girls in Science, on February 11th. The day highlights the vital role women and girls play in STEM (Science, Technology, Engineering, and Mathematics) and underscores the need for greater gender inclusivity in these fields. This year's theme, "Charting Progress to Shape the Future: The Best is Yet to Come," serves as a reminder of the achievements of women in STEM while inspiring the next generation to break barriers and pursue their passions.

The Historical Struggles and Triumphs of Women in STEM

Historically, women's contributions to STEM have been underrecognized, despite their groundbreaking work. Take, for example, the Harvard Computers, a group of women in the early 20th century who revolutionized astronomy by classifying stars and laying the foundation for future research.



Encouraging More Women in STEM

The presence of women leaders in STEM is essential for fostering inclusivity and inspiring young girls to pursue these careers.

Women role models provide mentorship, create a sense of belonging, and encourage girls to envision themselves in scientific and technological roles. Educational institutions and organizations must support these efforts through:

- Scholarships and funding for women in STEM education
- Mentorship and networking programs
- Inclusive workplace policies
- STEM outreach programs targeting young girls

Inspiring Stories from Today's Women in STEM

The journey of today's women in STEM is equally inspiring. Experts like **Dr. Priya Shah**, **Dr. Anushka Pal**, and **Ms. Samiksha Mahakulkar** have broken barriers and contributed immensely to their respective fields in physics, chemistry, and

aerospace engineering. Their experiences reflect the importance of persistence, passion, and institutional support in enabling women to thrive in STEM careers.

Meet the Speakers

Dr. Priya Shah: Currently an Assistant Professor in Physics at the Department of Physics, Maulana Azad National Urdu University. Dr. Shah was also the co-Chair of the Women in Astronomy Working Group of the International Astronomical Union and has been actively involved in outreach programs promoting women's participation in astronomy.

Dr. Anushka Pal: An Assistant Professor of Chemistry at Miranda House College, University of Delhi. She is an alumna of Miranda House and completed her Ph.D. from the Indian Institute of Technology, Delhi. Dr. Pal has published several research papers in international journals. Her dedication to research and education makes her a strong advocate for encouraging young women to pursue chemistry.

Ms. Samiksha Mahakulkar: A Launch Pad Operations Engineer at Isar Aerospace in Norway. Passionate about the space industry, she chose a career in aerospace despite receiving offers from other fields such as oil and gas. Her expertise covers both technical proficiency and operational excellence, and she continues to inspire young women to break barriers in the global aerospace sector.

Moving Forward: A Call to Action

While progress has been made, systemic changes are still needed to ensure equal opportunities for women in STEM. Governments, educational institutions, and private sectors must work together to:

- Bridge the gender gap in STEM careers
- Promote inclusive hiring and leadership roles
- Encourage young girls to explore STEM fields through education and mentorship

As we celebrate the achievements of women in STEM, we must also commit to building a future where gender is no longer a barrier in science and technology. The best is truly yet to come, and by fostering an environment of inclusion and support, we can inspire the next generation of women to reach for the stars–both literally and metaphorically.

A NIGHT WITH THE COSMOS

SPACE INDIA AND NPL ILLUMINATE THE WONDERS OF THE UNIVERSE

On the evening of February 11th, 2025, **SPACE India**, in collaboration with the **National Physical Laboratory (NPL)**, curated a truly unforgettable cosmic experience that **transported over 200 scientists** and their families into the heart of the universe. Held at NPL's sprawling grounds, the event offered attendees a rare and mesmerizing **two-hour stargazing journey**, powered by cutting-edge telescopes and live projections that brought the night sky to life.

Under the vast expanse of the cosmos, participants had the extraordinary opportunity to observe celestial marvels such as **Venus**, the captivating moons of **Jupiter**, the magnificent rings of **Saturn**, the icy polar caps of **Mars**, and the distant glow of **Uranus**. The evening also featured breathtaking views of the **Moon**, allowing viewers to study its cratered surface in exquisite detail. Adding to the experience were dazzling deep-sky phenomena, including the Orion Nebula and the Pleiades star cluster, alongside the celestial Winter Hexagon—each contributing to a shared awe of the universe's grandeur.

This night was more than just a scientific exploration; it was a celebration of humanity's shared connection with the cosmos. It reminded us of our ancient, enduring curiosity and bond with the stars, linking modern-day explorers to the dreamers and civilizations that have gazed up at the night sky throughout history.

The overwhelming success of this event showcases the power of collaboration in democratizing science and space exploration. By teaming up with NPL, SPACE India didn't just offer an exceptional educational experience—it provided a rare platform for families and individuals of all ages to connect with the wonders of the universe. This event underscores an important message: **space exploration is not the realm of astronauts and scientists alone; it belongs to everyone**.

As we continue to inspire curiosity and cultivate a deeper understanding of the cosmos, we invite you to join us on this incredible journey. There are more stars to discover, more questions to ask, and more horizons to explore. The cosmos is vast, and our adventure has only just begun.

Stay tuned for more exciting updates and events from SPACE India!

PLANETARY PARADE AT K.R. MANGALAM WORLD SCHOOL, VAISHALI

On **18th February 2025**, **K.R. Mangalam World School, Vaishali**, in collaboration with **SPACE India**, hosted the **Planetary Parade**, an extraordinary evening of stargazing and space exploration. Students of grades 4 – 5 and their parents gathered to witness the breathtaking beauty of the night sky, making it a truly unforgettable experience.

Three **Dobsonian telescopes** were set up, providing a rare opportunity to observe celestial objects in stunning detail. The event began with a **Comet-Making Demonstration**, where students discovered the composition and behavior of comets using simple materials. This hands-on activity, followed by an engaging **Q & A session**, deepened their understanding of these cosmic wanderers.

A guided **Sky Tour** introduced participants to **famous constellations**, the **brightest star**, and **visible planets**. Using laser pointers, students identified key celestial objects, enhancing their observational skills.

The highlight of the night was the **telescopic observation**, where attendees marveled at:

- **Mars** – The striking **Red Planet**, glowing in the night sky.
- **Venus** – Shining in its beautiful **crescent phase**.
- **Jupiter** – Displaying its **four Galilean moons**.
- **Pleiades** – The mesmerizing **Seven Sisters star cluster**.

The event ignited a passion for space science, inspiring young minds to explore the wonders of the cosmos. As the evening concluded, students and parents left with a newfound curiosity about the universe, making the **Planetary Parade** an enriching and unforgettable experience.

EXPLORING THE COSMOS

ASTRONOMY SHOWCASE AT DASHMESH INTERNATIONAL SCHOOL

Space India Brings the Wonders of the Universe to Dashmesh International School, Punjab.

On February 9th, Dashmesh International Public School in Punjab became the epicenter of an awe-inspiring space-themed event, organized by Space India, which drew over 3,000 attendees from various walks of life. The event, packed with an array of engaging, hands-on activities, captured the imaginations of students, educators, and parents alike, sparking a renewed curiosity and enthusiasm for space exploration.

The activities arraged included:

- **Weigh Yourself on Different Planets -** Visitors were invited to experience how their weight would change on different celestial bodies. This engaging activity provided attendees an exciting, real-world connection to concepts in physics and space science.
- **Comet Kitchen: -** Another fascinating segment was the "Comet Kitchen," where participants crafted their very own realistic comets using everyday materials. This hands-on activity offered young minds an opportunity to explore the building blocks of our solar system.

- **Hydro Rocketry Pop Rocketry and Stomp Rocketry -** The excitement reached new heights with the Hydro Rocketry activity, where water-powered rockets were launched. The demonstration of .

propulsion and aerodynamics not only thrilled the crowd but also gave them an insight into the science of rocketry in an interactive, practical format. The Pop Rocketry and Stomp Rocketry sessions, added to the excitement as attendees had the chance to build and launch their own soda-powered and stomp rockets.

- **Safe Solar Observation** - Under the supervision of expert educators, attendees were given tools to safely observe the Sun. This activity gave participants a chance to safely observe the Sun's powerful and captivating features.
- **Meteor Game and Ring the Planets -** The event also featured games designed to engage participants to understand the dynamics of meteors and planetary orbits. These playful, yet informative games helped attendees visualize complex astronomical phenomena in a fun and accessible way.
- **Mobile Planetarium-** One of the most awe-inspiring experiences of the event was the Mobile Planetarium, where small groups had the opportunity to embark on a 35-minute immersive journey through the wonders of the universe. The sessions provided a breathtaking, up-close look at the cosmos, leaving participants in awe of the vastness and beauty of the universe.

A Resounding Success

The event was met with enthusiastic praise from attendees, who lauded the interactive nature of the activities and the depth of educational value they offered. Space India's dedication to fostering a hands-on, immersive learning experience made this event a resounding success, leaving a lasting impact on everyone who attended.

BRIDGING HISTORY AND SCIENCE: A STELLAR WORKSHOP AT JANTAR MANTAR

On **February 18, 2025**, the iconic Jantar Mantar observatory in Delhi became the stage for an extraordinary educational event, bringing together history, science, and inspiration. Organized by **SPACE India** in collaboration with the **American Center** under the US Embassy workshop series, the workshop welcomed **31 bright young learners** from schools across Delhi NCR, including **Mayoor School (Noida)**, **Mount Abu Public School (Rohini)**, **Uttam School for Girls**, and **Imperial Heritage School (Gurugram)**.

Jantar Mantar, constructed in the 18th century by **Maharaja Jai Singh II**, stands as a symbol of India's unparalleled astronomical heritage. Its meticulously designed instruments, such as the **Samrat Yantra** (the world's largest sundial), **Jai Prakash Yantra**, **Rama Yantra**, and **Misra Yantra**, have withstood the test of time. These geometric marvels once guided ancient astronomers in tracking celestial movements, measuring time, and refining calculations.

Participants at the event were immersed in the wonder of these historic instruments through **live demonstrations** led by SPACE India educators. The **hands-on workshops** allowed students to explore the principles of **positional astronomy** and connect the methods of the past to the advancements of the present.

A highlight of the day was the engaging discussion on planetary motion and the positioning of celestial bodies in relation to Earth and the Sun. Students also delved into the exciting prospect of contributing to minor astronomical calculations at Jantar Mantar, sparking curiosity about how ancient observatories could play a role in modern research.

The event was more than just a lesson in history; it was a celebration of India's contributions to science and an invitation for young minds to dream big. By blending traditional knowledge with practical applications, the session showcased how ancient methods laid the groundwork for **modern space exploration**.

The collaboration between **SPACE India** and the **American Center** reaffirmed the value of preserving historical wisdom while inspiring the next generation of scientists, astronomers, and space enthusiasts.

Jantar Mantar remains not just a relic of the past but a bridge to the future—a place where young learners can look at the stars and imagine their limitless potential.

110 DEEP-SKY WONDERS IN ONE NIGHT: ARE YOU READY?

Astroport: A Stargazer's Paradise.

Astroport, a premier network of observatories and dark-sky resorts, has become a beacon for astronomy enthusiasts seeking an unspoiled view of the cosmos. With state-of-the-art facilities and locations far from the intrusive glow of urban lights, Astroport offers an unparalleled experience for stargazing, astrophotography, and celestial events.

The Messier Marathon: A Cosmic Challenge.

One of the most anticipated events for astronomers each year is the Messier Marathon—a grueling yet rewarding challenge in which participants attempt to observe all 110 Messier objects in a single night. Named after French astronomer Charles Messier, these objects include some of the most spectacular star clusters, nebulae, and galaxies visible from Earth.

This year's Messier Marathon will be conducted across Astroport's premier sites—Dhela, Sariska, and Dwarasamudra—taking advantage of their ideal dark-sky locations. Participants will have the rare opportunity to witness celestial wonders with minimal light pollution and maximum clarity.

Looking Back: Messier Marathon 2024 at Astroport.

Last year's Messier Marathon was held at Astroport Sariska and Astroport Dhela. Each location offered unique perspectives and breathtaking views of the night sky. Sariska's serene desert landscape and Dhela's forested surroundings created a perfect blend of nature and history, enha-ncing the experience for all who attended.

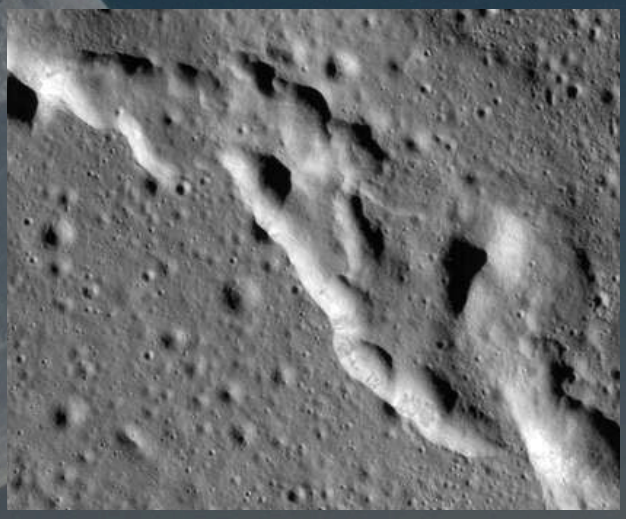
Participants at these sites shared stories of spotting elusive deep-sky objects and marveled at the sheer beauty of our universe. The camaraderie and shared passion for astronomy created lasting memories, setting a high bar for this year's marathon.

Conclusion: Join Us Under the Stars

Astroport invites stargazers, amateur astronomers, and seasoned skywatchers alike to join the upcoming Messier Marathon. With its world-class locations and dedication to preserving the night sky, Astroport continues to foster a love for astronomy and exploration. Prepare for an unforgettable night of discovery, wonder, and connection to the cosmos.

HIGHLIGHTS OF FEBRUARY 2025

Moonquakes and Wrinkles: Signs of Lunar Geological Activity



A wrinkle ridge on the nearside of the moon, in Mare Frigoris. (Image credit: NASA/LRO)

New research suggests that the Moon may still be geologically active, as its surface continues to shrink and wrinkle. Scientists studying images from NASA's Lunar Reconnaissance Orbiter have found 266 wrinkle ridges on the Moon's far side. These ridges appear to be relatively young, forming within the past 160 million years. This challenges the long-held belief that the Moon's geological activity ended billions of years ago.

Wrinkle ridges are well-known on the near side of the Moon, where large volcanic plains called lunar maria formed from ancient lava flows. As the Moon's interior cooled, its surface contracted, creating large ridges.

However, the far side has very few volcanic plains, making these newly discovered ridges unexpected. The ridges on the far side are also much smaller than those on the near side, measuring about 100 meters wide and 1,000 meters long.

Scientists determine the age of lunar features by counting impact craters–the fewer craters, the younger the surface. Based on this method, the far side's wrinkle ridges are estimated to be between 84 million and 160 million years old. This suggests that volcanic activity lasted much longer than previously thought

Looking down at the South Pole Aitken Basin, containing one of the few lunar maria on the farside of the Moon. The nearside, glimpsed on the right-hand side of the Moon in this image, is covered with maria. (Image credit: NASA/JPL)

More evidence supports the idea of recent activity. In 2020, China's Chang'e 5 mission brought back samples from a lunar mare on the near side. These samples contained volcanic glass beads that were about 123 million years old, reinforcing the possibility of ongoing geological processes. Seismometers from past Apollo missions have also detected moonquakes, which may be linked to the Moon's slow contraction.

If the Moon is still active, this has important implications for future lunar exploration. As space agencies plan missions to send astronauts to the Moon, understanding moonquakes and surface changes will be crucial for ensuring safety and designing infrastructure on the lunar surface.

THE UNEXPECTED SPIN: BLACK HOLES ARE ROTATING FASTER THAN PREDICTED

Scientists have discovered that some supermassive black holes rotate much faster than previously thought, offering new insights into their growth and evolution. Using data from the Sloan Digital Sky Survey (SDSS), researchers found that these black holes gained their spin not just through galaxy mergers but also by steadily consuming surrounding gas and dust over billions of years.

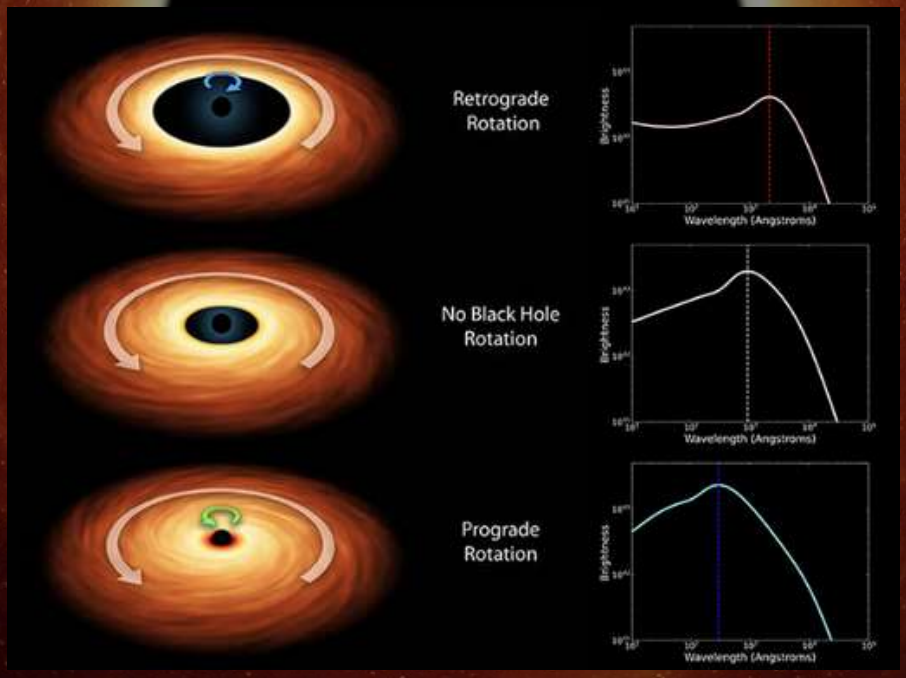
"We found that black holes at the centers of galaxies were spinning too fast to have formed solely from mergers," said Logan Fries from the University of Connecticut. "They must have grown significantly by pulling in material, which also sped up their rotation."

Measuring black hole spin is a challenge. While black holes are defined primarily by their mass and spin, distinguishing their own rotation from that of the surrounding accretion disk is difficult. However, by studying the inner regions of the disk–where gas is falling into the black hole–scientists can detect subtle shifts in emitted light that reveal spin rates.

Fries describes this process as "black hole archaeology," comparing it to examining a fossil record. When material falls into a black hole, it brings angular momentum, which preserves details of how the black hole has grown over time.

Previous models suggested that black holes primarily grew through mergers. Since merging galaxies have random rotations, their combined black holes should spin at moderate speeds. However, this study found that many black holes spin rapidly, especially in more distant galaxies. This suggests black holes build up spin over time by steadily consuming gas and dust.

Future observations with the James Webb Space Telescope (JWST) could further confirm these findings. "Black holes remain at the frontier of human understanding," said Juna Kollmeier, Director of SDSS-V. "Massive surveys like SDSS help us test and refine our models of the universe's most mysterious objects."



(Left) Artist's impressions of a black hole and its accretion disk with different spins. (Right) the corresponding multiwavelength spectrum that would be observed in each one.
(Image credit: Left: NASA/JPL-CaltechRight: Logan Fries and the SDSS collaboration)

NASA'S PUNCH MISSION TO UNVEIL THE SUN'S HIDDEN SECRETS

NASA is set to launch the Polarimeter to Unify the Corona and Heliosphere (PUNCH) mission on February 27 aboard a SpaceX Falcon 9 rocket. This groundbreaking mission aims to bridge the gap between the Sun's outer atmosphere (corona) and the solar wind, the charged particles streaming through space that shape our heliosphere.

PUNCH consists of four small satellites working together to create 3D observations of the inner heliosphere. The mission will help scientists understand how the corona transforms into the solar wind, improving space weather forecasting and protecting satellites, astronauts, and power grids from solar storms.

To achieve this, three of the satellites will function as wide-field imagers, capturing both the bright inner corona and the fainter, distant solar wind. The fourth satellite, built by the Naval Research Laboratory, will act as a narrow-field imager, creating an artificial total solar eclipse to continuously observe the corona–something natural eclipses allow for only a few minutes.

Image credit: NASA

Additionally, PUNCH is equipped with a polarimeter, which measures light polarization to determine the three-dimensional structure of the solar wind. This technique, similar to how polarized sunglasses reduce glare, enables scientists to track space weather events across the solar system.

The mission will work in conjunction with NASA's Parker Solar Probe, which directly samples the Sun's corona. Together, they will provide unprecedented insights into how solar activity influences space weather.

Beyond its primary objectives, PUNCH will also contribute to astronomy by creating the most comprehensive polarimetric star map of the sky. As the first mission to routinely track space weather events in three dimensions, PUNCH promises to revolutionize our understanding of the Sun and its impact on the solar system.

CURIOSITY CAPTURES MESMERIZING IRIDESCENT CLOUDS ON MARS

NASA's Curiosity rover has captured breathtaking images of iridescent twilight clouds drifting high above the Martian surface. These "noctilucent" clouds, composed of carbon dioxide ice, shimmer in shades of red and green, illuminated by the sun even after nightfall. They resemble the delicate cloud patterns seen on Earth, adding to the intrigue of Mars' dynamic atmosphere.

The images, taken on January 17, were stitched together into a time-lapse video, speeding up 16 minutes of cloud movement by 480 times. The clouds were observed at altitudes between 37 and 50 miles (60-80 km), where Mars' cold upper atmosphere causes carbon dioxide to condense into ice. Some ice crystals, forming thick white plumes, appear to fall before evaporating at around 31 miles (50 km) due to rising temperatures, creating an ever-changing display in the Martian sky.

Curiosity has now recorded these clouds during four Martian years, typically appearing in early southern autumn. They were first seen in 1997 by NASA's Pathfinder mission, but their formation remains a mystery. Interestingly, while the Perseverance rover in Jezero Crater has not observed such clouds since landing in 2021, Curiosity only spotted them for the first time in 2019, nearly seven years after its arrival in Gale Crater.

The unpredictability of these twilight clouds raises intriguing questions. Scientists believe **gravity waves–atmospheric ripples–**may cool specific regions enough for carbon dioxide to freeze, but the exact mechanisms behind this process remain poorly understood. Understanding how and why these clouds form in specific locations could provide valuable insights into the Martian climate.

Last year, researchers released the most comprehensive Mars cloud map, compiled from two decades of observations by ESA's Mars Express orbiter. The map highlights a wide variety of unique cloud patterns, some unlike anything on Earth, further deepening the mystery of Martian atmospheric behavior.

"Clouds on Mars are just as diverse and fascinating as those we see in our skies," said planetary geologist Daniela Tirsch. As scientists continue to study these atmospheric phenomena, the mesmerizing iridescent clouds serve as a stunning reminder of how much we have yet to discover about Mars' ever-changing skies.

(Image credit: NASA/JPL-Caltech/MSSS

DID THE FIRST SUPERNOVAS FLOOD THE UNIVERSE WITH WATER?

New simulations suggest that the universe's first supernovas could have created surprisingly large quantities of water. (Image credit: livescience/Getty Images)

A groundbreaking study suggests that the universe's earliest supernovas may have generated vast amounts of water, potentially making life possible just 100 million years after the Big Bang. This challenges conventional models of cosmic evolution, which assume that water accumulated gradually over billions of years.

Water is one of the most abundant compounds in the universe. Beyond Earth, astronomers have detected it on Mars, in the icy caps of Mercury, within comets, and even in massive interstellar gas clouds. Previously, scientists believed that water formed slowly as hydrogen combined with oxygen forged in stars. However, new simulations, published on Jan. 9 on the arXiv preprint server, propose a different scenario. Researchers modeled the deaths of Population III stars—the universe's first, massive stars, each about 200 times the mass of the Sun—and found that their supernova explosions could create conditions ideal for water formation.

These stellar explosions likely enriched dense gas clouds with hydrogen, oxygen, and other elements, leading to water concentrations up to 30 times higher than those found in interstellar space today. If confirmed, this discovery could reshape our understanding of the first galaxies and the origins of water in the universe.

However, challenges remain. Scientists have never directly observed Population III stars—only the remnants of their existence. Additionally, if early water production was significant, the modern universe should contain far more water than it does. Some researchers suggest that the universe experienced a drying-out period, where large quantities of water were lost due to ionization and other astrophysical processes.

While water is essential for life on Earth, its early presence does not necessarily imply that extraterrestrial life formed shortly after the Big Bang. Nonetheless, these findings open new avenues in the search for life and the evolution of galaxies.

BLUE GHOST LUNAR LANDER EMBARKS ON MOON MISSION

Image Credit: Firefly Aerospace

Firefly Aerospace's Blue Ghost lunar lander has officially begun its journey to the moon after successfully firing its engines to escape Earth's orbit. This milestone marks a crucial step in the mission, which is part of NASA's Commercial Lunar Payload Services (CLPS) program.

On February 9, Blue Ghost conducted a trajectory-correction maneuver to refine its path, ensuring it remains on course for lunar orbit. The spacecraft is expected to enter a high lunar orbit in the coming days before gradually lowering its altitude in preparation for landing.

"We'll then spend approximately 16 days in lunar orbit before we begin Blue Ghost's descent," Firefly stated. This extended orbiting period will allow the team to calibrate the navigation system and carry out preliminary scientific operations for NASA.

The lander is aiming for a touchdown within Mare Crisium (Sea of Crises), a vast basin on the moon's near side. As part of its mission, Blue Ghost will conduct subsurface drilling, sample collection, X-ray imaging of Earth's magnetic field, and dust mitigation studies. These experiments are expected to provide valuable insights into the lunar environment and contribute to future exploration efforts.

Firefly's Blue Ghost lunar lander captures the Blue Marble while in Earth orbit approximately 6,700 km above the planet on January 23, 2025. (Image Credit: Firefly Aerospace)

By leveraging commercial partnerships under NASA's CLPS initiative, Firefly Aerospace is helping advance lunar science and pave the way for sustained human and robotic exploration of the moon. If successful, this mission will further establish the role of private space companies in expanding humanity's presence beyond Earth.

WHAT'S UP IN THE SKY - MARCH 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, greatest eastern elongation 8 March. Lost from view mid-month.

Venus
Evening planet, sets over 3 hours after sunset on 1 March, lost after mid-month.

Mars
Evening planet, 56-arcminutes south of 74%-lit waxing gibbous Moon on 9 March.

Jupiter
Big gas giant, remains at a decent altitude throughout March.

Saturn
Not visible, ring plane crossing on 23 March which will make Saturn's ring disappear.

Uranus
Loses altitude due to brightening spring skies throughout the month.

Neptune
Cold planet. Not visible this month. Will require a telescope to spot.

BRIGHT DEEP SKY OBJECTS

Beehive Cluster (M44), or NGC 2623 is an open star cluster nearest to our galaxy located in Cancer constellation. It has an apparent magnitude of 3.1 and is best observed from northern hemisphere. It appears as a fuzzy patch of light when observed with unaided eyes. It contains about 1000 stars and is 600 million years old.

NGC 2548 also known as M48 is located in Hydra constellation with apparent magnitude of 5.8. Under good atmospheric condition, the cluster is visible to naked eyes. It contain about 80 stars and is 500 million years old. It was discovered by Charles Messier in the year 1771.

Pinwheel Galaxy, M 101 or NCG 5457 is a large spiral one, located in Ursa Major constellation with an apparent magnitude of 7.9. It is one of the galaxies which can be easily found by binoculars. It was discovered by Pierre Méchain in 1781.

M46 also known as NGC 2437, is best observed from the southern hemisphere. It is found in the Puppis constellation and has an apparent magnitude of 6. It can be easily observed through binocular or a small telescope. The cluster contains about 500 stars and is roughly 251 million years old.

EYES IN SPACE– FEBRUARY 2025

Webb Unveils Dazzling Light Show at Milky Way's Heart

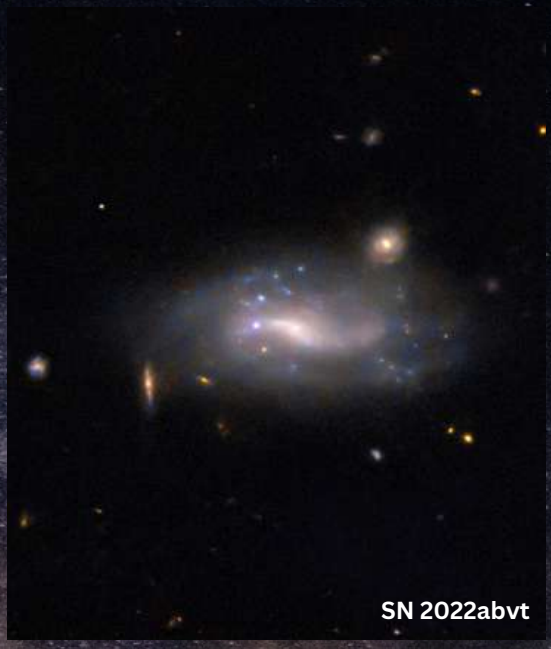
NASA's James Webb Space Telescope has captured unprecedented activity at the heart of the Milky Way, revealing constant flares from the accretion disk of Sagittarius A*, the galaxy's central supermassive black hole. These flares range from faint flickers to intense eruptions occurring daily. Researchers observed this variability over 48 hours across a year, identifying two separate processes likely driving the flares–turbulent fluctuations and magnetic reconnection events. Unexpectedly, they also detected a time delay between different wavelengths of light. These findings provide new insights into black hole behavior and could improve our understanding of galactic evolution and extreme astrophysical environments.

Webb Maps Full Picture of How Phoenix Galaxy Cluster Forms Stars

Researchers using NASA's James Webb Space Telescope have solved the mystery of the Phoenix cluster's unusually high star formation rate. Located 5.8 billion light-years away, this galaxy cluster has intrigued scientists due to its extreme gas cooling and rapid star birth, despite the presence of a massive black hole that typically prevents such activity. Building on data from NASA's Chandra X-ray Observatory and Hubble Space Telescope, Webb identified warm gas–previously undetected–bridging the temperature gap between extremely hot and cold gas. This missing link explains how cooling gas fuels star formation.

Using Webb's Mid-Infrared Instrument (MIRI), researchers mapped this gas, revealing its presence in cavities within the cluster. Additionally, Webb's infrared capabilities enabled scientists to detect faint neon emissions, revealing details previously hidden in ultraviolet light. This discovery advances understanding of galaxy cluster dynamics and star formation in extreme environments, highlighting both technological advancements and natural astrophysical quirks

Hubble's Cosmic Quest: Hunting Stellar Explosions



SN 2022abvt

NASA/ESA's Hubble Space Telescope captured a striking image of the supernova SN 2022abvt and its host galaxy, LEDA 132905, located over 400 million light-years away in the Sculptor constellation. The faint spiral galaxy is adorned with bright blue star clusters, while the supernova appears as a pinkish-white dot near its center.

SN 2022abvt, a Type Ia supernova, was discovered in late 2022 and observed by Hubble two months later. These stellar explosions occur when the exposed core of a dead star undergoes a sudden nuclear fusion burst. Scientists study Type Ia supernovae to measure cosmic distances precisely.

Catching these fleeting events is possible thanks to robotic telescopes that continuously monitor the night sky.

The ATLAS (Asteroid Terrestrial-impact Last Alert System) detected SN 2022abvt while scanning for asteroids. Along with asteroids, ATLAS tracks transient celestial events, including supernovae, variable stars, and galactic centers influenced by black holes.

Hubble Captures a Cosmic Cloudscape

Tarantula Nebula

The NASA/ESA Hubble Space Telescope captured a stunning image of swirling gas and dust near the Tarantula Nebula, a star-forming powerhouse in the Large Magellanic Cloud, about 160,000 light-years away. This nebula is home to some of the most massive stars known, surrounded by colorful clouds filled with wispy tendrils and dark clumps of cosmic dust. Unlike household dust, cosmic dust consists mainly of carbon or silicate molecules containing silicon and oxygen.

The image was taken as part of a research program studying cosmic dust in nearby galaxies. Despite its tiny size, dust plays a crucial role in space–helping form planets, cooling gas clouds to enable star formation, and even facilitating the creation of new molecules. By studying dust properties, astronomers gain deeper insights into the life cycles of stars and planetary systems, enhancing our understanding of the universe's intricate structure and evolution.

Rocket launches in MARCH 2025

TacSat

The TacSat mission, set to launch in March 2025 aboard an Atlas V rocket, is a significant step in advancing the United States' military space capabilities. The mission will deploy the Tactical Satellite (TacSat), designed to enhance tactical communication, reconnaissance, and intelligence gathering for the U.S. Space Force. The TacSat satellite will provide high-resolution imaging and real-time data to military units in remote areas, supporting military operations, and improving situational awareness in both conventional and asymmetrical warfare environments.


(Image credit: istockphoto.com)

Transporter 13 (Dedicated SSO Rideshare)

The Transporter-13 mission, is part of SpaceX's dedicated SmallSat Rideshare program, aimed at providing affordable access to space for small satellites. This mission will utilize the Falcon 9 Block 5 rocket, which is known for its reusability and cost-effectiveness. The Falcon 9 will carry a variety of small payloads into a Sun-synchronous orbit (SSO), supporting a broad range of commercial, government, and scientific missions.Transporter-13 will deploy dozens of small satellites from different organizations, each designed to conduct unique research or provide services in fields such as Earth observation, communications, and technology demonstration. By offering dedicated rideshare options, SpaceX enables multiple organizations to share the same rocket launch, drastically reducing costs for each participant while expanding the accessibility of space.

Farm 2

The Fram2, is a part of SpaceX iworld's first astronaut mission to polar orbit. Named after the Norwegian polar research ship Fram, the Crew Dragon spacecraft will launch into a 90° circular orbit from Florida, making it the first human spaceflight to fly over Earth's polar regions from low-Earth orbit.

During the 3-to-5-day mission, the crew will study green fragments and mauve ribbons of continuous emissions comparable to the phenomenon known as STEVE (Strong Thermal Emission Velocity Enhancement), persistently measured at an altitude of approximately 400 – 500 km above Earth's atmosphere, conducting a variety of research to better understand the effects of spaceflight on the human body, which includes capturing the first human x-ray images in space,


(Image credit: istockphoto.com)

Blue Moon Pathfinder

(Image credit: istockphoto.com)

The Blue Moon Pathfinder mission, set for launch in March 2025, marks a significant step in U.S. lunar exploration. Developed by Blue Origin, the mission aims to validate key technologies for future lunar operations, especially those supporting NASA's Artemis program. The Blue Moon lander will demonstrate landing precision, engine performance, and deployable systems, all crucial for future lunar missions. The lander is capable of delivering a variety of payloads, ranging from scientific experiments to hardware for human missions.

Launched atop United Launch Alliance's Vulcan Centaur rocket, the mission will help refine technologies needed for soft lunar landings, contributing valuable insights for NASA's sustainable lunar exploration. The Blue Moon Pathfinder will play a vital role in advancing deep space exploration and establishing long-term lunar operations.

OroraTech OTC-P1

The OroraTech OTC-P1 mission, scheduled for launch in March 2025, marks a significant leap forward in Earth observation technology. OroraTech, a German-based startup, aims to deploy its first commercial thermal infrared satellite, OTC-P1, aboard SpaceX's Falcon 9 Block 5 rocket. This satellite is designed to provide high-resolution thermal imagery of Earth, offering a unique capability to monitor the environment with advanced thermal sensing technology. OTC-P1 will be part of OroraTech's larger plan to develop a global network of satellites dedicated to continuous monitoring of wildfires, deforestation, and climate change, among other environmental factors.

The satellite's data will be used by governments, NGOs, and research organizations for effective climate action and resource management.The mission also represents an important step toward the commercialization of space-based Earth observation services, contributing valuable data for a wide range of applications, from agriculture to environmental sustainability.


(Image credit: istockphoto.com)

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

ISRO LAUNCHES IN MARCH 2025

Blue Bird Block 2 #1

Date: March 2025, Rocket: GSLV Mk III, Agency: ISRO, Country: India , Launch Site: Satish Dhawan Space Centre, Srihari Kota, India.

(Image credit: CNN.com)

The BlueBird Block 2 #1 mission, slated for launch in March 2025 aboard ISRO's LVM-3 (GSLV Mk III) rocket, aims to advance space-based cellular broadband through a groundbreaking partnership between ISRO and AST SpaceMobile. The mission will carry the BlueBird Block 2 satellite, designed to provide global, high-speed connectivity directly to standard smartphones, bypassing traditional ground-based infrastructure. This innovation promises to eliminate connectivity gaps in remote, rural, and underserved regions by offering real-time voice, text, and internet services.

The BlueBird Block 2 satellite features significant upgrades over previous models, including a 2,400-square-foot phased-array antenna – the largest of its kind deployed in Low Earth Orbit (LEO). This will enable the satellite to deliver high-bandwidth coverage and increase the capacity for mobile network connectivity. The mission will help validate space-based mobile communication technology and enable global broadband coverage for areas that traditional mobile towers cannot reach.

The LVM-3 (GSLV Mk III) rocket, ISRO's heavy-lift vehicle, will deliver the BlueBird Block 2 satellite to its designated orbit. Known for its reliability and power, the LVM-3 has been instrumental in launching major ISRO missions like Chandrayaan-2 and Chandrayaan-3, as well as in preparing for the Gaganyaan human spaceflight mission. This mission marks a further step in ISRO's commercial satellite launch services, reinforcing its role as a reliable space partner globally.

Beyond commercial use, the mission has significant strategic and humanitarian impacts. It will provide emergency communication in disaster-prone areas, support remote industry operations, and strengthen global telecommunications, especially in isolated regions. As AST SpaceMobile collaborates with major telecom providers like AT&T and Vodafone, the BlueBird Block 2 #1 mission is poised to transform the future of global mobile connectivity, offering continuous, uninterrupted service worldwide.

NISAR (NASA-ISRO Synthetic Aperture Radar)

Date: March 2025, Rocket: GSLV Mk II, Agency: ISRO & NASA
Country: India & USA, Launch Site: Satish Dhawan Space Centre, Srihari Kota, India.

The NISAR (NASA-ISRO Synthetic Aperture Radar) mission, a joint venture between NASA and ISRO, is a landmark collaboration that will launch in March 2025 aboard an Indian GSLV Mk II rocket. This mission is poised to revolutionize the understanding of Earth's ecosystems, climate dynamics, and natural disasters through the innovative use of radar imaging technology.


(Image credit: Wikipedia.org)

NISAR will be the first satellite dedicated to observing Earth's surface with unprecedented precision, using two radar frequencies: L-band (to penetrate dense vegetation and soil) and S-band (to detect surface displacements and movement), making it a powerful tool for monitoring global environmental changes.

The satellite's payload, a state-of-the-art synthetic aperture radar (SAR) system, will provide high-resolution, all-weather, and day-and-night imaging of the Earth's surface. This dual-frequency radar system, developed by both NASA and ISRO, allows for a highly accurate assessment of the planet's topography, surface deformations, and environmental shifts. NISAR will scan the entire globe, capturing data over various terrains, including forests, urban areas, and polar regions. Its ability to capture subtle changes in surface height with millimeter precision will allow it to monitor land subsidence, ice sheet movement, and deforestation—offering crucial insights into climate change, natural hazards like earthquakes and volcanoes, and global environmental health.

A notable aspect of the NISAR mission is its application for disaster response and mitigation. The radar's ability to monitor areas affected by natural disasters, such as floods and earthquakes, will aid in post-disaster assessments, helping with quicker recovery efforts.

The data collected will be invaluable for scientific research, climate modeling, and supporting the United Nations Sustainable Development Goals. The mission is also crucial for advancing space-based Earth observation technology and contributing to the international scientific community's understanding of Earth's evolving surface.

ISRO's GSLV Mk II rocket, known for its reliability and capability to launch heavier payloads, will carry the NISAR satellite into its designated orbit. This mission marks a significant milestone in India's growing space capabilities and its collaboration with global space agencies. The NISAR mission will contribute valuable data to the scientific community for the next 12 years, paving the way for a deeper understanding of the complex and dynamic processes that shape our planet.

Tour de Universe

Triangulum: A Celestial Bridge of Myth and Legend

In Greek mythology, Triangulum was often associated with the island of Delos, the sacred birthplace of the twin gods Apollo and Artemis. The story behind this connection is deeply rooted in the myth of Leto, a Titaness and the mother of these powerful Olympian gods. The Triangulum constellation was sometimes thought to represent Delos due to its simple, triangular shape, possibly symbolizing the three points of an island rising from the sea.

This constellation is located near the constellation Aries, which in some myths was linked to a ram that guided Leto during her escape. This further strengthens the connection between the constellation and the story of Delos.

Some scholars suggest that the Egyptians may have associated Triangulum with their sacred geography because of its shape, which closely resembles the triangular delta of the Nile. Since the Nile itself was closely linked to gods like Osiris, who represented life, death, and rebirth, Triangulum could have held special significance as a celestial representation of this sacred geography.

Image Credits: AlltheSky.com

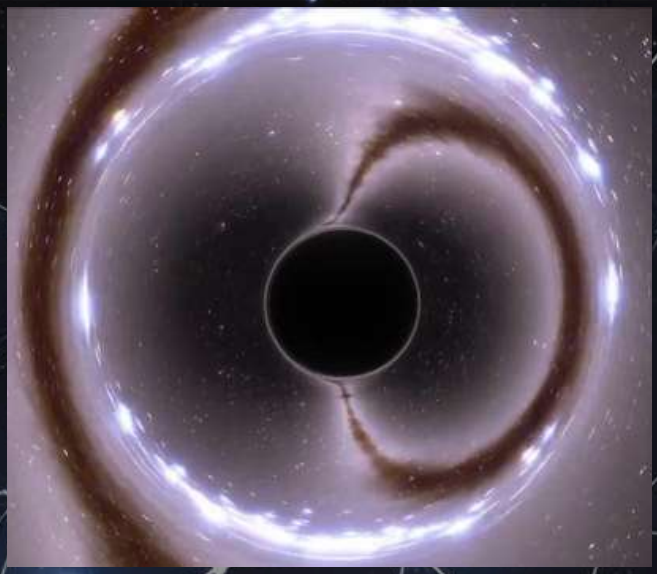
Another possible interpretation is that Triangulum was linked to the pyramidal shapes that were central to Egyptian religious and architectural traditions, further reinforcing its symbolic importance.

According to mythology, Pluto (Hades), the god of the underworld, abducted Persephone (Proserpina) while she was picking flowers in a field in Sicily. This event triggered deep grief in her mother, Ceres, who desperately searched for her daughter.

As Ceres mourned, the world became barren, and crops stopped growing, symbolizing the arrival of winter. Eventually, a deal was made where Persephone would spend part of the year in the underworld and part of the year on Earth, explaining the cycle of seasons.

Because Sicily played a central role in this myth, the Romans associated it with Triangulum, seeing the constellation as a celestial representation of the island that was sacred to Ceres.

M33 Triangulum Galaxy



Black hole, M33 X-7

Exploring the Constellation

Pinwheel Galaxy

Triangulum is the 78th constellation in size, occupying an area of 132 square degrees. It lies in the first quadrant of the northern hemisphere (NQ1) and can be seen at latitudes between +90° and -60°. The neighboring constellations are Andromeda, Aries, Perseus and Pisces.

Triangulum belongs to the Perseus family of constellations, along with Andromeda, Auriga, Cassiopeia, Cepheus, Cetus, Lacerta, Pegasus and Perseus.

Triangulum has one star with a confirmed planet and contains one Messier object, Messier 33 (M33, NGC 598, Triangulum Galaxy). The brightest star in the constellation is Beta Trianguli, with an apparent magnitude of 3.00.

The Triangulum Galaxy contains the largest stellar mass black hole (a black hole formed by the gravitational collapse of a massive star) known. The black hole, M33 X-7, was discovered in 2007 and has about 15.7 times the mass of the Sun. It orbits a companion star and eclipses it every 3.45 days. The total mass of the binary system is about 85.7 times that of the Sun. The companion star has a mass about 70 times solar, which makes it the most massive companion star known in a binary system containing a black hole.

Messier 33 is the third largest member of the Local Group of galaxies, after the Milky Way and Andromeda Galaxy. It is about 50,000 light years in diameter and contains about 40 billion stars. (For comparison, the Milky Way has about 400 billion and Andromeda about a trillion stars). The galaxy is also home to at least 54 globular clusters.

Happy Birthday

Credits: The marginalian

John Herschel

John Herschel (7 March 1792 – 11 May 1871) was an English astronomer, mathematician, and photographer who expanded William Herschel's stellar catalog and mapped the Southern Hemisphere's skies. His General Catalogue of Nebulae and Clusters led to the widely used New General Catalogue (NGC). He named seven moons of Saturn and four of Uranus. A photography pioneer, he coined "photography" and invented the cyanotype process. His work greatly influenced modern astrophysics, deep-sky observation, and scientific imaging, shaping multiple scientific fields.

U. P. Rao

Credits: Indiatvnews

Udupi Ramachandra Rao (10 March 1932 – 24 July 2017) , known as "The Satellite Man of India," was a pioneering space scientist and ISRO Chairman (1984–1994). He led the launch of India's first satellite, Aryabhata (1975), and developed the INSAT, IRS, and PSLV programs, transforming India's space capabilities. His work revolutionized communication, remote sensing, and meteorology. Honored with the Padma Bhushan (1976) and Padma Vibhushan (2017), Rao's contributions laid the foundation for India's rise as a global space leader.

Credits:infosysprize

Thanu Padmanabhan

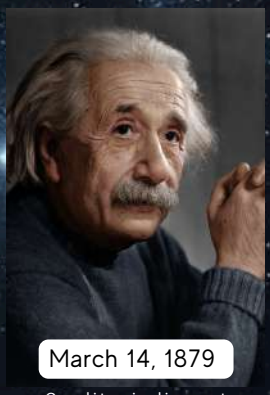
Thanu Padmanabhan (10 March 1957 – 17 September 2021) was a prominent Indian theoretical physicist known for his contributions to gravitation, cosmology, and quantum gravity. His groundbreaking work on the thermodynamic nature of gravity proposed that gravity arises from microscopic degrees of freedom. He advanced understanding of dark energy, general relativity, and cosmic expansion. He authored over 300 research papers and 10 books, receiving the Padma Shri (2007) and various international accolades, leaving a lasting influence on modern theoretical physics.

Gopal Krishna

Authentic photograph of Gopal Krishna is not publicly available.

Gopal Krishna (born 12 March 1948) is an Indian astrophysicist renowned for his pioneering work in radio astronomy, quasars, and active galactic nuclei (AGN). His research has greatly advanced the understanding of radio galaxies, relativistic jets, and the universe's large-scale structure. Associated with the National Centre for Radio Astrophysics (NCRA-TIFR), he contributed to India's Giant Metrewave Radio Telescope (GMRT). His studies on radio-loud and radio-quiet galaxies have provided crucial insights into galaxy evolution, strengthening India's role in global radio astronomy.

Happy Birthday



Credits: indiamart

Albert Einstein

Albert Einstein (14 March 1879 – 18 April 1955) , the "Father of Modern Physics," transformed science with his theories of relativity and the photoelectric effect, earning the 1921 Nobel Prize. His work laid the foundation for quantum mechanics, and his general relativity theory predicted black holes and gravitational waves. Beyond physics, he advocated for peace, education, and civil rights. Einstein's contributions continue to inspire advancements in space science, AI, and astrophysics, cementing his legacy as one of the 20th century's most influential scientists.

Kalpana Chawla

Credits: Businesstoday

Kalpana Chawla (March 17, 1962 – February 1, 2003) was an Indian-American astronaut and aerospace engineer, becoming the first woman of Indian origin in space. In 1997, she flew aboard Space Shuttle Columbia (STS-87), conducting microgravity experiments. Her journey from a small town in India to space symbolizes perseverance and dedication. Tragically, she died in the Columbia disaster (2003), but her legacy endures. Posthumously awarded the Congressional Space Medal of Honor, Chawla's name lives on through institutions and scholarships, inspiring future generations in space exploration.

Credits:Wikipedia

Govind Swarup

Govind Swarup (March 23, 1929 – September 7, 2020), the Father of Indian Radio Astronomy, revolutionized India's radio astronomy field. He spearheaded the design and installation of the Ooty Radio Telescope (ORT) and the Giant Metrewave Radio Telescope (GMRT) near Pune. As the founding director of NCRA-TIFR, he played a pivotal role in advancing radio astrophysics in India. His contributions earned him prestigious honors, including the Padma Shri (1973) and the Shanti Swarup Bhatnagar Prize (1972). Swarup's legacy continues to inspire and shape India's role in global radio astronomy.

Reinhard Genzel

Credits: Wikipedia

Reinhard Genzel (born March 24, 1952) is a German astrophysicist renowned for his groundbreaking research on the supermassive black hole at the Milky Way's center. By tracking stellar motions near Sagittarius A*, he provided direct evidence of its existence, confirming Einstein's General Relativity. His work earned him the 2020 Nobel Prize in Physics, shared with Andrea Ghez and Roger Penrose. Genzel's contributions continue to shape astrophysics, deepening our understanding of black holes, galaxy formation, and fundamental physics.

Role of AI in Space

AI from Orbit: Watching Over the Earth Like Never Before

Artificial Intelligence (AI) is revolutionizing Earth observation from space, enhancing our ability to monitor and analyze planetary changes with unprecedented accuracy. With satellites continuously capturing high-resolution images and environmental data, AI algorithms help extract meaningful insights, transforming how we monitor and manage our planet.

Climate and Environmental Monitoring:
AI-driven satellite systems play a crucial role in tracking climate change. Tracks temperature shifts, ice melting & carbon emissions. Improves climate change predictions.

Image Credits: https://medium.com

Image Credits: https://www.nexcom.com

Disaster Prediction & Response:
AI-powered satellite imagery aids to detect and predict wildfires, floods, earthquakes, enabling governments and relief agencies to prepare and respond swiftly, reducing the impact on human life and infrastructure.

Agriculture & Food Security:
AI-driven analysis supports global food security, ensures better planning and early detection of crop failures. This allows farmers to optimize resource use and mitigate the impact of droughts or pests.

Image Credits: Somkidthongdee/iStock


Image Credits: https://www.tabsgi.com

Wildlife & Ecosystem Protection:
AI analyzes satellite images to track wildlife movement, detect poaching activities, and monitor habitat destruction. It also tracks habitat destruction & helps to protect endangered species.

Revolutionizing Remote Sensing with Artificial Intelligence:
The integration of AI with satellite-based remote sensing revolutionizes global data analysis by enabling rapid processing, advanced pattern recognition, and predictive modeling. AI techniques, especially machine learning and deep learning, process vast amounts of satellite data efficiently, uncovering complex patterns and trends that would be impossible for humans to detect manually. This synergy enhances environmental monitoring, disaster management, climate change analysis, and resource mapping. By automating data interpretation and improving predictive accuracy, AI empowers scientists, governments, and industries to make faster, data-driven decisions, transforming how we understand and respond to pressing global challenges with unprecedented speed and precision.


Image Credits: https://www.c2m.net

Urban Planning & Smart Cities:
AI driven data can be used to monitor urban expansion, optimize traffic management, and plan sustainable cities. This technology aids in infrastructure planning and smart city development.

Maritime Surveillance and Ocean Monitoring:
AI plays a critical role in maritime surveillance by detecting illegal fishing activities, tracking oil spills, and monitoring plastic pollution.


Image Credits: https://www.solutelabs.com


Image Credits: janiecbros | iStock

Space Weather Prediction:
AI predicts solar storms, tracks radiation hazards, monitors the ionosphere, and enhances real-time space weather forecasting to protect satellites and infrastructure.

Challenges & The Future:
As AI and satellite technology continue to evolve, their role in Earth observation will become even more critical in protecting our planet and ensuring a sustainable future.


Image Credits: https://www.esa.int

Astronomical Perception

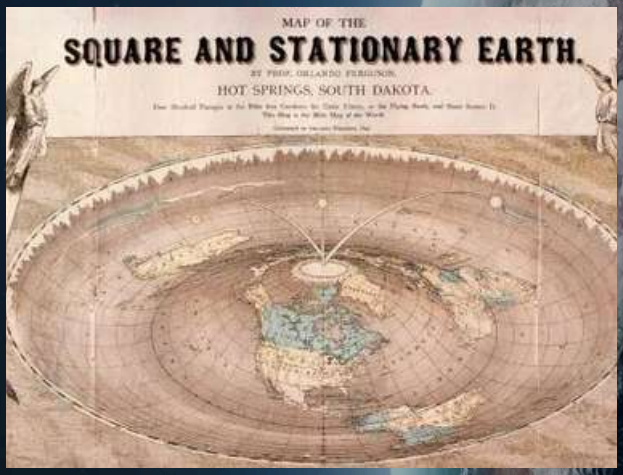
The Earth's True Shape: Beyond What Meets the Eye

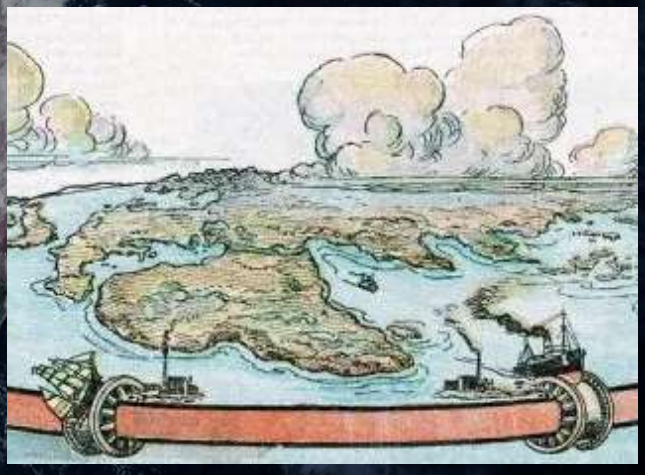
The debate over the shape of the Earth is one of the most captivating journeys in the history of science, filled with stories of curiosity, controversy, and discovery. The path from believing in a Flat Earth to accepting the Earth as a sphere is not just a tale of intellectual progress, but also one of human persistence, creativity, and eventual triumph.

Ancient Beliefs: The belief that the Earth was flat was common among ancient civilizations. Our ancestors lacked the tools and knowledge to observe the broader cosmos, and therefore, their interpretations of the world were shaped by what they could see. The Flat Earth model was practical in the sense that the horizon appeared level, and there were no obvious indications that the Earth had a spherical shape. In many cultures, the Earth was depicted as a flat disc floating on water, such as in ancient Mesopotamian beliefs, or as a flat surface held up by giant pillars, as suggested in ancient Hindu cosmology.

The ancient Greeks, however, were among the first to begin questioning the Flat Earth model. Philosophers like Pythagoras and Parmenides are often credited with early suggestions that the Earth might be spherical. However, it was Plato and his student Aristotle who presented the idea more seriously. Aristotle noted several pieces of evidence to suggest the Earth was spherical, including the curved shadow of Earth cast on the Moon during a lunar eclipse and the way travelers going south see southern constellations rise higher in the sky. Despite these observations, the idea of a spherical Earth was still not universally accepted during these times.

The Rise of the Spherical Earth Concept : By the time of Eratosthenes (276–194 BCE), the idea of a spherical Earth was gaining more traction. Eratosthenes, a Greek mathematician, made one of the most famous early attempts to measure the Earth's size. Using the fact that the Sun's rays cast different shadows in two cities, Syene and Alexandria (both in Egypt), at noon on the same day, He concluded that the Earth was indeed spherical. Another key figure in this intellectual shift was Ptolemy (90–168 CE), whose work, particularly the Almagest, provided evidence of a spherical Earth. In fact, during the Middle Ages, scholars in the Islamic world, like Al-Biruni and Ibn Sina, expanded on these concepts, making critical advancements in spherical geometry.





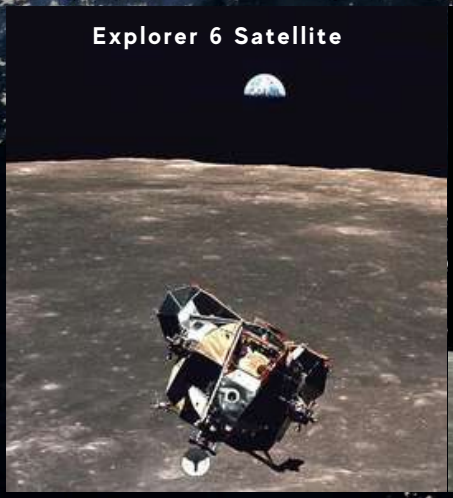
The Fall of Flat Earth : Despite the growing body of evidence for a spherical Earth, there remained pockets of belief in a flat Earth throughout the Middle Ages. This was largely due to religious and cultural factors. The church during the Middle Ages held considerable sway over intellectual life, and many scholars, like Thomas Aquinas, accepted the idea of a spherical Earth but also maintained that some ancient beliefs were more symbolic than scientific truths.

It wasn't until the Age of Exploration, with figures like Christopher Columbus and Ferdinand Magellan, that the flat Earth theory was significantly challenged. Columbus's journey to the New World (1492) and Magellan's circumnavigation of the globe (1519-1522) provided undeniable proof of the Earth's spherical nature.

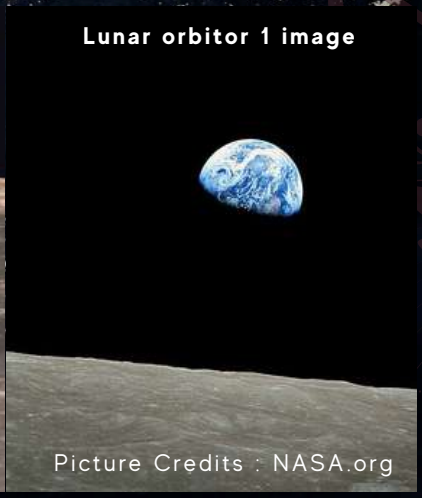
Failures and Misunderstandings: The Missteps of Early Scientists even with the evidence supporting a spherical Earth made the journey not without failures. Scientists, like Isaac Newton and Galileo Galilei, faced significant opposition, Galileo's support of the heliocentric model, which contradicts the Flat Earth model and earlier geocentric ideas, led to his infamous trial and conviction in 1633. Though Newton's laws of motion and universal gravitation conclusively showed that the Earth was spherical and rotated around the Sun, the rejection of these findings by traditionalist scholars delayed scientific progress for decades.

The Role of Modern Science: From Flat Earth to Spherical Earth It wasn't until the development of space exploration and satellite technology in the 20th century that we received definitive, irrefutable proof of the Earth's roundness. The Apollo missions in the 1960s and 1970s, particularly the famous Earthrise photograph taken by astronaut William Anders in 1968, became symbolic of humanity's leap into space and the final nail in the coffin of the Flat Earth theory. As technology progressed, it became increasingly impossible for even the most stubborn flat-Earth proponents to ignore the evidence provided by satellites, space probes, and even high-altitude photographs of the Earth from the International Space Station.

Explorer 6 Satellite

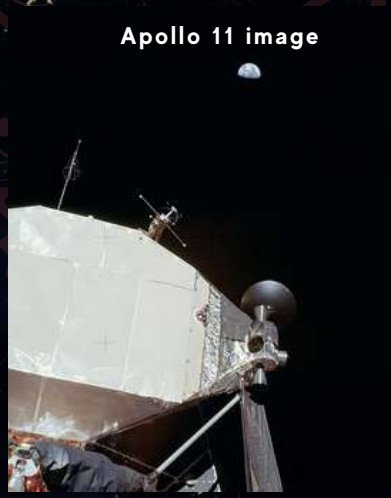


Lunar orbitor 1 image



Picture Credits : NASA.org

Apollo 11 image



Conclusion: In conclusion, While we can laugh at the misconceptions of the past, it is crucial to remember that these debates laid the groundwork for the scientific method, for skepticism, and for the very process by which we test and confirm the truths about our universe. Whether you look at the ancient myths of a flat Earth or the brilliant minds of early scientists, the journey from flat to round is a testament to human curiosity, perseverance, and the quest for knowledge. And in today's age, where even debates about science still exist, we can look back at this pivotal moment in history and smile at the achievement of learning that Earth, indeed, is no longer flat, but a beautiful blue sphere that orbits the sun.

ASTRONOMICAL EVENTS -MARCH 2025

MERCURY AT GREATEST EASTERN ELONGATION

Among the many fascinating events in our night sky, one that often escapes attention is Mercury at Greatest Eastern Elongation. This astronomical phenomenon occurs when the planet Mercury reaches its maximum apparent distance from the Sun in the evening sky. For skywatchers and astronomers alike, this is a golden opportunity to observe the elusive inner planet, which is usually lost in the Sun's glare.

What Happens During Greatest Eastern Elongation?
Mercury, being the closest planet to the Sun, never strays too far from our central star. As a result, it is only visible either shortly after sunset or just before sunrise, depending on its position. During Greatest Eastern Elongation, Mercury appears in the evening sky, hanging low near the horizon after sunset. This is when the planet is furthest from the Sun's blinding light, making it one of the best times to spot Mercury with the naked eye or through binoculars.

Why is This Event Important?
Mercury's visibility is notoriously challenging because of its proximity to the Sun. For much of the year, the planet is hidden in daylight or twilight glare. However, at elongation, Mercury achieves the best separation angle from the Sun, offering a rare and clear window to observe it. This makes elongations highly significant, not only for casual stargazers but also for scientific observations.
Astronomers use these opportunities to study Mercury's surface brightness, phases, and atmospheric conditions (though its atmosphere is extremely thin). For amateur astronomers, it's a valuable chance to tick off Mercury from their observation lists– since it's the least observed of the five classical planets visible to the naked eye (Mercury, Venus, Mars, Jupiter, Saturn).

Cultural and Historical Significance
Since ancient times, Mercury has held a place of mystery and importance in various cultures. Its fleeting appearance gave it a reputation as a swift messenger in Roman mythology. Observing Mercury today continues that tradition of celestial exploration, connecting modern science with ancient wonder.

Tips for Observing
To catch Mercury at Greatest Eastern Elongation, find an unobstructed view of the western horizon shortly after sunset. Look for a bright "star" just above the horizon– this is Mercury. Binoculars can enhance the view, though even the unaided eye should suffice if conditions are clear.

In summary, Mercury's Greatest Eastern Elongation is a special celestial event, offering both scientific value and a beautiful visual treat. For anyone who loves the night sky, it's a must-see phenomenon that reminds us how dynamic and ever-changing our solar system truly is.

THE VERNAL EQUINOX: A SYMBOL OF BALANCE AND RENEWAL

The Vernal Equinox, which occurs around March 20th or 21st every year, is a moment of cosmic balance that has captivated humanity for centuries. This astronomical event marks the moment when the Sun crosses the celestial equator, moving from the southern to the northern hemisphere. As a result, day and night are almost exactly equal in length all over the world. While it may seem like a simple shift in the Earth's orbit, the Vernal Equinox is symbolic of much more. It signifies renewal, growth, and the arrival of spring in the Northern Hemisphere, and autumn in the Southern Hemisphere. For many, it also carries deep cultural, spiritual, and historical significance.

The word "equinox" comes from Latin, meaning "equal night," referring to the day when the Earth's axis is not tilted toward or away from the Sun, resulting in nearly equal durations of daylight and darkness. This event is a reminder of the Earth's constant motion and the intricate dance between our planet and the Sun. As the equinox occurs, the tilt of the Earth's axis is positioned in such a way that the Sun shines directly on the equator, creating a sense of equilibrium in the natural world.
For those living in the Northern Hemisphere, the Vernal Equinox heralds the arrival of spring. The days begin to lengthen, temperatures rise, and the earth awakens from the cold grip of winter. This shift is marked by the blossoming of flowers, the return of migratory birds, and the general sense of renewal that permeates the environment. In many cultures, spring is seen as a time of growth, new beginnings, and the opportunity for fresh starts. It's no wonder that many traditions, festivals, and rituals are centered around the Vernal Equinox, celebrating themes of fertility, life, and hope.

In ancient cultures, the Vernal Equinox was often seen as a sacred time. The Egyptians, for example, linked the event to the rising of the star Sirius and the flooding of the Nile River, both of which were critical to their agricultural cycles. The Mayans built observatories to track celestial events like the equinox, using them to time planting and harvesting. In Greece, the Vernal Equinox was celebrated as the festival of Anthesteria, which honored Dionysus, the god of wine and fertility. Around the world, equinoxes were seen as times when the boundaries between the physical and spiritual worlds were thin, allowing for reflection, renewal, and a connection to the natural rhythms of life.

For the Southern Hemisphere, the Vernal Equinox signifies the arrival of autumn. While the day and night are of equal length, the event heralds a change in the environment. As the Earth continues its journey around the Sun, temperatures begin to cool, and the leaves of deciduous trees change color and fall. The Southern Hemisphere enters a season of harvest, reflection, and preparation for the colder months ahead.

The Vernal Equinox is not just an event for astronomers or agricultural societies—it serves as a reminder to all of us of the cycles of nature. It's a time to pause, reflect, and recognize that balance and change are inevitable parts of life. As we experience this cosmic shift, we are reminded of the power of nature to renew itself, offering a chance for us to renew our own perspectives and goals.
Whether we celebrate it as the arrival of spring or autumn, the Vernal Equinox encourages us to find harmony and balance in our own lives, making it not just an astronomical event, but a powerful symbol of growth, renewal, and hope.

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: Chennai / Date: 05th March / Time: 07.00 p.m.

Conjunction of Moon and Pleiades

On March 5th, the Moon and the Pleiades, also known as the Seven Sisters, will have their closest approach in the evening sky after sunset. The Moon will shine at a magnitude of -11.68, while the Pleiades will appear at a magnitude of 1.59. This celestial event will be visible from around 7:00 p.m. until 11:00 p.m.

Conjunction of Moon and Jupiter

On March 6th, the Moon and the "Big Brother" planet Jupiter will have their closest approach in the evening sky after sunset. The Moon will shine at a magnitude of -2.13, while Jupiter will appear at a magnitude of -11.95. This celestial event will be visible from around 6:40 p.m. until midnight.

Place: Chennai / Date: 06th March / Time: 06.40 p.m.

Place: Chennai / Date: 08th March / Time: 06.50 p.m.

Conjunction of Moon and Mars

On March 8th, the Red Planet Mars and the Moon will have their closest approach in the evening sky, visible in the western direction. The Moon will shine at a magnitude of -12.30, while Mars will appear at a magnitude of -0.90. This celestial event will be visible from around 6:50 p.m. onwards.

Conjunction of Mercury and Venus

On March 9th, the "Dead" planet Mercury and the hottest planet Venus will have their closest approach in the evening sky, located near the western horizon immediately after sunset. Mercury will shine at a magnitude of -0.01, while Venus will appear at a magnitude of -4.29. This celestial event will be visible from around 6:50 p.m.

Place: Chennai / Date: 09th March / Time: 06.50 p.m.

STUDENT'S CORNER

Mood Issues of Astronaut

Sourajit Mandal, Astronomy Camp Student

Space… who doesn't want to go there? Flying through space in zero gravity, viewing Earth from a perspective few have ever experienced, and generally foraging into the unknown sounds like a fantasy, correct? But what if it isn't so great? Is space really hard on the brain? Not only do astronauts just fight cosmic radiation and tech failure, extreme psychological challenges also come on their way. Being confined in a spaceship for months (or even years!) makes a person feel lonely, anxious, and utterly drained. Missing home, having the same small group of people every day, and knowing that something could go wrong at any moment puts a lot of pressure on the mind. Long-term space travel isn't just a physical journey–it's also a mental one.

Being kilometres away from home with no option to go there, no fresh air, and no human communication except your crew is quite isolation-crushing. Astronauts often face a lot of home sickness. It is the distance from home that makes them feel the need of their family members, pets, and even for small things like the smell of rain or the chirping of birds. Even communication with Earth is limited and takes time for the messages to go back and forth, and it makes them feel even farther away. The sense of loneliness can sometimes drive people into depression, and hence space agencies really try to keep them mentally sound.

Now, imagine being confined in a small spaceship with the same people for months. There is nowhere to go, no private space, and no escape from each other's habits. Small annoyances –like someone chewing too loudly or leaving things messy–can build up over time and lead to arguments. Even best friends can get on each other's nerves when stuck together 24/7! To avoid major conflicts, astronauts learn teamwork and manage stress before a mission. The astronauts also live by strict timetables, which keep their lives organized and reduce tension.

Initially, space sounds interesting, but soon enough every day becomes boring because of identical surroundings, same routines, and tasks. So, astronauts often get bored with themselves and tend to lose all the creativity from their minds when there are no new experiences, and their surroundings feel dull as well. There is also always the stress that comes with it- living in a dangerous place. What happens if something breaks? What if an emergency happens? Such pressure can result in exhaustion, and that's why astronauts have scheduled leisure time, fun activities, and even virtual reality programs to keep their minds active and healthy.

It's not merely a matter of having the best technology; rather, it is keeping astronaut's minds strong in space. In reality, loneliness, stress, and boredom have to be tackled by space travelers. Fortunately, space agencies go a long way to keep their astronauts happy and healthy through training, communication, and entertainment. Preparing to travel to Mars and beyond in a longer time span, one must understand as much about the human mind as one does in building the rocket. One day, when you go into space, don't forget-it's not only about being brave, it's also about staying mentally good in the stars!

Going Beyond Solid, Liquid, and Gas: Time Crystals

Anoushka Rajkumar, Astronomy Camp Student

Introduction:
Imagine a magical pendulum that swings back and forth without anyone ever pushing it. While this sounds like something out of a sci-fi movie, this technology isn't as far-fetched as you might think. Enter time crystals: a groundbreaking new state of matter that challenges our understanding of time and energy. Though still in the experimental stage, time crystals could revolutionise physics as we know it.

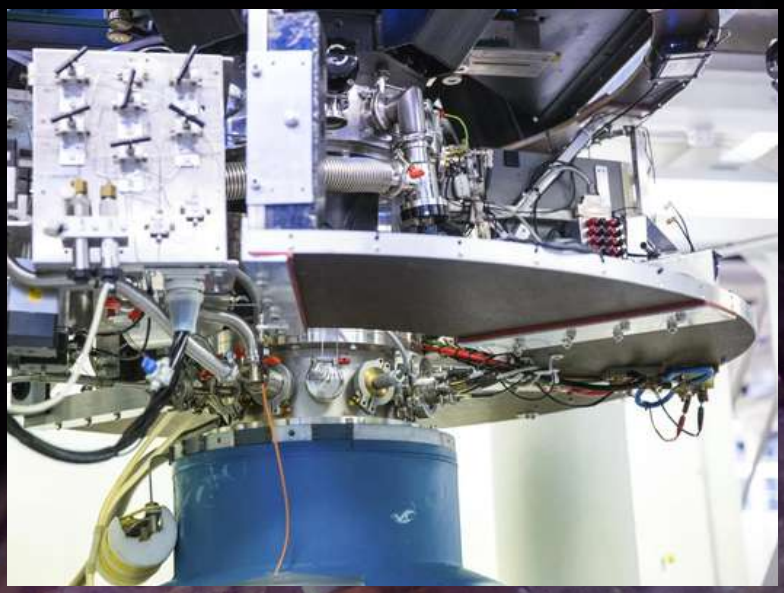
What are Time Crystals?
Time crystals are a unique state of matter that remain in motion without any external force acting on them. They oscillate without needing extra energy, unlike regular vibrations. Picture a swing. After being pushed, it eventually slows down and comes to a stop. But what if the swing never stopped? What if it kept swinging on its own, without needing any extra push?

What Makes Time Crystals So Unique?
In typical states of matter, such as solids, liquids, and gases, particles lose kinetic energy and slow down when cooled. Time crystals, however, are different. Even in their ground state (the lowest energy level an object can reach), they continue moving. This constant oscillation, without energy loss, makes them particularly fascinating. Oscillation is the periodic to-and-fro motion of an object.

The Discovery of Time Crystals:
Time crystals were first theorised in 2012 by Nobel laureate Frank Wilczek. In 2013, Xiang Zhang, a nano-engineer at the University of California, Berkeley, and his team proposed creating a time crystal by using a constantly rotating ring of charged ions. In 2017, two independent groups achieved the first successful attempts at making time crystals.

Do Time Crystals Break the Law of Conservation of Energy?
The law of conservation of energy states that energy cannot be created or destroyed. Time crystals don't violate this law. They don't require additional energy to continue their oscillations, nor do they create new energy. Instead, time crystals simply maintain their motion without energy input, remaining in constant motion without losing energy. Could this open the door to new forms of technology we hadn't even dreamt of yet?

The Google Sycamore chip used in the creation of a time crystal. (Image credit: Google Quantum AI).



Researchers cooled a helium-3 superfluid down to one ten-thousandth of a degree from absolute zero and proceeded to create two time-crystals inside the liquid. (Image credit: Mikko Raskinen / Aalto University).

Time Crystals and Space:

Propulsion: Time crystals have the potential to develop new propulsion methods, which could reduce energy usage, particularly in long-term space missions. They could help minimise fuel consumption, making space exploration more efficient. What if this allowed us to journey further into space without worrying about the limitations of fuel?

Black Holes: Some researchers believe time crystals could offer clues to the deepest mysteries of our universe—what happens near black holes, where time and space behave unusually. Their constant oscillation might mimic the strange behaviours of matter near black holes. This could aid our understanding of what happens around the event horizon (the point beyond which nothing can escape a black hole).

Timekeeping in Space: Time crystals could revolutionize timekeeping in space. Currently, space agencies rely on signals sent from Earth, which take both time and energy. Time crystal clocks, which could potentially be space-based, are expected to be more accurate than current atomic clocks. Their ability to maintain accurate time without the need for constant adjustments could improve navigation and synchronization in space.

Conclusion:
Time crystals open the door to mind-blowing possibilities for the future. While research is ongoing, these extraordinary objects could significantly impact fields like quantum computing, space exploration, and our understanding of the universe itself. Are time crystals the key to unlocking a future where we could manipulate time? As scientists continue their work, time crystals may change the way we think about time and energy forever.

What Happens Inside a Black Hole? Prepare for a Mind-Bending Journey!

Varsha S K, iAstronomer

Have you ever wondered what's on the other side of a black hole? Imagine a place where gravity is so strong that not even light can escape. It sounds like something out of a science fiction movie, but black holes are very real—and one of the most mysterious and fascinating objects in space!

So, what exactly happens if you were to fall into one? Well, the first thing you'd experience is spaghettification (yep, that's the actual term!). As you get closer to the black hole, its gravity starts pulling harder on your feet than your head. This causes your body to stretch out, like a piece of spaghetti. Pretty wild, right? Now, you're probably wondering: "What's beyond that?"

Once you cross the event horizon, the point of no return, there's no coming back. You'd be trapped. At this point, time itself starts to behave strangely. From your perspective, everything around you seems to slow down as you fall deeper, while from an outside observer's point of view, it looks like you freeze and never quite reach the center. Time really starts to play tricks on you! And speaking of the center, what's there? Well, it's called the singularity—a point where gravity becomes infinite and the laws of physics break down. What happens there?

We don't know for sure because our current understanding of physics can't explain it! Some scientists think it could even be a gateway to another universe or dimension. The wildest part? Despite all this, black holes are crucial for the universe! They help shape galaxies, and some scientists believe they might be responsible for the formation of stars and other cosmic phenomena. Isn't it fascinating how something so mysterious plays such a big role in the universe's structure? So, would you dare to venture near a black hole?

While we can't travel to one just yet, they'll always remain one of space's most intriguing wonders.

The Roaming Light

Varsha S K, iAstronomer

Have you ever caught sight of a comet racing across the night sky? It's like a glowing streak that catches your eye and leaves you wondering, "Where did it come from? Where is it headed?"

These aren't just ordinary visitors–they're cosmic nomads on journeys that last millions of years, with no permanent place to call home. Imagine being a traveler with no final destination, floating alone through the vast emptiness of space. Sounds like an adventure, right? Now, picture this: a tiny ball of ice and rock, hanging out in the farthest, coldest corners of our solar system, way beyond the planets you're familiar with. This is where comets are born–far out in the Kuiper Belt. It's like the outer rim of the solar system, an icy wasteland where comets drift in silence, untethered to anything. But then, something incredible happens.

A cosmic force, maybe a passing planet or a shift in gravity, nudges the comet, sending it on a massive journey toward the Sun. As it travels closer, the Sun's warmth starts to melt the comet's icy surface. The ice turns into gas, creating a glowing cloud of dust, and–voila–the comet's tail appears! It's huge, stretching for millions of miles, lighting up the sky like a cosmic firework. For a short while, it shines brighter than all the stars combined.

How cool is that? But here's the twist: as the comet gets too close to the Sun, it has to pull away. The heat becomes too intense, and the tail starts to fade. It's like stepping into the sun on a summer day, only to run back into the cool shade. The comet can't stick around near the Sun for long, so it continues its journey, back into the icy void of space. When a comet swings by Earth, it doesn't stick around.

People see it, enjoy the show for a brief moment, and then it's gone, moving on with its epic adventure. It's a wanderer at heart–no planet or star can hold it down. The comet's path is always unpredictable, driven by the pull of gravity and the forces of the universe.

No one knows exactly where it's headed next. Now, here's the bittersweet part: As the comet continues its rounds near the Sun, it slowly loses some of itself. The heat and radiation cause its icy surface to evaporate, and the tail fades a little each time. Over millions of years, the comet may shrink or break apart. Eventually, it may fade away completely, leaving behind only a tiny rock, lost in space—no more dazzling streaks across the sky.

Here's something mind-blowing: Comets are among the oldest objects in the solar system. Think of them as cosmic time capsules, holding clues about the early days of our universe. Every time a comet passes by, it gives us a peek into a past we can't fully experience. It's like being able to look through a window into the creation of our solar system. How amazing is that? So, why don't comets settle down?

An image of Halley's Comet taken in 1986. (Image Credit: NASA).

Comet NEOWISE captured on July 6, 2020, above the northeast horizon just before sunrise in Tucson. Credits: Vishnu Reddy

Simple: they're not supposed to. They're not built to stay in one place. Their journey is all about exploration. They travel through the vastness of space, witnessing stars being born, galaxies spinning, and black holes lurking in the shadows. The comet's "loneliness" isn't sad—it's part of the adventure. It's already part of something bigger: the endless wonders of the universe.

Next time you see a comet racing across the sky, don't just admire it for its beauty. Remember: it's a cosmic wanderer, always moving forward, carrying with it ancient secrets and mysteries. It's a reminder of how vast and mysterious the universe is—and how sometimes, the journey itself is the most important part of the story

ASTROPHOTOGRAPHS FROM SPACE TEAM

Polar Startrail Captured by D Priyadharshini, Senior Educator, STEPL.

Polar Startrail Captured by E Ranjith Kumar Regional Product Manager - South India , STEPL.

Crescent Moon and Venus, Captured by Mr. Neeraj Ladia, CEO, GAPL.

Jupiter with its Moon's, Captured by Mr. Shiril - Senior Technical Executive - GAPL.

Orion Nebula, Captured by Manthan Gandhi, Deputy Chief Enginer, STEPL.

Cigar Galaxy, Captured by Ambarish Chauhan, Technical Expert, Astroport.

HISTORICAL EVENTS HAPPENED IN MARCH

VENERA ON VENUS

Amid the popular race to the Moon, there was another race; to Venus. While NASA had a variety of programs like Mariner, Pioneer etc. the U.S.S.R had Venara; a series of space probes developed between 1961 and 1984 to gather information about Venus.

Venera 3 stamp by the U.S.S.R government circa 1966

Soviet Russia's Venera program established several precedents in space exploration. Venera 3, for example, became the first object to enter another planet's atmosphere and crash on an extraterrestrial surface.

Venera 3, made up of an entry probe and flyby spacecraft, was launched on 16th November 1965 from Baikonur Cosmodrome, Kazakhstan. The mission aimed to land on the Venusian surface, which was why the entry probe, containing a radio communication system, scientific instruments, electrical power and a medallion boring the Soviet Union Coat of Arms, was sterilised before launch.

Venera 3, unfortunately, was not successful. Its initial trajectory missed Venus by 60, 550km. A course correction manoeuvre, on 26th December 1965, brought the probe into a collision course with Venus which occurred on 1st March 1966. Despite this, Venera 3 became the first space probe to traverse another planet's atmosphere before crashing on the planet's surface. Since contact was lost on 15th February 1966, due to overheating, no planetary data was returned.

More than 4 years later, on 15th December 1970, Venera 7 successfully soft-landed on Venus, becoming the first spacecraft to safely land on another planet.

Venera 13 stamp by the U.S.S.R government circa 1982

This was not the end of the Venera program. Several Venera spacecraft were sent towards Venus and exactly 16 years later, on 1st March 1982, Venera 13 would successfully land on Venusian surface. Venera 13, launched on 30th October 1981, was the first lander to transmit colour photographs of another planet's surface.

Venera 13 was also the first lander to transmit sound from another planet. The lander also had an arm which drilled the surface, picking up a small amount of Venusian regolith and analysing it. Results indicated that the planet's surface is similar to compacted ash material.

Voyager 1 Visits Jupiter

After travelling for 2 years since launch in 1977, Voyager 1 made its closest approach to Jupiter on 5th March 1979. It passed 349,000 km from the planet's centre and the close approach allowed for a greater photographic resolution which gave us a look of Jupiter we had never seen before.

Voyager 1 started photographing the largest planet in the solar system from January to April 1979. The data it captured expanded our understanding of the Jovian system while giving new insights. Among its many discoveries, Voyager 1 discovered a thin ring around Jupiter making Jupiter the second planet in the solar system to have a ring system. It also became the first spacecraft to discover the natural satellite of a planet (Thebe and Metis).

However, the biggest surprise and most exciting information from Voyager 1's flyby of Jupiter is the ongoing volcanic activity on Io. The volcanoes are powered by the heat generated by the tidal forces the moon endures as it orbits Jupiter elliptically. The discovery of volcanism is the first time active volcanoes were observed on another celestial body in the Solar system. Additionally, Io's volcanoes seemingly affect the entire Jovian system, appearing to be the source of matter that is present in the Jovian magnetosphere. (A magnetosphere is the region of space that is influenced by the planet's strong magnetic field.

After flying by Jupiter, Voyager 1 travelled to Saturn before slingshotting itself out of the solar system. It is now on a lonesome journey in interstellar space.

Jupiter meanwhiles has been visited by more space probes which has built our understanding of the Solar System's King of Planets.

The Pioneer 10 mission was launched with a number of instruments, and one of its science goals was to become the first spacecraft to visit and take data from Jupiter. Some of the first images of Jupiter from in situ are shown at right, showcasing a total solar eclipse shadow on Jupiter's right side. (Credits: Rick Giudice (L); NASA/Pioneer (R)).

Dream, Hope, Reality

"The dream of yesterday is the hope of today and the reality of tomorrow". *Dr. Robert H. Goddard.*

On 16th March 1926, the first liquid-fuel rocket was launched from a farm in Auburn, Massachusetts by Dr Robert H. Goddard. Today he is recognized as the father of American Rocketry and a pioneer in theoretical exploration of space. However, when he was alive, and dreaming of using rocket propulsion to explore Earth's upper atmosphere and space, he received little recognition for his work.

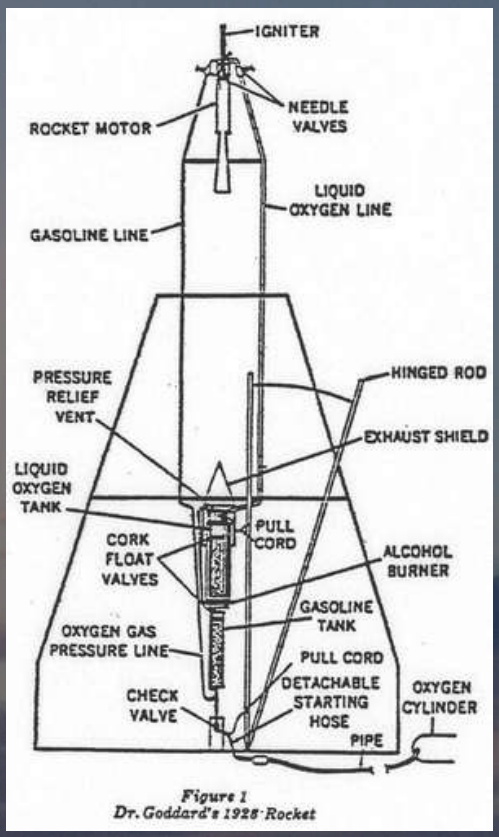


Figure 1
Dr. Goddard's 1926 Rocket

Goddard showed an early interest in science and mathematics and wrote his first paper on the feasibility of using liquid propellant to fuel rockets in 1909. By 1914, he registered his first two patens which described multi-stage rockets and rockets fueled by solid or liquid propellant. In 1919, the Smithsonian published 'A Method of Reaching Extreme Altitudes' where Goddard summarised theoretical and experimental rocketry research. He did not get recognition from his colleagues and faced ridicule from the media.

In September 1921, Goddard experimented with liquid-fueled rocket engines. After successful tests and refinement of the engine, he was ready.

Nell, what Goddard would later call his first rocket, was fueled with gasoline and liquid oxygen. Nell, weighing 4.5 kg, including fuel and reaching 3 m tall, reached 12 m in altitude and landed 56 m away; a modest beginning. Nell was designed with the engine on top and the fuel and oxidizer tanks below, a configuration he believed to be more stable at the time. After a couple more tests, Goddard realized that having the rocket engine beneath the propellant tanks still provided adequate stability with the overall design simplified.


Goddard Posing with Nell

He also realised that for longer flights, rockets needed additional stabilisation and he added vanes to the engine exhaust and gyroscopes to control the rocket's attitude.

Eventually, he outgrew his facilities in Massachusetts. With help from the famed aviator Charles Lindbergh, the Guggenheim family provided funding for new and larger facilities in Roswell, New Mexico. Yet, Goddard's efforts remained underfunded but the highest altitude his rockets reached was over 2700m.

During his lifetime, Goddard designed, built and launched 35 rockets, improving on the design and the same basic technology he used to launch Nell would be used to launch Saturn V to the Moon.

DISCOVERING COMET SHOEMAKER-LEVY 9

Nighttime, 24th March 1993. Husband and wife duo, Carolyn and Gene Shoemaker, alongside their colleague David Levy, pursue the photos captured by the 0.4 meter Schmidt telescope at the Palomar Observatory, when they spotted a strange-looking periodic comet. At the time the trio did not realize that the 9th comet they had discovered together was nearing the end of its life.

Comet Shoemaker-Levy 9 was observed to be elongated. Subsequent observations informed astronomers that the comet had already been pulled apart into at least 21 individual fragments the previous year during an extremely close flyby of Jupiter because of tidal forces. Further observations of the comet aided in defining its orbit when it was proposed that Comet Shoemaker-Levy 9 could impact Jupiter in July 1994. With the advance notice, astronomers and observatories made plans to observe the first collision between two solar system bodies to be observed.

On 16th July 1994, Comet Shoemaker-Levy 9 fragments crashed into Jupiter's atmosphere. For the next week, Shoemaker-Levy 9 bombareded Jupiter at dizzying speeds of 216,000 km/h and with a force of 300,000,000 atomic bombs. In its descent, the fragments created plumes as high as 3,000 km and heated the atmosphere to 40,000 degrees Celsius. Shoemaker-Levy 9 left dark, ringed scars that were easier to spot than the Great Red Spot. It was one of the most spectacular ends that humans ever witnessed.

Shoemaker-Levy 9's original size, before July 1992, was calculated to be between 1.5 and 2 kilometres wide. If an object of similar size hits our home planet, it would be devastating.

The collision brought the dangers of celestial objects to the forefront and resulted in planetary defence. NASA, in 1998, was given the authority to seek Near Earth Objects that could pose a danger to Earth. In 2013, the dangers of Near Earth objects to Earth reared their ugly head with the arrival of a small asteroid that broke up over Chelyabinsk, Russia. In 2016, NASA established the Planetary Defense Coordination Office (PDCO) which manages the agency's mission of finding, tracing and understanding asteroids and comets that could be a hazard to Earth. Today, over 90% of asteroids larger than 1km have been identified. At least 33% of asteroids between 140 and 1000 meters have been identified.

Fragments of Comet Shoemaker-Levy 9

DISCOVERING TITAN

Christiaan Hyugens

In the mid-17th century, Christiaan Huygens proposed that a thin, flat ring, inclined to the ecliptic encircled Saturn. With his brother's help, Huygens built several telescopes to prove his hypothesis. Huygens didn't find Saturn's rings with the first telescope he built, instead, he discovered Titan on 25th March 1655. When he published his findings, Huygens called the moon a simple 'Saturni Luna'. This simple name worked for twenty years while it was a lone moon. However, after the discovery of six other Saturnian moons, John Herschel suggested naming Saturn's first moon 'Titan'.

Titan is Saturn's largest moon and is larger than Mercury, the smallest planet in the solar system. For some time, scientists mistakenly believed it was the largest moon in the solar system.

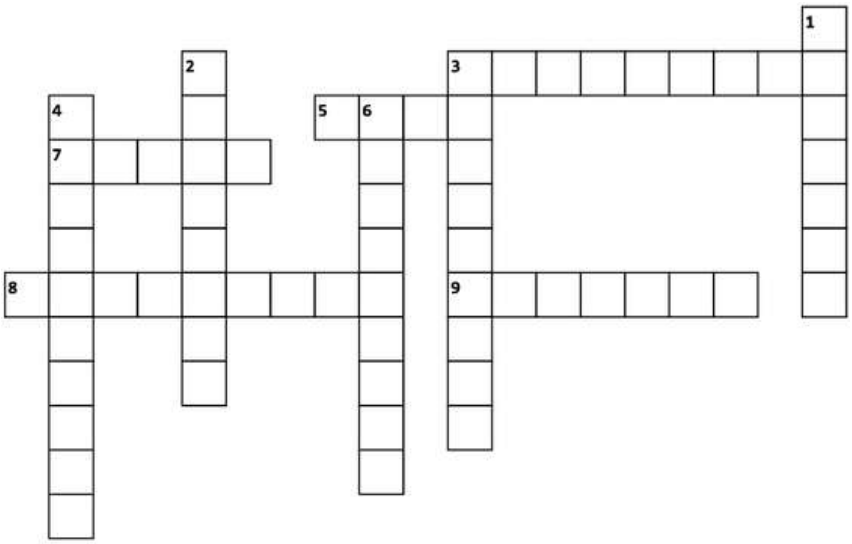
This mistake was due to Titan's thick and opaque atmosphere - the only satellite in the solar system known to have an atmosphere. Titan also has large seas of pure liquid methane close to its north pole, whose seabed is covered with a sludge of organic-rich material.

Thus far, three spacecraft and one lander have studied Titan. Results from the data collected show that the satellite comprises several layers with a hot centre. Additionally, Titan's thick atmosphere's rotation speed is higher than its surface's speed, like Venus, Jupiter and Saturn. Despite its chilly surface temperature, Titan is also known to have wind and rain. Titan's similarities to Earth, have led many scientists to speculate that microbial alien life could exist on the moon.

Saturn and Titan in true colour as captured by Cassini

TRAIN YOUR BRAIN

CROSSWORD



Across

3. What was India's first satellite?
5. Which NASA mission studied the dwarf planet Ceres?
7. What spacecraft will carry astronauts on Artemis 2?
8. Who formalized the geocentric model in ancient Greece?
9. Which moon has the tallest cliff in the Solar System?

Down

1. Who is known as the "Father of Modern Science and Astronomy"?
2. Which humanoid robot will be onboarding the G1 test flight?
3. Which galaxy is the closest spiral neighbor to the Milky Way?
4. Who proposed the heliocentric model in 1543?
5. Who is the Greek demigod associated with Ophiuchus constellation?

Astronomy Word Puzzle

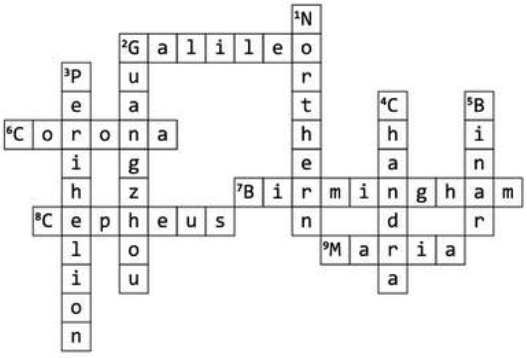
Spot the instruments that unlock the mysteries of space!

Astronomical Instruments

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

TELESCOPE
PLANISPHERE
INTERFEROMETER
ORRERY
SPECTROSCOPE
PHOTOMETER
ASTRARIUM
BOLOMETER
GYROSCOPE
TORQUETUM
ASTROLABE
SEXTANT
SUNDIAL
COMPASS

Answers for last month puzzles.



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

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

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