



SPACETM
EMPOWERING LIFE

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Galactica

Astronomy and Space Science Magazine

NEW DEVELOPMENT BY
SPACE GROUP: SPACE OBSERVATORY

What's Inside?

SPACE Insights

Highlights From October

Moon Phases And Planet Visibility

What's Awaiting in November

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Historical Events Happened In November

November Born Legends

Train Your Brain

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

Team

Editor in Chief

Sachin Bahmba

Managing Editor

Shivam Gupta

Section Editors

Javed Alam

Sanjana Nayak

HR Team

Contributors

iAstronomers

Space Students

Editors

Ranjith Kumar E

Sruthi Suresh

Priyadharshini D

Assistant Editors

Sruthi Nambiar

Ilma Ansari

Sunita Chauhan

Shivani Bansode

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ABOUT SPACE



Legacy of 23 years



Pioneer Organization



10000+ Activities Developed



1000+ Schools Associated



1.5M+ Students Engaged



10K+ Outreach Events



10+ Cities Presence

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

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

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

CMD's Message



Dr. Sachin Bahmba,
CMD, SPACE

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

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

MD's Message

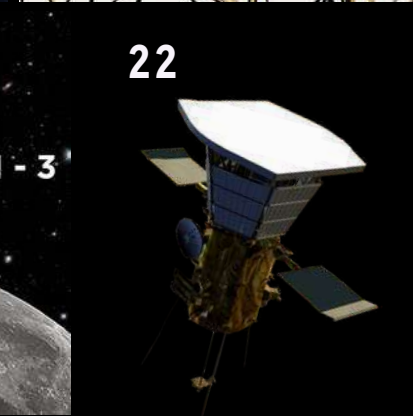
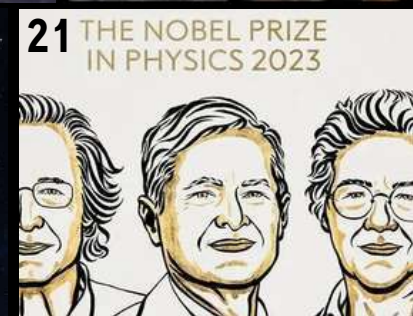


Mr. Shivam Gupta,
MD, SPACE

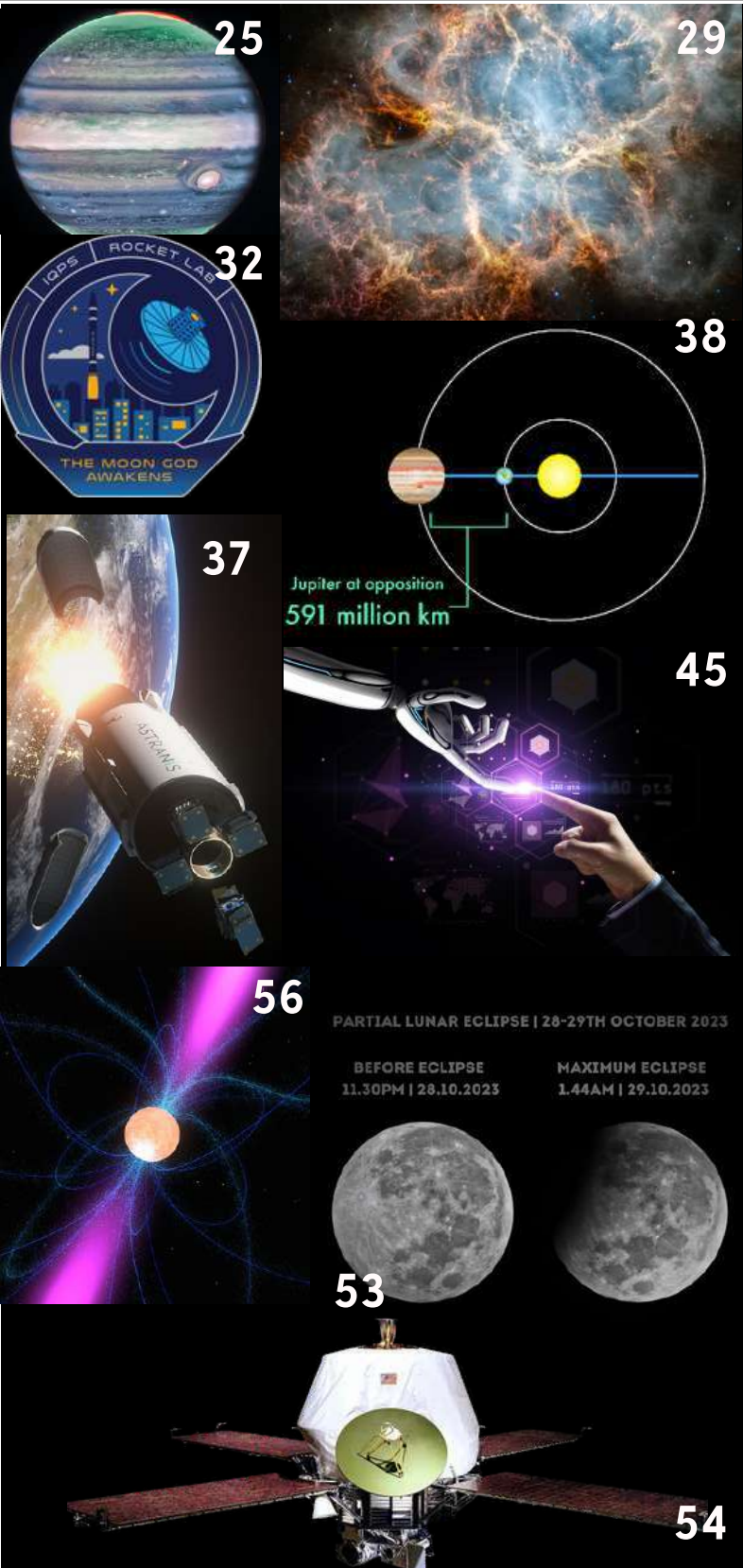
Education is integral to humankind growth and it strongly contributes towards innovation and developments. Space is transforming India to provide better learning opportunities through Experiential and Hands-on learning in the very niche field of Astronomy and Space Science. Our mission to build from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

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SPACE INSIGHTS

EDU-ODYSSEY: CHANDRAYAAN 3 AND BEYOND 2023-LUDHIANA AND CHENNAI

Introduction:

Humanity's insatiable curiosity for exploration has always driven us to push the boundaries of knowledge. On October 6th, 2023, two remarkable events unfolded, uniting space enthusiasts in a celebration of our cosmic journey. "EduOdyssey: Chandrayaan - 3 and Beyond," a collaborative effort by SPACE India and Kundan Vidya Mandir School, Ludhiana, showcased the wonders of space. Another extraordinary event, "Edu-Odyssey: CHANDRAYAAN 3 and Beyond 2023," organized by Space India in collaboration with Chennai Public School, Thirumazhisai, Chennai, marked a pivotal moment in education and space exploration.

Event Highlights:

Chandrayaan - 3 and Beyond:

The Ludhiana event was graced by the presence of Chief Guest Dr. Mamta Chauhan, a distinguished Scientist from the Geo Sciences Division at the Indian Institute of Remote Sensing (IIRS) at ISRO. The event commenced with a mesmerizing 'Shiv Shakti Vandana' performance by Kundan Vidya Mandir School students, setting an auspicious tone. The event was illuminated with the traditional lamp lighting ceremony, symbolizing the enlightenment of knowledge.

Ms. Avani Patwa, CEO of Space India, captivated the audience with a presentation highlighting Space India's significant contributions to education. She celebrated the organization's achievements and milestones, inspiring millions of students nationwide.

Dr. Mamta Chauhan's speech provided insights into the Chandrayaan-3 mission and the future of Indian space exploration. She emphasized the vast career opportunities in astrophysics and space sciences.

Interactive Sessions:

A lively Q&A session with students further engaged the audience, making the event an interactive learning experience. A fireside chat with Dr. Mamta Chauhan, Ms. Avani Patwa, and Col. (Dr) Rajesh Jaisial explored the nuances of space exploration, inspiring dreams and addressing challenges.



Chennai Event:

The Chennai event welcomed Mrs. G Usha, a Senior Scientist at ISRO's U R Rao Satellite Centre, as the esteemed Chief Guest. A prayer song and dance performance by Chennai Public School students set the stage for an event dedicated to knowledge and enlightenment.

Mrs. G Usha's presentation delved into the Chandrayaan 3 mission, offering valuable insights into its design, objectives, and findings. She emphasized the vast career opportunities in Astronomy and Space Science.

Interactive Discussions:

A fireside session allowed attendees to engage in insightful discussions with Mrs. G Usha, gaining deeper insights into Chandrayaan 3, upcoming missions, and the life of a Scientist.

Conclusion:

Both events concluded with a sense of unity and a group photograph, capturing the spirit of togetherness in the cosmic journey. The Astronomy Showcase featured interactive activities, allowing participants to explore the wonders of space. These events left an indelible mark, igniting a passion for exploration and emphasizing the importance of nurturing young talent in the field of astrophysics and space sciences.

In the end, these EduOdysseys serve as a reminder that our capacity for learning and discovery is boundless. They inspire us to push the boundaries of human knowledge, propelling us towards new frontiers in the great cosmic tapestry.



International Observe the Moon Night

iASTRONOMER

iAstronomer club, SPACE India hosted International Observe the Moon Night on Instagram Live on 19th October, 2023. International Observe the Moon Night is a time to come together with fellow Moon enthusiasts and curious people worldwide to observe the Moon.

International Observe the Moon Night occurs annually in September or October when the Moon is around the first quarter, a great phase for evening observation. A first-quarter Moon offers excellent viewing opportunities along the terminator (the line between night and day), where shadows enhance the Moon's cratered landscape.

International Observe the Moon Night is sponsored by NASA's Lunar Reconnaissance Orbiter mission and the Solar System Exploration Division at NASA's Goddard Space Flight Center, with many contributors.

International Observe the Moon Night was so special as it was hosted by iAstronomers itself. A number of iAstronomers shed light on different aspects of the International Observe the Moon Night Event. iAstronomer Sukhman Singh was the star of the Live Webinar as he showed us the Moon through the planetary camera and Telescope from Chandigarh. The view was enchanting as the features of the Moon were clearly visible along the Terminator line of the Moon.

iAstronomer Myraa Khatter co-hosted the International Observe the Moon Night Event. She told us the importance of the Moon and the cultural connection we share with the Moon. She talked about why we celebrate International Observe the Moon Night. iAstronomer Myraa was as charismatic as Moon itself. She briefed everyone about the Goals of IOMN, to unite people across the globe in celebration of lunar observation, science, and exploration.

Moon captured using Planetary Camera and Newtonian Telescope by iAstronomer Sukhman Singh (114mm Aperture, 900mm Focal Length, EQ Newtonian Telescope. Sv205 Planetary Camera)



By Sukhman Singh



iAstronomers with their beautiful setup



iAstronomer Grantha Samir Pradhan celebrated the International Observe the Moon Night by reciting a beautiful poem on the Moon and explaining all the features of the Moon. Not only this, he also shared the details on the Mares and Craters which were visible on 19th October to the participants.

iAstronomer Mohammed Zaiduddin explained the phases of the Moon with a very interesting activity. He made phases of the Moon using Cadbury's Oreo cookies in the Live Webinar. It was very mesmerizing how he tastefully used the white cream of the Cookies to represent the Illuminated part of the Moon.

iAstronomer Swaantaj Srivastava gracefully shed light on ISRO's plan to set foot on the Lunar Surface. He talked about ISRO, the Indian Space Agency is planning to make a space station by 2035 and a manned Moon landing by the year 2040.

The event was successful as iAstronomers and all the Participants had a great time observing the Moon. The event left everyone with such a sense of realization about Moon's beauty and the cultural connection we share with Moon.



World Space week in UITS and PTM

Parent-teacher meetings provide a great way for parents to be involved in their child's education. While report cards, academics, and classroom behavior are frequently the topics of these sessions, schools can make the event more engaging by adding unique exhibits that serve as educational and inspirational resources. An exhibition dedicated to astronomy is one such interesting addition. With all of its secrets and beauty, astronomy offers a fantastic platform for engrossing parents and students in an exciting cosmic journey. The advantages and elements of an astronomy display at parent-teacher conferences will be covered in this article.

In JBM Global School, Noida, Delhi Public School, Greater Faridabad, and KR Mangalam World School, Vaishali PTM is conducted in October. Many entertaining science kits and student-made models, stress-buster activities like stomp rockets, lung capacity tests, weighing yourself on different planets, and many more were shown, and people of all ages—from kids to parents—enjoyed them all immensely. This interactive, educational, and entertaining area of the school attracted everyone's attention in addition to helping the kids decompress. Encouraging Curiosity: People of all ages can get more curious about astronomy because of its allure. Parents can be lured into science and discovery by exhibiting cosmic wonders, which can spark stimulating conversations at home.



World Space Week

A spectacular celebration of everything space-related takes place during World Space Week. Every year, it is held from October 4 to October 10. People get together from all over the world to support space science and exploration during this week.

World Space Week seeks to increase public knowledge of the advantages of space technology and to stimulate young minds. It's a fantastic chance to find out about the most recent developments in space exploration and the amazing accomplishments of scientists and astronauts.

People are encouraged to explore the marvels of the universe during World Space Week by hosting stargazing activities and educational programs. It's an opportunity to recognize the wonder and immensity of space and to comprehend how it affects our day-to-day existence.

The exciting field of space exploration is waiting for you to explore, whether your interests lie in astronomy, space travel, or simply wondering what's beyond Earth. World Space Week is the ideal opportunity to do so. Have a great week and never give up on your goals!

Activities conducted in different UITS schools.

- Astro Art
- UFO Making Activity
- Astrotoon
- Aurora Making
- Colour the planets
- India in Space Drawing
- Cardboard tube space shuttle
- Galaxy in a Jar
- Galaxy Slime
- Coloured Sensory Play Tray
- Papercraft Earth
- Space Small world tray
- Astronomy eye mask
- Community Engagement
- Isro on the Moon
- AstroSketch
- Astriorock
- Solar Observation
- Planetarium Show
- Sat From Trash
- Astro Face Mask
- Colour the Europa



INDIA STEM AWARD 2023



The 5th edition of India STEM Summit & Awards 2023 took place on the 16th and 17th of October 2023. Hosted by the All India Council for Robotics and Automation (AICRA), whose commitment to promoting and advancing the Science, Technology, Engineering, and Mathematics (STEM) fields in India shines through this event. The summit and award serve as a vital catalyst to drive progress, innovation, and knowledge dissemination in STEM and is a groundbreaking platform for collaboration and recognition. A key focus of the event is to promote equitable economic growth while fostering inclusive, woman-led, and youth-led development. Shri Nitin Jairam Gadkari, Minister of Road Transport and Highways graced his presence and female scientists from ISRO had a group discussion where they emphasized the inclusion of students in upcoming ISRO missions.



Participants even got the chance to explore the India STEM Education Exhibition 2023. The exhibition is a platform that shows the latest resources, technologies, and methodologies that could enrich STEM education in India.

A key highlight of India STEM Summit & Awards 2023 is celebrating excellence. SPACE India is delighted to announce that we were honoured with the 'Vocational Education Award' for empowering students in astronomy, space science, robotics, and artificial intelligence through vocational courses and activities. Mr Mitul Jain, Managing Director of Space Group collected the award on behalf of the company. Shivam Gupta, another Managing Director at Space Group was honoured with the "STEM Entrepreneur of the Year Award" for his outstanding contributions to the education sector in STEM while advocating highly for grassroots activism. SPACE India is incredibly proud and humbled by the recognition and vows to continue its role in empowering students.



Exploring the Universe: Space India's Astronomical Observatory

Observatories are those majestic structures nestled in far-flung corners of the globe, hold the key to unraveling the universe's mysteries. These scientific wonders are more than just telescopes and domes; they are portals to the vastness of space, providing us with a glimpse of the cosmic wonders that have captivated humanity for centuries.

For millennia, humans have been fascinated by astronomy, the oldest of the natural sciences. Observatories are heavens for astronomers and stargazers alike, providing them with the tools and technology they need to explore distant galaxies, study celestial phenomena, and comprehend the complexities of our universe. From Stonehenge to cutting-edge facilities outfitted with advanced telescopes, observatories have played a critical role in shaping our understanding of the cosmos.



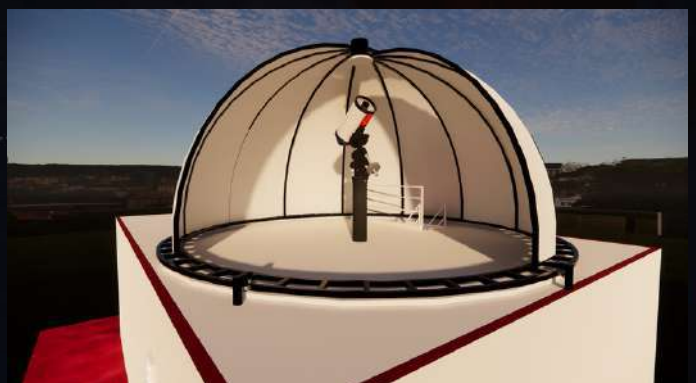
We believe in inspiring the boundaries of exploration and unraveling the mysteries of the universe at Space India. Our cutting-edge Astronomical Observatory demonstrates our dedication to understanding the universe. Our state-of-the-art facility, is outfitted with cutting-edge telescopes and advanced technology that allows us to peer into the depths of space.

Our dedicated team of astronomers and scientists works tirelessly to solve the universe's mysteries. We are constantly expanding our knowledge of the universe, from studying distant galaxies and nebulae to observing planetary phenomena.

These are made to meet specific scientific needs and are available in a variety of sizes and shapes. 360-degree views of the night sky are possible with telescopes mounted on dome-shaped observatories, which are able to tilt and rotate. Adaptive optics and digital imaging technology, which are features of contemporary observatories, allow astronomers to take breathtaking pictures of celestial objects with unmatched clarity. It's brilliant architectural designs serve as both a tool for scientific research and a monument to human ingenuity.

Observatories can serve as crucial for conveying awareness of protecting dark skies in a time when light pollution is endangering our ability to view the night sky. These keep pushing the limits of what we can find out as technology develops.

The future of observatories is full of exciting possibilities, ranging from space-based projects like the Hubble Space Telescope to initiatives like the James Webb Space Telescope.



These developments hold the potential to completely alter our perception of the cosmos and reveal long-hidden secrets. Our public stargazing events are one of the highlights of our Astronomical Observatory. We invite families, astronomy enthusiasts, and inquisitive minds to spend a night beneath the stars with us.

Participants get the opportunity to view celestial objects through our powerful telescopes, ask questions, and learn about the fascinating phenomena taking place in the night sky, all under the guidance of our knowledgeable astronomers. Join us on an exciting journey through the world of observatories, where science and wonder meet beneath the canopy of stars.

Unravelling Genius: The APJ Abdul Kalam Quiz Championship

A spectacular event ignited young minds and celebrated the spirit of inquiry in the hallowed halls of learning, where knowledge meets curiosity – the APJ Abdul Kalam Quiz Championship. This quiz competition, named after India's Missile Man and former President, Dr. APJ Abdul Kalam, was more than just a competition; it was a tribute to the visionary who inspired generations.

The school buzzed with excitement on the day of the Inter School quiz championship held on 16th October, 2023. The event was hosted by Sri Venkateshwar International School, Sector 18, Dwarka, in collaboration with SPACE India. Event was graced with the presence of Mrs. Avani Patwa (CEO, Space Technology & Education Pvt. Ltd.), and Ms. Nita Arora, Director of the Sri Venkateshwar International School.



7 schools participated in the event:

- Sri Venkateshwar International School, Dwarka;
- ST. Martin's Diocesan School, Delhi Cantonment;
- K. R. Mangalam World School, Vikaspuri;
- K. R. Mangalam World School, Vaishali;
- Bal Bharti Public School, Pitampura;
- GD Goenka Public School, Model Town;
- Delhi Public School, Greater Faridabad



The auditorium was packed with eager participants, each armed with a reservoir of knowledge and enthusiasm. Before the event registrations of the participants were completed. The event commenced with a welcome note and recognition of work done by Space India for enhancing education and grassroots. The place was ceremonially illuminated as guests gathered to light the traditional lamp, symbolizing the illumination of knowledge at the beginning of an event. In their welcome address to the audience, the principal and Chief Guest sparked a lot of excitement for the occasion. A total of 56 students participated in the quiz. The air was thick with anticipation as the quiz masters prepared to reveal a series of difficult questions that would put the young prodigies to the test.

This was followed by the group photo of the honoraries. The competition was divided into two groups: Category 1 (Class 6-7) and Category 2 (Class 8-9). Each group went through two rounds to embark on their success. The teams were named as Nebula, Lyra, Orion, Cygnus, Aquila, etc.

The first round consisted of pictorial questions, multiple-choice questions, and a buzzer round. Every question was carefully crafted to elicit critical thinking. Participants were encouraged to think, analyze, and deduce rather than simply regurgitate facts. They not only broadened their intellectual horizons, but they also learned the value of reasoning, which will serve them well in the future. After a fiercely contested first round, participants were rewarded with well-deserved refreshments to rejuvenate their energy for the subsequent challenges.

The second round included both rapid-fire and multiple-choice questions. "Name an object from space, often traveling at high velocities, collides with the surface of a celestial body.," Comment true /False "Light travel in a straight path"? are examples of the questions asked during rapid fire round. Both rounds for each group were completed in one and a half hours, respectively. While the competition was fierce, an atmosphere of camaraderie prevailed. Participants collaborated within their teams, brainstorming ideas and debating answers. This not only encouraged teamwork but also instilled a sense of sportsmanship. Even in the face of challenging questions, the teams displayed resilience and determination, making the event a true testament to the spirit of healthy competition.



There was a noticeable sense of tension in the room as the last round got closer. After competing in fierce rounds, the finalists displayed their knowledge and light-heartedness one last time. As the quizmasters asked the final question, the audience held its breath. Proceeding on, the championship's final results were declared. ST. Martin School prevailed in the junior division, while DPS Faridabad School triumphed in the senior division. The winning team appeared, their faces glowing with pride and a renewed sense of self-assurance, and the room broke out in cheers.

After the declaration of results, vote of thanks was delivered to the audience attending and the participants and the event was concluded. This quiz competition was transformed into a celebration of knowledge, curiosity, and the unwavering conviction that, with the correct direction and perseverance, any dream is achievable in honour of Dr. APJ Abdul Kalam.

The championship's legacy endured as the competitors left, their hearts full of fresh inspiration and reverberating with the words of the great leader and scientist himself: "Dream, dream, dream." Dreams become thoughts, and thoughts become deeds."

MONTHLY TELESCOPIC OBSERVATION

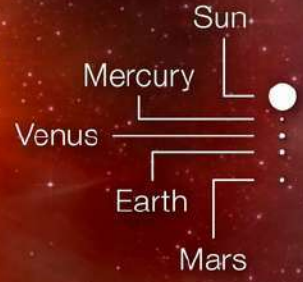
SPACE ARCADE team conducted their 10th. Monthly Telescopic Experience session on the 21st of October in Delhi.

People from various places joined the observation with their telescopes, binoculars, and other astronomical equipment. They learned and experienced the breathtaking view of the Moon and planets such as Saturn and Jupiter. They also learned about different types of telescopes and cleared all their queries on the Alignment of various telescopes then did basic Astrophotography.

Everyone had their hands-on telescopic experience and enjoyed the view of the moon and its craters through the 8" Dobsonian telescope and Schmidt-Cassegrain telescope set up by the SPACE team.



HIGHLIGHTS OF OCTOBER 2023



The mysterious dimming of supergiant star Betelgeuse may finally be explained

The passage you provided discusses the observations and findings regarding the dimming of the red supergiant Betelgeuse in early 2019. The dimming led some to speculate that it was a sign the star was nearing the end of its life and would go supernova. However, new images from the European Southern Observatory show that Betelgeuse returned to normal after the event.

The observations were made by a team from France's Université Côte d'Azur, who used the MATISSE instrument on the European Southern Observatory's Very Large Telescope Interferometer in Chile. The images revealed that while Betelgeuse as a whole appeared to darken, its photosphere actually brightened during the event. This observation supports a theory that the dimming was caused by a burst of dust, specifically silicon monoxide, emanating from the star, possibly due to a sudden cooling of its surface.

This finding aligns with a 2021 study that suggested Betelgeuse expelled a bubble of gas due to a drop in temperature, which then condensed into solid dust, creating a veil that dimmed the star from our perspective. The MATISSE images provide further evidence for this theory and suggest that dust can form very close to stars, potentially contributing to the formation of new star systems.

The passage also mentions that supergiants like Betelgeuse still pose many mysteries to astronomers, particularly in the late stages of their stellar lives. Additionally, if another star in our galaxy is on the verge of going supernova, astronomers are uncertain about what to expect, as the last observed instance of such an event dates back to the 17th century.

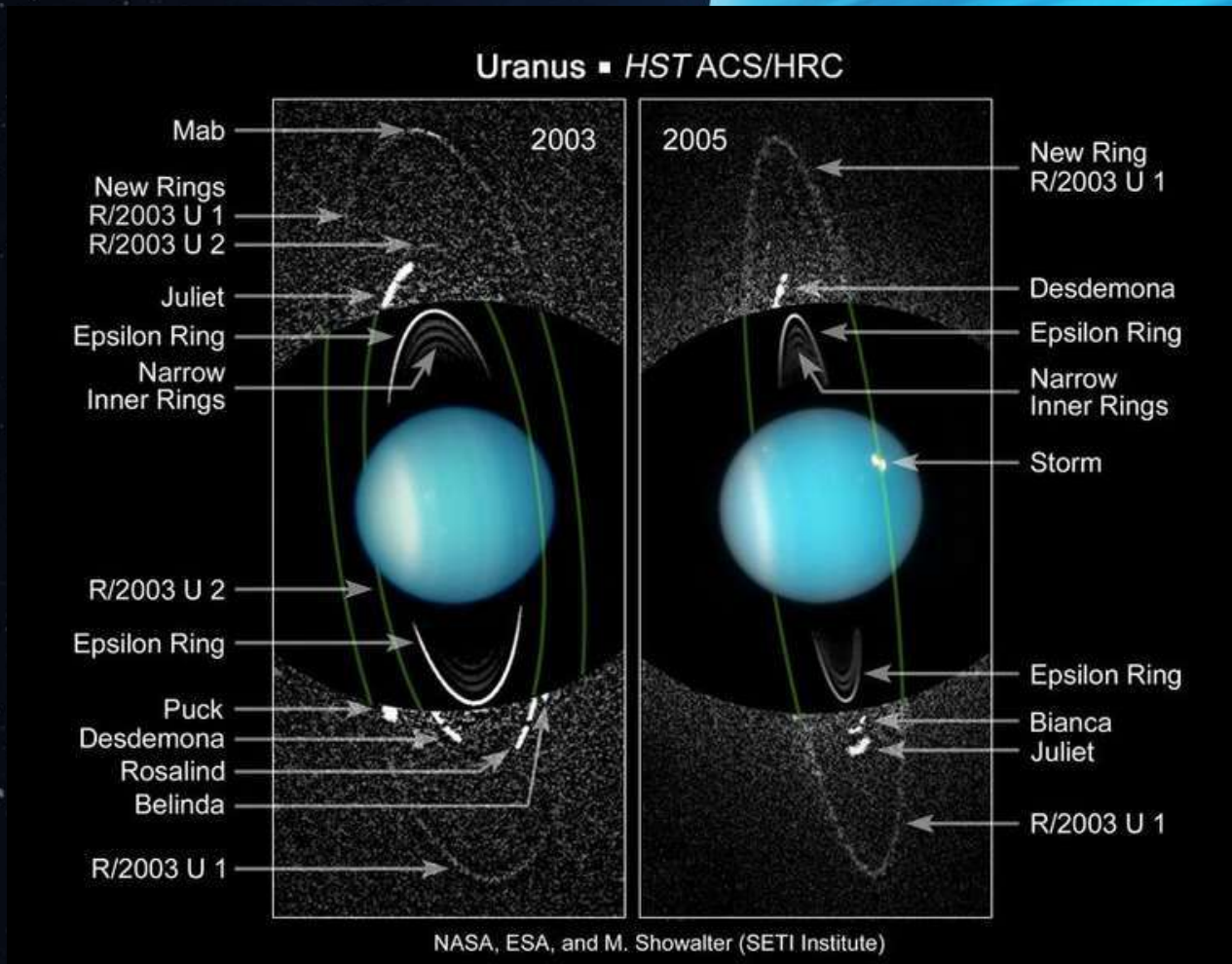
The rings of Uranus are being held back by its pesky moons

New simulations shed light on the origins and dynamics of Uranus' enigmatic ring system, revealing a complex interplay between the planet's five major moons and the rings themselves. Uranus, the seventh planet from the sun, stands out for its extreme axial tilt of 98 degrees, a result of a colossal impact in its distant past.

Researchers, including Stephen Kane, a planetary astrophysics professor at the University of California, Riverside (UCR), sought to unravel the mystery of whether the rings of Uranus are remnants of the ancient impact that tipped the planet on its side. Their simulations indicated that this is unlikely, as the ring material would not have endured over time.

The study focused on the interactions between Uranus' five primary moons – Umbriel, Titania, Oberon, Miranda, and Ariel – and the rings, particularly when the moons are in "mean motion resonances" with the rings. These resonances occur when an outer object completes a whole number of orbits in the time it takes the inner object to complete its orbits. In this case, it influences the size and stability of Uranus' ring system.

Of particular note are the resonances with Uranus' two innermost large moons, Miranda and Ariel. These resonances significantly truncate the rings, restricting them to a distance of 4.3 planetary radii from Uranus.



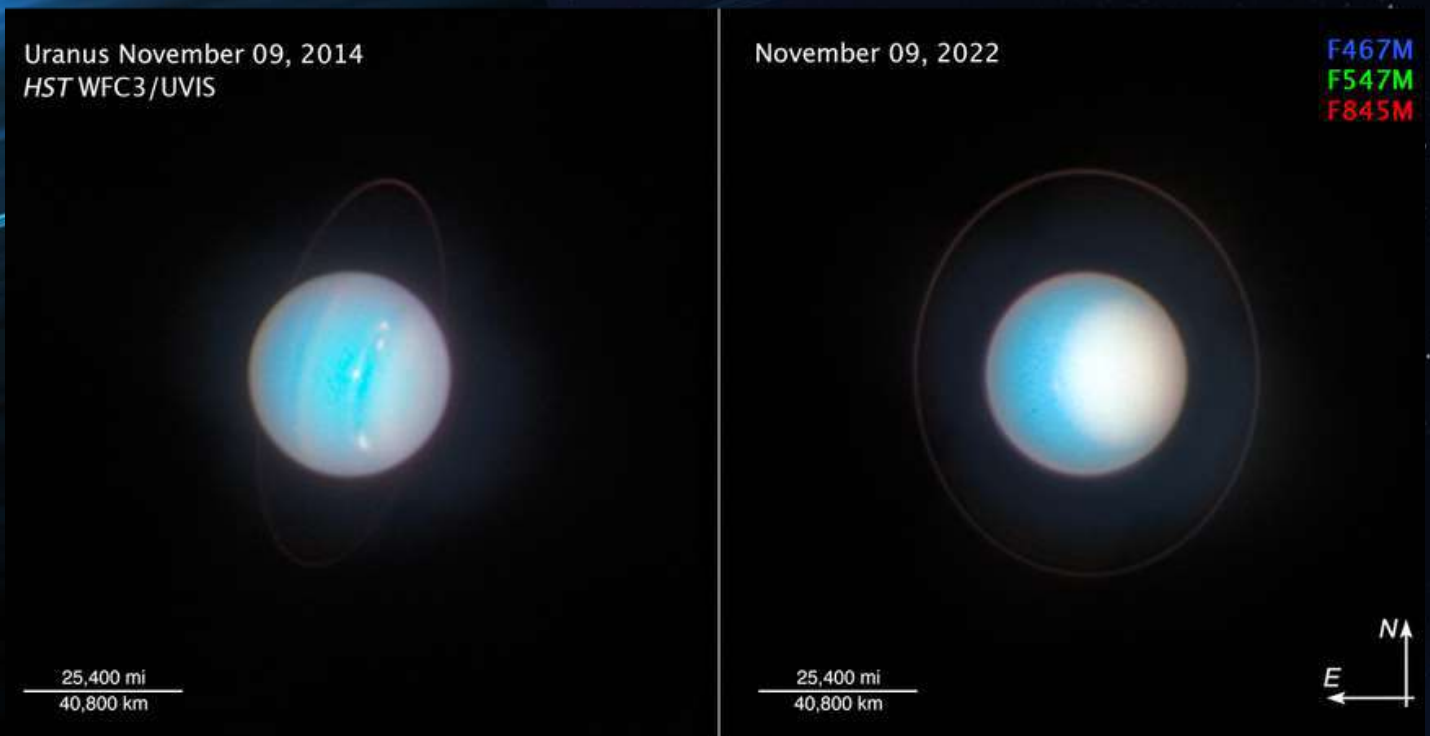
GALACTICA

The rings of Uranus are believed to have been more extensive and brighter at their formation, but their size has been diminished over time due to the influence of the moons. Nevertheless, the persistence of the rings suggests that they are continuously replenished by various sources of dust in the Uranian system. One significant source is impacts on the moons, which release particles into the system.

Outgassing, a process where internal flexing of the moons induces cryovolcanism, can also contribute to the supply of particles. Following an influx of dusty material into the Uranian system, the moons expel 35% of that material within a distance of 40 planetary radii from Uranus in just half a million years, according to Kane and Li's simulations. This rate of mass loss gradually slows and eventually reaches 40% after tens of millions of years.

The orbits of Uranus' moons have changed over time, leading to shifts in resonances and affecting the interaction with the rings. There is evidence to suggest that the moons have moved into different resonant locations, potentially influencing the severity of ring truncation in the past.

Similar interactions occur in the Jupiter system, where the Galilean moons play a comparable role in ejecting dusty material. While theoretical modeling has provided valuable insights, future missions to Uranus, like the proposed orbiter mission slated for the mid-2030s, may provide crucial measurements of mass loss from the system. This mission aims to explore Uranus' interior, potentially shedding light on the ongoing dynamics of its ring system and uncovering new revelations about this relatively unexplored frontier in the solar system. With the promise of exciting discoveries on the horizon, Uranus awaits further exploration.



Two views of the planet Uranus appear side-by-side for comparison. At the top, left corner of the left image is a two-line label. The top line reads Uranus November 9, 2014. The bottom line reads HST WFC3/UVIS. At the top, left corner of the right image is the label November 9, 2022. At the left, bottom corner of each image is a small, horizontal, white line. In both panels, over this line is the value 25,400 miles. Below the line is the value 40,800 kilometers. At the top, right corner of the right image are three, colored labels representing the color filters used to make these pictures. Located on three separate lines, these are F467M in blue, F547M in green, and F845M in red. On the bottom, right corner of the right image are compass arrows showing north toward the top and east toward the left.

Credits ScienceNASA, ESA, STScI, Amy Simon (NASA-GSFC), Michael H. Wong (UC Berkeley). Image Processing: Joseph DePasquale (STScI)



India's Gaganyaan Mission: A Giant Leap for ISRO

India's space agency, the Indian Space Research Organization (ISRO), continues its remarkable journey in space exploration with the ambitious Gaganyaan mission. This mission, translating to "celestial vehicle" in Sanskrit, aims to send at least three astronauts into low-Earth orbit by the close of 2024, marking a significant milestone in India's space endeavors.

Scheduled for October 21, ISRO will conduct a crucial test flight from the Satish Dhawan Space Center. This test will evaluate the effectiveness of the crew capsule's emergency escape system. The Crew Module (CM) used in this test mirrors the pressurized module that will house astronauts during their ascent to space, albeit in an unpressurized state. It will be launched via a specially developed single-stage liquid rocket designed to simulate an abort scenario.

The actual CM will be transported by a 143-foot-tall Launch Vehicle Mark-3 (LVM3) rocket, comprising solid, liquid, and cryogenic stages. Impressively, the cryogenic stage recently received human safety certifications, attesting to ISRO's unwavering commitment to astronaut safety.

During this test, several critical components will be examined. Drogue parachutes, pivotal for stabilizing and decelerating the spacecraft during reentry, will undergo evaluation. The Crew Escape System (CES) will be tested, a crucial element in ensuring astronauts' safety in the event of an emergency. This system, designed to eject astronauts if necessary, will be subjected to rigorous scrutiny. The CM fairing and Interface Adapters will also be assessed, further enhancing the emergency escape system's readiness.



The test flight is designed to replicate abort conditions experienced during the ascent trajectory, corresponding to a Mach number of 1.2, mirroring conditions in the actual Gaganyaan mission. Following the abort sequence, including CES separation and parachute deployment, the CM will execute a safe touchdown in the sea.

Upon return to Earth, the CM will be retrieved by a dedicated diving team from the Indian Navy in the Bay of Bengal, utilizing a specialized vessel. Subsequent steps in the mission will include further tests, including vibration tests with the Crew Escape System, and integration with the launch vehicle on the pad.

Looking ahead, another milestone looms on the horizon. A subsequent test flight will introduce Vyommित्रा, a robot aptly named "space's friend." Vyommित्रा possesses human-like features, including a face and the ability to communicate like a human, along with robotic arms. This innovative step demonstrates India's commitment to advancing technology in space exploration.

As ISRO surges forward with its Gaganyaan mission, it not only marks a significant achievement in India's space exploration but also stands as a testament to the nation's dedication to pushing the boundaries of human knowledge and capabilities in the cosmos. With each successful step, India solidifies its place on the global stage of space exploration.

A composite image showing the Chandrayaan-3 lunar lander on the surface of the Moon. The lander is positioned in the center, with the Indian national flag flying from a pole behind it. The Moon's surface is visible in the foreground, and the dark, starry expanse of space is in the background. The ISRO logo is visible on the Moon's surface below the lander.

CHANDRAYAAN-3

CHANDRAYAAN-3'S SULFUR DISCOVERIES: PAVING THE WAY FOR LUNAR EXPLORATION

India's Chandrayaan-3 mission has marked a significant milestone in lunar exploration, touching down 375 miles from the Moon's south pole on August 23, 2023. In under 14 Earth days, it provided invaluable data that promises to revolutionize our understanding of the lunar landscape. The Indian Space Research Organization (ISRO) promptly shared these findings, unveiling a surprising discovery - the presence of sulfur in the lunar soil.

While scientists were aware of the existence of sulfur in lunar rocks and soil, its concentration was believed to be minimal. However, Chandrayaan-3's rover, aptly named Pragyan, revealed otherwise. Equipped with advanced instruments including an alpha particle X-ray spectrometer and a laser-induced breakdown spectrometer (LIBS), Pragyan successfully detected sulfur near the landing site.

Sulfur's significance lies in its potential to aid future lunar exploration endeavors. As a key component in volcanic activity, it holds potential for sustaining human life on the Moon, potentially enabling astronauts to utilize it as a resource.

The Moon's geology is characterized by two predominant rock types - dark volcanic rock and brighter highland rock. Typically, volcanic plains contain higher concentrations of sulfur compared to highland material. This phenomenon arises from the process of volcanic activity, where sulfur from deep-seated rocks becomes integrated into the magma. Upon eruption, much of the sulfur is released into the atmosphere.

Chandrayaan-3's measurements of sulfur represent a groundbreaking achievement, being the first of their kind on the Moon. While the exact sulfur content is pending calibration, initial data from LIBS suggests that highland soils near the poles may possess a higher sulfur concentration than both equatorial highland soils and dark volcanic soils.

This revelation provides vital insights into the Moon's geological processes, shedding light on its unique environmental conditions. Furthermore, the presence of concentrated sulfur at the poles suggests intriguing possibilities, including its potential formation from the lunar atmosphere or ancient volcanic activity.

For future space missions, the discovery of sulfur as a resource holds immense promise. In-situ resource utilization, a concept central to long-term lunar missions, envisions using naturally occurring materials like sulfur for various applications, from constructing infrastructure to generating power.

Chandrayaan-3's pioneering discoveries not only deepen our understanding of lunar geology but also open doors to a future where humans may thrive on the Moon, utilizing its resources to forge a sustainable presence in space exploration.

Discoveries on lunar surface

Chandrayaan-3's Pragyan rover has confirmed the presence of sulphur on the lunar surface, in the first such measurements

Observations from LIBS

Investigations underway regarding presence of Hydrogen

Elements identified

- Al: Aluminum
- S: Sulphur
- Ca: Calcium
- Fe: Iron
- Cr: Chromium
- Ti: Titanium

'First-ever measurements'

"Laser-Induced Breakdown Spectroscopy (LIBS) instrument on board the Rover unambiguously confirms the presence of sulphur (S) on the lunar surface near the south pole, through first-ever in-situ measurements."

— Isro

Significance of the findings

The findings near the lunar south pole will be crucial for understanding the Moon's elemental composition. "A lot of our findings will be critical because we will be getting that information for the first time." — Anil Bhardwaj, director, Isro's Physical Research Laboratory

Credits: hindustantimes.com

"Laser-Induced Breakdown Spectroscopy (LIBS) instrument onboard the Rover unambiguously confirms the presence of Sulphur (S) in the lunar surface near the south pole, through first-ever in-situ measurements," Isro said in a statement.

Japan's SLIM Lander: Pioneering Lunar Exploration

Japan's Smart Lander for Investigating Moon (SLIM) has embarked on a groundbreaking mission, aiming to achieve a highly precise soft landing on the lunar surface. Launched on September 6, SLIM has cleared its initial critical operation stage, confirming the successful functionality of its essential systems, including solar panels, communications, and propulsion. This achievement, announced by the Japan Aerospace Exploration Agency (JAXA) on September 14, signifies a major milestone in the mission's progress.

Presently, in an Earth orbit phase, SLIM is slated to spend approximately 20 days undergoing rigorous equipment verification and preparation for insertion into the lunar transfer orbit. JAXA recently released an optical observation of SLIM from a distance of about 37,300 miles (60,000 kilometers) away from Earth. Notably, the XRISM X-ray observatory, launched concurrently with SLIM, was captured in a separate image.

SLIM's unique trajectory to the moon involves an extended journey beyond the lunar orbit before looping back. This strategic maneuver allows the spacecraft to execute a more efficient burn for lunar orbit entry, optimizing fuel consumption and reducing overall mass.

In the months to come, SLIM will transition into lunar orbit, gearing up for a precision landing within the Shioli Crater. This "pinpoint" landing approach represents a significant advancement compared to previous international missions, showcasing Japan's pioneering technological capabilities.

The successful execution of SLIM's mission would not only mark Japan's achievement of a historic lunar landing but also pave the way for future daring lunar and planetary exploration endeavors. If all goes as planned, Japan will join the elite ranks of nations, including the Soviet Union, the United States, China, and India, to achieve a soft landing on the moon.

SLIM's triumph could signify a turning point in space exploration, demonstrating the potential for even more ambitious missions in the years ahead. With its cutting-edge technology and precise architecture, SLIM is a testament to Japan's dedication to advancing space exploration and expanding humanity's understanding of the cosmos.

SLIM is a small-scale exploration lander designed for pinpoint landings on the Moon's surface, reduction in the size and weight of equipment used in Moon landings, and investigation into the Moon's origins. It will also test technology fundamental to exploration in low-gravity environments, an important requirement for future scientific investigation of the solar system.



NOBEL PRIZE IN PHYSICS AWARDED TO 3 SCIENTISTS WHO GLIMPSED THE INNER WORLD OF ATOMS WITH TINY LIGHT PULSES

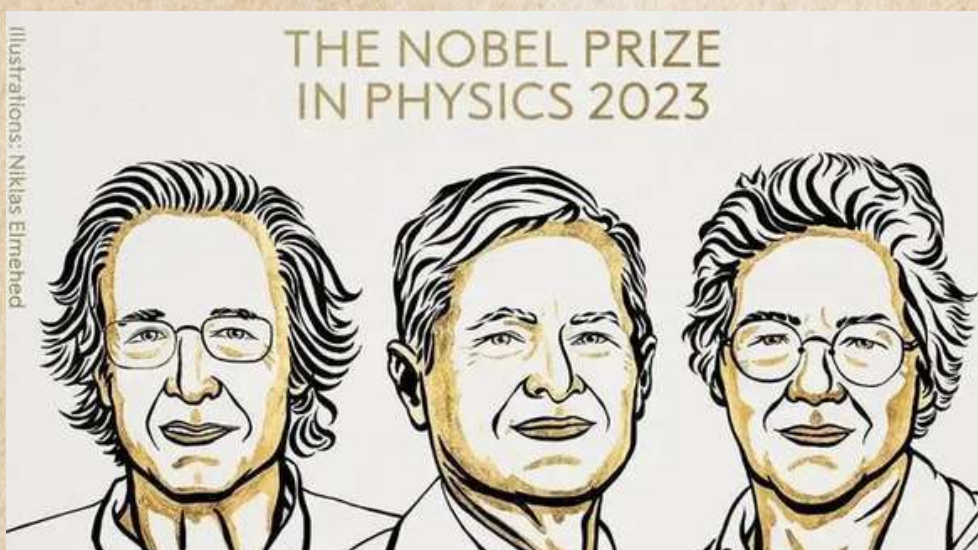
The 2023 Nobel Prize in Physics has been awarded to three distinguished scientists, Pierre Agostini, Ferenc Krausz, and Anne L'Huillier, for their groundbreaking work in the field of attosecond physics. The Royal Swedish Academy of Sciences announced on October 3rd that the trio would share the prestigious 11 million Swedish krona (\$1.02 million) prize.

Their achievement centers around the creation of attosecond pulses of light, an extraordinary feat that allows scientists to delve into the inner workings of atoms. To put it into perspective, an attosecond is to a second what a second is to the age of the universe – an incredibly minuscule unit of time, measuring one quintillionth of a second. This newfound capability enables researchers to observe the swift movements of electrons and molecules with unprecedented precision.

The journey towards this groundbreaking discovery commenced in 1987 when Anne L'Huillier, through her experimentation with noble gases and laser light, unveiled a phenomenon wherein multiple overtones of light, each possessing distinct frequencies, were generated. By strategically superimposing these overtones, causing them to largely cancel each other out, L'Huillier managed to produce an extraordinarily brief pulse of light.

Pierre Agostini, a physicist affiliated with The Ohio State University, and Ferenc Krausz, based at the Ludwig Maximilian University in Munich, Germany, subsequently took up L'Huillier's work and refined the technique. Their combined efforts culminated in the creation of consecutive pulses lasting 250 attoseconds, as well as a single pulse lasting 650 attoseconds.

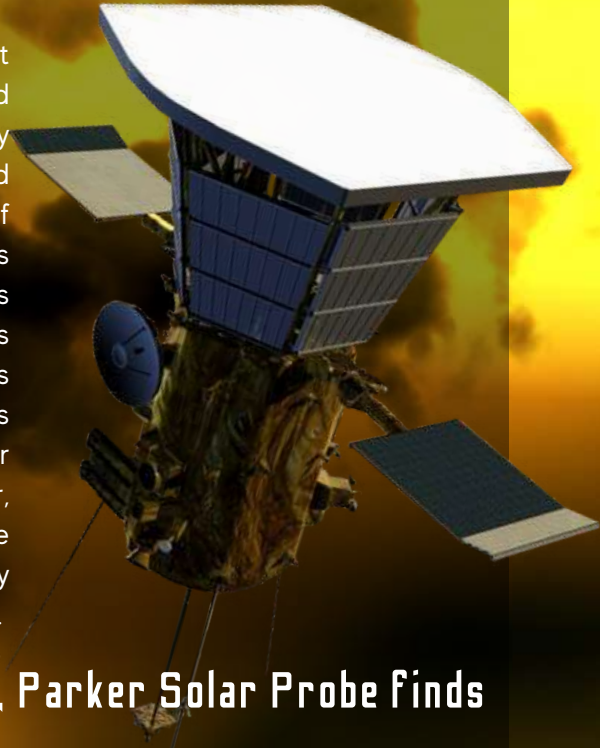
This revolutionary method opens up a realm of possibilities for the observation and manipulation of electrons – the agents behind the transmission of electricity – and molecules that hold significant potential for medical applications on a minute scale, according to the Nobel committee. Eva Olsson, Chair of the Nobel committee for physics, emphasized the transformative potential of attosecond physics, stating, "We can now open the door to the world of electrons. Attosecond physics gives us the opportunity to understand mechanisms that are governed by electrons. The next step will be utilizing them."



An artist's sketch of Pierre Agostini, Ferenc Krausz and Anne L'Huillier.
(Image credit: Niklas Elmehed/Nobel Prize Outreach)

NASA's Parker Solar Probe - Fastest man-made object

NASA's Parker Solar Probe has shattered records as the fastest human-made object, hurtling through space at unprecedented speeds. Launched in 2018, the probe is on a mission to study the Sun's outer atmosphere and understand solar wind and magnetic fields. On its closest approach, it reaches speeds of up to approximately 430,000 miles per hour (700,000 kilometers per hour), dwarfing previous records set by the Helios spacecraft in the 1970s. The Parker Solar Probe's speed enables it to conduct critical observations and collect data from regions of the Sun's corona that were previously inaccessible. This breakthrough allows scientists to gain new insights into solar phenomena and advance our understanding of space weather, which can impact technology and infrastructure on Earth. The probe's remarkable velocity is a testament to human ingenuity and technological achievement in the field of space exploration.



'Lightning' on Venus may not be lightning at all, Parker Solar Probe finds

NASA's Parker Solar Probe, on its seven-year mission to study the Sun, made a significant discovery related to Venus in 2021 during a routine flyby. The probe's aim was to use Venus's gravitational pull to adjust its trajectory towards the Sun. The findings challenge previous assumptions about lightning on Venus.

Harriet George, lead author of the study and a postdoctoral researcher at the Laboratory for Atmospheric and Space Physics, emphasized Parker's capacity for new discoveries, stating, "Everywhere it goes, it finds something new."

The study reveals that flashes of light on Venus, traditionally attributed to lightning, may not be lightning bolts at all. Instead, they appear linked to disturbances in the magnetic fields surrounding the planet. This suggests that Venus may have less lightning than previously believed.

For nearly four decades, there has been ongoing debate about lightning on Venus. The research team used a phenomenon known as "whistler waves" to draw their conclusions. Whistler waves are electromagnetic waves that can travel through various mediums, and on Earth, they are associated with lightning discharges.

While previous observations of whistler waves on Venus led scientists to assume significant lightning activity, Parker's close encounter with the planet revealed a different story. The whistler waves observed were moving downward towards the planet, contrary to the expected outward movement seen with Earth's lightning-induced whistler waves.

The researchers theorize that these waves result from disruptions in Venus's magnetic fields. Specifically, magnetic field lines may break apart and rejoin, releasing bursts of energy in the form of whistler waves.

Parker Solar Probe is set to make its seventh and final pass by Venus in 2024, approaching to within 250 miles of the Venusian surface. This close encounter is expected to provide even more insight into the nature of lightning on Venus.

CAN HUMANS REPRODUCE IN SPACE? MOUSE BREAKTHROUGH ON ISS A PROMISING SIGN

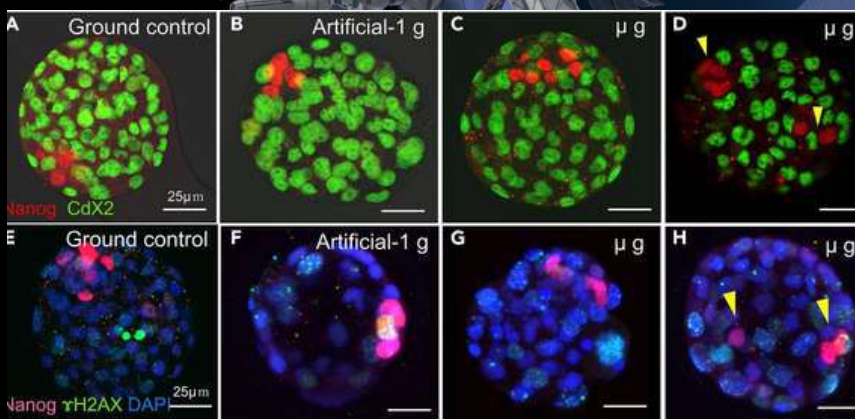
Researchers have achieved a groundbreaking milestone by successfully cultivating mouse embryos aboard the International Space Station (ISS) for the first time. This achievement, hailed as a significant leap, indicates that mammals, including humans, may potentially reproduce in space. The University of Yamanashi and National Research Institute Riken jointly announced this groundbreaking feat, emphasizing that it marks the world's inaugural experiment in cultivating early-stage mammalian embryos in the complete microgravity environment of the ISS.

Led by Teruhiko Wakayama, a molecular biologist at the University of Yamanashi's Advanced Biotechnology Center, in collaboration with a team from the Japan Aerospace Space Agency (JAXA), the study sought to determine if a mammalian fetus could develop normally in the limited gravity conditions of space. In August 2021, frozen mouse embryos were sent to the ISS via a SpaceX Falcon 9 rocket. Once on the space station, the embryos were thawed using specialized equipment and cultured under microgravity for four days. Subsequently, the samples were returned to Earth for comparative analysis with mouse embryos grown under normal gravity.

The findings, detailed in a paper published in the journal *iScience*, revealed that embryos cultured under microgravity conditions progressed into blastocysts—a cluster of dividing cells formed by a fertilized egg—with normal cell counts. The researchers emphasized that gravity had no significant impact on blastocyst formation and initial differentiation of mammalian embryos.

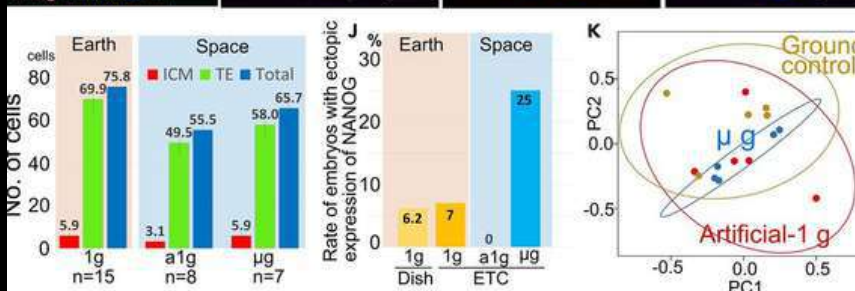
Furthermore, the team observed that if allowed to progress, the blastocysts would develop into mouse fetuses and placentas without significant DNA alterations or changes in gene expression. However, the survival rate of embryos grown on the ISS was slightly lower than those cultivated on Earth.

The researchers highlighted the importance of transplanting the blastocysts cultured in the ISS's microgravity into mice to determine if they can lead to successful births. This step is crucial in confirming the normalcy of blastocysts grown in microgravity.



While the study delved somewhat into the effect of radiation on space-based mammalian embryo growth, further investigation into radiation exposure during live embryo cryopreservation and culturing phases will be necessary.

This breakthrough holds profound implications for future human space exploration, particularly for extended stays or potential permanent habitation on the moon and Mars. As humanity sets its sights on these ambitious ventures, the knowledge gained from this research could prove indispensable in shaping the future of reproduction beyond the bounds of Earth.



A graph showing the quality of blastocysts developed in microgravity on the ISS. (Image credit: *iScience*/(CC BY-NC-ND 4.0))

SUPERVOLCANO ERUPTION ON PLUTO - GIVES HINT OF HIDDEN OCEAN BENEATH THE SURFACE

In 2015, NASA's New Horizons spacecraft made a historic visit to Pluto, revealing a complex world that continues to surprise scientists nearly a decade later. Recent studies of data collected by the spacecraft have unveiled an extraordinary feature near a bright, heart-shaped region on Pluto known as Sputnik Planitia.

Researchers have identified a 44-kilometer-wide crater, named Kiladze, located northeast of Sputnik Planitia. Initially resembling impact craters left by meteorites, Kiladze presented peculiarities that set it apart. Unlike typical impact craters, Kiladze lacked a central peak and exhibited an elongated shape, suggesting the influence of tectonic forces within Pluto. These observations prompted further investigation into this unique geological formation.

What sets Kiladze apart from the rest of Pluto's surface is the prominent presence of water ice. While most of the planet's terrain is dominated by methane and nitrogen ice, the distinct water ice in and around Kiladze stands out. This discovery led to the hypothesis that Kiladze might be linked to a cryovolcano, a volcano that erupts ice rather than molten rock, a phenomenon known as cryovolcanism.

This cryovolcanic activity implies the existence of a hidden subsurface ocean on Pluto. The eruption from Kiladze is believed to have expelled water from this concealed ocean onto the planet's surface, resulting in a transformation over millions of years. The significance of this finding lies not only in the presence of the ocean but also in the relatively recent timing of the eruption, estimated to have occurred just a few million years ago.

This revelation challenges previous assumptions about the thermal activity within Pluto. The dwarf planet's small size suggests that it should have cooled significantly since its formation, making it unlikely to possess a heat source capable of driving volcanic eruptions. One proposed explanation is the presence of radioactive elements in Pluto's core, which would release heat as they decay. However, earlier research questioned whether there were enough of these elements to sustain such activity.

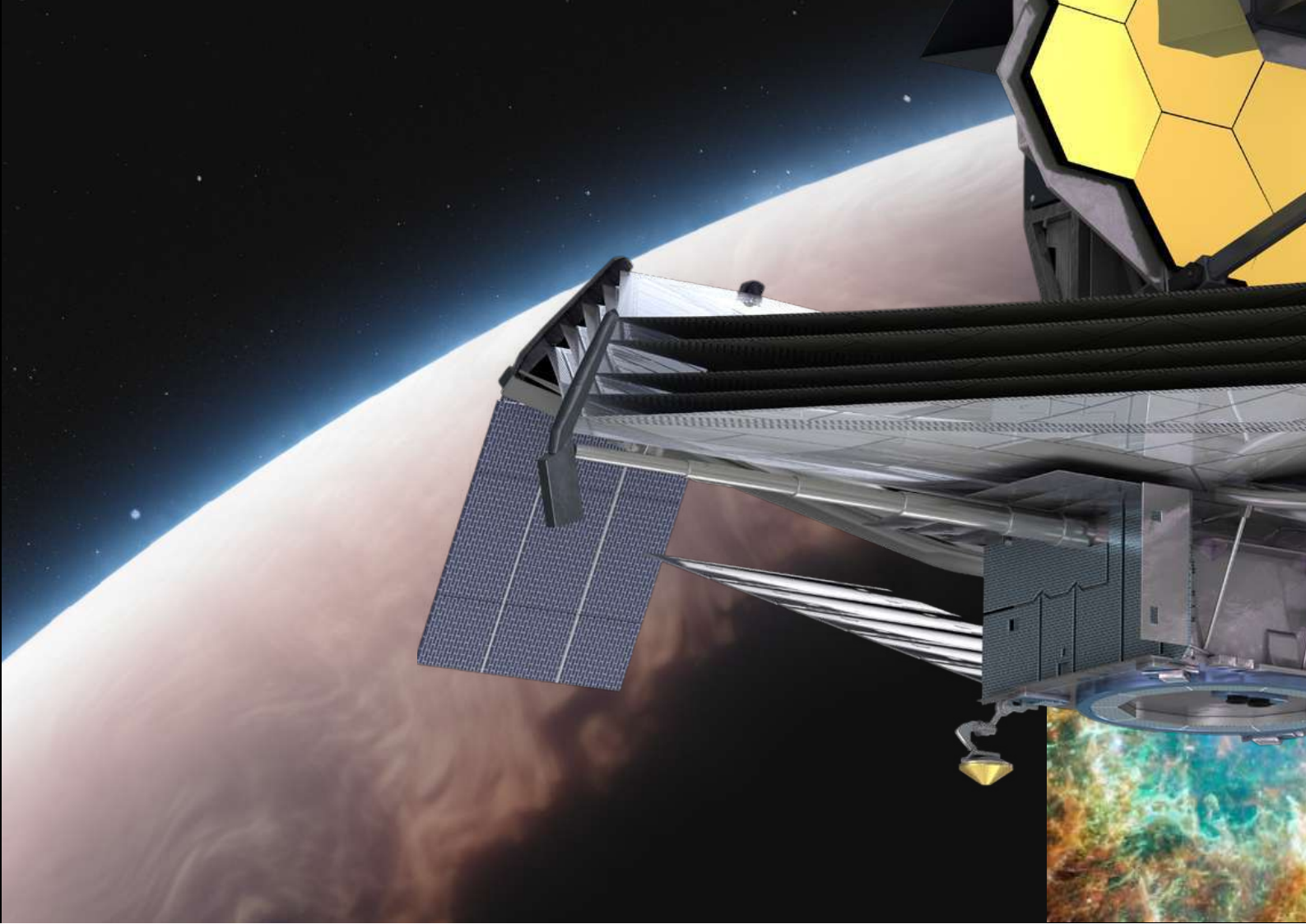
The discovery of Kiladze and its cryovolcanic activity raises intriguing questions about the resilience of Pluto's subsurface ocean. Despite the passage of cosmic time, something within the dwarf planet's interior appears to be preventing the ocean from freezing entirely. One hypothesis posits that as Pluto cooled, pockets of liquid water may have been retained, potentially serving as the source for these eruptions.

Ultimately, the enigma of Kiladze and its cryovolcanic activity underscores the dynamic and ever-evolving nature of distant celestial bodies. As scientists continue to scrutinize the data provided by New Horizons, new revelations about Pluto's complex geological history may come to light, deepening our understanding of this distant world and its place in the broader solar system.

GALACTICA

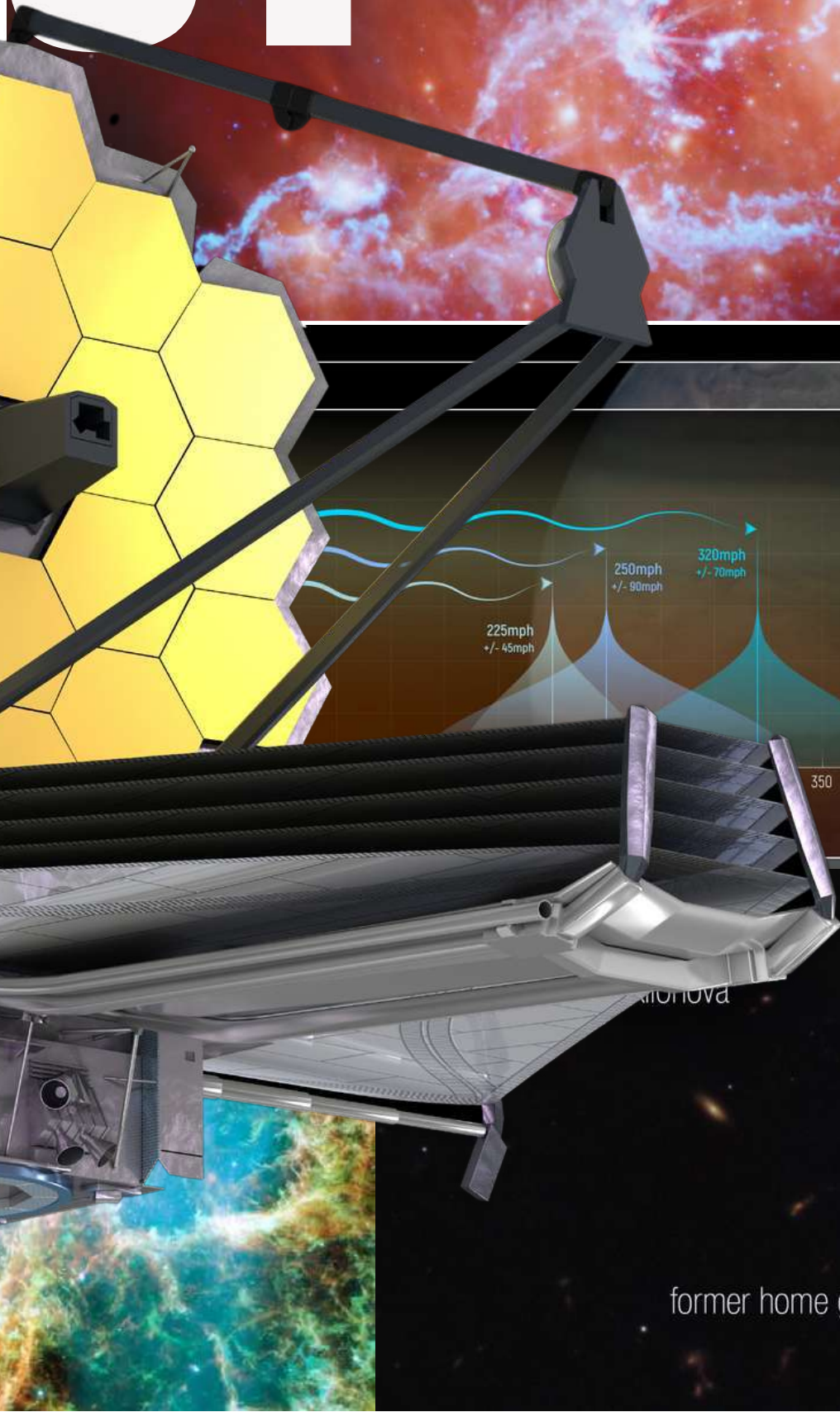


JW



GALACTICA

ST



former home galaxy

WEBB CAPTURES AN ETHERAL VIEW OF NCG 346

Beyond the distant worlds and around the stars, NGC 346 - the brightest and greatest star-forming region in the Small Magellanic Cloud - is visible in a new image from our web's Mid-Infrared Instrument (MIRI). The Small Magellanic Cloud (SMC) is a Milky Way satellite galaxy observable with the naked eye in the southern constellation Tucana

This tiny companion galaxy is more primitive than the Milky Way because it contains less heavy metals, which are created in stars through nuclear fusion and supernova explosions, than our own galaxy. Because cosmic dust is composed of heavy elements such as silicon and oxygen, scientists predicted the SMC to be devoid of significant amounts of dust. However, both the latest MIRI image and an earlier view of NGC 346 from Webb's Near-Infrared Camera released in January indicate plenty of dust in this region.

Blue tendrils track emission from dusty silicates and sooty chemical compounds known as polycyclic aromatic hydrocarbons, or PAHs, as depicted in representative-color image below. Warm dust heated by the region's brightest and most massive stars emits more diffuse red emission. An arc in the upper left corner could be a reflection of light from a star near the arc's center. (In the lower left and upper right, similar, fainter arcs emerge associated with stars.) Finally, brilliant spots and filaments indicate places with a high density of protostars.



The researchers searched for the reddest stars and discovered 1,001 pinpoint points of light, the majority of which were young stars still imprisoned within their dusty cocoons. Astronomers can perform a more complete census of the stars and protostars in this active region by combining Webb observations in the near-infrared and mid-infrared. The findings have ramifications for our knowledge of galaxies billions of years ago, during a period in the universe known as "cosmic noon," when star formation was at its zenith and heavy element concentrations were lower, as observed in the SMC.

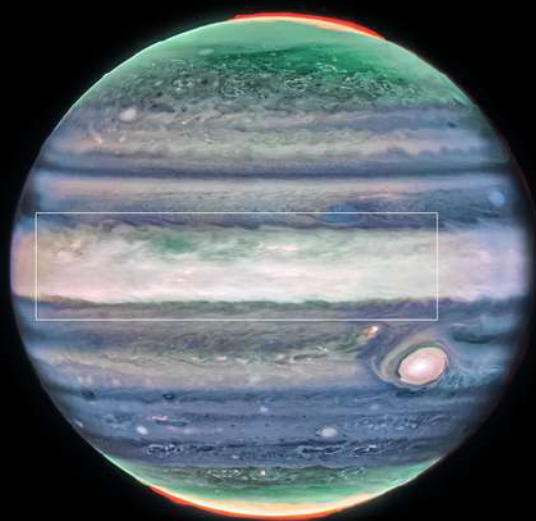
NASA'S WEBB DISCOVERS NEW FEATURE IN JUPITER'S ATMOSPHERE

The James Webb Space Telescope of NASA has discovered a previously overlooked feature in Jupiter's atmosphere. The high-speed jet stream, exceeding 3,000 miles (4,800 kilometers) wide, sits above the main cloud decks on Jupiter's equator. The discovery of this jet sheds light on how the layers of Jupiter's famously turbulent atmosphere interact with one another.

Webb's new look into the near-infrared is sensitive to higher-altitude layers of the atmosphere, about 15-30 miles (25-50 kilometers) above Jupiter's cloud tops. High-altitude hazes appear blurry in near-infrared imaging, with increased brightness over the equatorial region. Finer details are resolved within the bright, hazy band with Webb.

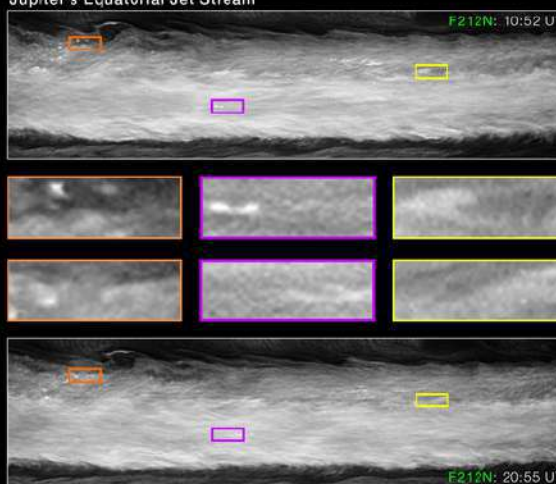
JAMES WEBB SPACE TELESCOPE

JUPITER | JULY 27, 2022



NIRCam Filters | F164N F212N F306M

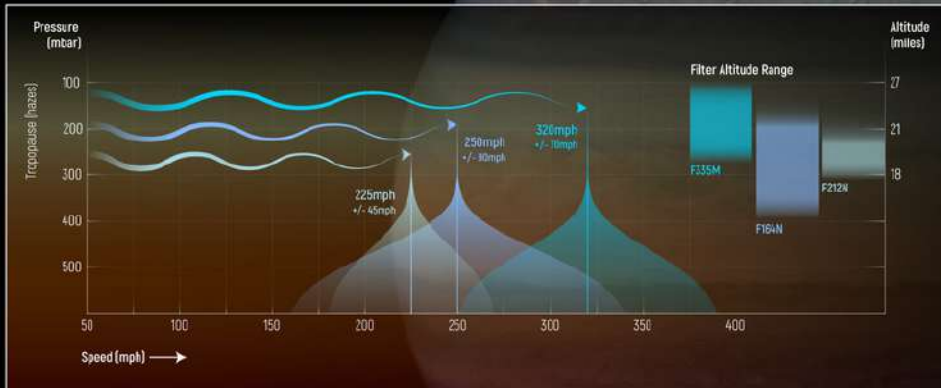
Jupiter's Equatorial Jet Stream



"Even though various ground-based telescopes, spacecraft like NASA's Juno and Cassini, and NASA's Hubble Space Telescope have observed the Jovian system's changing weather patterns, Webb has already provided new findings on Jupiter's rings, satellites, and its atmosphere," he said.

While Jupiter and Earth are very different in many ways – Jupiter is a gas giant, while Earth is a rocky, temperate world – both planets have layered atmospheres. These other missions' observations of infrared, visible, radio, and ultraviolet light wavelengths detect the lower, deeper layers of the planet's atmosphere, where massive storms and ammonia ice clouds reside.

JAMES WEBB SPACE TELESCOPE
WINDS ON JUPITER



WEBB
 SPACE TELESCOPE

The newly discovered jet stream travels at approximately 320 miles per hour (515 kilometers per hour), which is twice the sustained winds of a Category 5 hurricane here on Earth. It is located in Jupiter's lower stratosphere, about 25 miles (40 kilometers) above the clouds. The team was able to measure how fast the winds change with altitude and generate wind shears by comparing the winds observed by Webb at high altitudes to the winds observed by Hubble at deeper layers.

While Webb's exceptional resolution and wavelength coverage enabled the detection of small cloud features used to track the jet, complementary Hubble observations taken one day after the Webb observations were also critical in determining the base state of Jupiter's equatorial atmosphere and observing the development of the convective storms in Jupiter's equator not connected to the jet.

"We knew that the different wavelengths of Webb and Hubble would reveal the three-dimensional structure of storm clouds, but we were also able to use the timing of the data to see how rapidly storms develop," said team member Michael Wong of the University of California, Berkeley, who led the associated Hubble observations.

The researchers are looking forward to more Webb observations of Jupiter to see if the speed and altitude of the jet change over.

"Jupiter has a complicated but repeatable pattern of winds and temperatures in its equatorial stratosphere, high above the winds measured in clouds and hazes at these wavelengths," team member Leigh Fletcher of the University of Leicester in the United Kingdom explained. "If the strength of this new jet is linked to this oscillating stratospheric pattern, we might expect the jet to vary significantly over the next 2 to 4 years - it'll be really exciting to put this theory to the test in the coming years." It amazes me that after years of tracking Jupiter's clouds and winds from various observatories, we still have so much to learn about Jupiter, and features like this jet could remain hidden from view until these new NIRCcam images were taken.

WEBB'S STUDY OF THE SECOND-BRIGHTEST GAMMA-RAY BURST EVER SEEN REVEALS TELLURIUM.

A team of scientists used multiple space and ground-based telescopes, including NASA's James Webb Space Telescope, NASA's Fermi Gamma-ray Space Telescope, and NASA's Neil Gehrels Swift Observatory, to observe an exceptionally bright gamma-ray burst, GRB 230307A, and identify the neutron star merger that caused the burst.

Webb further assisted scientists with discovering the chemical element tellurium in the explosion's aftermath. Other elements near tellurium on the periodic table, such as iodine, which is required for much of life on Earth, are also likely to be present in the kilonova's ejected material. A kilonova is an explosion caused by a neutron star merging with either a black hole or another neutron star.

Kilonovas are extremely rare, making them difficult to observe. Short gamma-ray bursts (GRBs), which are traditionally thought to last less than two seconds, can be byproducts of these infrequent merger episodes. Long gamma-ray bursts, on the other hand, can last several minutes and are usually associated with the explosive death of a massive star.)

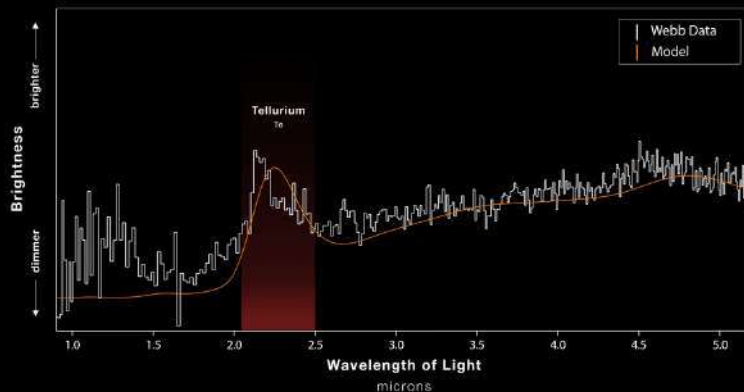
The case of GRB 230307A is especially noteworthy. It is the second brightest GRB observed in over 50 years of observations, about 1,000 times brighter than a typical gamma-ray burst observed by Fermi. Despite its different origin, it also lasted 200 seconds, firmly placing it in the category of long duration gamma-ray bursts.



GRB 230307A

KILONOVA EMISSION SPECTRUM

NIRSpec | PRISM

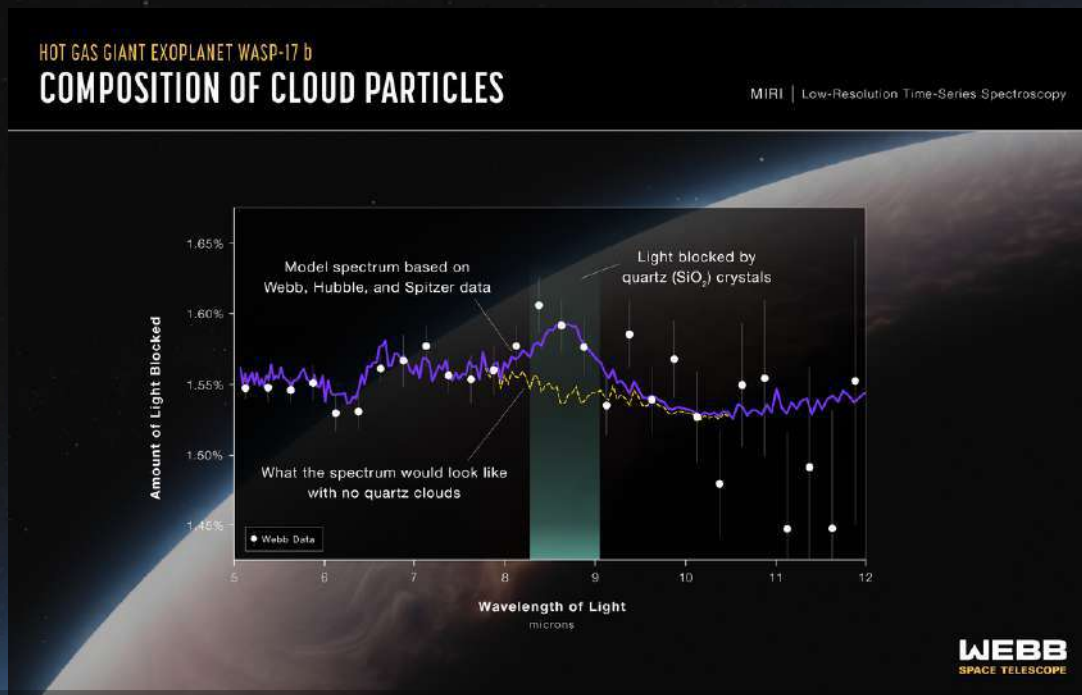


Following the initial detection, an intensive series of ground and space observations, including Swift, were launched to pinpoint the source on the sky and track how its brightness changed. These observations in gamma-ray, X-ray, optical, infrared, and radio wavelengths revealed that the optical/infrared counterpart was faint, evolved quickly, and became very red - all of which are characteristics of a kilonova.

Webb's highly sensitive infrared capabilities assisted scientists in determining the residence of the two neutron stars that created the kilonova: a spiral galaxy approximately 120,000 light-years away from the site of the merger. They were once two ordinary massive stars that formed a binary system in their home spiral galaxy. Knowing that the pair was gravitationally bound, they were launched together twice: when one of the stars exploded as a supernova and became a neutron star, and when the other star followed suit.

In this case, despite two explosive jolts, the neutron stars remained as a binary system and were ejected from their home galaxy. Before merging several hundred million years later, the pair traveled roughly the diameter of the Milky Way galaxy.

JWST DETECTS TINY QUARTZ CRYSTALS IN CLOUDS OF HOT GAS GIANT



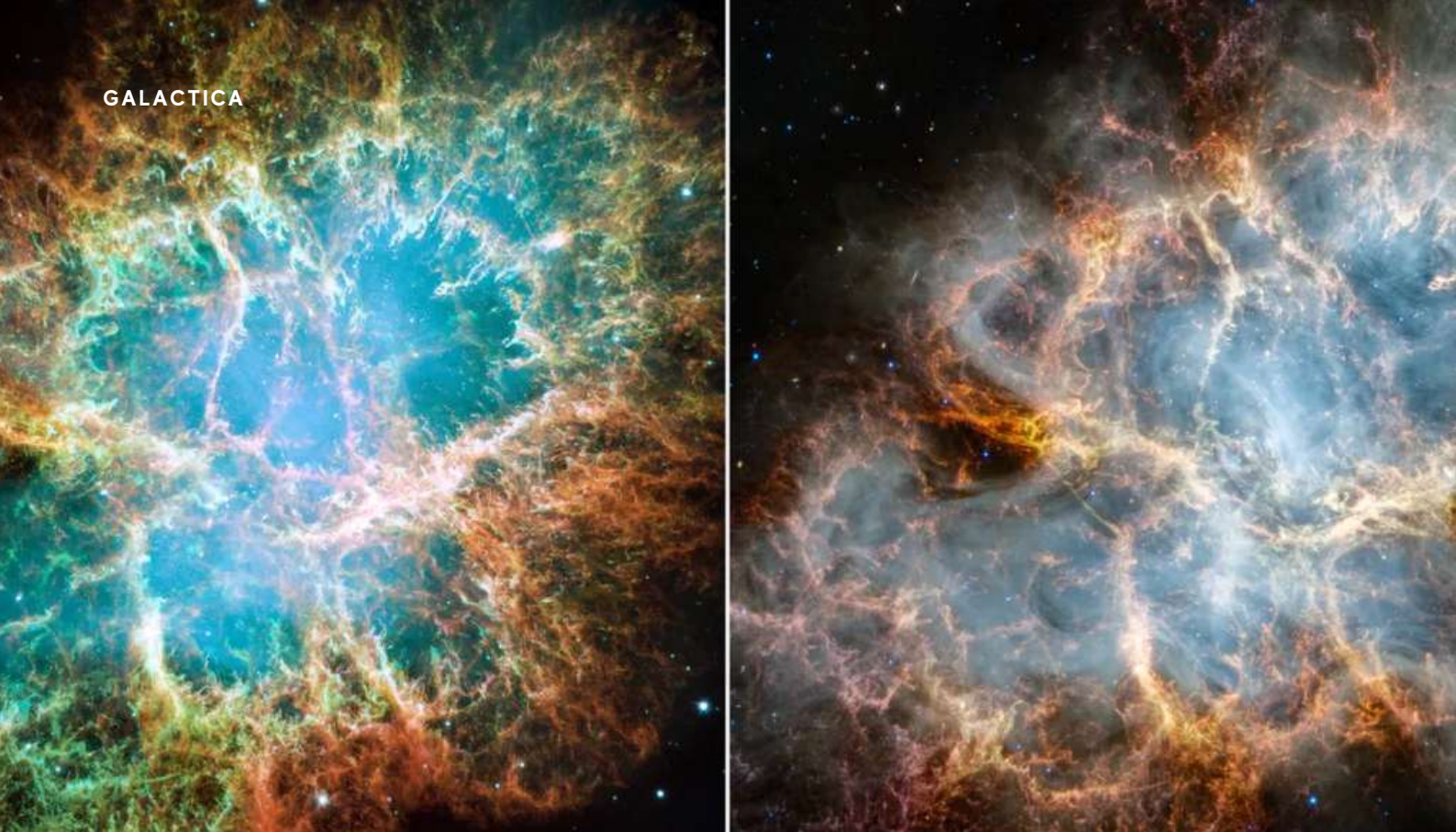
WASP-17 b (a hot 2,700 degrees Fahrenheit (1,500 degrees Celsius), Jupiter exoplanet 1,300 light-years from Earth,) is one of the largest and puffiest known exoplanets, with a volume more than seven times that of Jupiter and a mass less than one-half that of Jupiter. This, combined with the planet's short orbital period of 3.7 Earth days, makes it perfect for transmission spectroscopy.

The discovery by MIRI (Webb's Mid-Infrared Instrument), is the first of its kind in an extraterrestrial atmosphere, where Quartz nanocrystals have been discovered in the high-altitude clouds, by researchers using Webb Telescope. "We were thrilled!" said David Grant, a researcher at the University of Bristol in the United Kingdom. "We knew from Hubble observations that there must be aerosols - tiny particles making up clouds or haze - in WASP-17 b's atmosphere, but we didn't expect them to be made of quartz."

The previously identified silicate grains in the atmospheres of exoplanets and brown dwarfs appear to be composed of magnesium-rich silicates such as olivine and pyroxene, rather than quartz alone - which is pure SiO_2 - unlike silicates, which are highly prevalent throughout the galaxy. These findings provide a new perspective on how exoplanet clouds develop and evolve.

Webb monitored the WASP-17 system for approximately ten hours, taking over 1,275 brightness measurements of 5- to 12-micron mid-infrared radiation as the planet passed in front of its star. The team calculated the amount of each wavelength blocked by the planet's atmosphere by subtracting the brightness of particular wavelengths of light that entered the telescope when the planet was in front of the star from the brightness of the star on its own.

These crystals resemble pointed hexagonal prisms and are tiny approximately 10 nanometers across - one millionth of a centimeter. Unlike mineral particles seen in Earth's clouds, the quartz crystals identified in WASP-17 b's clouds are not swept up from a rocky surface. They are generated by the atmosphere itself. "In the strenuous conditions of hot atmosphere and pressure only about one-thousandth of what we experience on Earth's surface solid crystals can form directly from gas, without going through a liquid phase first." "These beautiful silica crystals tell us about the inventory of different materials and how they all come together to shape the environment of this planet." stated Wakeford



THE CRAB NEBULA SEEN IN NEW LIGHT BY NASA'S WEBB

The Crab Nebula, a supernova remnant located 6,500 light-years away in the constellation Taurus, has been observed by NASA's James Webb Space Telescope. Since 11th-century astronomers recorded this energetic event in 1054 CE, the Crab Nebula has continued to draw attention and additional study as scientists seek to understand the conditions, behavior, and aftereffects of supernovae through detailed study of the Crab, a relatively nearby example. A crisp, cage-like structure of fluffy gaseous filaments is shown in red-orange in Webb's infrared observation. Webb, on the other hand, maps emission from dust grains (yellow-white and green) for the first time in the central regions.

In the infrared light captured by Webb, additional aspects of the Crab Nebula's inner workings become more visible and are seen in greater detail. Webb emphasizes synchrotron radiation in particular: emission produced by charged particles, such as electrons, moving at relativistic speeds around magnetic field lines. Throughout the interior of the Crab Nebula, the radiation appears as milky smoke-like material.

This feature is driven by the nebula's pulsar, which is a rapidly rotating neutron star. In accordance with the pulsar's strong magnetic field, particles are accelerated to extremely high speeds and emit radiation as they wind around magnetic field lines. Despite being emitted across the electromagnetic spectrum, Webb's NIRCam instrument captures it in astounding clarity.

The white material curves sharply inward from the filamentary dust cage's edges and goes toward the neutron star's location at the center left and right, as if the nebula's waist is pinched. This abrupt slimming could be caused by a dense gas belt containing the supernova wind's expansion.

The wind produced by the pulsar heart continues to rapidly push the shell of gas and dust outward. Yellow-white and green mottled filaments form large-scale loop-like structures within the remnant's interior, representing areas where dust grains reside. As astronomers continue to analyze the Webb data and consult previous observations of the remnant taken by other telescopes, the search for answers about the Crab Nebula's past continues.

WHAT'S UP IN THE SKY - NOVEMBER 2023

LUNAR CALENDAR

IMPORTANCE OF MOON PHASES FOR STARGAZERS

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

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

Monthly Lunar Calendar November 2023



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

PLANETS VISIBILITY

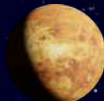
Mercury

Evening planet, not really viable this month due to low altitude after sunset.



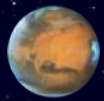
Venus

Bright morning planet, visible against dark skies all month.



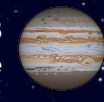
Mars

Solar conjunction on 17 November. Too close to the Sun to be seen this month.



Jupiter

Superbly placed, reaching opposition on 3 November. Attains 50° altitude when due south.



Saturn

Well-placed evening planet. Moon close on 20 November.



Uranus

The planet is at opposition on 13 November. It sits 2.2° south of Betein



Neptune

Well-placed evening planet. All month, Neptune reaches its highest position in darkness.



BRIGHT DEEP SKY OBJECTS

M29 is a binocular and telescope open cluster that's situated in the highly crowded Milky Way region of Cygnus. The cluster is certainly worth a look due to its location and unusual shape. It appears like a squashed dipper that loosely resembles the main stars of Ursa Major. Adding to the view is a stunning backdrop of literally thousands of distant Milky Way stars



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

M27 was the first planetary nebula ever discovered. The term "planetary nebula" is based on the nebula's round, planet-like appearance when viewed through smaller telescopes. The nebula results from an old star that has shed its outer layers in a glowing display of color. In Hubble's image, blue represents oxygen, green represents hydrogen, and red indicates sulfur and nitrogen.



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

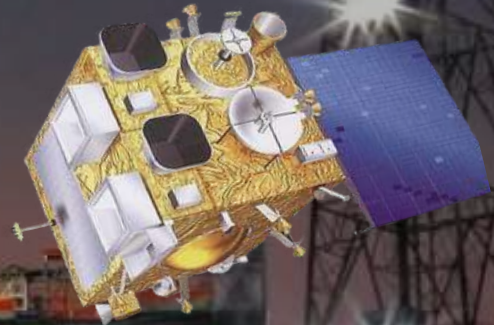
ROCKET LAUNCHES IN NOVEMBER 2023

INSAT-3DS

INSAT-3DS is a meteorological, data relay, and satellite-aided search and rescue satellite developed by the ISRO and will be launched successfully on 01 NOVEMBER 2023 using a GSLV MK3 launch vehicle from SHAR SRRIHARIKOTA.

It is an Indian weather satellite built by the Indian Space Research Organization and operated by ISRO as part of the Indian National Satellite System.

It provides meteorological services to India using a 6-channel imager and a 19-channel sounder, as well as search and rescue information and message relays for terrestrial data collection platforms. The satellite will be a follow-up to INSAT-3DR.



The satellite has many new technology elements like star sensor, micro stepping Solar Array Drive Assembly (SADA) to reduce the spacecraft disturbances and Bus Management Unit (BMU) for control and telecom and telemetry function.

It also incorporates new features of bi-annual rotation and Image and Mirror motion compensations for improved performance of the meteorological payloads.

The mission goal is stated as "to provide an operational, environmental & storm warning system to protect life & property and also to monitor earth's surface and carryout oceanic observations and also provide data dissemination capabilities."

THE MOON GOD AWAKENS (QPS-SAR-5)

MISSION OVERVIEW

QPS-SAR-5 is a synthetic-aperture radar (SAR) satellite that will join a constellation after QPS-SAR-6 is already in orbit. IQPS's satellites are small, high-performance SAR satellites that use a lightweight, large, stable antenna to collect high-resolution images of Earth, even through clouds and adverse weather conditions.

MISSION TYPE-EARTH SCIENCE

ORBIT-LEO

LAUNCH SITE- ONENUI STATION, MAHIA PENINSULA, NEW ZEALAND

Rocket Lab is an American aerospace manufacturer with a wholly owned New Zealand subsidiary. The company develops lightweight, cost-effective commercial rocket launch services. The Electron Program was founded on the premise that small payloads such as CubeSats require dedicated small launch vehicles and flexibility not currently offered by traditional rocket systems. Its rocket, the Electron, is a lightweight rocket and is now operating commercially. Electron currently launches from only Mahia Peninsula in New Zealand however they are currently looking into developing a facility in the US.

Electron is a two-stage orbital expendable launch vehicle (with an optional third stage) developed by the American aerospace company Rocket Lab. Electron is a small-lift launch vehicle designed to launch small satellites and CubeSats to sun-synchronous orbit and low earth orbit. The Electron is the first orbital class rocket to use electric-pump-fed engines, powered by the 9 Rutherford engines on the first stage.

ENGINES RUTHERFORD

The Rutherford is a small (25cm Dia. 35kg) liquid propellant rocket engine designed by aerospace company Rocket Lab. Ten Rutherford engines are used on Rocket Labs Electron rocket, nine for the first stage, and one vacuum-optimized version for the second stage. It is fueled by refined kerosene (RP-1) mixed with liquid oxygen(LOX).

RUTHERFORD VACUUM

The Rutherford Vacuum-optimized is a small liquid propellant rocket engine with a longer nozzle than the sea-level version, designed by aerospace company Rocket Lab. Ten Rutherford (sea-level engines are used on Rocket Labs Electron rocket, nine for the first stage, and one vacuum-optimized version for the second stage. It is fueled by refined kerosene (RP-1) mixed with liquid oxygen(LOX).





Resurs-P No. 4

Resurs-P[4] (is a series of Russian commercial Earth observation satellites capable of acquiring high-resolution hyperspectra (HSI), wide-field multispectral (MSI), and panchromatic imagery. The projected release date is presently set for November 2023

Imagery collected by Resurs-P satellites are used by the Russian Ministries for map making, environmental control, agricultural monitoring, hydrology, measuring soil salinity, and searching for potential oil or mineral deposits. The Russian Ministry of Defense also used the satellite for military purposes to include surveying terrain in support of operations in Syria.

A Roscosmos Soyuz-2 rocket will launch the Resurs-P 4 mission from the launch site of LC-31/6, Baikonur Cosmodrome, Kazakhstan. Soyuz-2 is the 21st-century version of the Russian Soyuz rocket. In its basic form, it is a three-stage carrier rocket for placing payloads into low Earth orbit. The 2.1b version adds an upgraded engine (RD-0124) with improved performance to the second stage.

PAYLOADS:

Resurs-P4's primary payload is the **Geoton-L1 high-resolution MSI imager** with a 38 km swath (at 475 kilometer altitude), 1.0 meter panchromatic resolution, and 3–4 meter color resolution using push-broom scanning. Geoton-L1 MSI collects visible (VIS) and near-infrared (NIR) light in six wavebands

KShMSA consists of a control unit, high-resolution camera (ShMSA-VR), and medium resolution camera (ShMSA-SR). Both cameras, developed by NPP Opteks, have six spectral channels, five multispectral channels across the visible and NIR spectra and one panchromatic (PAN)

The **High-resolution** camera collects over a 96 kilometer swath (at 475 kilometer altitude) using a P-200 lens with a relative aperture of 1:3 and a focal length of 200 millimeters.

The **Medium-resolution** camera collects over a 480-kilometer swath (at 475-kilometer altitude) using a TM-40 lens with a relative aperture of 1:4 and a focal length of 40mm.

GSA collects in 216 spectral channels with a spectral resolution between 5–10 nanometers and a spatial resolution of 30 meters over a 30 kilometer swath (all at nadir and 475 kilometer altitude) at 14 bits per pixel. The spectral range of GSA is between 0.4 μm and 1.1 μm which spans the visible spectrum and nearly half of the near-infrared spectrum.

LONG MARCH 7A

China, known for its relentless pursuit of space exploration, achieved another milestone on Friday night with the successful launch of a **Long March 7A** carrier rocket. The event took place at the **Wenchang Space Launch Center** in Hainan province and marked China's 51st rocket launch of the year.

The China Aerospace Science and Technology Corp., a state-owned conglomerate, officially announced the launch, detailing that the rocket took off at precisely 10:54 pm. The primary objective of this mission was to deploy an experimental satellite known as the Communication Technology Demonstrator 10 into a designated orbit.

The Communication Technology Demonstrator 10, developed by the Shanghai Academy of Spaceflight Technology, has a critical role to play in the advancement of multi-band, high-speed satellite communication technologies. This satellite will be instrumental in verifying and improving these technologies, contributing to the continued progress of China's space program.

The Long March 7A rocket, designed by the China Academy of Launch Vehicle Technology, is an impressive piece of engineering with a liftoff weight of 573 metric tons and a core-stage diameter of 3.35 meters.

One of its remarkable capabilities is the ability to transport a 7-ton spacecraft to a geosynchronous transfer orbit. This successful mission was the fifth for the Long March 7A rocket, further solidifying its reliability and importance in China's space endeavors.

China's commitment to space exploration is evident through its frequent rocket launches and technological advancements. As the nation continues to invest in its space program, it is likely that we will witness even more remarkable achievements in the years to come.

The successful deployment of Communication Technology Demonstrator 10 is just one of many steps on China's journey towards becoming a major player in the global space industry.

SpaceX Launches - November 2023

USSF-52

Launch Date- To be announced..

To be launched from:

LC-39A, Kennedy Space Center, Florida, USA

SLC-6, Vandenberg SFB, California, USA

The first competitively won Air Force mission for Falcon Heavy. SpaceX's \$130 million Falcon Heavy bid beat ULA's Delta IV Heavy. Falcon Heavy is a partially reusable heavy-lift launch vehicle designed and manufactured by SpaceX.

It is derived from the Falcon 9 vehicle and consists of a strengthened Falcon 9 first stage as the center core with two additional Falcon 9-like first stages as strap-on boosters. Falcon Heavy is currently the 2nd most powerful operational rocket behind SLS. (Image Credits: SpaceX)

Liftoff Thrust: 22,819 kN

Payload to LEO: 63,800 kg

Payload to GTO: 26,700 kg

Stages: 2

Strap-ons: 2

Rocket Height: 70.0 m

Fairing Diameter: 5.2 m

Fairing Height: 13.0 m

About SpaceX

Space Exploration Technologies Corp., or SpaceX, is an American aerospace manufacturer and space transport services company headquartered in Hawthorne, California. It was founded in 2002 by entrepreneur Elon Musk with the goal of reducing space transportation costs and enabling the colonization of Mars.

SpaceX operates from many pads on the East Coast of the US. They operate from SLC-40 at Cape Canaveral Space Force Station and historic LC-39A at Kennedy Space Center. They also operate from SLC-4E at Vandenberg Space Force Base, California, usually for polar launches. Another launch site is being developed at Boca Chica, Texas.

NOVA-C IM-1



The Intuitive Machines 1 (IM-1, TO2-IM) mission objective is to place a lander, called Nova-C, on the crater rim of Malapert A near the south pole of the Moon. The Launch is currently scheduled for no earlier than 15 November 2023.

After launch on a SpaceX Falcon 9 from Cape Canaveral. The Nova-C spacecraft will go into a 185 x 60,000 km Earth orbit, followed by a translunar injection and a maneuver to put it in a 100 km lunar orbit. The lander will land on the Moon on the rim of Malapert A crater near the south pole. The lander is capable of operating for about 14 Earth days in sunlight.

The commercially built lander will carry five NASA payloads and commercial cargo. The scientific objectives of the mission include studies of plume-surface interactions, radio astronomy, and space weather interactions with the lunar surface. It will also be demonstrating precision landing technologies and communication and navigation node capabilities. IM-1 was selected through NASA's Commercial Lunar Payload Services (CLPS) initiative, in which NASA contracts with a commercial partner, in this case Intuitive Machines, that provides the launch and lander.

The Nova-C Lander is a hexagonal cylinder, 4.0 meters tall and 1.57 meters wide, on 6 landing legs with a launch mass of 1908 kg. It is capable of carrying approximately 100 kg of payload to the surface. It uses solar panels to generate 200 W of power on the surface, using a 25 amp-hr battery and a 28 VDC system. Propulsion and landing use liquid methane as fuel and liquid oxygen as an oxidizer powering a 3100 N main engine mounted on the bottom of the lander. Communications are via S-band.

The scientific payload includes the Laser Retro-Reflector Array (LRA), Navigation Doppler Lidar for Precise Velocity and Range Sensing (NDL), Lunar Node 1 Navigation Demonstrator (LN-1), Stereo Cameras for Lunar Plume-Surface Studies (SCALPSS), and Radio wave Observation at the Lunar Surface of the photoElectron Sheath (ROLSSES). In total there are five NASA and four commercial payloads planned.

ASTRANIS BLOCK 2 MISSION

November, 2023

Rocket: Falcon 9 Block 5

Liftoff Thrust: 7,607 kN

Payload to LEO: 22,800 kg

Payload to GTO: 8,300 kg

A SpaceX Falcon 9 will launch 4 MicroGEO satellites for Astranis. The satellites are designed to be much smaller than typical GEO sats and are therefore deployed closer to GEO, cutting down on the time between deployment and operation. Of the four satellites, one will provide broadband access to Peru through Latin American telecom company Groupon Andesat, two will be leased to Anuvu to provide internet connectivity to airplanes and cruise ships, and the final customer's identity has not been revealed.

Astranis Space Technologies Corp. is an American company specializing in geostationary communications satellites. In 2018, Astranis launched DemoSat-2, a prototype 3U cubesat. The launch aimed to test Software-Defined Radio (SDR) technology for future larger communications satellites. The company publicly disclosed its projects in March 2018, following a funding round that was aimed at the development of geostationary communications satellites.

In January 2019, Astranis initiated a commercial program with Pacific Dataport, Inc. to increase the satellite internet capacity in Alaska. A 350 kg satellite was launched on April 30, 2023, as part of a multi-satellite payload.

On January 12, 2018, Astranis launched its first satellite, "DemoSat 2", using an Indian PSLV-XL rocket. The satellite was a 3U cubesat measuring 10 cm x 10 cm x 30 cm and weighing less than 3 kg. It carried a prototype of the company's software-defined radio.

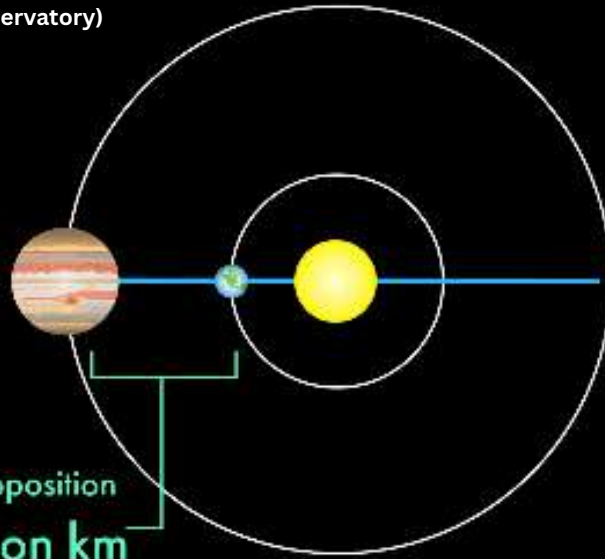
In 2019, Astranis leased its first MicroGEO spacecraft to Pacific Dataport, Inc., a subsidiary of Microcom. The satellite, named Arcturus, initially had an anticipated launch date in early 2022, which was later delayed to April 2023. After the launch, the company confirmed successful communication with the satellite and hardware deployment. Subsequent tests showed the spacecraft could deliver up to 8.5 Gbps, compared to its design specification of 7.5 Gbps.

***Note: Launch dates of the missions are scheduled to be launched in November 2023 but may subject to change.**

ASTRONOMICAL EVENTS - NOVEMBER 2023

JUPITER AT OPPOSITION

(Image Credit: Lowell observatory)



Jupiter at opposition
591 million km

BEST DAY
TO OBSERVE
JUPITER

What Is Opposition?

“Opposition occurs when the Sun, Earth, and planet lie along a straight line with the Earth in the middle,” thus putting the Sun and planet on opposite sides of the Earth, hence the term ‘opposition’. This means that the planet is as close to the Earth as possible and will appear as big and as bright as it can ever get. This is a great time to take a look and discover Jupiter in opposition to yourself. During Jupiter’s opposition, Earth will pass between Jupiter and the Sun, and the proximity will make Jupiter appear larger in the sky. On the day of opposition, Jupiter rises when the Sun sets.”

Some of the best times to see planets in the night sky occur when they are at opposition. During opposition, the planet appears at its most prominent and brightest, and it is above the horizon for much of the night. For stargazers and astrophotographers, it’s an ideal time to view and photograph the superior planets. Planetary oppositions for Jupiter, Saturn, Uranus, and Neptune occur almost every year, as Earth’s much faster orbit passes between these planets and the Sun.

When to watch: On Nov.3, Jupiter is generally closest to Earth around opposition, and on that day, its distance will be approximately four astronomical units from Earth.

Opposition constellation: Aries

Brightness at opposition: With a magnitude of -2.9, Jupiter will shine as the 4th-brightest object in the sky, after the sun, the moon, and the planet Venus.

Size at opposition (as seen through a telescope): 49.45 arcseconds across.

Through binoculars (anytime): Jupiter reveals a bright disk. If you look closely, you’ll see several of its four Galilean moons appearing as pinpoints of light, arrayed in a line that bisects the giant planet.

URANUS AT OPPOSITION

Uranus will be high in the sky throughout October and November, but it will be in its closest and most visible position when it enters opposition. When a planet enters opposition, it's directly across from the Sun, on the same side of our star as the Earth. "Perigree" is the term for when a planet makes its closest approach to Earth. While "apogee" is defined as when a planet is on the other side of the Sun, i.e., as far from Earth as possible.

When and where to watch: Uranus is theoretically visible to the unaided eye (assuming you have good eyesight) and in a dark sky. The planet is easily visible in good binoculars or a telescope. By the time of its November 13 opposition, Uranus is rising in the east at sunset and is visible all night. It'll remain in the evening sky through April of 2024.

Opposition for Uranus: On November 13, 2023, at 10:30 p.m.

Brightness at opposition: With a magnitude of +5.6, the seventh planet shine at its brightest for 2023 and will have a diameter of 3.7 arcseconds. Uranus will be brightest in 2023 from Oct. 11 to Dec. 17.

Distance from Earth: At its least distance from Earth for 2023, i.e., approx. 18.6 a.u.

Constellation: Uranus is in front of the constellation Aries.

Through a telescope, Uranus appears as a tiny, greenish disk 3.7 arcseconds across. Look for up to four moons of Uranus as well.

How often is Uranus in opposition?

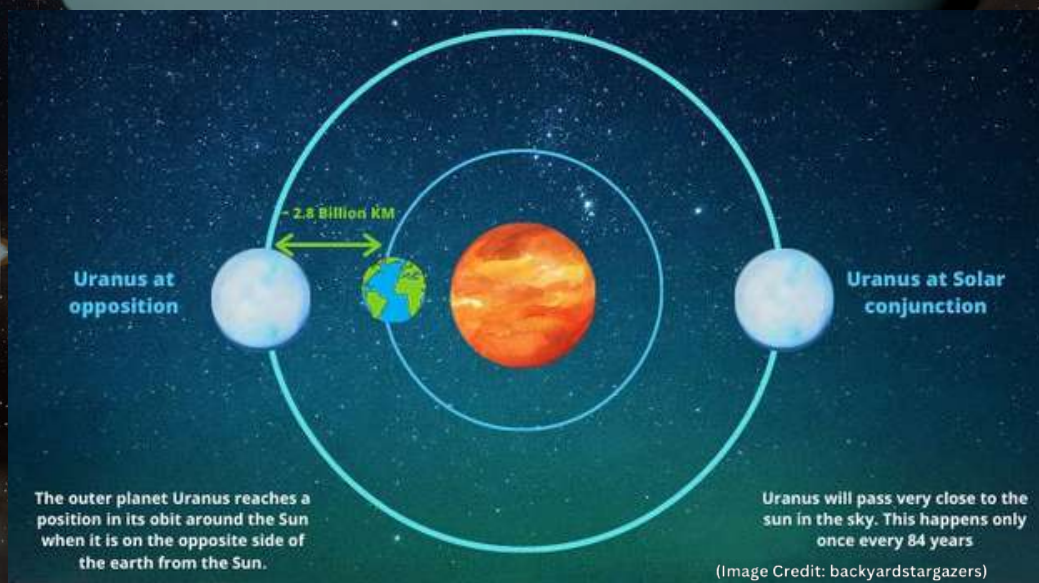
Uranus is the seventh planet from our sun. A year on Uranus is 84.4 Earth-years long. Because Uranus's orbit around the sun is so gigantic and because Earth whips around the sun so quickly in comparison, Uranus's opposition date falls about four days later each year.

2022 Uranus opposition – November 9

2023 Uranus opposition – November 13

2024 Uranus opposition – November 16

2025 Uranus opposition – November 21



LEONID METEOR SHOWER

Comet 55P/Tempel-Tuttle is a small comet with its nucleus measuring only about 2.24 miles (3.6 kilometers) across. It takes Tempel-Tuttle 33 years to orbit the sun once. The Tempel-Tuttle last reached perihelion (closest approach to the sun) in 1998 and will return again in 2031.

The pieces of space debris that interact with our atmosphere to create the Leonids meteor shower originate from the comet "Tempel-Tuttle". This usually weak annual meteor shower takes place each November, and peaks mid-month. When comets come around the sun, the dust they emit gradually spreads into a dusty trail around their orbits. Every year the Earth passes through these debris trails, which allows the bits to collide with our atmosphere where they disintegrate to create fiery and colorful streaks in the sky.

Every 33 years, or so, the Leonid meteor shower becomes a meteor storm. A "meteor storm" is defined as having at least 1,000 meteors per hour. Viewers in 1966 experienced a spectacular Leonid storm wherein thousands of meteors per minute fell through Earth's atmosphere during a 15-minute period. There were so many meteors seen that they appeared to fall like rain. The last Leonid meteor storm took place in 2002. Generally, comets are usually named for their discoverer(s) or for the name of the observatory/telescope used in the discovery. And since both Ernst Tempel and Horace Tuttle discovered this comet it is named after them. While the letter "P" indicates that Tempel-Tuttle is a periodic comet. Periodic comets are the ones which have an orbital period of less than 200 years.

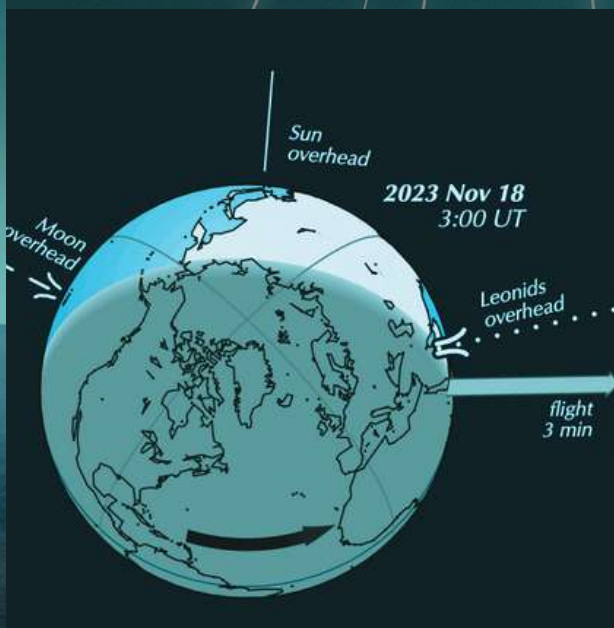
Predicted peak: For November 18, 2023, at 12:00 IST

Overall duration of shower: Nov.6 - Nov.30

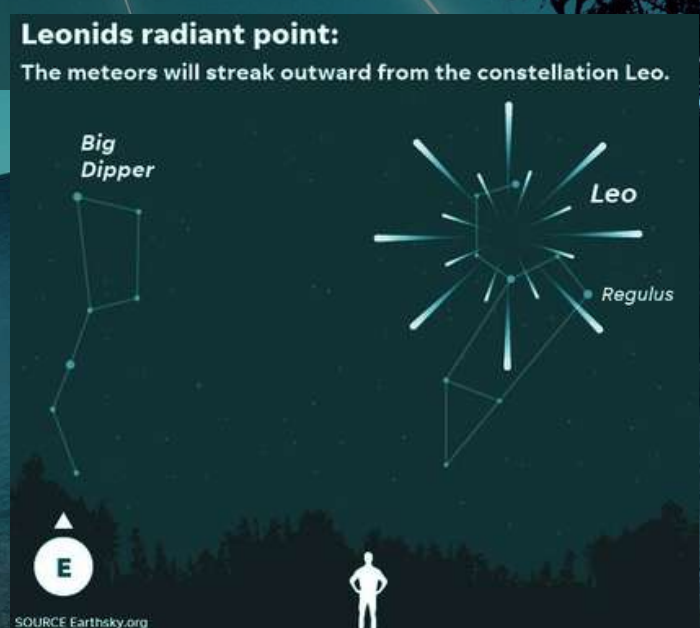
Radiant: The radiant is highest in the sky around 07:00 IST

Nearest moon phase: 25% Illuminated waxing crescent Moon.

Expected meteors at peak, under ideal conditions: Upto 15 meteors are visible every hour.



(Image Credit & Copyright: Earthsky.org)



(Image Credit & Copyright: Earthsky.org)

CONJUNCTIONS FOR THE MONTH

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

Conjunction of Moon and Venus

On November 9th, the Earth's twin sister Venus will meet the 25-day-old Moon in the constellation Virgo. The apparent distance between the two objects will be $4^{\circ}35'$ in the late night. They will be in the Eastern direction. Venus is at a magnitude of -4.34 and the Moon has a magnitude of -8.42 .



Place: New Delhi / Date: 9th November / Time: 4:30 a.m.



Place: New Delhi / Date: 20th November / Time: 09:34 p.m.

Conjunction of Moon and Saturn

On November 20th, the ringed planet Saturn will meet the 7-day-old Moon in the constellation Aquarius. The apparent distance between the two objects will be $2^{\circ}55'$ in the late night. They will be in the South-western direction. Saturn is at a magnitude of 0.82 and the Moon has a magnitude of -10.6 .

Conjunction of Moon and Jupiter

On November 25th, the gaseous giant Saturn will meet the 12-day-old Moon in the constellation Aries. The apparent distance between the two objects will be $2^{\circ}55'$ in the late night. They will be in the Eastern direction. Jupiter is at a magnitude of -2.8 and the Moon has a magnitude of -12.7 .



Place: New Delhi / Date: 25th November / Time: 06:38 p.m.

STUDENT'S CORNER

The Hubble Space Telescope: A Window to the Cosmos

**Nikhilesh B
Iastronomer**

Since its launch on April 24, 1990, the Hubble Space Telescope (HST) has been a remarkable testament to human ingenuity and scientific curiosity. Orbiting 547 kilometers above the Earth's surface, this iconic telescope has provided us with breathtaking images, groundbreaking discoveries, and a deeper understanding of the universe. The Hubble Space Telescope has revolutionized astronomy, delivering unparalleled insights into the cosmos, and it continues to shape our perception of the universe to this day.

The Hubble Space Telescope was named after the renowned American astronomer Edwin Hubble, who made pioneering contributions to the understanding of the expansion of the universe. Its development began in the 1970s, and it was a joint effort between NASA and the European Space Agency (ESA). The primary mirror, with a diameter of 2.4 meters, was ground to an unprecedented level of precision. However, upon its launch, it was discovered that a manufacturing error had caused a spherical aberration, affecting the telescope's image quality. This could have been a catastrophic blow to the mission, but a heroic effort in 1993 successfully corrected the issue by installing corrective optics.

The HST has been instrumental in exploring various facets of our universe. Its location above Earth's atmosphere eliminates the distortion and absorption of light caused by the atmosphere, allowing it to capture images with unparalleled clarity. The telescope observes the universe in ultraviolet, visible, and near-infrared light, enabling astronomers to study celestial objects and phenomena across a broad spectrum.

The HST has made numerous groundbreaking discoveries, including determining the rate of the universe's expansion, providing evidence for the existence of dark matter, and identifying the presence of exoplanets in distant star systems. It has played a vital role in studying the formation and evolution of galaxies, shedding light on the birth and death of stars, and uncovering the secrets of distant quasars. Its ability to observe objects near and far, young and ancient, has transformed our understanding of the universe's history and dynamics.

The Hubble Space Telescope has transcended its initial challenges to become a beacon of scientific discovery and a symbol of human achievement. It has not only expanded our understanding of the universe but has also fostered a sense of wonder and curiosity among people from all walks of life. The HST's legacy will continue to inspire future generations of scientists, educators, and space enthusiasts, reminding us of the limitless potential of human exploration and our quest to uncover the mysteries of the cosmos. The Hubble Space Telescope, our window to the universe, continues to shine brightly, unveiling the beauty and complexity of the cosmos.

CELESTIAL EVENTS IN NOVEMBER 2023

Navya Kiran
IAstronomer

This year has been full of magical and very remarkable celestial events, including meteor showers and moon occurrences. Each month has been a magical one, and now, let's dive into the month of November and explore the celestial occurrences happening in this month.

1. JUPITER AT OPPOSITION (NOVEMBER 3)

On this day, Jupiter's face would be fully illuminated by the sun as Jupiter would be facing the sun, and we would be able to see it so brightly only at this time of the year. This would be the best opportunity to take its pictures. It would be best visible by a telescope, but you would also be able to see it from binoculars and the naked eye.



2. TAURIDS METEOR SHOWER (NOVEMBER 4,5)

The Taurids is a long-running meteor shower producing 5 to 10 meteors per hour. It happens every year between the range of September 7th and December 10th and this year, it is going to happen on the night of November 4th and the morning of November 5th. The second quarter moon may block some meteors, but you still would be able to catch a few good meteors after midnight at a dark location, far from city lights. These meteors will also put the constellation Taurus into view, and we would be able to see it from the naked eye.



3. NEW MOON (NOVEMBER 13)

The moon will be on the same side of the earth as the sun and will not be visible. This phase will occur at 9:28 UTC. It will be the best time of the month to catch some galaxies and constellations since there will be no moonlight to interfere.



4. URANUS AT OPPOSITION (NOVEMBER 13)

This will be the best time of the year to view Uranus as it will be facing the Earth and will be fully illuminated by the sun. We would be able to see it only as a blue dot from the naked eyes and small telescopes. A powerful telescope would give a much better view.



5. LEONIDS METEOR SHOWER (NOVEMBER 17 AND 18)

This is an average meteor shower, producing up to 15 meteors per hour at its peak. This shower is unique as it has a cyclonic season in which we experience 100 showers per hour at one go. This happens after 33 years. The last occurred in 2001. This happens between November 6 and 30 and this year it will happen between the night of November 17 and the morning of November 18. The crescent-shaped moon will leave the sky dark, dark enough to get an amazing view of the showers. The meteors will radiate the constellation Leo, but they can appear anywhere in the sky.



6. FULL MOON (NOVEMBER 27)

The moon will be on the opposite side of the earth and will be fully illuminated by the sun. This phase occurs at 09:17 UTC. This full moon was named by the Native American tribes as the beaver moon because this was the time to set the beaver traps before the swamps and the rivers froze. It is also known as Frosty Moon or Dark Moon.

In Search of Intelligence

By Sourajit Mandal
Club Student

We, humans are curious creatures. We are profound in our search for the "truth" of our creation and the mystery of life itself. We have also constantly wondered about the existence of other possibilities of life in the cosmos since our very beginning. With the many huge and extraordinary advances in our technology we may be closer to finding the answer to our questions than ever before. We have been sending signals to outer space for over 50 years in hope for extraterrestrial intelligent life to receive it and know about our existence.

At this point our own radio signals have travelled over 100 light years in all directions and has crossed 75 star systems. We have all our eyes and ears towards the sky for many years now. It's extremely likely to have found something by now. But, we haven't found anything.

This puzzling situation is known as the Fermi Paradox, named after the physicist Enrico Fermi who asked "Where is everybody?" in 1950. The Fermi Paradox is a conflict between the high probability of extraterrestrial intelligence and the lack of evidence for it. There are many possible solutions to this paradox, such as:

1. The Rare Earth hypothesis: This suggests that life is very rare in the universe, and that Earth has some unique features that make it suitable for life.
2. The Great Filter: This proposes that there is some barrier that prevents most civilizations from reaching a high level of technological development, such as self-destruction, environmental catastrophe, or lack of resources.
3. The Zoo hypothesis: This implies that extraterrestrial intelligence exists, but they are deliberately hiding from us or observing us without interfering, for ethical, scientific, or cultural reasons.
4. The Prime Directive: This is similar to the Zoo hypothesis, but it assumes that there is a universal law or agreement among advanced civilizations to avoid contact with less developed ones, to protect their natural evolution.

These are just some of the many possible explanations for the Fermi Paradox. However, none of them are conclusive or universally accepted. The search for extraterrestrial intelligence continues, and we may one day find the answer to this fascinating question. It may also be possible that we are looking at the wrong signals altogether. There is no definitive answer to what kind of signals we should look for in the search for extraterrestrial life. Different types of signals may have different advantages and disadvantages, depending on the distance, direction, and intention of the sender.

One type of signal that has been widely used in the search for extraterrestrial intelligence (SETI) is radio waves. Radio waves are electromagnetic waves that can travel long distances across space and penetrate through interstellar dust and gas. They are also relatively easy to generate and detect with existing technology. However, radio waves also have some drawbacks. They can be affected by interference from natural sources, such as pulsars, or artificial sources, such as satellites and radars. They can also be diluted or distorted by the Doppler Effect, which changes the frequency of the waves depending on the relative motion of the source and the observer.

Another type of signal that has been proposed for SETI is optical or infrared pulses. These are short bursts of light that can be modulated to encode information. They have the advantage of being more directional and less affected by interference than radio waves. They can also be detected with telescopes smaller than radio dishes. However, optical or infrared pulses also have some challenges. They can be obscured by atmospheric absorption or scattering, which reduces their brightness and clarity. They can also be confused with natural phenomena, such as stars or meteors.

A third type of signal that has been suggested for SETI is gravitational waves. These are ripples in space-time that are produced by massive objects accelerating or colliding, such as black holes or neutron stars. They have the benefit of being unaffected by any intervening matter or radiation, and carrying information about the nature and origin of the source. However, gravitational waves also have some limitations. They are extremely difficult to generate and detect with current technology, requiring very sensitive instruments and large-scale collaborations. They are also very rare and unpredictable, making it hard to establish a reliable communication channel.

These are just some examples of possible signals that could be used for SETI. There may be other types of signals that we have not yet considered or discovered, such as neutrinos, dark matter, or quantum entanglement. Ultimately, the best signal for SETI may depend on the characteristics and preferences of the extraterrestrial civilization that we are trying to contact, or that is trying to contact us. We may need to use a combination of different signals and methods to increase our chances of finding and communicating with alien life.

Until then, we can only wonder and imagine what lies beyond our planet.

Meteoroids, Meteors & Meteorites

Vetrivel Thirunavukkarasu
Astronomer

Meteoroids, Meteors and Meteorites are all related to the 'shooting Star' we sometimes see streaking across the night sky. We call the same celestial objects by different names, depending on where they are.

What Are Meteoroids and Meteors:

When one asteroid bangs into another, it may break into pieces- these pieces are called meteoroids. A meteoroid is a small rocky or metallic natural object that enters Earth's atmosphere. When a meteoroid falls to Earth with great speed, there is a resistance [or drag] of the air on the rock, which heats it up. As it falls and comes closer to Earth and passes through our atmosphere, it starts to vaporize [becomes gaseous], and a streak of light is seen, which is the hot air left behind the burning piece of rock. This is a meteor, a strike of light in the sky. Meteors are not really stars, but due to their appearance and streaks of light, they are also known as 'shooting stars'! Meteors are something confused with comets due to the light they both seem to emit. However, they are different from comets. Comets are made of ice and dust, not rock.

Meteorites:

Most meteoroids get vaporized by the time they enter the Earth's atmosphere, however some of these rocks do not disintegrate. Instead, they reach the surface of Earth and are known as meteorites. Most meteorites are the size of small pebble, but some rare ones can also be the size of a large boulder. Since meteorites originate from asteroids, they are useful to scientists, who can gain more information about these ancient rock-like objects.

In Real Life:

The Hoba is the largest meteorite found on the Earth. Found in 1920 in Namibia, Africa, it weighs approximately 53,977 kilograms! It is an ataxite, an iron meteorite which contains more than 16% nickel.

It's Raining Meteors!

When many meteors rain to the Earth at the same time, they are referred to as a meteor shower. Meteors fall at the same speed which is 32 times faster than that of a speeding bullet!

A meteor shower is generally named after the constellation from which it appears to be coming. Scientists have estimated that there are nearly 21 meteor showers that occur annually. Listed below are some of the major meteor showers, their constellations, and the months when they can be viewed.

Quadrantids: [Originally Quadrans Muralis, now Bootes constellation]: December/ January.

Lyrids: [Lyra constellation]: April.

Perseids: [Perseus constellation]: August.

Orionids: [Orion constellation]: October.

Leonids: [Leo constellation]: November.

Geminids: [Gemini constellation]: December.

Isn't It Amazing!

More than 45,000Kg of space debris falls on the Earth every day. Meteors enter Earth's atmosphere at high speeds ranging from over 4,000Km per second to the unimaginable to the human mind!

In the year 1908, an object as large as a residential building fell from the sky and exploded in the air above Siberia. Known as the Tunguska event, named after a river, this object razed trees in the spanning nearly 2,072Km. Luckily, no human being or creature was killed or hurt, but it is one of the most significant events of this kind to ever be recorded in human history. Scientists are not sure of the object's origins and whether it was a comet or an asteroid.

Dark Matter: The Cosmic Enigma

Nikhilesh B
Astronomer

Dark matter is one of the most perplexing and mysterious entities in the universe. Unlike ordinary matter, dark matter doesn't emit, absorb, or reflect light, making it invisible to all forms of electromagnetic radiation. This enigmatic substance is believed to account for approximately 27% of the universe's total mass and energy, yet its nature remains largely unknown. In this essay, we will explore the concept of dark matter, its significance in the cosmos, and the ongoing efforts to unravel its secrets.

Dark matter's existence was first postulated in the 1930s by Swiss astronomer Fritz Zwicky when he noticed that galaxies in the Coma Cluster were moving faster than they should based on visible matter alone. He hypothesized the presence of "dunkle Materie," or dark matter, to explain this discrepancy. Since then, numerous pieces of evidence have emerged supporting the existence of dark matter.

One of the most compelling pieces of evidence comes from the observation of galaxy rotation curves. In a galaxy, stars closer to the center should move faster than those farther away due to the gravitational pull of the central mass. However, these galaxies rotate at nearly constant speeds, suggesting the presence of invisible matter exerting an additional gravitational force. Similarly, gravitational lensing—the bending of light by gravity—indicates the presence of unseen mass in galaxy clusters.

Dark matter plays a vital role in shaping the cosmos. Its gravitational influence binds galaxies together in clusters, maintains the stability of galaxies, and even affects the large-scale structure of the universe. Without dark matter, the universe as we know it would look significantly different, and galaxies might not have formed or evolved in the same way.

Additionally, dark matter's role in the universe's expansion is intertwined with another mysterious phenomenon: dark energy. While dark matter's gravity acts to slow down the universe's expansion, dark energy—a repulsive force—pushes it to accelerate. Together, these two dark entities hold the balance in the cosmic dance of creation.

Despite its profound significance, the exact nature of dark matter remains elusive. Scientists have proposed various hypotheses, but none have been definitively proven. Some of the leading candidates for dark matter include weakly interacting massive particles (WIMPs), axions, and primordial black holes, but none have been directly detected or observed.

Studying the Universe

Vetrivel Thirunavukkarasu
Astronomer

All the matter and energy present everywhere, including in space, and life on Earth, is part of the mighty universe. Human beings have come a long way since ancient times when it was believed that the Sun, the Moon, and Earth were the main celestial bodies of the universe. Today, we know that Earth and the solar system are only a tiny part of the vast universe.

What Is the Universe?

Our Universe is about 13.8 billion years old. Everything that exists in time and space—including all objects, energy, over a hundred billion galaxies containing hundreds of billions of stars, the solar system, the planets, etc., are all part of what we call a universe. The universe is so vast that it really cannot be measured. We can only imagine how big it is by understanding that some celestial objects are so very far away in the universe that light traveling from them takes billions of years to reach Earth! The universe is also referred to as the cosmos. In astronomy, the cosmos is described as the entire physical universe, which is considered as one integrated whole. The word 'cosmos' comes from the Greek word, 'Kosmos' meaning 'order', 'harmony' and 'the world'. Cosmology is thus a particular field of study that combines natural science, specifically astronomy, and physics, in a joint effort to understand the physical universe as a whole. Space—on the other hand—is a limitless, three-dimensional expanse in which objects and events occur and have relative positions and directions.

What Comprises the Universe?

Our universe is full of light-emitting and light-absorbing sources. It consists of stars, galaxies, quasars, clusters of galaxies, and a complex cosmic structure. It also contains dust, neutral gas, dark matter, energy, different types of radiation, and black holes, amongst other cosmic bodies. It has vast empty spaces in between the structures.

Isn't It Amazing?

There are about a billion trillion stars in the universe. Some scientists believe that there are more stars in our universe than there are grains of sand on Earth!

More About the Universe

We know that the universe is vast and also that human beings do not really know its measure. In fact, the Milky Way galaxy, in which our solar system lies, is only one among the hundred billion galaxies that exist in the universe! The Milky Way is part of the Local Group group of over 20 or more neighboring galaxies. With extensive research, we have been able to learn more about the composition and shape of the universe.

Chemical Elements:

Matter contains chemical elements. A chemical element is any substance that cannot be further broken down into simpler substances by ordinary chemical processes. Hydrogen and helium are the main chemical components of the universe and were produced when the universe first came into existence, some other 90-odd chemical elements are created in the stars, but these make up only a small % of the overall mass of the universe. These other elements are called 'metals' by astronomers, though in ordinary usage we do not refer to elements like oxygen and carbon as metals. The quantity of 'metals' varies depending on how stars were formed in that region.

Shape Of the Universe:

Scientists have concluded that mass causes space to curve. When objects move within that curved space, they are forced to alter or change their direction. If space is curved, then the shape of the universe may be any one of the three types, spherical or saddle-shaped. How significant are these shapes to understanding the universe?

The saddle-shaped surface has [-] iver curvature. The flat surface is said to have zero curvature.

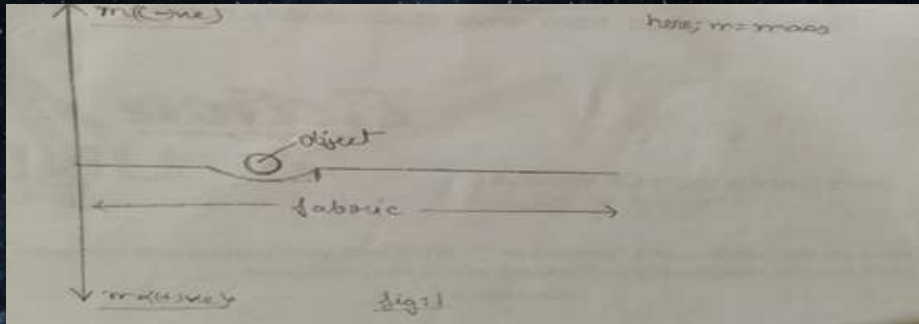
The spherical surface has [+] iver curvature. If space has [-] curvature, it means that the universe has no limit and will continue to expand forever this is called an open universe. If the space has zero curvature, then the universe has no limit and will expand forever, but the expansion rate will gradually approach zero. This is termed a flat universe. If space has [=] iver curvature, it means the expansion will eventually stop and contraction will begin. So, galaxies will stop moving away from each other and get closer. As a result, the universe will disintegrate. This is a closed universe. Recent observations show that the expansion of the universe is speeding up. This strongly implies that the universe is geometrically 'flat'. However, this still remains one of the major unexplained problems in modern cosmology.

Conceptual explanation of energy utilization with the help of Space time fabric

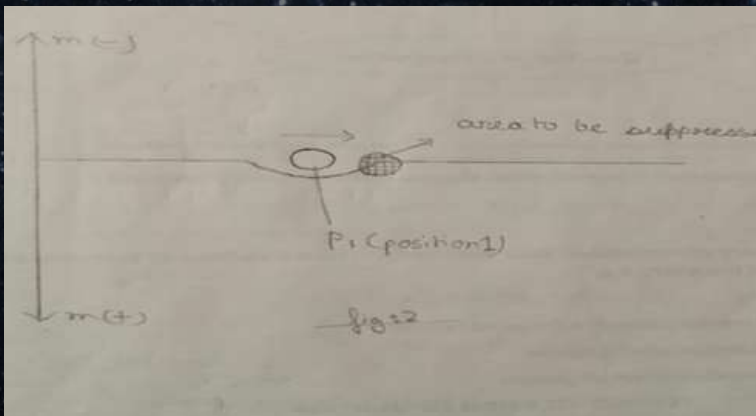
Dipanshu
Astronomer

We have been known of various celestial bodies in motion, but never we tried to find out the effects of the movement upon the space time fabric and never we tried to understand energy usage in space time fabric. This explanation will tell you about how energy is utilised to move by the representation of it in space time fabric.

Lets start with a heavy object and the space time curvature made by it. (fig:1)

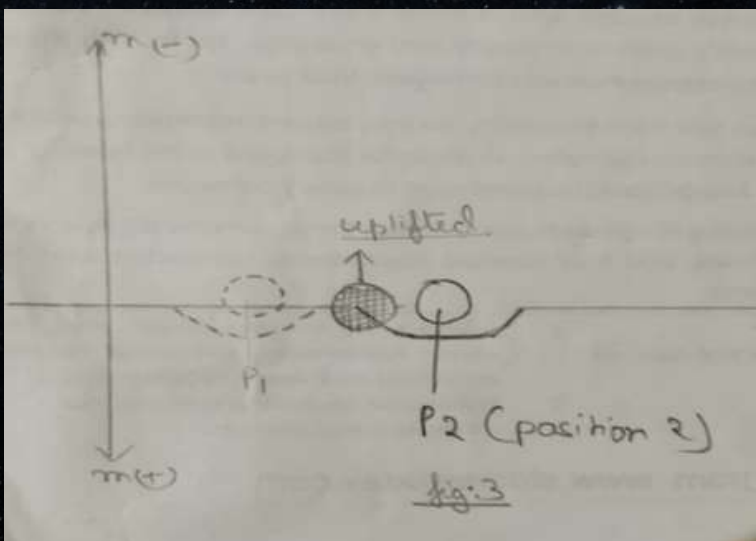


Now let the object to move. So in order to move the object, we need energy. Let the energy been supplied to it, but also the object needs to suppress the uplifted portion of fabric ahead of it. So it will use the energy supplied to suppress the fabric. (Fig:2)



Now here a big question arises that what that uplifted part of the fabric ahead of the object is?

This is non other than the inertia of the object. Let me to put this more relatable to the fabric. Here as per fig:1 we have the depth of the curvature directly proportional to the mass of the object and have the hight of the fabric to be suppressed is equal to the depth of the curvature. And we all know that inertia is nothing but the mass of an object. Therefore, we can say that the energy supplied to the object to move is nothing than the energy supplied to overcome it's inertia. But here in fig:3 we have seen that as the object moves, the suppressed portion behind of it up lifts. How does it happens? It has a simple law behind it that is law of conservation of energy. The energy supplied to suppress the fabric is been used by the fabric to uplift it self.

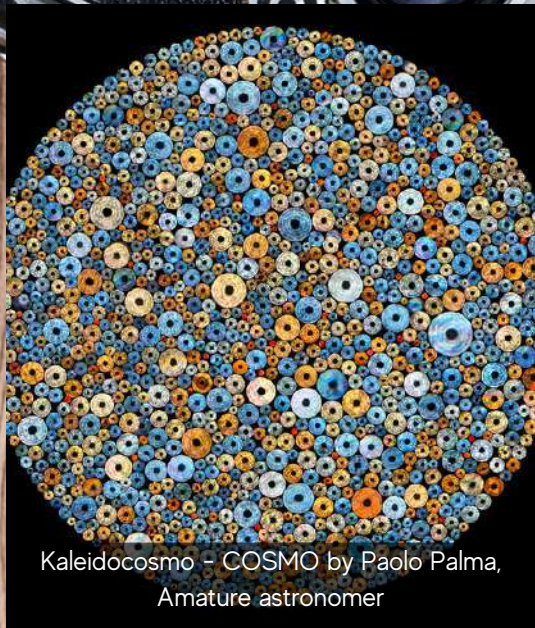


Therefore, we have seen the space time fabric representation of the utilisation of energy by an object to move in the space.

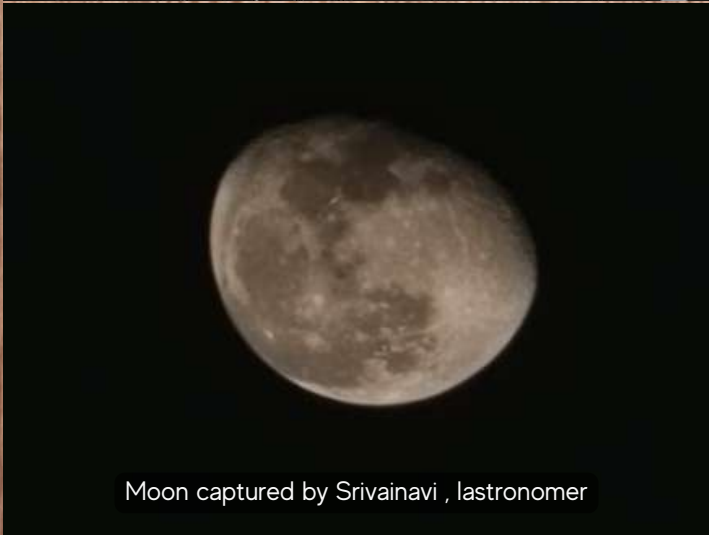
VISUAL ARTS FROM SPACE ASSOCIATED ASTRONOMERS



Celestial sky painted by Shavika Agrawal , lastronomer



Kaleidocosmo - COSMO by Paolo Palma, Amature astronomer



Moon captured by Srivainavi , lastronomer



Moon captured by Krithin Kumar ,Club student



Nebulae painted by Anshveer Goyal, lastronomer



Stars captured by Shree Viswajith S , Club Student

Happy

Marie Curie

Marie Curie (7 November 1867 – 4 July 1934) was a French-Polish physicist and chemist who conducted pioneering research on radioactivity – a term she coined. Due to her work, she became the first woman to win a Nobel Prize in 1903 and, in 1911, the first person to win two Nobel Prizes, in 1911. Till today she is the only person who has won a Noble Prize in two scientific fields, Physics and Chemistry. Born as Marya Salomea Skłodowska in Warsaw, Poland, she chose to pursue higher studies at the University of Paris. During her studies, she met Pierre Curie; the man who would become her partner in life and science. After Pierre Curie's death, in 1906, Marie Curie was the first female professor at the University of Paris. During World War 1, she built mobile X-ray units to provide X-ray services to field hospitals. She founded several institutes such as the Curie Institute in Paris and the Curie Institute in Warsaw which are major research centres today.



7 November 1867



7 November 1888

C.V. Raman

Easily recognizable by his trademark turban, Sir Chandrasekhara Venkata Raman (7 November 1888 - 21 November 1970) is the first Asian to win a Nobel Prize in a science subject. Born in Tiruchirappalli, South India, C. V. Raman showed a distinct enthusiasm for science since his childhood. On the 28th of February 1928, he, along with his student K.S. Krishnan, discovered a type of light scattering which was subsequently called Raman effect or Raman Scattering. After winning a Nobel Prize for this discovery, he became the first Indian Director of the Indian Institute of Science, founded the Indian Academy of Sciences, and established the Raman Research Institute. In 1954, C.V Raman was honoured with the first Bharat Ratna, India's highest civilian award. Nowadays, 28th February is celebrated annually as the National Science Day.

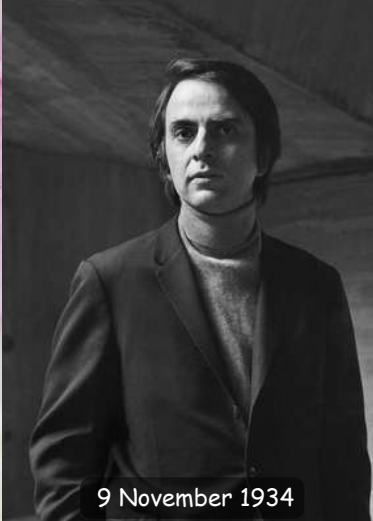
Charles Thomas Kowal

Charles Thomas Kowal (8 November 1940 – 28 November 2011) was born in Buffalo New York. He was a staff astronomer at Caltech's Mount Wilson and Palomar Mountain Observatories between 1961 and 1984, where he discovered a centaur, two of Jupiter's moons, asteroids, comets, and supernovae. In 1979, he was honoured for his contributions to Astronomy by being awarded the James Craig Watson Medal of the U.S. National Academy of Sciences. In 1980, after going through astronomical literature, Kowal made an interesting discovery when he found a 1613 drawing by Galileo Galilei that shows Neptune near Jupiter. This predated the formal discovery of Neptune in 1846. Kowal was awarded the inaugural R. R. Newton Award for Scientific History for his discovery.



8 November 1940

Birthday



9 November 1934

Carl Edward Sagan

Carl Edward Sagan (9 November 1934 – 20 December 1996) was an American astronomer who was a gifted storyteller. Professor Sagan pioneered the field of exobiology and promoted the search for extra-terrestrial intelligent life. He played a leading role in every major planetary a key figure in many planetary missions of NASA and was the man behind the Pioneer plaque and Voyager Golden Record. Additionally, he was the narrator of PBS's "Cosmos: A Personal Voyage" the most widely watched series in TV history, with 500 million viewers across 60 countries. In 1990, as Voyager 1 was reaching the outer edge of the solar system, Professor Sagan, among several others, persuaded NASA to aim the spacecraft's camera back toward Earth and take a picture. This photo, part of the family portrait of the solar system would be called the "Pale Blue Dot."

Frederick William Herschel

Frederick William Herschel's (15 November 1738 – 25 August 1822) interest in astronomy came about from his previous career: as a musician and composer. Born as Friedrich Wilhelm Herschel, in Hanover Germany, he anglicized his name upon shifting to England. Through his years of observing, he became familiar with the night sky to the point he could spot an object that was out of place. This led to his best-known discovery of Uranus as well as its two largest moons. While looking at the night sky, Herschel recorded and published his observations in several catalogues. These catalogues became the basis for the New General Catalogue that is used by modern-day astronomers. Of the 7,840 Nebulas and clusters found in the modern catalogue, 4,630 were discovered by William Herschel, his sister; Caroline Herschel, and his son; John Herschel.



15 November 1738



20 November 1889

Edwin Powell Hubble

By 1929, Edwin Powell Hubble (20 November 1889 – 28 September 1953) had expanded humanity's view of the universe. Using the findings of previous astronomers, Professor Hubble proved that many nebulae were galaxies beyond the Milky Way. Through this, he played a crucial role in establishing the fields of extragalactic astronomy and observational cosmology. While cataloging the many galaxies that litter the night sky, Hubble created a system to classify the various types of galaxies, a version of which we use today. He also provided evidence that the universe is expanding. Hubble's spirit of discovery lives on in the Hubble Space Telescope, one of the most famous telescopes in the world.

ASTROPHOTOGRAPHS BY SPACE



Full Moon captured by Mr. Deepanshu Rai ,
Star Gazing Expert, Astroport



Star trail captured by Ms. D Priyadarshini,
Educator, STEPL



Moon captured by Dr. Sachin Bahmba, CMD, SPACE



Jupiter captured by
Mr. Neeraj Ladia,
CEO, Space Arcade.

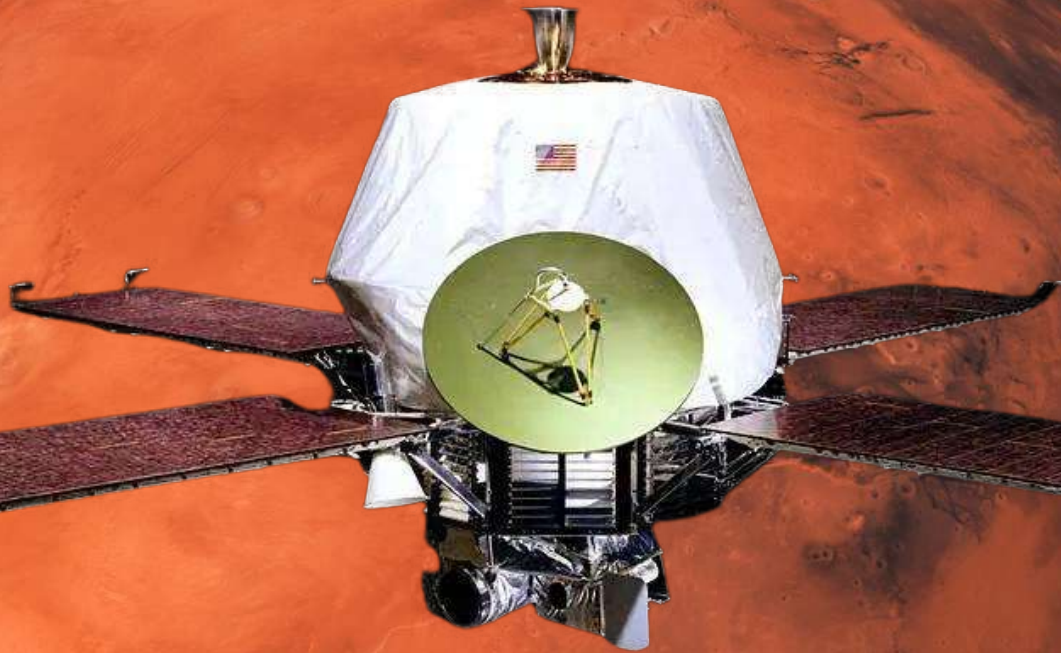
PARTIAL LUNAR ECLIPSE | 28-29TH OCTOBER 2023

BEFORE ECLIPSE 11.30PM 28.10.2023	MAXIMUM ECLIPSE 1.44AM 29.10.2023
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Partial Lunar Eclipse captured by Mr. Ranjith Kumar E,
Sr. Educator, STEPL.



Partial Lunar Eclipse captured by
Mr. Neeraj Ladia , CEO-Space Arcade.

HISTORICAL EVENTS HAPPENED IN NOVEMBER

MISSION CONTROL, WE ARE ORBITING MARS!

Five and a half months after leaving Earth's orbit, Mariner 9, part of NASA's Mariner program, entered the Martian orbit on 14 November 1971. It is one of the great early robotic missions as it was the first spacecraft to orbit another planet and one of the most influential missions of the space age.

The primary goal of the mission was to map 70% of the Martian surface within the first three months of arrival. This part of the mission started soon after Mariner 9's arrival, but a massive dust storm abode the Martian surface hid Mars' features from its camera. Once the duststorm subsided in early 1972, Mariner 9 returned spectacular images of the surface. These images transformed humanity's perception of Mars.

From the images that Marine 9 sent, there was evidence of water flowing on the planet's surface in the ancient past. Additionally, there were a lot of volcanoes. By February 1972, the spacecraft had identified over 20 volcanoes, among which one was Olympus Mons, the volcano that dwarfs all volcanoes on Earth. Another feature that the spacecraft imaged was a system of canyons that is more than 4,000 km long, 200 km wide, and 7 km deep which was later named Valles Marineris, after Mariner 9.

Throughout its mission, Mariner 9 sent 7329 images of the Martian surface to Earth. The landing site for Viking missions was selected using the photos Mariner 9.

When Mariner 9 formally concluded on 27 October 1972, it lasted longer than the projected mission lifetime of 90 days. By the end of the mission, Mariner 9 mapped 85 % of the planet's surface and collected valuable information on Mars' atmosphere. Upon mission conclusion, Mariner 9 was left in orbit around Mars.

As of November 2023, Mariner 9 is assumed to have entered the Martian atmosphere and has either burned up or crashed onto the surface.

RETURNING TO THE MOON

At 1.47 a.m., on 16th November 2022, aboard the Space Launch System (SLS) rocket, the Orion spacecraft propelled into the night sky. Five decades after the Apollo missions concluded, NASA was returning to the Moon.

Artemis I, launched from Launch Pad 39B at NASA's Kennedy Space Centre in Florida. It was the first integrated test flight of the Orion spacecraft and the SLS rocket. Artemis I was also the debut launch of SLS, the world's most powerful rocket. SLS's performance on launch met or exceeded expectations and can be used to launch a deep space rocket.

During the mission, Orion spent three weeks in space where it completed two flybys of the Moon where its closest approach was 130 km above the lunar surface. Orion's reached 432,210 km from Earth which is the furthest any lunar expedition spacecraft has travelled since Apollo 13. Artemis I was an important test for the agency before the crewed Artemis II mission.

Artemis I is the first mission of the Artemis missions where the first woman and person of colour will walk on the lunar surface. These missions will pave the way for a long-term lunar presence which will serve as a stepping stone for astronauts on their way to Mars. The main objective of Artemis I was to test the heat shield of the spacecraft before a crewed mission took place.

Artemis I concluded on 11 December 2022 when Orion splashed down in the Pacific Ocean.

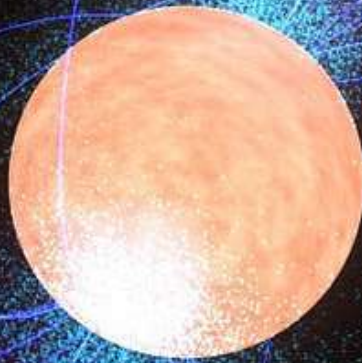


Discovery of Pulsars

In August 1967, Jocelyn Bell was looking for signs of quasars when she noticed a signal that was out of place in her data. She, and her supervisor, Anthony Hewish, dismissed the signal as a radio interference of an extraterrestrial source. However, on 28 November 1967, using a fast strip chart recorder, they resolved the signal into a series of pulses that occur every 1.337 seconds. The duo had discovered an unknown object.

In February 1967, they would publish their findings. By then, Bell would have discovered three more pulsars.

The word pulsar comes from a pulsating radio source. Pulsars are highly magnetized rotating neutron stars that emit beams of electromagnetic radiation out of their magnetic pole. Neutron stars are small, extremely dense objects that form when stars between 10 and 25 solar masses catastrophically explode. Pulsars, like all neutron stars, have a short, regular rotational position, which produces a precise interval between pulses that ranges from milliseconds to seconds. The nature of the rotation is the reason for the regular, pulsed, appearance of the emission when we observe it on Earth. This is similar to the light from a lighthouse and an observer in the distance. Most known neutron stars are observed as pulsars.



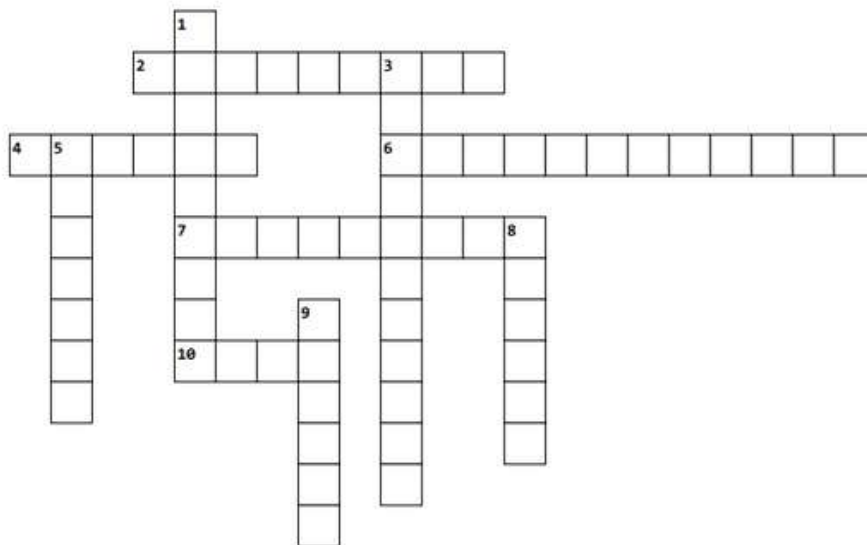
Dame Jocelyn Bell Burnell

Pulsars are crucial to understanding the nature of stars, especially exotic stars like black holes. They also have a lot of extreme physics that takes place inside them, which makes them one of the finest tools to test Einstein's theory of general relativity on a cosmic scale. Additionally, Pulsars have helped to measure the structure of the Milky Way by looking at the way the signals of the pulsar's emission are answered when they travel through denser regions of materials in space.

In 1974, Dr Antony Hewish and Sir Martin Ryle won the Nobel Prize in Physics for the role they played in the discovery of pulsars. Though Jocelyn Bell did not get recognized by the Nobel Committee, she received other awards for her role in discovering these strange stars.

TRAIN YOUR BRAIN

CROSSWORD



ACROSS

- 2. The first remote-controlled roving robot on the Moon
- 4. The Rover that discovered the ancient volcano on planet Mars is?
- 6. The Mars Rover with the nickname Percy is?
- 7. What was the first successful Mars rover name?
- 10. Name of the rover by Chinese Chang'e 3 mission to the Moon.

DOWN

- 1. The first rover to dig on Mars?
- 3. What is the name of the second rover to Mars by NASA?
- 5. Rover on the Moon by ISRO is named as?
- 8. Name of the United Arab Emirates rover to the moon is?
- 9. what was the recent Russian lunar mission that crashed on the surface of the moon?

ASTRONOMY WORD PUZZLE

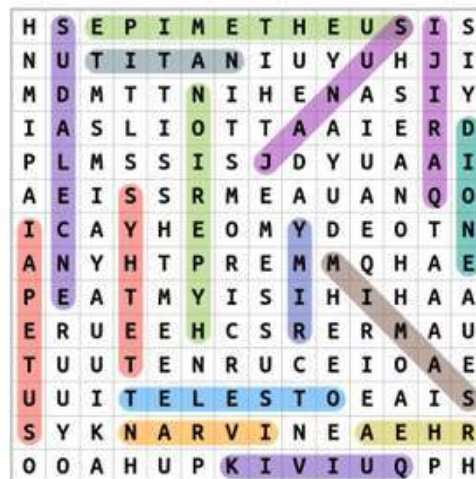
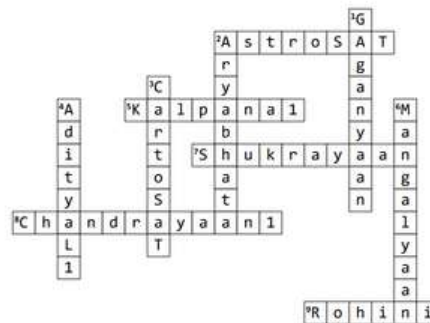
Find the names of the famous moons of Saturn Part 2 from the mixed letters and mark them.

Moons of Saturn Part 2

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

- PROMETHEUS
- ERRIAPUS
- FARBAUTI
- HATI
- LOGE
- ANTHE
- FORNJOT
- ALBIORIX
- SIARNAQ
- PHOEBE
- DAPHNIS
- SURTUR
- PAALIAQ
- METHONE
- BERGELMIR

Answers for last month puzzles.



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

NEWSLETTER

The nine hues of Navratri

Navratri, as the name implies, is a nine-day festival celebrated throughout the nation. People from all religions take part in the celebrations in different ways, from worshipping Goddess Durga to dancing with passion. We chose

to dress up as the nine gorgeous hues of Navratri to honor these energies, which include the triumph of good over evil, fearlessness, and the embodiment of tenacity, devotion, strength, and courage in Lord Durga's avatars. Every color represents the distinct, beautiful energy of Maa Durga! Spacians were extremely enthusiastic to dress up and inherit the energies.

Birthday celebration-

Space India nailed the Birthday Calendar once more! There's nothing better than celebrating your birthday with your Space family while eating cake, dancing to Garba songs, and engaging in fun activities.



Diya Competition-

The roof was about to explode because of the high enthusiasm of the Spacians to decorate their own diya. The competition was too high, and the judges were blown away by the amazing creativity and imagination of all the Spacians.



NOVEMBER 2023

www.space-global.com

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Intern's Point of View- Ms. Himakshi Solanki-

Words fall short to express my gratitude to everyone who I've worked with. The guidance and support I've had at SPACE India during my time here by Shivam Sir, Avani Ma'am, Pubali Ma'am, Yashika Ma'am and Yachika Ma'am is highly valued. It was an honor to put their guidance into practice every day and I'm really grateful for all the things I've learnt at SPACE India.

The experience I gained here shall be relished for years to come!



Learning & Development wing-

HR has taken the initiative to introduce the Protection of Children Against Sexual Offenses Act (POCSO) to our educators and partners. This initiative's sole objective was to raise awareness and motivate our employees to create a better, safer environment for our young learners.

Spacian of the Month- Mr. Vikrant Narang

His technical assistance and contribution to the observatory's development were exceptional. We are especially appreciative of his vision of turning the observatory into an innovative space research facility and creating initiatives that allow students to engage in real-world scientific research.

Fire Drill-

There's nothing better than being prepared for fire-related mishaps. With great enthusiasm, Spaniards attended the safety course and learned how to take precautions to keep themselves and others safe.



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