

# Galactica

Astronomy and Space Science Magazine

## What's Inside?

SPACE Insights

Highlights From August

Moon Phases And Planet Visibility

What's Awaiting in September

Student's Corner

Historical Events Happened In September

September Born Legends

Train Your Brain

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

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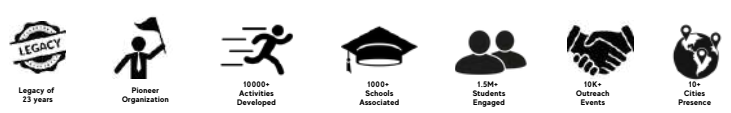
iAstronomers

Space Students

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# ABOUT SPACE



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

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

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

## CMD's Message



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

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

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

## CEO's Message



**Mr. Shivam Gupta,**  
CEO & 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 impart scientific temperament so the next generation can be entrepreneurs, scientists & astronauts!

# LIST OF

Page no.

Topics

- 1 **SPACE Insights**  
**Highlights of August 2023**
- 13 Chandrayaan-3 Landed!
- 16 Can this machine finally hunt down dark matter?
- 17 Russia's Luna-25 Spacecraft crashes on the moon
- 19 NASA's Ingenuity Mars flies again
- 21 Unveiling the enigmatic Dance of a Cosmic jet
- 23 Chang'e -5 Moon mission sample return misinformation
- 25 Insights into the Mars's rotation
- 26 25 years of discovery of Dark Energy
- 27 Mysteries of Neptune
- From the eyes of Webb**
- 31 Colors of Earendel
- 33 Remains of Dying star revealed!
- 35 Gravitational arcs in 'El Gordo' Galaxy cluster
- 37 Supernova 1987A
- 39 **What's up in the Sky**



# CONTENTS



**Rocket launches in September 2023**

- 40 4X Tianqi
- 41 Aditya - L1
- 43 Atlas V 501 Project Kuiper
- 22 GALACTIC 03 SPACESHIP 2 44
- 34 THEOS-2 Earth Observation Satellite 45

**46 SpaceX Launches - September 2023**

**Astronomical Events- September 2023**

- 49 Mercury at greatest western elongation
- 50 Neptune At Opposition
- 51 Autumn Equinox
- 52 Conjunctions for the month

**53 Students corner**

**57 Astrophotographs by SPACE Team**

**59 September Born Legends**

**Historical Events in September**

- 60 Discovery of 3 Juno
- 61 The tale of two Vikings
- 63 Launch of Voyager 1
- 65 Discovery of Mimas
- 66 Discovery of Neptune
- 67 **Train your brain**

# SPACE INSIGHTS

## Unleashing Curiosity: ISRO's Dynamic Partnership with SPACE India



In a monumental step towards advancing space education, SPACE India, a trailblazing figure in the field, is thrilled to announce its collaboration with the Indian Space Research Organisation (ISRO) as an official Space Tutor. This partnership represents a significant milestone in space education, as SPACE India leverages its expertise to enrich the learning experiences of aspiring space enthusiasts worldwide.

Embracing the winds of change, ISRO steps into a vibrant role, ensuring that the light of enriched space knowledge reaches every eager mind. In this dynamic landscape, a constellation of NGOs and educational institutions have risen as guiding stars. They weave their own frameworks, inviting curious students to explore the cosmos through the lens of space science and technology.

In the spirit of unity, SPACE India emerges as a beacon of inspiration. With a legacy spanning 23 years in Astronomy, Space Science, and STEM Education, they now stand as an official Space Tutor in collaboration with ISRO. This alliance marks a historic stride in India's space education journey, a milestone that shines bright in the cosmos of possibilities.

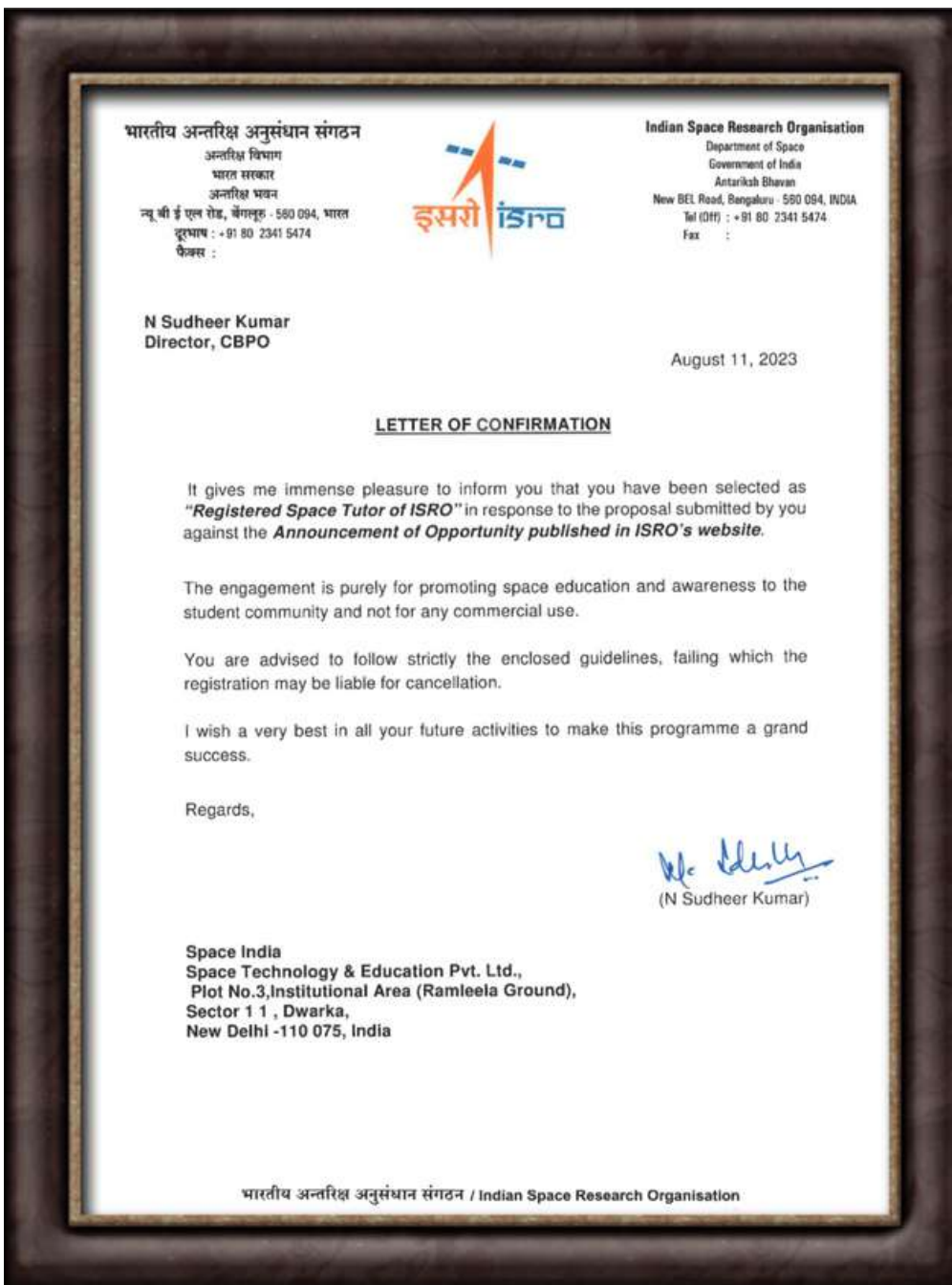
ISRO spokesperson in a statement said, "ISRO recognizes that, over the years, several institutions have come up with their own framework to teach space science and technology to students. This usually consists of books and lab works that coexist with the regular classroom curriculum. Additionally, content creators and online educators who make use of social media and mobile applications create a virtual classroom to engage with students. SPACE India has stood out in its quest for quality space education and would add tremendously to the ISRO Space Tutor program".

Dr. Sachin Bahmba, CMD of SPACE India, said, “As an ISRO Space Tutor, Space India is honored to contribute to our nation’s effort to nurture scientific temperament while fostering a passion for space exploration among our students. We look forward to continuing to deliver high-quality space education and empowering young minds to unlock their potential as they discover more about the fascinating reality of space. Space India embraces the opportunity to cultivate the next generation of space enthusiasts and professionals”.

As an official Space Tutor, SPACE India delves into topics that ignite curiosity and drive:

- The marvel of satellites
- The epic tales of space missions
- The ingenuity of rockets

The stories written in the stars



### SPACE India's partnership with ISRO comes alive through a treasure trove of resources:

- Videos that ignite curiosity
- Presentations that unveil mysteries
- Interactive activities that turn learning into an adventure

This dynamic duo aims to enrich young minds with the magic of Space Science, nurturing a generation of dreamers and doers.

This collaboration doesn't just enrich minds; it ignites a cosmic flame within each learner. With ISRO's research projects and missions as guiding lights, SPACE India leads the way into a universe of boundless exploration.

So, as we join hands in this cosmic dance, we inspire generations, fostering a love for learning that reaches for the stars and beyond.

The letter of confirmation as received from the ISRO Director to the SPACE India.

# EDUODYSSEY CHANDRAYAN-3 & BEYOND

Humanity's thirst for exploration knows no bounds, and when it comes to the vast expanse of space, that curiosity becomes a beacon guiding us through the mysteries of the cosmos. On 19th August 2023, a captivating event took place that united space enthusiasts under one roof. EduOdyssey: Chandrayaan - 3 and Beyond, a collaborative effort by SPACE-India and Bal Bharati Public School, Pitampura, unfolded as an inspiring and enlightening journey through the cosmos.

The event was graced by the presence of Mr. N. Raghu Meetei, Deputy Director of the Directorate of Technical Development and Innovation (DTDI) at the Indian Space Research Organisation (ISRO). The event took off with a memorable moment as Dr. Sachin Bahmba, (CMD), SPACE India, felicitated Mr. N. Raghu Meetei with an extraordinary gift: a picture of the Chandrayaan -3 launch, captured by one of the educators. This picture has achieved the remarkable feat of being featured in the prestigious Astronomy Picture of the Day - NASA.

Mr. Shivam Gupta (CEO & MD), SPACE - India, and Avani Patwa (CEO), Space Technology & Education Pvt. Ltd. honored Ms. Sonia Chhabra, Vice Principal of Bal Bharati Public School, Pitampura. The event was ceremonially illuminated as guests came together to light the traditional lamp, symbolizing the illumination of knowledge and the beginning of an event. Then Vice Principal Ma'am stepped forward to share her thoughts about the significance of space exploration. Her words echoed with gratitude towards SPACE-India for spearheading such an inspiring event. She underlined the importance of igniting young minds with curiosity and awe for the universe, cultivating the seeds for future space exploration.

The stage was then taken by Mr. Vikrant Narang, CTO of Space-India, who initiated his talk with a thought-provoking quote from, Carl Sagan. With this, he opened a gateway to the awe-inspiring achievements of ISRO. He wove a narrative that journeyed through time, from the inception of ISRO under the visionary Dr. Vikram Sarabhai to India's first satellite launch. Mr. Vikrant Narang then turned the spotlight to the remarkable image of the Chandrayaan-3 launch, an image that encapsulated the dreams and aspirations of the nation.

The esteemed Mr. N. Raghu Meetei then took the stage to share the incredible odyssey of Chandrayaan-3, an embodiment of India's relentless pursuit of knowledge. His speech resonated with the majesty of the universe, the intricate details of our solar system and the profound significance of our Moon.





He elaborated on the Chandrayaan-3 mission, offering insights into its objectives and the advancements it promised. He also spoke about the forthcoming missions - Aditya L1 and Gaganyaan - that promise to take India's space exploration to new heights. Mr. Meetei also emphasized the numerous career opportunities that await young minds passionate about space.

The event took an engaging turn as a fireside chat unfolded between Dr. Sachin Bahmba and Mr. N. Raghu Meetei. This candid conversation delved into the nuances of space exploration, the challenges, the triumphs, and the dreams that drive the quest for knowledge beyond our planet. The floor was then opened to a Q&A session where enthusiastic students posed insightful questions about Chandrayaan-3, moon colonization, and the future of space technology. Mr. Meetei also shared information about Yuvika, ISRO's sponsored Young Scientist program, igniting young minds with the possibilities that lie ahead.

The event concluded with a sense of unity as participants gathered for group photographs, encapsulating the spirit of togetherness in this cosmic journey. The Astronomy Showcase was inaugurated with a hydro rocket launch by Mr. Meetei, ushering in a realm of interactive activities. Attendees immersed themselves in terrestrial observation using Dobsonian telescopes, engaged in astronomy-themed games, explored pop rocketry and stomp rocketry, watched comet making, and were treated to a display of fascinating astronomy kits.





EduOdyssey: Chandrayaan-3 and Beyond celebrated human ingenuity, curiosity, and the unyielding spirit of exploration. As the event ended, attendees left with hearts full of wonder and minds ignited with the spark of curiosity, ready to embrace the boundless universe that awaits us all. For those who missed the chance to attend in person, the event was live-streamed on YouTube, enabling viewers worldwide to join in the cosmic odyssey.

# MONTHLY TELESCOPIC OBSERVATION

SPACE ARCADE team conducted their 6th Monthly Telescopic Experience session on the 26th of August in Chennai and Delhi respectively.

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. 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.



# STAR PARTY BY SPACE INDIA

A "Star Party" was set up in schools with the joint efforts of the Astronomy educators and students from various schools, on 25th August and 31st August. In this Star Party, a multitude of fun-filled Astronomy-based activities were conducted which were thoroughly enjoyed by people of all age groups- from students to parents. Apart from being a stress buster for the children; this was an interactive, informative, and fun zone in the school which caught everyone's attention.

It was held during the evening where the volunteers handled their duties well and helped in the smooth conduction of activities. There was a plethora of fun-filled Astronomy activities like Hydro rocketry, Discovering the skies, Hit the space rock, moon walk, weigh yourself on different planets, Ring the planets, Shoot the Alien, Tattoo station, Quiz, etc. Students observed our moon - Luna with a 50 mm refractor telescope and Dobsonian telescope. Students also discovered objects visible in night sky like the Constellation Orion, Canis Major, and Canis Minor, Stars like Sirius, Procyon, Planet Venus, Saturn, etc.

The school principal and all astronomy enthusiasts enjoyed all the activities during the event thoroughly. Both students and parents participated in the activities with full zeal and they thoroughly enjoyed them. People were amazed to see the scientific temperament and logical thinking of the students. In all, it was a "hands-on session" day and was thoroughly enjoyed by everyone. For many students, this moon observation event served as a gateway to a more profound interest in astronomy and science. They had the opportunity to interact with astronomers and ask questions about the moon and the universe beyond. The moon observation event for students and parents was more than just an evening of stargazing; it was a journey of discovery and wonder.

The observers left with a newfound appreciation for the moon, a deeper understanding of lunar science, and a desire to continue exploring the mysteries of the cosmos. In an age of screens and distractions, this event served as a reminder that the universe is a captivating, tangible, and inspiring place waiting to be explored by generations to come.



# SPACIANS ACROSS THE NEWS

In the run-up to Chandrayaan 3's imminent landing, space educators have assumed the role of science communicators. They've simplified the mission's intricacies, making it comprehensible to the general public. Space educators were extensively featured in top news channels like India Today, CNN News 18, and Aaj Tak, as well as in print media such as The Times Now and The Hindu. SPACE India's significant achievement as the official space tutor recognized by ISRO has also garnered attention. Their efforts serve as a vital link between the masses and India's space exploration aspirations.

**CHANDRAYAAN-3 MOON LANDING**  
Our Experts Live on Various **NEWS CHANNELS**

**SPACE**™  
EMPOWERING LIFE


Logos: TIMES NOW, नवभारत, R. भारत, INDIA TV, INDIA TODAY, NEWS 18, इंडिया, भारत, TIMES NOW, CNN NEWS 18, newsX, ZEE NEWS, ZEE SALAAM, Aaj Tak

Home > Technology Science

**TIMES NOW**

## ISRO and SPACE India Forge a New Horizon to Elevate Space Education

SPACE India collaborates with ISRO as an official Space Tutor, marking a significant milestone in space education and aiming to foster scientific temperament and innovation in India.

THE HINDU

humanitarian crisis of cancer in low-resource regions across the globe.

**Duolingo** and **YouGov** recently conducted a survey to understand the motivations of Telugu speakers in Andhra Pradesh and Telangana in learning English. Key highlights were: 81% strongly believed that English proficiency is key for self-confidence and assurance; 75% indicated that they sought to improve career prospects and facilitate communication across regions as their primary incentives; 9 out of 10 strongly felt that English proficiency not only significantly enhanced career prospects but also granted access to better educational resources; and 90% felt that the Telugu cinema stars played a role in motivating their fans to learn English.

**SPACE India**, an organisation that develops astronomy, space science, and STEM education, hosted an interaction with N. Raghu Meetei, Deputy Director, Directorate of Technology Development and Innovation, ISRO, at Bal Bharati Public School, Pitampura, New Delhi. The event, titled **EduOdyssey**, focused on the Chandrayaan 3 launch and journey. The organisation has also collaborated with ISRO as an official Space Tutor, to promote space education and encourage the development of scientific temperament, and inspire a culture of innovative thinking among students.

**SPACE** भारत के लिए ऐतिहासिक दिन

पेलोड 2 करेगा चांद की सतह के तापमान की जांच

**Mr. Anil Kumar**  
Praising Universe In The School (UITS) Program of SPACE India

Our esteemed partner school Principal, Mr. Anil Kumar of DPS Faridabad, praised our space program, 'Universe in the School (UITS)' during the media coverage of Chandrayaan 3 on Zee Business Channel. He stated, "Space & Astronomy offers endless possibilities, there's always something new to learn and explore about this field. We have initiated a unique space program for our students called 'Universe for all', aligned with India's National Education Policy 2020. This program is available for the students of classes 1 to 12, providing them with hands-on learning experiences through the telescope. They will delve into various space phenomena, such as the solar system and galaxies, which will satiate their curiosity about space and astronomy".

# Astronomy Showcase and Model Exhibition

## “A Celestial Delight for All Ages”

Astronomy, often referred to as the gateway to the cosmos, has an undeniable ability to spark curiosity and wonder among people of all ages. The Astronomy Showcase and Model Exhibition, are collaborative efforts between the Astronomy Educators and students of Bal Bharati Public School in Pitampura and Delhi Public School in Greater Faridabad. These events held during the Parent-Teacher Meetings on August 05, 2023, in Bal Bharati Public School and August 19, 2023, in Delhi Public School, Greater Faridabad, left attendees enthralled with their array of celestial experiences.

The collaborative event, which combined education with entertainment, proved to be more than just a platform for learning; it was a playground for the imagination. Visitors, ranging from eager students to intrigued parents, were treated to plenty of astronomy-based activities that transcended traditional classroom learning. This initiative served as a stress-buster for students while creating an interactive, informative, and fun-filled zone within the school premises.

In Bal Bharati Public School, Pitampura, students of grade 7 volunteered for the showcase and explained activities to the guests. There was a plethora of fun-filled Astronomy activities like Ring the Planet, Weigh yourself on different planets, Hydro Rocketry, Can you be an Astronaut, Students Corner, Shoot the Alien, and Solar observation using solar filter and a Dobsonian telescope.



In Delhi Public School, Greater Faridabad, students of grade 6 participated and showcased their astronomy-related working model on the theme "Universe: Beyond Earth's Atmosphere". Students displayed a variety of operational models, including those of solar and lunar eclipses, rotation and revolution, rocket launching and staging, the solar system, constellations, the Hubble Space Telescope, the life cycle of a star, the rotation of the earth, and the planet Uranus.

Students and parents enthusiastically participated in the activities and enjoyed them. People were amazed to see the students' scientific temperament and logical thinking. These were "hands-on learning" days and were enjoyed by everyone. The showcase and exhibition were appreciated by everyone in the schools and received great feedback from students and parents.

In a world that often moves at breakneck speed, events like these serve as a reminder of the beauty of slowing down, looking up at the stars, and wondering about the mysteries of the cosmos. The Astronomy Showcase and Model Exhibition will undoubtedly be remembered as a shining example of how education, entertainment, and inspiration can come together to create a celestial journey for all ages.



# Exploring the Celestial Dance- iAstronomer Club Live Webinar on the Moon-Saturn Conjunction

The universe has a way of captivating our imaginations, with its celestial wonders and awe-inspiring phenomena. On the 30th of August, a remarkable event unfolded in the virtual realm, as the iAstronomer Club hosted a live webinar that delved into the captivating conjunction of the Moon and Saturn. The webinar not only united astronomy enthusiasts but also shed light on the intriguing concepts of conjunction, astrophotography, and measuring the vast expanse of the night sky.

The webinar, which garnered an impressive audience of over 100 participants, featured two distinguished iAstronomers - Kripita Srivastava and Sukhman Singh. Their expertise shone as they unraveled the mysteries of celestial events and the science behind them.

The focal point of the webinar was the rare conjunction of the Moon and Saturn. A conjunction occurs when two celestial bodies appear close together in the sky, creating a mesmerizing visual spectacle. Kripita Srivastava, with her deep knowledge of astronomy, articulated the mechanics behind this phenomenon, explaining how the orbital paths of the Moon and Saturn aligned just right, giving us a celestial dance to remember.

Sukhman Singh, an accomplished astrophotographer, took participants on a visual journey through the art of capturing the night sky. He shared tips and tricks to capture stunning images of the Moon-Saturn conjunction, inspiring budding astrophotographers to venture into the captivating realm of celestial photography.

The educational experience didn't stop there. The club's esteemed educator demonstrated a "handy way to measure the sky" showcasing a technique that fascinated participants. This technique involved using one's hand to measure the apparent distance between the Moon and Saturn in the night sky, a skill that brings the vastness of the cosmos a little closer to our grasp.





BRAHMAND



iASTRONOMER  
World's Largest Astronomy Club



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## Astrophotography

BRAHMAND



PHOTOGRAPHED BY SUKHMAN SINGH



PHOTOGRAPHED BY SUKHMAN SINGH



Astrophotography, also known as astronomical imaging, is the photography or imaging of astronomical objects, celestial events, or areas of the night sky.

A highlight of the event was an engaging activity designed to enhance participants' understanding of the conjunction. Attendees were encouraged to measure the separation between the Moon and Saturn using the technique demonstrated earlier. This interactive session fostered a sense of involvement and hands-on learning, transforming the webinar into an immersive experience.

As the event drew to a close, the audience was treated to a live view of the Moon-Saturn conjunction through telescopic observation. The gasps of amazement and excitement from participants were a testament to the success of the webinar in creating a deep connection between enthusiasts and the celestial wonders above.

The iAstronomer Club's live webinar on the Moon-Saturn conjunction stands as a resounding success. It not only united individuals with a shared passion for astronomy but also educated and inspired them to explore the universe around us. With Kripita Srivastava and Sukhman Singh's expertise, the captivating concepts of conjunction and astrophotography came to life, while the interactive activities made the learning experience truly unforgettable.

In a world where virtual connections have become the norm, events like these remind us of the beauty and fascination that lie beyond our screens. As we look to the skies with wonder and curiosity, the iAstronomer Club's webinar serves as a brilliant example of how a digital platform can bridge the gap between enthusiasts and the enchanting mysteries of the cosmos.

# HIGHLIGHTS OF AUGUST 2023

## Chandrayaan-3 landed!

Step into the realm of cosmic triumph as we celebrate India's monumental achievement – the Chandrayaan-3 moon mission. With unwavering determination and pioneering spirit, India has once again etched its name on the moon. On a historic July 14, 2023, Chandrayaan-3 embarked on its journey from the Satish Dhawan Space Centre in Sriharikota, launching a wave of excitement that reverberated across the universe.

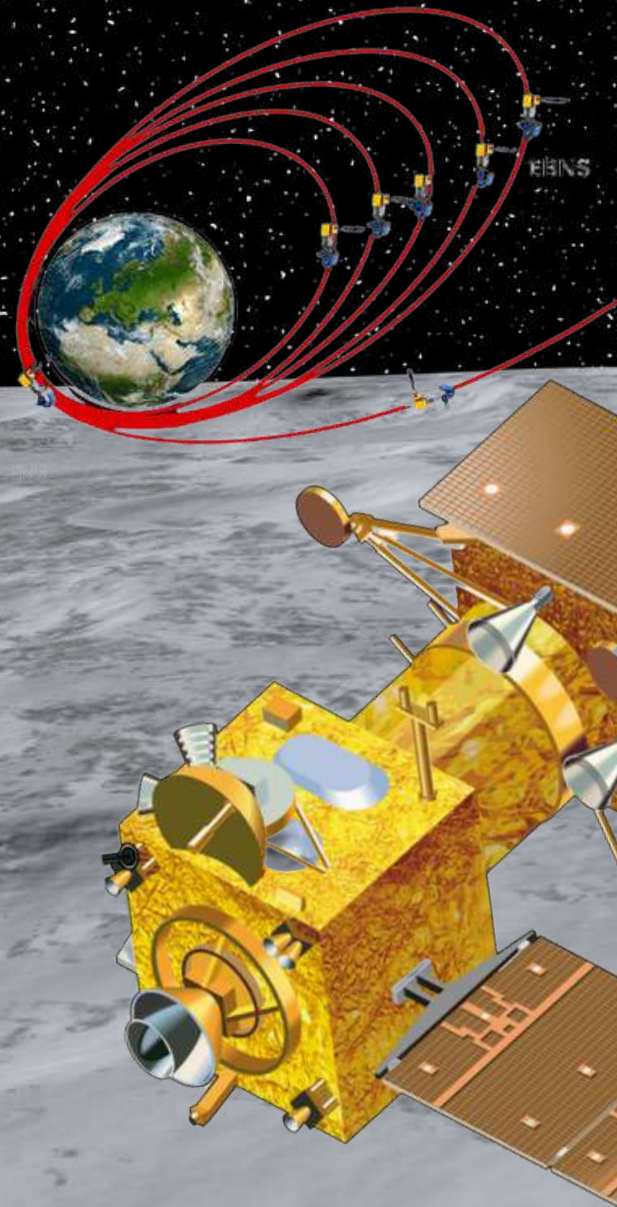
This mission stands as a beacon of perseverance, building upon the legacy of Chandrayaan-2. Its purpose is clear – to showcase our prowess in achieving safe lunar landings and explorations. This spacecraft is not just a machine; it's a testament to human ingenuity and the limitless potential of scientific exploration.



**LVM3 - M4**

**Height**  
43.5 m

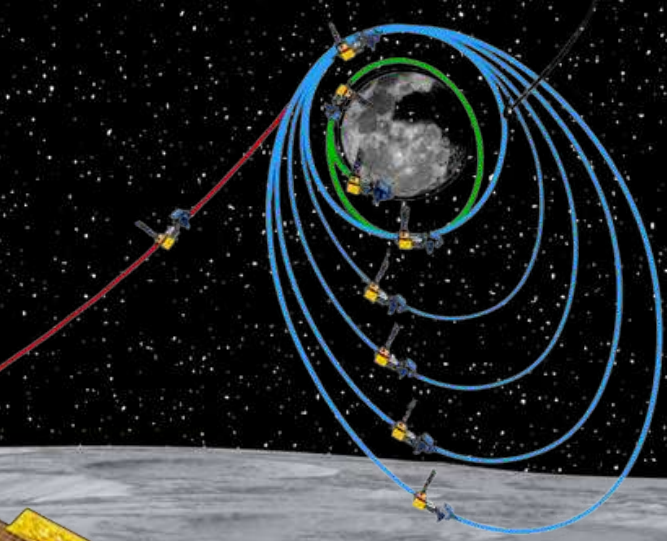
**Lift off Mass**  
642 ton



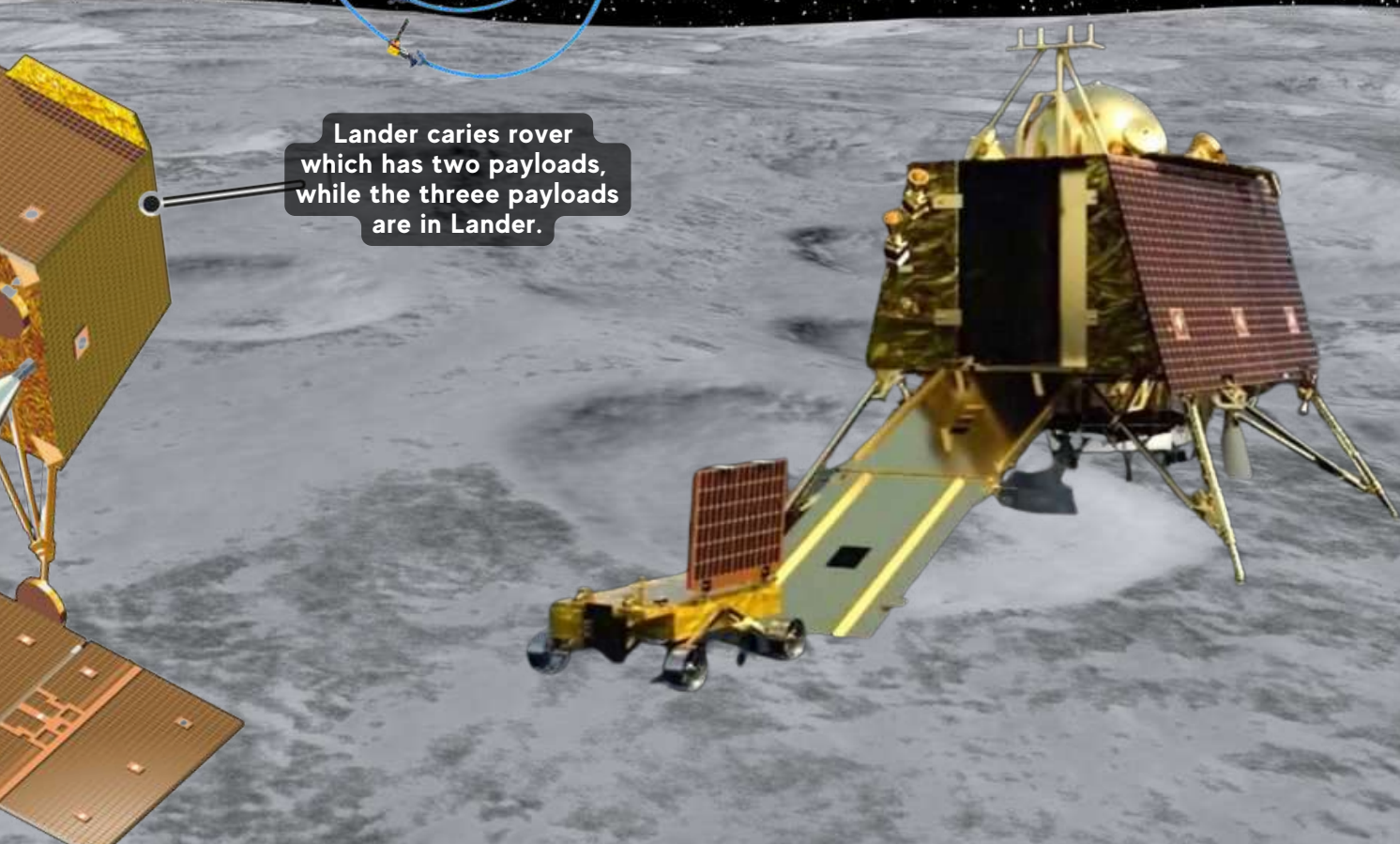
The propulsion module carries the Lander and Rover duo, guiding them on their journey until they embrace the lunar realm at the 100 km mark. It's not just about reaching the moon; it's about reaching for the stars, armed with knowledge and curiosity. And now, Pragyan, the rover, has embarked on its lunar voyage. Named after the Sanskrit word for wisdom, Pragyan's footsteps on the moon are symbolic of India's quest for knowledge and exploration. The Indian Space Research Organization (ISRO) announced this victory with a fervor that echoed across platforms, from X, formerly known as Twitter, to every corner of the globe.

"The Ch-3 Rover ramped down from the Lander and India took a walk on the moon!" proclaimed ISRO, igniting a wave of celebration. Pragyan descended onto the moon's surface from the Chandrayaan-3's Vikram lander, marking India's inaugural successful moon landing and the world's first near the lunar south pole. This is a triumph that shines brightly in the annals of human achievement, a symbol of our unyielding spirit and pursuit of the unknown.

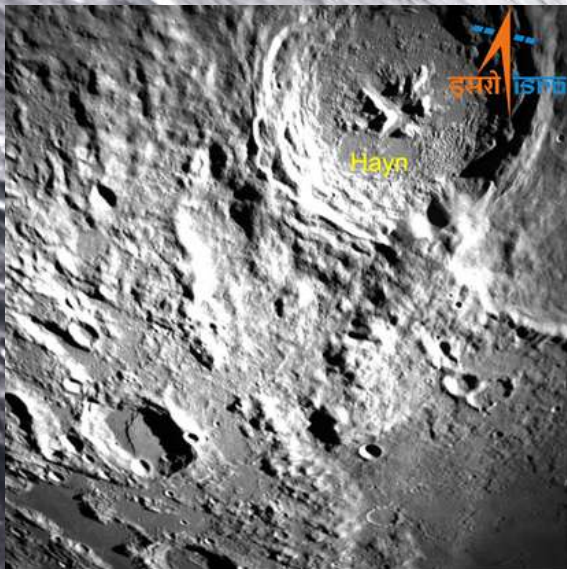
But this isn't just a victory for ISRO; it's a victory for all of humanity. It's a reminder that we are bound together by the vastness of the cosmos and the boundless potential that resides within us. As we stand at the precipice of discovery, with "all activities on schedule" and "all systems normal," we inspire generations to come, showing them that the stars are within reach, waiting to unveil their secrets to those who dare to dream.



Lander carries rover which has two payloads, while the three payloads are in Lander.



# Images Captured by Chandrayaan-3 Rover and lander

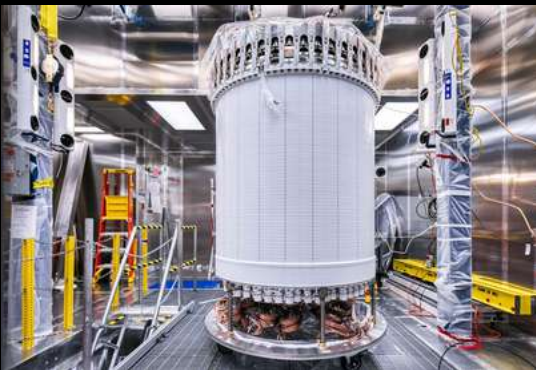


Lunar far side area as imaged from the Lander Hazard Detection and Avoidance Camera (LHDAC) onboard Chandrayaan-3 on August 19, 2023



Lunar far side area as imaged from the Lander Hazard Detection and Avoidance Camera (LHDAC) onboard Chandrayaan-3 on August 19, 2023

## CAN THIS MACHINE FINALLY HUNT DOWN DARK MATTER ?



In the quest to unravel the mysteries of the cosmos, scientists have embarked on a groundbreaking mission deep beneath the Earth's surface. The focus of their endeavor is dark matter, an enigmatic substance that constitutes a significant portion of the universe. With a unique experimental program taking place in South Dakota, researchers are hunting for a specific type of dark matter particle called WIMPs - Weakly Interacting Massive Particles.

Dark matter, unlike its counterpart dark energy, is thought to be the glue that binds galaxies together through its gravitational pull. However, its elusive nature has posed a considerable challenge to scientists aiming to directly observe and study it. WIMPs are one of the leading candidates for dark matter particles due to their hypothesized properties, including their weak interaction with regular matter and their massive nature. To carry out this ambitious quest, researchers have established the Sanford Underground Research Facility in South Dakota, nestled almost a mile below the surface. Shielded from cosmic radiation that could interfere with the experiments, this subterranean laboratory provides an ideal environment for the detection of rare and subtle particles like WIMPs.

Within the facility, an experiment named LUX-ZEPLIN (LZ) has taken center stage. It features a tank filled with liquid xenon, which is incredibly sensitive to the interactions of WIMPs. The idea is that if a WIMP were to collide with a xenon atom, it would produce faint signals that can be detected and analyzed. The researchers are on the lookout for these elusive signals, which would serve as direct evidence of dark matter's existence.

However, the pursuit is not without challenges. The search requires extreme precision, as the signals from potential WIMP interactions are expected to be incredibly faint. Distinguishing these signals from background noise is a complex task that demands cutting-edge technology and thorough data analysis.

The efforts to observe WIMPs in South Dakota's underground laboratory hold the promise of unraveling one of the most perplexing cosmic enigmas. Success could revolutionize our understanding of the universe's composition and the forces that shape it. As researchers delve deeper into the Earth in their quest to uncover the secrets of dark matter, they are pushing the boundaries of human knowledge and paving the way for new discoveries that could reshape the field of physics.

# RUSSIA'S LUNA-25 SPACE CRAFT CRASHES INTO MOON

Roscosmos has reported that Luna 25 has crashed on the surface.

Luna 25, also designated the Luna-Glob-Lander, is a Russian lunar lander mission that launched on 10 August 2023. It is targeted to the south polar region of the Moon. There are two primary scientific objectives of the mission: to study composition of the polar regolith, and to study the plasma and dust components of the lunar polar exosphere.

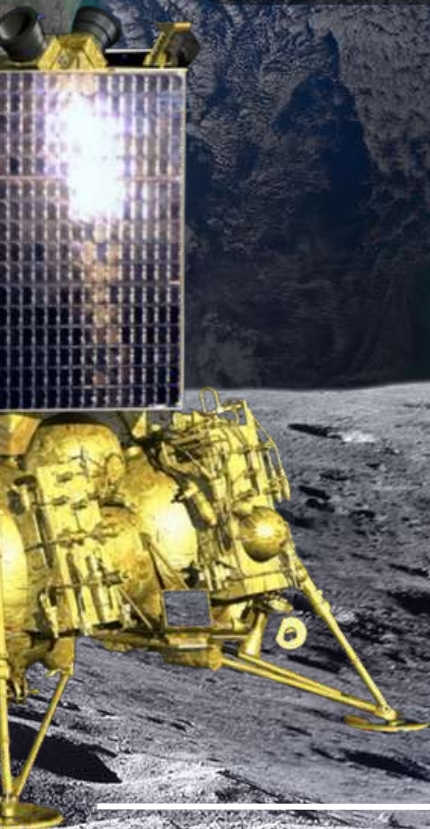
The lander has a four-legged base containing the landing rockets and propellant tanks, an upper compartment holds the solar panels, communication equipment, on-board computers, radiothermal heaters and radiators, and most of the science apparatus. Dry mass is about 800 kg, and it is expected to have roughly 950 kg of propellant at launch. The lander has a 1.6 meter-long Lunar Robotic Arm (LRA, or Lunar Manipulator Complex) to remove and collect the surface regolith to depths of 20 to 30 cm. The LRA is equipped with a scoop (175 cubic cm volume) and a sample acquisition tool, a 4.7 cm long tube with an internal diameter of 1.25 cm. The arm has four degrees of freedom / rotations: azimuthal, shoulder, elbow, and wrist/scoop. Total mass of the LRA is 5.5 kg, it uses 30 W nominal, and 50 W maximum power.



There are eight science instruments. ADRON-LR is a gamma-ray and neutron spectrometer to study the surface regolith. ARIES-L detects charged particles and neutrals in the polar exosphere. LIS-TV-RPM, an infrared spectrometer, measures surface water and OH and is mounted on the LRA. The LASMA-LR mass spectrometer will measure the composition of regolith samples (1 - 2 cubic cm) from the LRA using laser ablation. The PML detector will study dust in the polar exosphere. STS-L is a panoramic and local imaging system. THERMO-L will study the regolith thermal properties, and the lander will also carry a laser retroreflector panel. Data transmission rates back to Earth are planned to be 4 Mbits/sec.

Luna 25 launched on 10 August 2023 at 23:10 UTC (7:10 pm EDT, 2:10 a.m. August 11 Moscow Time) from Vostochny Cosmodrome. The launch was on a Soyuz-2 Fregat into Earth orbit. It then fired the Fregat upper stage again to go into a lunar transfer orbit. On 16 August at 08:57 UT, it reached the Moon and fired its engines to enter lunar orbit. On August 19 at 11:10 UT it fired its engines to go into its pre-landing orbit, but at 11:57 UT communications were lost. It reportedly has crashed on the lunar surface.

The following is the mission plan if it had made a successful landing. Landing would have been in the region of the lunar south pole, the main landing site was at 69.545 S, 43.544 E, north of Boguslavsky crater. The reserve landing site was at 68.773 S and 21.21 E, southwest of Manzini crater. Both coordinate points are centers of 15 x 30 km landing ellipses. The lander was expected to operate on the lunar surface, studying surface regolith and exospheric dust and particles, for one year. Source:NASA



(Image Credit: Generative AI by Rahul Gupta/India Today)


# NASA's Ingenuity Mars Helicopter Flies Again After Unscheduled Landing

NASA's Ingenuity Mars Helicopter successfully completed its 54th flight on Aug. 3, the first flight since the helicopter cut its July 22 flight short. The 25-second up-and-down hop provided data that could help the Ingenuity team determine why its 53rd flight ended early.

Flight 53 was planned as a 136-second scouting flight dedicated to collecting imagery of the planet's surface for the Perseverance Mars rover science team. The complicated flight profile included flying north 666 feet (203 meters) at an altitude of 16 feet (5 meters) and a speed of 5.6 mph (2.5 meters per second), then descending vertically to 8 feet (2.5 meters), where it would hover and obtain imagery of a rocky outcrop. Ingenuity would then climb straight up to 33 feet (10 meters) to allow its hazard divert system to initiate before descending vertically to touch down.

Instead, the helicopter executed the first half of its autonomous journey, flying north at an altitude of 16 feet (5 meters) for 466 feet (142 meters). Then a flight-contingency program was triggered, and Ingenuity automatically landed. The total flight time was 74 seconds.





“Since the very first flight we have included a program called ‘LAND\_NOW’ that was designed to put the helicopter on the surface as soon as possible if any one of a few dozen off-nominal scenarios was encountered,” said Teddy Tzanetos, team lead emeritus for Ingenuity at NASA’s Jet Propulsion Laboratory in Southern California. “During Flight 53, we encountered one of these, and the helicopter worked as planned and executed an immediate landing.”

The Ingenuity team is confident that the early landing was triggered when image frames from the helicopter’s navigation camera didn’t sync up as expected with data from the rotorcraft’s inertial measurement unit. The unit measures Ingenuity’s acceleration and rotational rates – data that makes it possible to estimate where the helicopter is, how fast it is moving, and how it is oriented in space. This was not the first occasion on which image frames were dropped by the helicopter’s Navcam during a flight. Back on May 22, 2021, multiple image frames were dropped, resulting in excessive pitching and rolling near the end of Flight 6.

After Flight 6, the team updated the flight software to help mitigate the impact of dropped images, and the fix worked well for the subsequent 46 flights. However, on Flight 53 the quantity of dropped navigation images exceeded what the software patch allows.

“While we hoped to never trigger a LAND\_NOW, this flight is a valuable case study that will benefit future aircraft operating on other worlds,” said Tzanetos. “The team is working to better understand what occurred in Flight 53, and with Flight 54’s success we’re confident that our baby is ready to keep soaring ahead on Mars.”

# Stellar Blink: Unveiling the Enigmatic Dance of a Cosmic Jet

Astronomers have unveiled a captivating spectacle – a jet of highly magnetic plasma hurled into space by a voracious black hole, feasting on gas and dust. This enigmatic dance, like a cosmic heartbeat, is no ordinary sight.

Astronomers, armed with the Five-hundred-meter Aperture Spherical radio Telescope (FAST) in China, have captured this celestial phenomenon. Our star of the show is GRS 1915+105, a mesmerizing object known for its peculiar behavior. This cosmic duo comprises a regular star orbiting a stellar black hole – a powerful entity born from the ashes of a massive star. As they waltz through space, a cosmic drama unfolds. The star's material spirals into the black hole, a cosmic gulp that sends a fraction of it spiraling outward. This outward rush forms a jet, a cosmic fountain that emerges from the black hole's poles.

Wei Wang, a professor of astrophysics at Wuhan University in China and lead author of this research, explains, "The peculiar signal has a rough period of 0.2 seconds or a frequency of about 5 Hertz. Such a signal does not always exist and only shows up under special physical conditions." Luck smiled upon the team, allowing them to witness this cosmic symphony twice, in January 2021 and June 2022.

GRS 1915+105 holds the key to a mysterious realm known as a microquasar – a celestial cousin to the quasars that light up the cosmos. Quasars, those dazzling galactic centers, house supermassive black holes that dwarf even our sun.

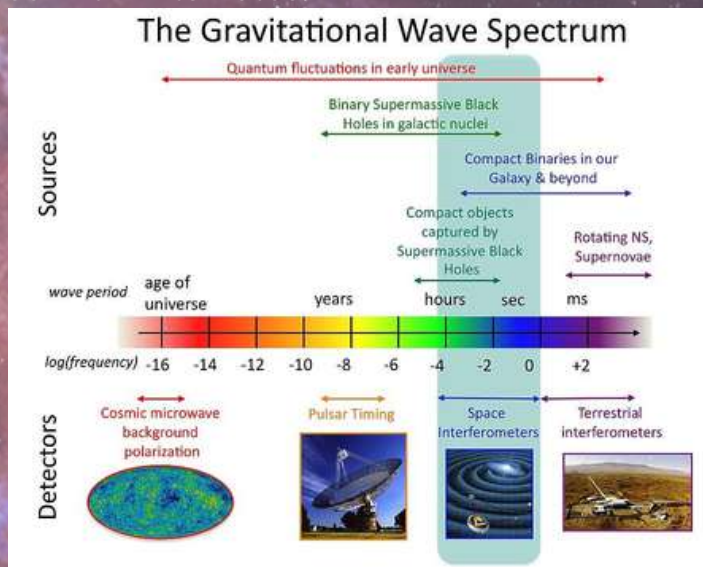


## Unlocking the Universe's Hum through Gravitational waves

In a milestone achieved earlier this year, after 15 years of meticulous pursuit, scientists have at last tuned in to the gentle background murmur of low-frequency gravitational waves that reverberate through the expanse of our cosmos. With this harmonious revelation comes the commencement of an arduous yet exhilarating endeavor: the quest to pinpoint the origins of these subtle undulations in the fabric of spacetime.

The breakthrough emanates from the efforts of researchers united under the North American Nanohertz Observatory for Gravitational Waves (NANOGrav) collaboration. Their journey encompassed the scrutiny of 68 swiftly rotating neutron stars, or pulsars, celestial bodies that emit radiation in predictable cycles toward Earth. These pulsars metamorphose into precision chronometers known as "pulsar timing arrays."

As gravitational waves ripple across the cosmic stage, they choreograph a dance that compresses and stretches the very fabric of spacetime. This orchestration intertwines with the data collected by pulsar timing arrays, eventually harmonizing into a detectable signal, a symphony of information known as a "spectra." This composition awaits the scrutiny of scientists, inviting them to decipher the secrets encoded within its notes.



A diagram illustrating the gravitational wave spectrum and the detectors needed to hunt for these ripples in spacetime. (Image credit: NASA Goddard Space Flight Center)

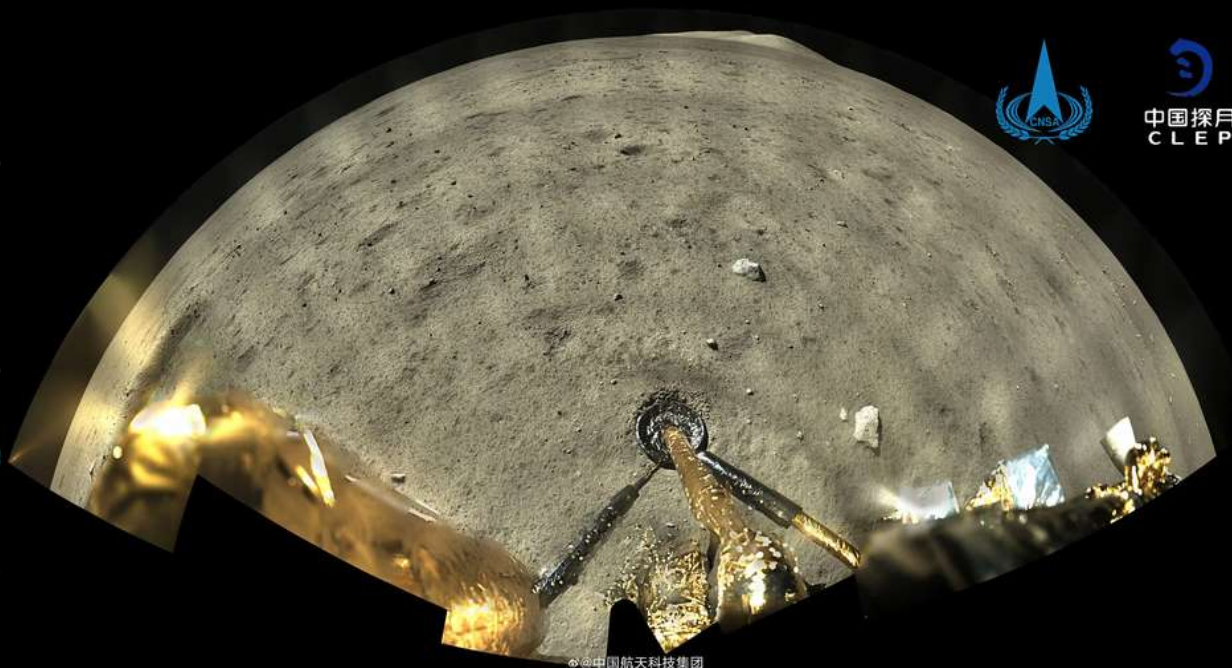
# CHANG'E-5: CHINA'S MOON SAMPLE RETURN MISSION

China's space agency, the China National Space Administration (CNSA), has taken a groundbreaking step in advancing lunar exploration and international collaboration. Following the successful return of the Chang'e 5 mission, which collected lunar samples, China has announced its decision to open these precious samples to international researchers for scientific examination. This move signifies China's commitment to promoting global scientific cooperation and expanding humanity's understanding of the Moon's composition and history.

The Chang'e 5 mission, launched in late 2020, marked a significant achievement for China's space program as it aimed to collect samples from the Moon's surface and bring them back to Earth. The mission's success in accomplishing this complex task has now paved the way for international researchers to access these lunar samples, marking an unprecedented gesture of transparency and collaboration in the field of space exploration.

By allowing scientists from around the world to study the lunar samples, China is contributing to the advancement of lunar science on a global scale. These samples hold crucial information about the Moon's geological evolution, its relationship with Earth, and the broader history of the solar system. International researchers will have the opportunity to analyze the samples using cutting-edge technology and share their findings, potentially leading to new insights and discoveries.

This move also signifies a broader shift in the landscape of space exploration. Traditionally, space missions have been driven by competition between nations. However, China's decision to share its lunar samples demonstrates a willingness to transcend political boundaries in pursuit of scientific knowledge. This open approach to collaboration could serve as a model for future international space missions, fostering a spirit of cooperation that benefits all of humanity.



LUNAR SURFACE PANORAMA FROM CHANG'E-5 China's Chang'e-5 spacecraft captured this image of the lunar surface shortly after landing in the Ocean of Storms on 1 December 2020. Image: CNSA / CLEP

As researchers begin to examine the Chang'e 5 lunar samples, the global scientific community anticipates exciting discoveries that could reshape our understanding of the Moon's history and its role in shaping the solar system. The data generated from these samples will contribute to ongoing studies of lunar geology, impact history, and planetary evolution, enriching our knowledge of both Earth's celestial neighbor and the broader cosmos.

In conclusion, China's decision to make the Chang'e 5 lunar samples available to international researchers is a commendable step towards fostering global scientific collaboration and advancing our understanding of the Moon. This move highlights the potential for space exploration to unite humanity in the pursuit of knowledge, transcending political boundaries and inspiring new levels of cooperation in the realm of scientific discovery.

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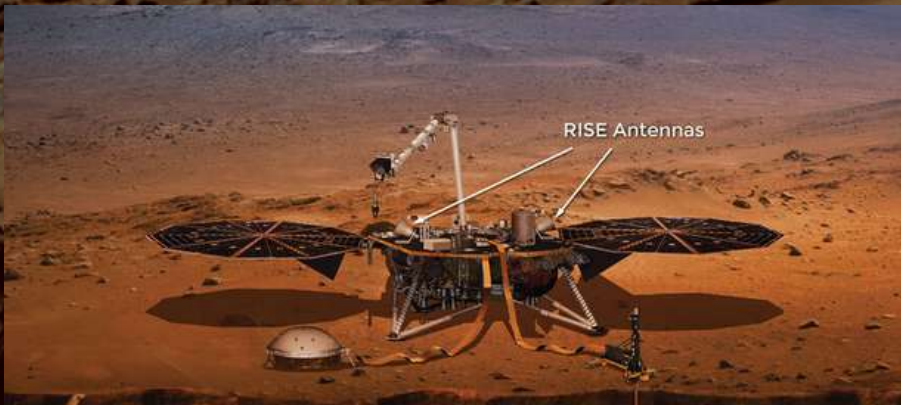
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# UNPRECEDENTED INSIGHTS INTO THE RED PLANET'S ROTATION

In a remarkable scientific feat, researchers have achieved the most accurate measurements ever recorded of Mars' rotation. This achievement not only captures the planet's rotation but also reveals the intricate wobble caused by the churning of its molten metal core. Published in a recent Nature paper, this breakthrough is anchored in the data amassed by NASA's InSight Mars lander, which diligently operated for four years until its extended mission concluded in December 2022 due to power depletion.

The focus of the investigation rested on one of InSight's instrumental marvels: the Rotation and Interior Structure Experiment, abbreviated as RISE. By harnessing a radio transponder and a network of antennas, scientists uncovered a subtle acceleration in Mars' rotation, approximately 4 milliarcseconds per year<sup>2</sup>. This nuanced alteration corresponds to a fractional reduction in the Martian day's length, measured in milliseconds annually.

The cause of this delicate acceleration remains enshrouded in mystery. Researchers propose a range of possibilities, including the accumulation of ice on the polar caps or the phenomenon of post-glacial rebound, where landmasses experience elevation after being ensconced beneath ice.



This annotated artist's concept of NASA's InSight lander on Mars points out the antennas on the spacecraft's deck. Along with a radio transponder in the lander, these antennas make up an instrument called the Rotation and Interior Structure Experiment, or RISE. Credits: NASA/JPL-Caltech

Comparable to an ice skater who adjusts their spin by extending and then retracting their arms, the redistribution of a planet's mass can trigger acceleration. Dr. Bruce Banerdt, the principal investigator of InSight at NASA's Jet Propulsion Laboratory in Southern California, expressed profound enthusiasm for this milestone. He remarked, "It's truly remarkable to obtain this latest measurement with such precision. My involvement in the endeavor to deploy a geophysical station like InSight on Mars spans decades, and achievements like this validate the relentless efforts invested over the years."

As the mysteries of Mars continue to unfold, this achievement stands as a testament to the relentless pursuit of knowledge and the remarkable advancements that fuel our understanding of the cosmos.



# 25 YEARS AFTER ITS DISCOVERY, DARK ENERGY REMAINS FRUSTRATINGLY ELUSIVE

Dark energy, a perplexing force that shapes the fate of our universe, continues to baffle scientists even a quarter-century after its initial identification. Discovered two and a half decades ago, dark energy was found to be the driving factor behind the accelerated expansion of the cosmos. However, its true nature and origin remain enigmatic, leaving researchers and astronomers with more questions than answers.

Imagine the universe as an ever-expanding balloon, with galaxies like dots on its surface. Initially, scientists thought gravity was slowing down this expansion. But when they observed distant exploding stars called supernovae, they made an astonishing realization: the universe was actually expanding at an accelerating rate. This defied all expectations and led to the idea of dark energy – an invisible force counteracting gravity's pull, pushing galaxies apart.

Efforts to unravel dark energy's secrets have been met with frustration. Scientists have proposed various theories, from modifications to Einstein's theory of gravity to the existence of exotic particles. However, direct evidence remains elusive, primarily because dark energy interacts so weakly with matter and light.

One common theory is that dark energy is related to a property of space itself, often referred to as "cosmological constant." This idea suggests that empty space contains energy that drives the universe's expansion. Yet, confirming this theory requires precise measurements and observations that are challenging to obtain.

In the next 25 years, scientists hope to develop more advanced instruments and telescopes that can peer deeper into space and time. By gathering more data and improving our understanding of the cosmos, we may finally uncover the nature of dark energy. Until then, this mysterious force continues to remind us of how much we have yet to learn about the universe we call home.

# NEPTUNE'S MYSTERIOUS CLOUD DISAPPEARANCE : A SOLAR CONNECTION?

Neptune, the enigmatic ice giant located on the outer fringes of our solar system, has recently encountered a perplexing phenomenon that has left scientists and astronomers astounded. Its characteristic clouds, which have long contributed to the planet's distinct appearance and atmosphere, have mysteriously vanished. As researchers delve into this unprecedented event, a surprising suspect has emerged: the Sun.

Neptune's atmosphere is composed primarily of hydrogen and helium, along with traces of methane, which lends the planet its striking blue hue. The presence of clouds in its atmosphere has been attributed to the condensation of methane at different altitudes, creating intricate cloud formations that add to the planet's allure. However, recent observations by telescopes and space probes have revealed a startling absence of these clouds, sparking a race to understand the underlying cause.

One hypothesis gaining traction suggests that the Sun, despite its enormous distance from Neptune, could be influencing the disappearance of the clouds. The Sun's activity follows an approximately 11-year solar cycle, characterized by periods of high and low solar activity. During heightened solar activity, the Sun emits greater amounts of energetic particles and radiation, which can impact the outer planets' atmospheres. These particles can influence the temperature and composition of Neptune's upper atmosphere, potentially affecting the formation and stability of its clouds.

The correlation between Neptune's cloud disappearance and solar activity presents an intriguing avenue for research. Scientists are investigating whether the Sun's varying output could disrupt the balance of chemicals in Neptune's atmosphere, causing methane to be distributed differently and impacting cloud formation. However, the exact mechanisms at play and the extent of the Sun's influence on Neptune's atmosphere remain subjects of ongoing study.

Unraveling this celestial puzzle not only deepens our understanding of Neptune's unique atmospheric dynamics but also highlights the intricate interplay between distant celestial bodies within our solar system. The disappearance of Neptune's clouds serves as a stark reminder of the complexity and interconnectedness of the universe, where even the distant Sun can have far-reaching effects on the enigmatic ice giant's atmospheric conditions. As scientists continue to piece together the puzzle, we inch closer to comprehending the awe-inspiring forces that shape our cosmic neighborhood.



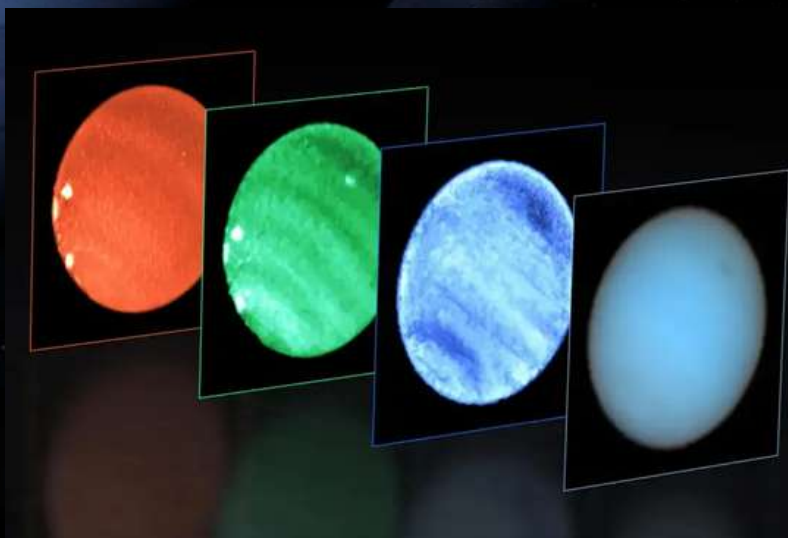
# MYSTERIOUS DARK SPOT ON NEPTUNE DETECTED FROM EARTH FOR THE FIRST TIME

In a remarkable astronomical discovery, a mysterious dark spot has been observed on the distant planet Neptune, marking the first time such an event has been detected from Earth. This intriguing phenomenon has ignited excitement among scientists and space enthusiasts alike, adding a new layer of complexity to our understanding of the dynamic processes at play on this enigmatic ice giant.

Neptune, known for its striking blue hue, is characterized by its turbulent atmosphere featuring high-speed winds and ever-shifting cloud formations. The emergence of this dark spot is a departure from its usual appearance and has left researchers intrigued about its origins and implications. The dark spot's appearance is likely linked to localized atmospheric disturbances or storms within Neptune's complex weather system. While similar features, often referred to as "Great Dark Spots," have been observed on Neptune's surface by spacecraft like Voyager 2 in the past, this new detection from Earth-based telescopes is a testament to advancements in observational technology and techniques.

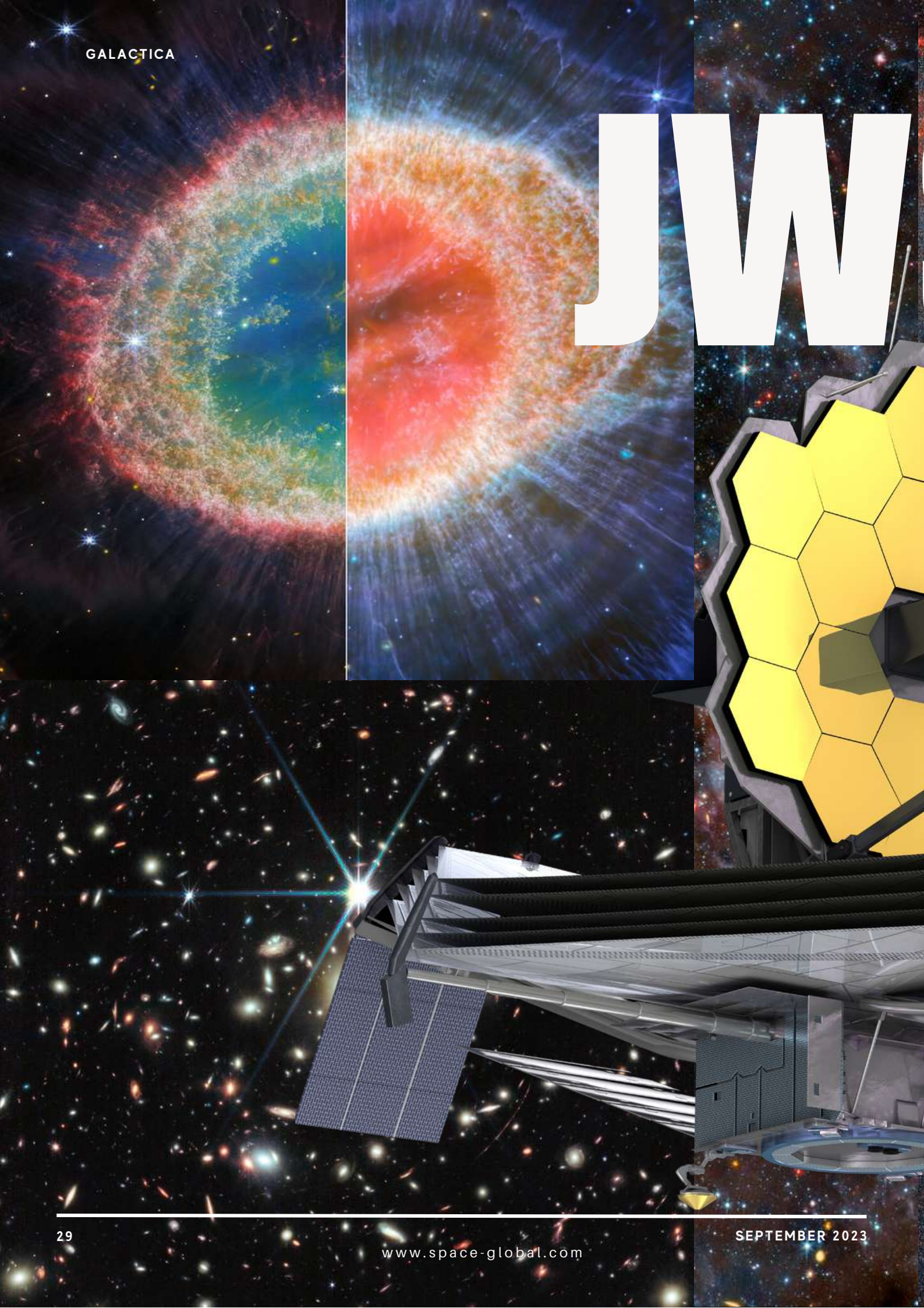
Studying this dark spot could provide valuable insights into Neptune's atmospheric dynamics, including the movement of gases and the behavior of cloud formations. It could also lead to a better understanding of the planet's intricate interactions with solar radiation and its internal heat sources.

As scientists continue to monitor and analyze this dark spot, they will harness the power of advanced telescopes and imaging technology to unveil the mysteries of Neptune's ever-evolving atmosphere. This discovery underscores the ongoing excitement and potential for groundbreaking revelations that the universe holds, even from distances as vast as Neptune's.



This image shows Neptune observed with the MUSE instrument at ESO's Very Large Telescope (VLT). At each pixel within Neptune, MUSE splits the incoming light into its constituent colors or wavelengths. This is similar to obtaining images at thousands of different wavelengths all at once, which provides a wealth of valuable information to astronomers. Credit: ESO/P. Irwin et al.

# JW



GALACTICA

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# WEBB REVEALS COLORS OF EARENDEL, MOST DISTANT STAR EVER DETECTED

Imagine peering back in time to a billion years after the big bang, where the NASA James Webb Space Telescope joins forces with the Hubble Space Telescope to unveil the secrets of a star that's been hidden in the depths of space. This star, named Earendel by the research team, shines as a beacon from a distant galaxy, thanks to the incredible power of technology and a cosmic phenomenon known as gravitational lensing.

Earendel, a massive B-type star, outshines our own Sun in a mesmerizing display of brilliance. With temperatures over twice as scorching and a luminosity a million times brighter, it's a cosmic fireball that defies imagination. This star, nestled within the Sunrise Arc galaxy, would have remained hidden if not for the gravitational lensing magic.

Picture a galactic magnifying glass – that's what the massive galaxy cluster WHL0137-08 acts as. Positioned between us and Earendel, it warps the very fabric of space, creating a lensing effect that amplifies the star's light. Both Hubble and Webb harnessed this cosmic trick to unveil Earendel's distant glow. While the galaxy cluster bends and distorts light, Earendel emerges as a solitary point of light, shining like a distant diamond.

## GALACTICA

Earendel's brilliance isn't the only gem uncovered by Webb's watchful gaze. The Sunrise Arc, the most magnified galaxy from the universe's first billion years, comes to life in astonishing detail. Imagine gazing at young star-forming regions, where celestial nurseries give birth to new stars, alongside established star clusters as tiny as 10 light-years across. It's like peering into a cosmic cradle where the universe's history unfolds.

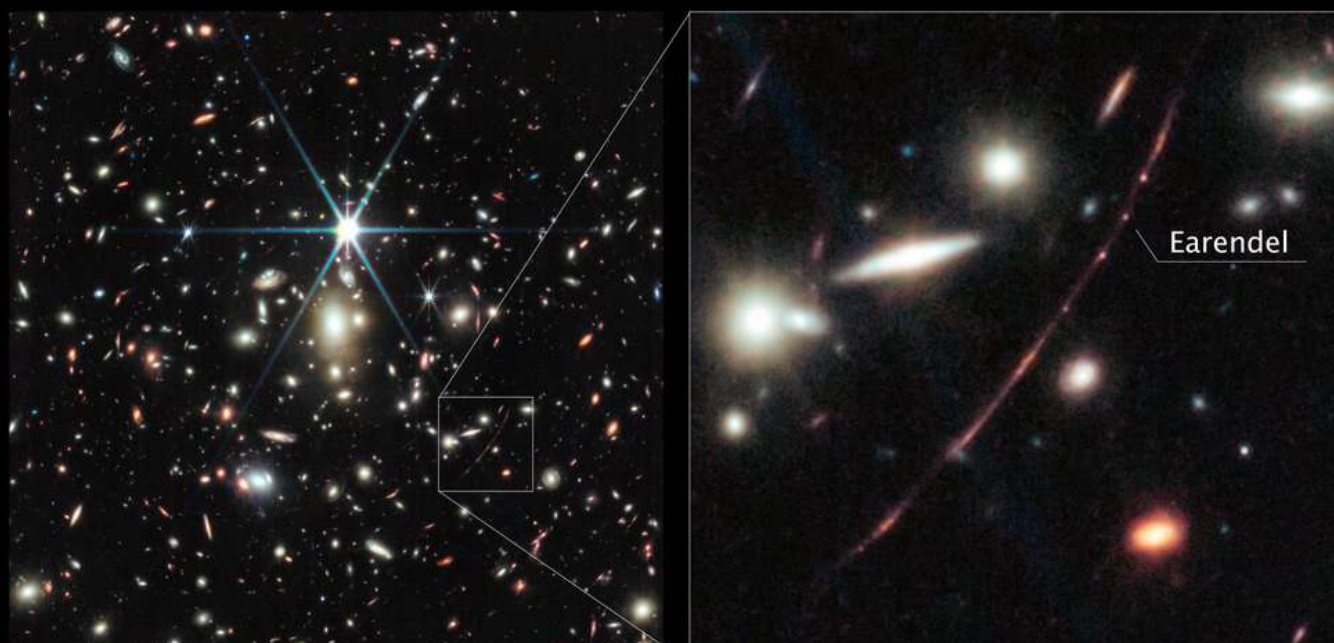
But the surprises don't stop there. Amidst this galactic wonderland, clues emerge about Earendel's potential companion. Although Webb wasn't expected to reveal such secrets, the star's colors hint at a cooler, redder companion. This elusive partner, too faint for Hubble's eyes, comes into view as Webb stretches its light beyond the visible spectrum.

As if Earendel and the Sunrise Arc weren't enough, Webb's keen eye spots more celestial magic. Gravitational lensing's dance distorts the view, creating elongated star-forming regions on one side and older star clusters on the other. In this cosmic ballet, we glimpse stars as old as time, giving us a glimpse into the past of our own Milky Way.

Hold your breath as astronomers meticulously analyze Webb's NIRSpec instrument data, gathering insights about Earendel and the Sunrise Arc's composition and distance. With each discovery, we're uncovering the universe's deepest secrets, inching closer to understanding the cosmic symphony that's been playing for billions of years. So, dear reader, prepare to be enchanted by the stars, where science and wonder collide in a cosmic waltz that spans the ages.

Since Hubble's discovery of Earendel, Webb has detected other very distant stars using this technique, though none quite as far as Earendel. The discoveries have opened a new realm of the universe to stellar physics, and new subject matter to scientists studying the early universe, where once galaxies were the smallest detectable cosmic objects. The research team has cautious hope that this could be a step toward the eventual detection of one of the very first generation of stars, composed only of the raw ingredients of the universe created in the big bang – hydrogen and helium.

The James Webb Space Telescope is the world's premier space science observatory. Webb is solving mysteries in our solar system, looking beyond to distant worlds around other stars, and probing the mysterious structures and origins of our universe and our place in it. Webb is an international program led by NASA with its partners, ESA (European Space Agency) and the Canadian Space Agency.



Credits: Image: NASA, ESA, CSA, D. Coe (STScI/AURA for ESA; Johns Hopkins University), B. Welch (NASA's Goddard Space Flight Center; University of Maryland, College Park). Image processing: Z. Levay.

# WEBB REVEALS INTRICATE DETAILS IN THE REMAINS OF A DYING STAR

Get ready to embark on a cosmic journey that will leave you awestruck! Imagine peering into the universe's heart, where dying stars blaze in a final spectacle of color and light. Brace yourselves as NASA's James Webb Space Telescope unveils the enigmatic beauty of the Ring Nebula, a celestial masterpiece that has captivated skygazers for ages.

Breathe in the excitement as we dive into the mysteries of planetary nebulae – those bewitching clouds of gas and stardust. Imagine, once thought to be simple and circular, they now reveal themselves as intricate tapestries woven by the hands of the cosmos. These cosmic wonders, born from the fiery throes of a red giant, shed their outer layers in a cosmic dance, giving birth to vibrant displays of luminosity. The Ring Nebula takes center stage in this galactic ballet, and its secrets are about to be unveiled.

Enter Roger Wesson from Cardiff University, our cosmic storyteller. With his team of experts known as ESSEncE, they're peeling back the layers of this starry enigma. Join them on their quest to decode the secrets of the Ring Nebula, a brilliant spectacle merely 2,200 light-years away, shining bright like a diamond in the night sky. Imagine catching a glimpse of its splendor with nothing more than binoculars on a warm summer night.

"Planetary nebulae were once thought to be simple, round objects with a single dying star at the center. They were named for their fuzzy, planet-like appearance through small telescopes. Only a few thousand years ago, that star was still a red giant that was shedding most of its mass. As a last farewell, the hot core now ionizes, or heats up, this expelled gas, and the nebula responds with colorful emission of light. Modern observations, though, show that most planetary nebulae display breathtaking complexity. It begs the question: how does a spherical star create such intricate and delicate non-spherical structures?"

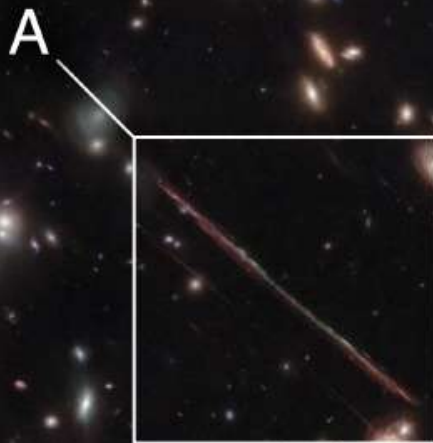
In a twist of fate, Webb's powerful gaze turns towards the Ring Nebula. The heart of the nebula spills its secrets, and we are left breathless by the intricate details it unveils. Imagine the thrill of discovery as we witness a dazzling ring composed of thousands of molecular clumps, each as massive as Earth itself. And that's not all – nestled within the ring, a delicate dance of polycyclic aromatic hydrocarbons paints the canvas with unexpected hues.

But the surprises don't end there. Beyond the radiant ring, enigmatic spikes pierce the darkness, like celestial beacons pointing to the unknown. Picture these spikes as whispers from the cosmic shadows, telling tales of molecules that dare to form in the hidden corners of the nebula. Shielded from the scorching embrace of the central star's radiation, they emerge as cosmic phenomena.

# WEBB SPOTLIGHTS GRAVITATIONAL ARCS IN 'EL GORDO' GALAXY CLUSTER

Prepare to journey through the cosmos as we unveil the mysteries of a galactic treasure, "El Gordo." This galaxy cluster, captured in a remarkable infrared image by NASA's James Webb Space Telescope, unveils a realm of hidden wonders never before seen. With each pixel of this image, we're diving into a treasure trove of scientific discovery, where cosmic secrets come to light.

Imagine gazing at a portrait of El Gordo – a cosmic congregation of hundreds of galaxies, a celestial city bustling with stars and mysteries. Born 6.2 billion years ago, it stands as a "cosmic teenager," existing in a universe still finding its way. And the name "El Gordo," Spanish for the "Fat One," suits it well.



El Gordo isn't just any cluster; it's a natural magnifying glass, bending and shaping light like an artist's brushstroke on canvas. This phenomenon, known as gravitational lensing, is like nature's own magic trick, revealing hidden galaxies lying beyond the cluster's grasp.

Brenda Frye from the University of Arizona explains, "El Gordo's lensing effect is like a spotlight on distant galaxies. It brightens and enlarges their presence, granting us a unique glimpse into the cosmos." Brenda is part of the PEARLS-Clusters team, a group of scientists delving into the mysteries of El Gordo's secrets.

And speaking of secrets, let's zoom into the image itself. Among its stunning features, there's a radiant red arc that steals the spotlight at the upper right corner. Fondly named "El Anzuelo," or "The Fishhook," this arc tells a tale spanning 10.6 billion years, as its light travels through space and time to meet our eyes. Its crimson hue holds hints of its journey – a mix of its own dust and the universe's expansion.

By peering through the lensing distortion, we've discovered that this background galaxy, embedded within El Gordo's cosmic embrace, is disk-shaped and about a quarter the size of our very own Milky Way.



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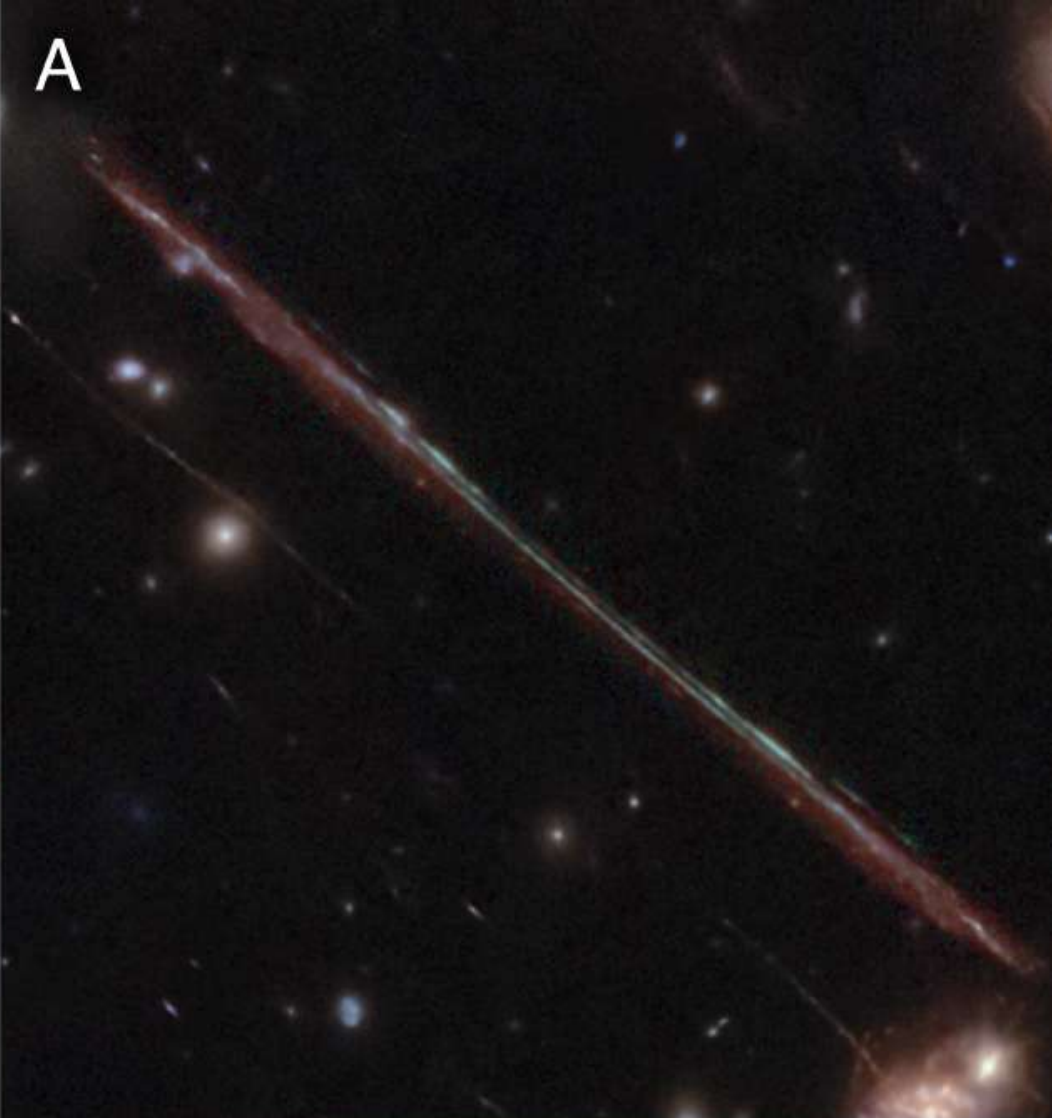


But it's not just size that we uncover. Imagine unwrapping the history of this galaxy's stars – a narrative of creation and transformation. We find that star formation, once vibrant, now wanes in its center, an event known as "quenching."

Patrick Kamieneski from Arizona State University shares, "With Webb's gaze, we've unraveled the veils of dust that enshroud the galaxy's heart. This curtain of dust that once hid its secrets is now laid bare, allowing us to witness the birth of galaxies from the inside out."

We venture into the cosmos, led by the light of El Gordo's hidden treasures. With each discovery, we peel back the layers of the universe's story, revealing the grand tapestry woven by time, gravity, and the brilliance of distant stars. It's a journey of discovery that shows us the universe's past, present, and perhaps even a glimpse into its future.

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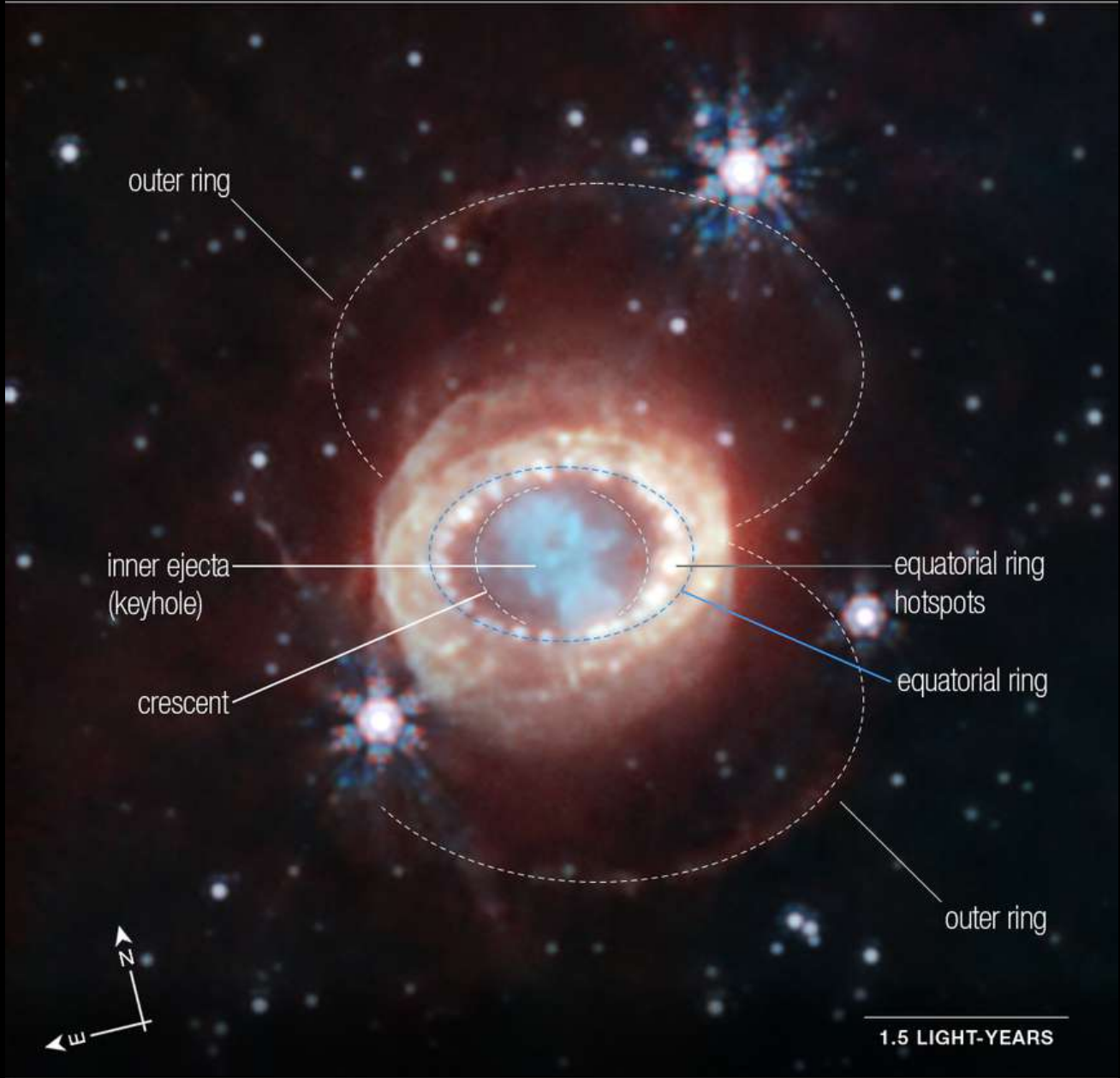


B



# THE DAWN OF A NEW ERA FOR SUPERNOVA 1987A

JAMES WEBB SPACE TELESCOPE  
**SUPERNOVA 1987A**



NIRCam Filters | F150W F164N F200W F322N F405N F444W

Webb’s NIRCam (Near-Infrared Camera) captured this detailed image of SN 1987A (Supernova 1987A), which has been annotated to highlight key structures. At the center, material ejected from the supernova forms a keyhole shape. Just to its left and right are faint crescents newly discovered by Webb. Beyond them an equatorial ring, formed from material ejected tens of thousands of years before the supernova explosion, contains bright hot spots. Exterior to that is diffuse emission and two faint outer rings. In this image blue represents light at 1.5 microns (F150W), cyan 1.64 and 2.0 microns (F164N, F200W), yellow 3.23 microns (F322N), orange 4.05 microns (F405N), and red 4.44 microns (F444W).

Credits: NASA, ESA, CSA.

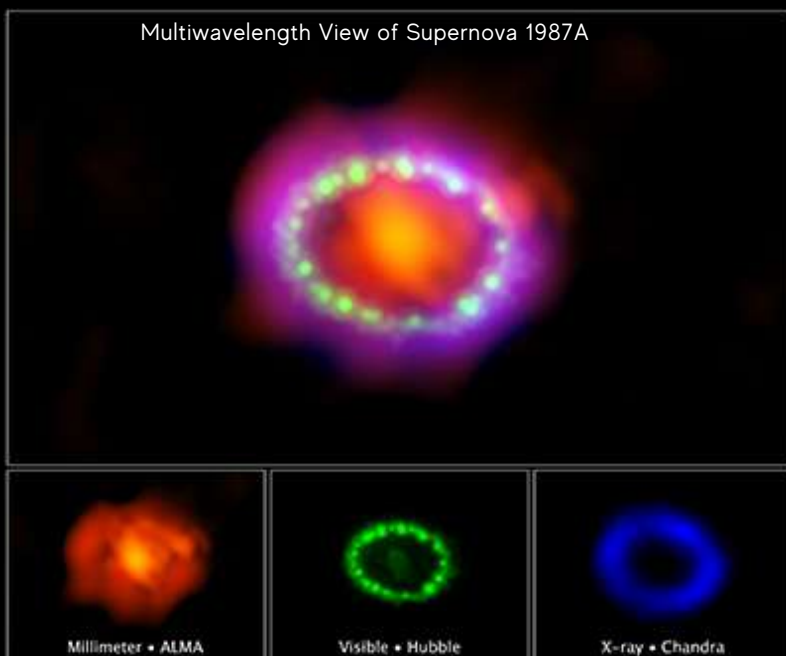
## GALACTICA

NASA's James Webb Space Telescope has embarked on a groundbreaking study of one of the most famous supernovae in history, SN 1987A (Supernova 1987A). This supernova, located 168,000 light-years away in the Large Magellanic Cloud, has intrigued scientists for nearly four decades. Webb's Near-Infrared Camera (NIRCam) is shedding new light on the evolution of this supernova, unveiling previously unseen details.

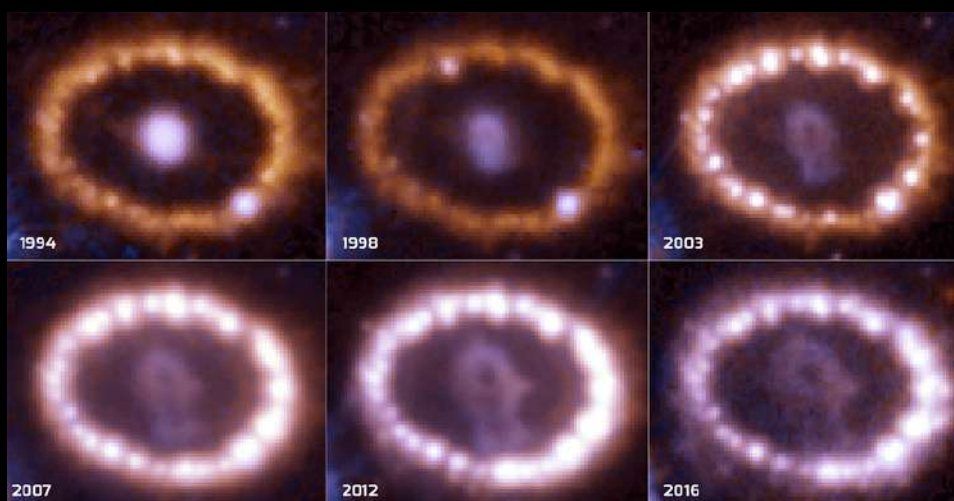
The image captured by Webb unveils a central structure resembling a keyhole, filled with dense gas and dust ejected during the supernova explosion. This dust is so thick that even Webb's near-infrared detection cannot penetrate it, creating the dark "hole" in the keyhole.

Surrounding this inner keyhole is a bright, equatorial ring formed from material ejected thousands of years before the supernova's explosion. This ring contains hot spots where the supernova's shock wave impacted it. Beyond the ring, faint arms in an hourglass shape extend outward. Spots outside the ring signify locations where the supernova shocks hit additional material.

Webb's images also reveal small crescent-like structures, previously unseen. These are believed to be part of the outer layers of gas expelled during the supernova explosion. Their brightness suggests limb brightening, an optical effect due to our viewing angle, making it appear as if there's more material in the crescents than there might actually be.



What makes these images remarkable is their high resolution, unparalleled by previous telescopes like Spitzer. Despite decades of research, many mysteries remain, particularly regarding the neutron star expected to form after the supernova. Webb's Near-Infrared Spectrograph (NIRSpec) and Mid-Infrared Instrument (MIRI) will continue to observe SN 1987A, providing astronomers with new insights. Webb will collaborate with other observatories to uncover the past and future of this legendary supernova.



The evolution of the supernova 1987A between 1994 and 2016, as captured by Hubble. Credit: NASA, P. Challis, R. Kirshner (Harvard-Smithsonian Center for Astrophysics) and B. Sugerman (STScI)

# WHAT'S UP IN THE SKY - SEPTEMBER 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  
September 2023



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

## PLANETS VISIBILITY

### Mercury

Greatest western elongation on 22 September. Mercury will be rising 100 minutes before sunrise.



### Venus

Impressively bright planet, visible against dark skies at the end of the month, rising four hours before sunrise.



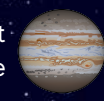
### Mars

Mars appears along with the sun, thus not visible this month.



### Jupiter

Bright morning planet reaching its highest position under darkness from mid-month. The Moon is close on 4/5 September.



### Saturn

Evening planet, currently well presented. Reaches 24° altitude under dark sky conditions.



### Uranus

Morning planet near Jupiter. Peak altitude, due south, in a dark sky mid-month onwards.



### Neptune

Binocular planet, reaching opposition on 19th September.



## BRIGHT DEEP SKY OBJECTS

Like shiny flakes sparkling in a snow globe, over 100,000 stars whirl within the globular cluster M13, one of the brightest star clusters visible from the Northern Hemisphere. Located 25,000 light-years from Earth with an apparent magnitude of 5.8, this glittering metropolis of stars in the constellation Hercules can be spotted with a pair of binoculars most easily in July.



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

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



Messier 19 is a globular cluster in the constellation Ophiuchus. It was discovered by Charles Messier on 1764 and added to his catalogue of comet like objects that same year. It was resolved into individual stars by William Herschel in 1784. The cluster is located 28,500 light-years from Earth and it has an apparent magnitude of 7.7.



## ROCKET LAUNCHES IN SEPTEMBER 2023

### 4X TIANQI

Galactic Energy is set to launch 4x Tianqi Commercial flight on 5th September 2023 at 5.30 AM IST.

Galactic Energy is a private aerospace company headquartered in Beijing E-Town. Established by senior engineers in the national space system, Galactic Energy engages in low-cost commercial space launch business. The main team has 10-20 years of research and development experience in the space industry.

Named after the first asteroid discovered by humans. Ceres is the goddess of agriculture and harvest in Roman mythology. Ceres-1 is the first solid propellant launch vehicle of Galactic Energy, and it is the main carrier rocket type for narrow-band Internet of Things network construction and constellation supplement launch.

Galactic Energy successfully conducted its first launch in November 2020 with a Ceres-1 rocket. Galactic Energy became the second private company in China to put a satellite in orbit successfully (after i-Space) and the fourth to attempt an orbital launch (after Landspace, OneSpace, and i-Space).

On 6 December 2021, Galactic Energy launched its second Ceres-1 rocket, becoming the first Chinese private firm to reach orbit twice. In January 2022, the company raised \$200 million for reusable launch vehicle development. (Image credits: Galactic Energy, Dongfanghour)

# ADITYA - L1

The Indian Space and Research Organisation (ISRO), India's national space agency, will launch its first space-based mission to study our parent star on 2nd September 2023 from the Sathish Dhawan Space Centre in Sriharikota. The launch of the Aditya-L1 mission takes place a couple of days after the potential lunar landing of Chandrayaan-3.

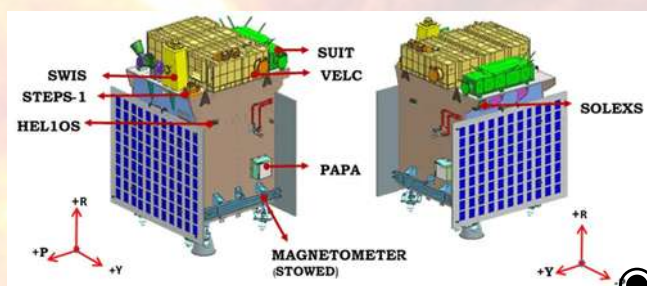


The XL variant of ISRO's Polar Satellite Launch Vehicle (PSLV) will launch the satellite. This launch is the 59th launch of the PSLV class and the 56th commercial launch. Aditya-L1, like the Chandrayaan spacecraft, will initially be placed in the Low Earth Orbit (LEO), before being propelled toward the L1 point, a journey that approximately takes four months.

The primary goal of Aditya-L1 is to study the solar atmosphere (an extremely hot and dynamic region,) and the solar magnetic field. The major objectives of the mission in detail are:

- To study the dynamics of the chromosphere and corona.
- To understand the physics of the partially ionized plasma, the initiation of coronal mass ejection (CME) and flares and study the heating in the chromosphere and corona.
- To understand the physics of the solar corona and its heating mechanism.

The Aditya-L1 satellite is 1500 kg with seven special instruments called payloads onboard. Four of them carry out the remote sensing of the sun, while three will carry out the in-situ observations. These payloads will provide crucial information that could help us to understand solar weather and the solar magnetic field.



# About the Mission

**Distance:** 1.5 million kilometers from the Earth, about 4 times farther than the Moon.

**Spacecraft:** Space-based, observatory-class solar probe

## Science Payloads

The spacecraft carries seven scientific payloads for systematic study of the Sun. All payloads are indigenously developed in collaboration with various ISRO Centres.

**VEIC** -Visible Emission Line Coronagraph is designed to study solar corona and dynamics of coronal mass ejections. The payload is developed by Indian Institute of Astrophysics, Bengaluru in close collaboration with ISRO.

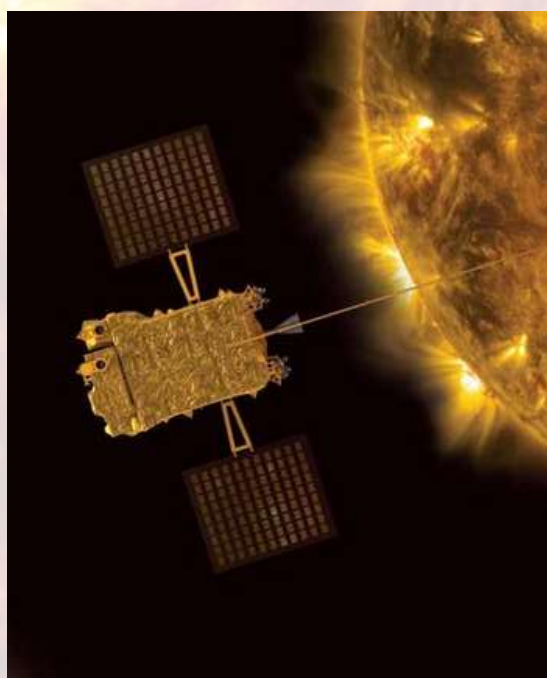
**SUIT**- Solar Ultra-violet Imaging Telescope to image the Solar Photosphere and Chromosphere in near Ultra-violet (UV) and, to measure the solar irradiance variations in near UV. The payload is developed by Inter University Centre for Astronomy and Astrophysics, Pune in close collaboration with ISRO.

**SoLEXS HELIOS**-Solar Low Energy X-ray Spectrometer and High Energy L1 Orbiting X-ray Spectrometer are designed to study the X-ray flares from the Sun over a wide X-ray energy range. Both these payloads are developed at U R Rao Satellite Centre, Bengaluru.

**ASPEX**-Aditya Solar wind Particle EXperiment and Plasma Analyser Package for Aditya payloads are designed to study the solar wind and energetics, as well as their energy distribution.

**PAPA ASPEX** is developed at Physical Research Laboratory, Ahmedabad.  
PAPA is developed at Space Physics Laboratory, Vikram Sarabhai Space Centre, Thiruvananthapuram.

**MAG** - Magnetometer payload is capable of measuring interplanetary magnetic fields at the L1 point. The payload is developed at Laboratory for Electro Optics Systems, Bengaluru.



# ATLAS V 501

## PROJECT KUIPER



**TUE • SEPTEMBER 26TH, 2023**  
**5:30 AM GMT+5:30**

### Mission:

**Project Kuiper (Atlas V #1/Demo Mission)**

**Type: Communications**

**Launch Cost: \$120,000,000**

This launch will probably launch 2 KuiperSat demonstration satellites to 500 km altitude, 30 degree inclination orbit. They were previously scheduled on the 1st Vulcan launch.

Project Kuiper is a mega constellation of satellites in Low Earth Orbit that will offer broadband internet access, this constellation will be managed by Kuiper Systems LLC, a subsidiary of Amazon. This constellation is planned to be composed of 3,276 satellites. The satellites are projected to be placed in 98 orbital planes in three orbital layers, one at 590 km, 610 km and 630 km altitude.



### Agency:

**United Launch Alliance - ULA**

- **Type: Commercial**
- **Abbreviation: ULA**
- **Administration: CEO: Tory Bruno**
- **Founded: 2006**
- **Launchers: Atlas | Delta IV | Vulcan**
- **Spacecraft: CST-100 Starliner**
- **Country: USA**



# GALACTIC 03 SPACESHIP 2

Virgin Galactic has unveiled its plans for the launch of Galactic 03, marking its third commercial spaceflight and eighth space mission overall. Set to take off on September 8, Galactic 03 will carry three paying customers to experience suborbital space travel from Spaceport America in New Mexico. Although the passengers' identities remain undisclosed, they are part of Virgin Galactic's "Founder" astronauts, individuals who paved the way for regular commercial space travel with their visionary outlook and early ticket purchases.

These visionary pioneers secured their tickets as early as 2005 and have actively participated in Virgin Galactic's thriving Future Astronaut community. This launch will mark their transformation into the 14th, 15th, and 16th astronauts of the Virgin Galactic program, flying alongside Colin Bennett, an astronaut instructor.

VSS Unity, Virgin Galactic's spaceplane, will host Galactic 03's passengers on this journey. Piloted by Nicola Pecile and Michael Masucci, Unity will launch beneath the wings of VMS Eve, the company's carrier aircraft, before igniting its onboard rocket motor to ascend to suborbital space. Passengers will revel in a few minutes of weightlessness, beholding Earth against the cosmic backdrop before a runway landing back at Spaceport America.

Virgin Galactic's previous flight, Galactic 02, made history by carrying a former Olympian and a mother-daughter duo into space for the first time. Notably, the daughter, an 18-year-old college student, earned the title of the youngest person ever to venture into space.

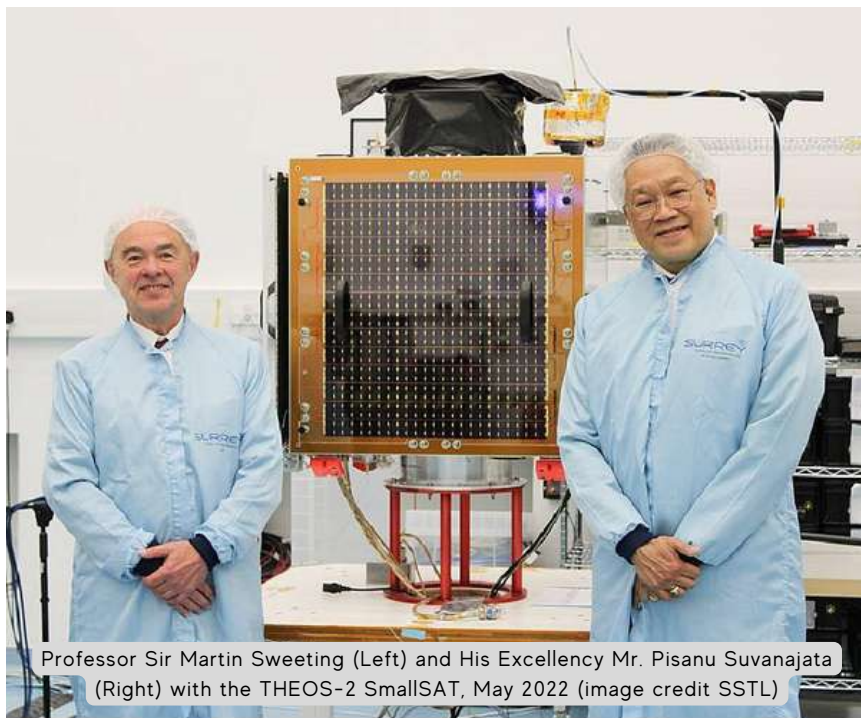
Virgin Galactic offers tickets at \$450,000, though the three passengers of Galactic 03, being "founding astronauts," likely secured their seats at a lower price, considering the fluctuations in ticket costs over the years. This upcoming launch epitomizes a journey that visionary individuals embarked upon nearly two decades ago, fostering the realization of a new era of commercial space travel. (Image Credits: VSS Imagine, the first SpaceShip III in the Virgin Galactic fleet.)





In a significant step towards advancing its space capabilities, Thailand's government announced in June 2018 that Airbus has been chosen to manufacture THEOS-2, a groundbreaking Earth observation satellite. THEOS-2 will supersede THEOS (Thaichote), Thailand's inaugural Earth observation satellite launched in 2008. GISTDA (Geo-Informatics and Space Technology Development Agency), Thailand's space agency, confirmed this selection, with the momentous event taking place at Bangkok's Mandarin Oriental in the presence of dignitaries including Deputy Prime Minister Somkid Jatusripitak and Airbus' CEO Thomas Enders.

The THEOS-2 initiative gained approval from the Thai cabinet in March 2017. An investment of approximately US\$238 million (7,800 million THB) has been dedicated to the project, reflecting the country's commitment to nurturing and evolving its space-related industries. (Image credits: Thailand posts).



Professor Sir Martin Sweeting (Left) and His Excellency Mr. Pisanu Suvanajata (Right) with the THEOS-2 SmallSAT, May 2022 (image credit SSTL)

Dr. Anond Snidvongs, Executive Director of GISTDA, expressed enthusiasm for this collaboration: "We are very pleased to be working with Airbus to jointly develop an innovative end-to-end geo-information platform that will become a national center of excellence." This platform aims to seamlessly harness multi-source data, facilitating interoperability and integration. The insights derived from this venture will serve as vital information sources for Thai leaders, empowering them to enact Actionable Intelligence Policy (AIP), which fosters informed area-based management and decision-making.

A photograph of a SpaceX Falcon 9 rocket launching. The rocket is vertical, with a large plume of fire and white smoke at its base. A service tower is visible to the right of the rocket. The background is a clear blue sky with some light clouds.

## SpaceX Launches - September 2023

# STARLINK GROUP 6-13 FALCON 9 BLOCK 5

### **Starlink Group 6-13:**

A batch of satellites for the Starlink mega-constellation – SpaceX's project for space-based Internet communication system.

### **Core Landing:**

The Falcon 9 first stage will attempt to land on an ASDS after this flight.

### **Autonomous Spaceport Drone Ship – ASDS**

An autonomous spaceport drone ship (ASDS) is an ocean-going vessel derived from a deck barge, outfitted with station-keeping engines and a large landing platform. Construction of such ships was commissioned by aerospace company SpaceX to allow for recovery of rocket first-stages at sea for high-velocity missions which do not carry enough fuel to return to the launch site after lofting spacecraft onto an orbital trajectory.

### **About Space X:**

Space Exploration Technologies Corp., known as 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.

# USSF 124 | FALCON 9

**SpaceX is set to launch a classified payload for the US Missile Defense Agency on September 29, 2023. The time of launch is yet to be decided. USSF-124 is a classified mission for the United States Space Force, to be launched from SLC-40, Cape Canaveral SFS, Florida, USA.**

Falcon 9 is a two-stage rocket designed and manufactured by SpaceX for the reliable and safe transport of satellites and the Dragon spacecraft into orbit. The Block 5 variant is the fifth major interval aimed at improving upon the ability for rapid reusability.

Space Exploration Technologies Corp., commonly known as SpaceX, is an American aerospace manufacturer and space transport services company based in Hawthorne, California. Founded by entrepreneur Elon Musk in 2002, the company's mission centers on reducing the costs of space transportation and ultimately facilitating human colonization of Mars.

With operational sites including SLC-40 at Cape Canaveral Space Force Station and LC-39A at Kennedy Space Center on the East Coast, as well as SLC-4E at Vandenberg Space Force Base in California for polar launches, SpaceX is expanding its presence. The company is also developing a launch site in Boca Chica, Texas. With these endeavors, SpaceX is spearheading innovation, making strides in space transportation, and pioneering humanity's journey to the cosmos. (Image Credits: ULA)

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

# SOYUZ - MS24

A Roscosmos Soyuz-2 rocket will launch the Soyuz MS-24 mission on Friday, September 15, 2023 at 3:44 PM (UTC).

"The "Soyuz MS-24" manned spacecraft with "Roscosmos" cosmonauts Oleg Kononenko and Nikolai Chub and NASA astronaut Loral O'Hara should fly to the station on September 15", - the Russian state corporation said in a statement.

Deputy Head of the Cosmonaut Training Center, commander of the "Roscosmos" cosmonaut corps Oleg Kononenko, together with Roscosmos cosmonaut Nikolai Chub and NASA astronaut Laurel O'Hara, was supposed to go to the ISS on March 16, 2023 on the "Soyuz MS-23" spacecraft. However, due to the depressurization of the outer contour of the radiator of the thermal control system of the "Soyuz MS-22" spacecraft, the state commission decided to lower the damaged spacecraft in an unmanned mode, and cosmonauts Sergei Prokofiev, Dmitry Petelin, and astronaut Frank Rubio, whose mission was extended, to return on the "Soyuz MS-23" spacecraft.

Progress MS-24 (85P) is a cargo resupply mission that will be heading to the International Space Station (ISS). ROSCOSMOS will launch it using an uncrewed Progress MS spacecraft atop a Soyuz 2.1a launch vehicle. The rocket will lift off from Launch Complex 31/6, at the Baikonur Cosmodrome in Kazakhstan. This mission will mark the 24th flight of the Progress MS capsule.



# ASTRONOMICAL EVENTS - SEPTEMBER 2023

## MERCURY AT GREATEST WESTERN ELONGATION

### *Best day to observe Mercury*

#### Greatest Eastern Elongation

**Elongation** is defined as the angular distance in celestial longitude separating the Moon or a planet from the Sun. Degrees to the east or west of the sun are used to measure elongations. The ideal time to observe one of the inner planets coincides with the greatest elongations. Venus or Mercury are often the planets with the greatest elongation from the sun's glare.

- Mercury or Venus are visible as evening objects that set in the west after the sun reaches its greatest eastern elongation.
- Mercury or Venus are seen as morning objects that rise in the east before the sun when they are at their greatest western elongation.

At superior conjunction, Venus or Mercury is behind the sun from Earth. While, at inferior conjunction, Venus or Mercury are between the Earth and the sun.

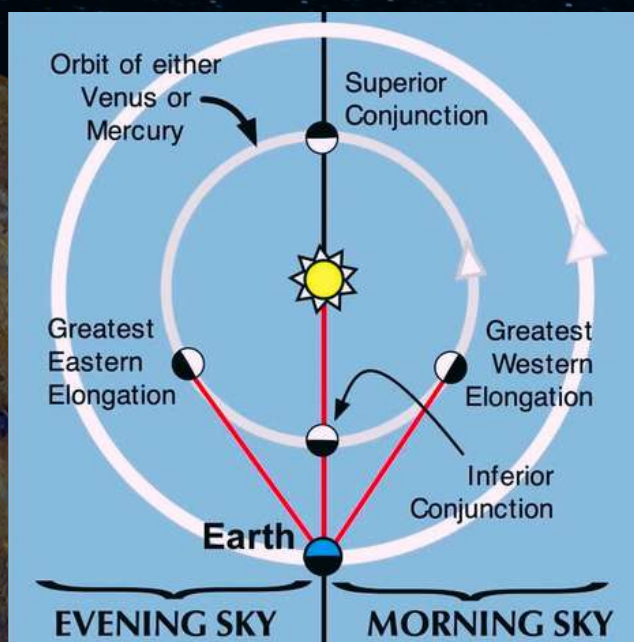
#### When to watch:

Mercury becomes visible in the mid-September 2023 morning sky. It'll be especially easy to find if you are in the Northern Hemisphere, where the ecliptic makes a steep angle with the eastern predawn horizon. The greatest elongation is when Mercury will be farthest from the sunrise on our sky's dome on September 22. But the planet will continue getting brighter after that. So, in late September, although it'll be edging back toward the sunrise, Mercury will be easier to spot in the morning twilight.

**Where to look:** Look in the sunrise direction, as the sky is getting lighter.

Though the greatest elongation is on September 22 at 6.30 p.m., for India, the best time would be during sunrise. Mercury is shining at -0.3 magnitude.

Through a telescope on and around September 22, Mercury appears 51% illuminated, in a gibbous phase, and 7.1 arcseconds across. The greatest elongation represents the best time for stargazers to view the inner planets, Mercury and Venus.



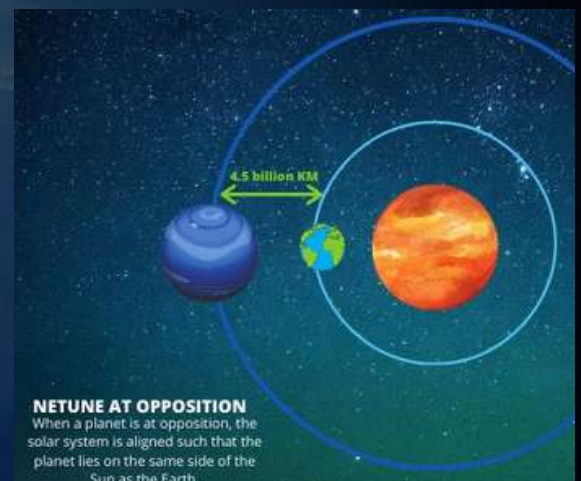
**"Maximum & Minimum  
Angular distance of Mercury  
from the sun (seen from the  
Earth) at greatest elongation  
are 28 & 18 degrees  
respectively."**

# NEPTUNE AT OPPOSITION

Neptune is the 8th planet from our sun. A year on Neptune is 165 Earth-years long. Because Neptune's orbit around the sun is so gigantic, and because Earth whips around the sun so quickly in comparison, Neptune's opposition date comes only a few days later each year. Neptune is at its least distance from Earth for 2023, 240 light-minutes or 28.9 AU from Earth on September 19. Despite its far-off residence in the solar system, this icy giant's opposition will take place on September 19 at 10:24 IST. The planet will appear in the constellation Pisces with a brightness of 7.8. It will appear in the sky just after sunset and move in the opposite direction of the Sun. It will reach its peak about midnight local time and remain there until daybreak.

## What's interesting about planetary oppositions?

The optimum moment to observe a planet or other celestial body is when they are in opposition. The Sun is fully illuminating everything at that time, making everything in the sky sparkle brightly. Additionally, planetary oppositions take place when a planet is at its largest and is closest to the Earth. An opposition also provides us plenty of time to observe the stars.

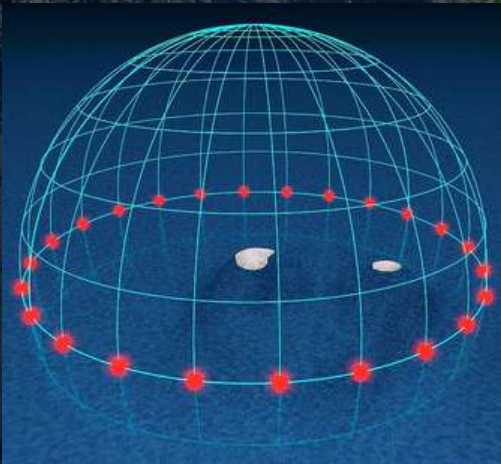


When a planet is in astronomical opposition, it indicates that it is situated on the other side of the Earth from the Sun. This event occurs for the planets farther from the Sun than the Earth since an opposition can only happen when the Earth is between the Sun and another celestial body. Mars, Jupiter, Saturn, Uranus, and Neptune are among them.

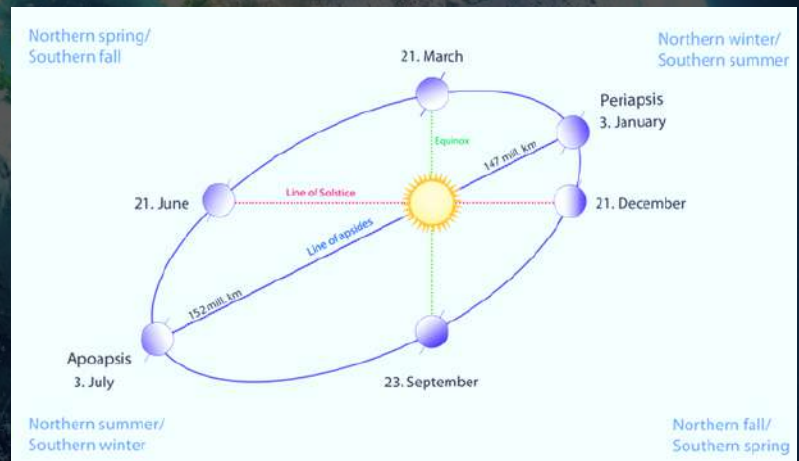
When the Earth is in the correct alignment with the planets in relation to the Sun, the oppositions of the planets take place around once a year. Mars is the sole exception here. The Earth "outraces" Mars just once every 27 months or so because the Red Planet's orbit and orbital speed are similar to those of the Earth. Mars oppositions only occur once every two to three years because of this. We will never witness Mercury and Venus in opposition because of their location within the Earth's orbit. The majority of the planets are visible with your naked vision in opposition, but binoculars or a telescope will allow you to view them even more clearly.

# AUTUMN EQUINOX

The Latin origin of the word 'Equinox' is equal night. The autumn equinox is a spectacular celestial occurrence that occurs when the Earth's axis is neither tilted away from nor tilted toward the Sun. This alignment results in roughly equal day and night durations all around the earth. The autumn equinox normally occurs between September 21st and September 23rd in the Northern Hemisphere, whereas it symbolizes the onset of spring in the Southern Hemisphere. An equinox is the time when the sun crosses the equator of the Earth. The sun's northern and southernmost locations in our sky are marked by a solstice. The 23.5 degree tilt of the Earth's axis is the cause of this. It makes sense to believe that the varying lengths of time between Earth and the sun cause the world's seasons. In contrast, we are further from the sun in the northern summer and closer to it in the northern winter. Therefore, the seasons do not vary as a result of Earth's distance from the sun. Instead, on our tilted planet, the angle of sunlight impacting your position changes on a yearly cycle, as shown below.



The day arc of the Sun, every hour, during the equinox as seen on the celestial dome, from the pole.



Position of Earth throughout the year as it revolves around the Sun. The image shows the four positions where we see the change of seasons.

## THE PERFECT DAY TO LOCATE DUE EAST AND DUE WEST

Finding the directions due east and due west from your preferred location to observe the sky is easiest on the equinox day. At the equinoxes, the sun rises in the east and sets in the west. No matter where on Earth you reside, it is true. Why? We all see the same sky, after all.

There's a due east and due west point on the horizon everywhere on Earth, except for the North and South Poles. Your horizon and the celestial equator, the fictitious line that lies above the actual equator of the Earth, meet at this point. The graphic above depicts how the sun appears above at local solar noon at the equinoxes when viewed from Earth's equator. The sun is directly over the celestial equator. Everywhere on Earth, the celestial equator crosses at due east and due west. At the equinox, the sun rises and sets in exact east and west positions.

***The September equinox, which falls on September 23 at 6:50 UTC (12:20 pm, Indian Standard Time (IST)), is autumn for the Northern Hemisphere and spring for the Southern Hemisphere in 2023.***



# 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. In astronomy, conjunctions relate to two or more objects brought together in the sky. 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 Jupiter

On September 4, the gas giant Jupiter will meet the 19-day-old Moon in the constellation Aries. The apparent distance between the two objects will be  $3^{\circ}18'$  in the late night. They will be in the Eastern direction. Jupiter is at a magnitude of  $-2.62$  and the Moon has a magnitude of  $-11.12$ .



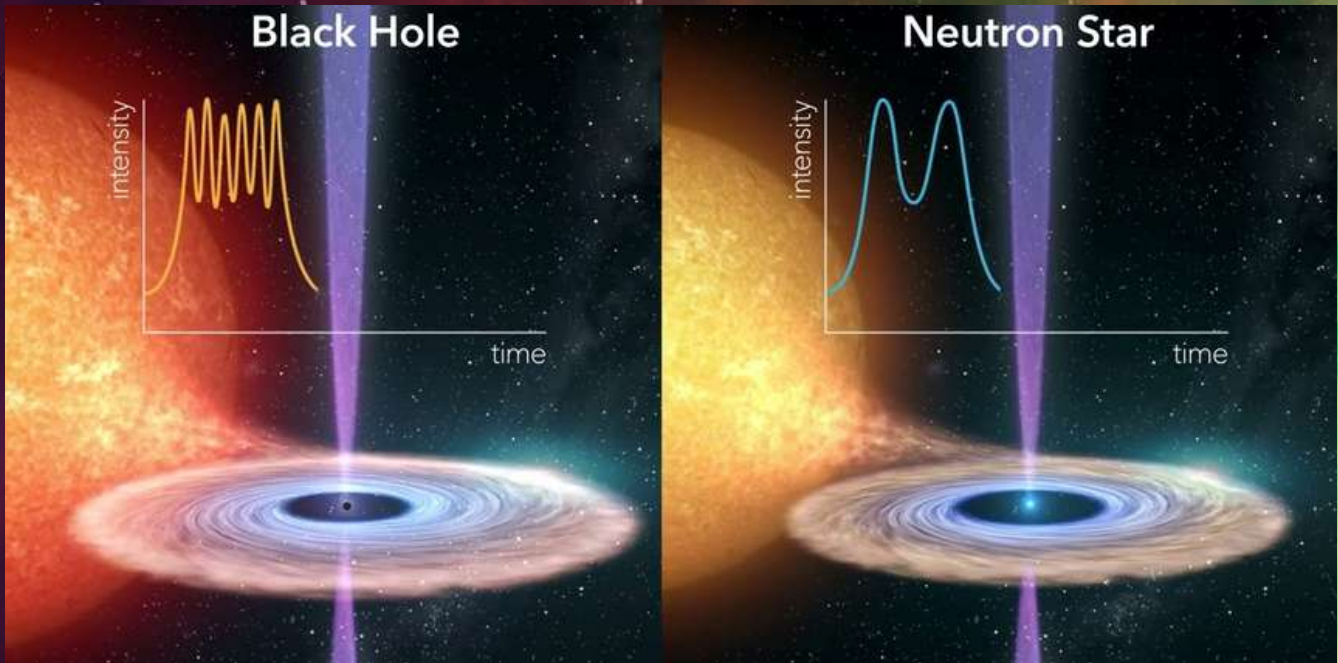
## Conjunction of Moon and Saturn

On September 27th, the ringed planet Saturn will meet the 12-day-old Moon in the constellation Aquarius. The apparent distance between the two objects will be  $2^{\circ}38'$  in the late night. They will be in the Western direction. Saturn is at a magnitude of  $-0.57$  and the Moon has a magnitude of  $-12.07$ .

# STUDENT'S CORNER

## Neutron Stars: Cosmic Powerhouses of the Universe

Nikhilesh B  
lastronomer



In the vast expanse of the universe, among the myriad celestial objects that captivate the imagination of astronomers and enthusiasts alike, neutron stars stand out as some of the most fascinating and enigmatic entities. These incredibly dense remnants of massive stars, born from the cataclysmic events of supernovae, possess extraordinary properties and play a crucial role in advancing our understanding of fundamental physics and astrophysics.

### Formation and Structure:

Neutron stars are born from the fiery deaths of massive stars, typically those with masses between about 8 and 30 times that of our Sun. When these stars exhaust their nuclear fuel and can no longer support themselves against gravity, they undergo a supernova explosion. This explosion is one of the most energetic events in the universe, releasing an immense amount of energy in the form of light and matter.

The core of the collapsing star is compressed to an astonishingly high density, causing protons and electrons to merge and form neutrons through a process known as neutronization. This results in a highly compact object composed almost entirely of neutrons, hence the name neutron star. These stars are incredibly small, typically only about 20 kilometers (12 miles) in diameter, yet they can have masses greater than that of our Sun.

### Extreme Density and Gravitational Effects:

The density of neutron stars is truly mind-boggling. A teaspoon of neutron star material would weigh billions of tons on Earth due to the strong force of gravity. The gravitational pull near the surface of a neutron star is so immense that it distorts the spacetime around it, causing light to bend and time to slow down. This phenomenon, known as gravitational time dilation, was famously predicted by Einstein's theory of general relativity.

**Pulsars: Beacons of Precision Timekeeping:**

One of the most captivating aspects of neutron stars is their ability to emit highly regular beams of electromagnetic radiation. When these beams of radiation are aligned with Earth's line of sight, they appear as pulsating signals, leading to the creation of pulsars. Pulsars are essentially rotating neutron stars with incredibly stable rotation periods, making them some of the most accurate natural timekeepers in the universe.

**Exotic States of Matter:**

Neutron stars provide a unique opportunity to explore the behavior of matter under extreme conditions. The gravitational forces are very strong.

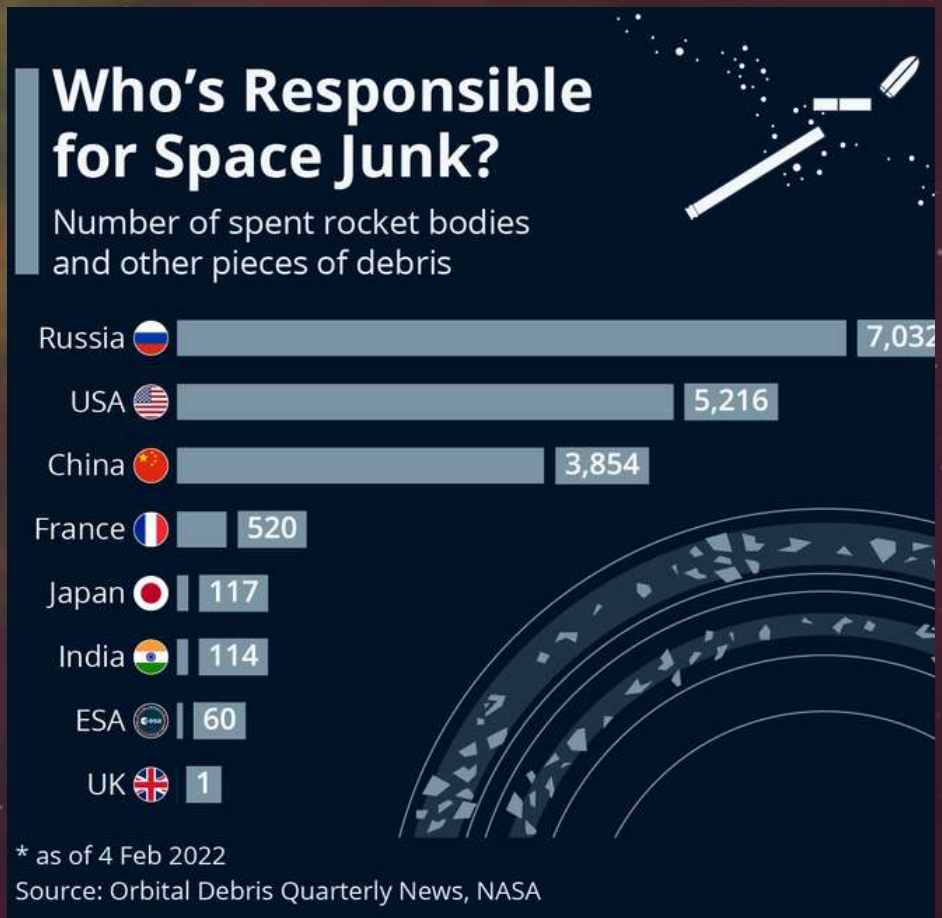
**Conclusion:**

In the cosmic symphony of celestial objects, neutron stars shine as some of the most intriguing and mysterious entities. Their extreme density, strong gravitational effects, and exotic matter properties challenge our understanding of the universe's fundamental principles. From being the cosmic remnants of massive stars to becoming sources of precision timekeeping and gravitational wave emissions, neutron stars continue to inspire awe and drive the advancement of scientific knowledge. As our technology and understanding improve, these enigmatic objects promise to reveal even more about the nature of matter, spacetime, and the universe itself.

# Space Debris

**Sourajit Mandal**  
Astronomy Camp student

Science is developing at a faster rate than ever before. So is our knowledge of the universe. We are launching over a hundred rockets every single year. By the end of January 2022, there were 12293 objects launched into the space. With every launch, we are increasing our knowledge and experience of launching things into space. But in the process, we are also increasing something problematic for future missions. Something that can possibly trap us on our own tiny planet and stop us from exploring the rest of the universe forever.



Space debris is an existential problem and can be mainly classified into 3 types. These are:

**Payload:** These are mainly satellites. This includes fragments produced by wear and tear and collisions.

**Rockets:** Remains of stages used to propel missions in orbit. This also includes fragments produced by wear and tear and collisions.

**Mission-related objects:** Things that have been dropped by humans in space like dropped tools, screws, cables, cameras, etc.

These space debris are of sizes ranging from below 1 cm to more than 10 cm. They can be classified as:

**Below 1 cm:** Estimated to be more than 128 million fragments, most of these are extremely hazardous and are undetectable.

**Between 1 and 10 cm:** It is calculated that there are around 900,000 in orbit, which range from the size of a marble to a tennis ball.

**More than 10 cm:** These objects include everything from tools lost during missions to defunct satellites.

An example of the danger of space debris was seen in 2018. A tiny hole in a Russian capsule allowed air to leak from the International Space Station (ISS). The hole was caused by a small space junk below 1 cm. If it went unnoticed it could have led to serious danger for the astronauts. Thankfully the potential danger was noticed and NASA and Russian space officials said that the six astronauts were in no danger.

This is just a glimpse of the potential hazards that can occur due to space debris. This is a huge obstruction to the advent of mankind in space. We need to act to solve this problem. The main challenge of ADR (Active debris removal) should be to not create more space debris and to identify the debris accurately. When it comes to the debris already in orbit, many satellites, as well as the International Space Station, have Whipple Shields which is an outer shell that protects the walls of the object from a possible collision. Here are some of the other strategies used to avoid this problem:

- **Orbital changes:** Many modern satellites are launched into elliptical orbits with perigees within the Earth's atmosphere, which causes them to break up eventually.
- **Self-destruction:** consists of programming the satellite to leave its orbit at the end of its useful life and be eliminated when it comes into contact with the atmosphere.
- **Passivation:** is the removal of any internal energy contained in the vehicle at the end of its useful life. Although the chassis remains in orbit, there is less risk of explosions. The same applies to the rocket stages.
- **Reuse:** These rockets return to Earth intact. These are used by Space X, the aerospace company owned by Elon Musk.
- **Lasers:** consisting of stopping the fragments by vaporizing their surface with a powerful laser, which stops them and causes them to fall.

There are many more methods that can be utilized to overcome this great obstacle in our way of space exploration. We, humans, have faced many difficult challenges and obstacles in our path that we have successfully crossed. This is another one of those problems. Let's work and hope for the best!

# The Oort Cloud: Exploring the Outer Fringes of our Solar System

Priyadarsini.C  
Astronomer

The Oort Cloud, a mysterious and distant region at the outermost fringes of our solar system, remains one of the most intriguing and least understood components of our cosmic neighborhood. Named after the Dutch astronomer Jan Oort, who first theorized its existence in 1950, the Oort Cloud is a hypothetical reservoir of icy bodies that is thought to stretch far beyond the orbit of Pluto. This essay delves into the origin, composition, significance, and potential implications of the Oort Cloud in our understanding of the solar system and beyond.

The Oort Cloud is believed to consist primarily of icy remnants from the early days of our solar system, remnants that never coalesced to form larger bodies like planets or moons. These objects, known as "planetesimals," are remnants of the solar nebula, the cloud of gas and dust from which our solar system formed around 4.6 billion years ago. Gravitational interactions with the giant planets, such as Jupiter and Saturn, could have sent these planetesimals into the outer reaches of the solar system, creating the Oort Cloud as a vast reservoir surrounding the sun. It is thought to be divided into two regions: the inner Oort Cloud, which extends from about 2,000 to 20,000 astronomical units (AU) from the sun, and the outer Oort Cloud, which stretches much farther, perhaps up to 100,000 AU.

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# VISUAL ARTS FROM SPACE ASSOCIATED ASTRONOMERS



Moon captured by Kavith Shah, Club student



Scorpius constellation captured by students of Gateway International School, Padur.



Sagittarius constellation captured by students of DAV Public School, Velachery.

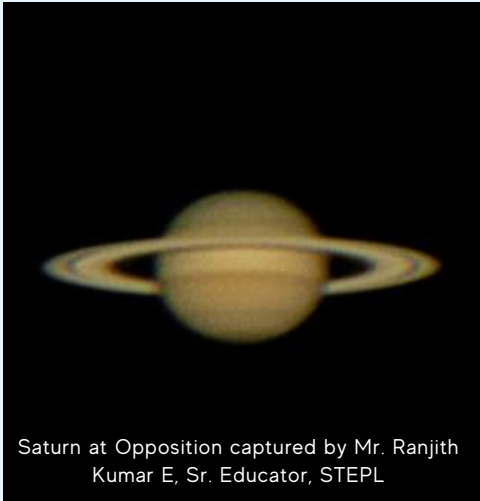


Moon captured by Daksh Rathi, Club student,

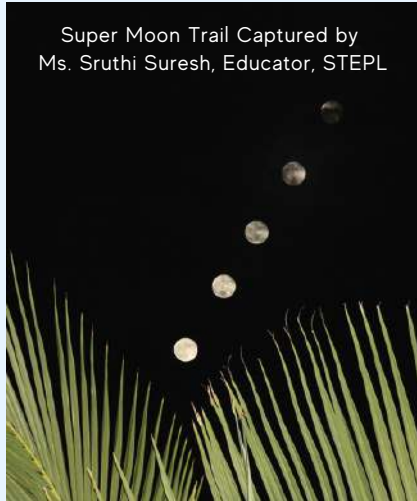


Scorpius and Sagittarius constellation captured by students of Bhavan's Rajaji Vidyasharam, Kilpauk.

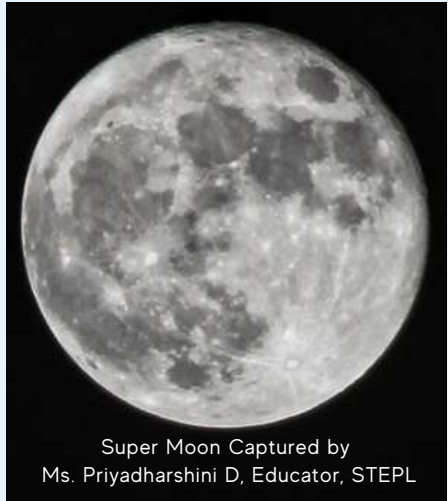
# ASTROPHOTOGRAPHS BY SPACE



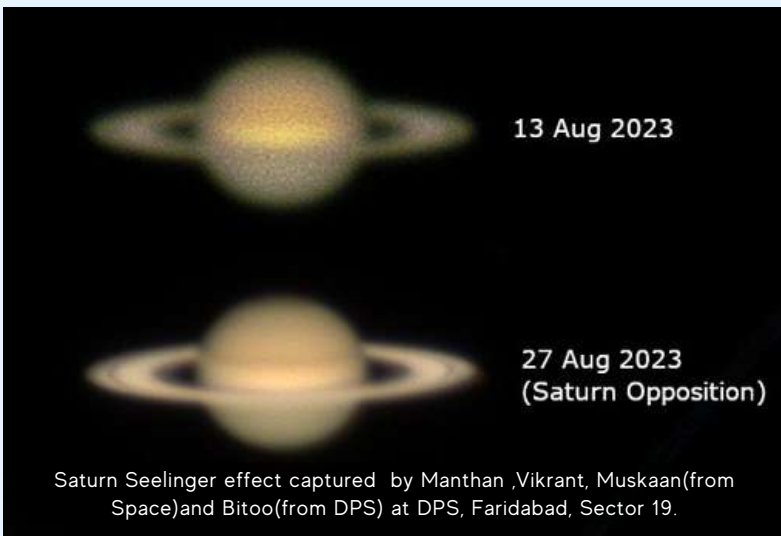
Saturn at Opposition captured by Mr. Ranjith Kumar E, Sr. Educator, STEPL



Super Moon Trail Captured by Ms. Sruthi Suresh, Educator, STEPL



Super Moon Captured by Ms. Priyadharshini D, Educator, STEPL



13 Aug 2023

27 Aug 2023  
(Saturn Opposition)

Saturn Seelinger effect captured by Manthan, Vikrant, Muskaan (from Space) and Bitoo (from DPS) at DPS, Faridabad, Sector 19.



Moon captured by Mr. Slamuddin, Senior Assistant.



Milkyway captured by Mr. Ranjith Kumar E, Sr. Educator, STEPL



Saturn at Opposition captured by Mr. Neeraj Ladia, CEO, GAPL

# James Van Allen



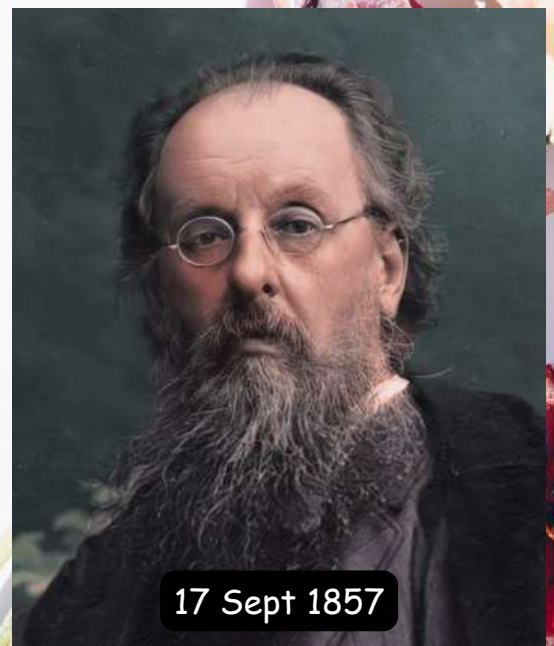
7th Sept 1914

James Alfred Van Allen (7 September 1914 – 9 August 2006) was a pioneer who helped give birth to America's space age. The first discovery of the space age, the presence of two doughnut-shaped belts that circle the Earth, known as the Van Allen radiation belts, was done by him. Additionally, his design of the Geiger-tube cosmic ray detector was one of the three pieces of equipment on Explorer 1. Other credentials to his name include his discovery of a new moon of Saturn in 1979 and the radiation belts around Saturn. He also developed the first plans for an International Geophysical Year and was a founder member of the International Academy of Astronautics.

# Happy Birthday

## Konstantin Tsiolkovsky

Konstantin Eduardovich Tsiolkovsky was a scientist, mathematician, teacher, and the 'Russian Father of Rocketry'. He wrote many theoretical papers focusing on the principles of aeronautics and astronautics. Tsiolkovsky first determined the escape velocity from Earth and how to achieve it by using multi-stage rockets. He came up with Tsiolkovsky's formula. This equation provided the mathematical relationship between the changing mass of a rocket as it burns through fuel, the velocity of exhaust gasses, and the final speed of the rocket. The most prominent crater on the moon's far side is named after him, as is the asteroid 1590 Tsiolkovsky.



17 Sept 1857



# HISTORICAL EVENTS HAPPENED IN SEPTEMBER

## DISCOVERY OF 3 JUNO

Inspired by the discovery of Uranus by brother-sister duo William and Caroline Herschel decades earlier, Vereinigte Astronomische Gesellschaft, or United Astronomical Society, invited 24 astronomers to find additional planets in the solar system in 1800. German astronomer Karl Harding was among the invitees. While he was a part of this group, Karl Harding discovered the third asteroid in the main-asteroid belt from Schröter's observatory on 2 September 1804.

Discovered after 1 Ceres and 2 Pallas, 3 Juno (or Juno) was initially assumed to be a planet, thus named after the highest Roman goddess. However, during the 1850s, it was reclassified to be an asteroid. Juno is composed of hard silicate rock, classifying the asteroid as a stony type (S-type). Since fragments of S-type rocks could survive the trip through our atmosphere, scientists believe that Juno could be the parent of many meteorites that rain on Earth.



**Karl Ludwig Harding**



Juno is one of the largest asteroids in the main asteroid belt. With measurements of its diameter around 243 km and estimates of its mass stating that it contains 1% of the main asteroid belt's total mass, Juno is either the 10th or 11th largest asteroid and the second largest S-type asteroid after 15 Eunomia. However, comparing Juno to the heaviest asteroid, Ceres, Juno is tiny. Its mass is 3% of Ceres's mass.

An unusual property of Juno is its highly reflective surface, even for an S-type asteroid. Its high albedo is the reason for its early discovery, before asteroids larger than it was observed.

# The tale of two Vikings

In the second installment of NASA's early missions to investigate the Red Planet, Viking-2 soared into the cosmos on September 9, 1975, aboard a Titan rocket—akin to its twin, Viking-1, launched a month prior. Although initially named Viking-A, the mission was later renamed Viking-2 due to technical delays. The ambitious Viking missions encompassed an orbiter and a lander, aiming to delve into the depths of Mars like never before.

Eleven months after launch, on 7th August 1976, Viking-2 successfully inserted itself into the Martian orbit. The spacecraft spent a month orbiting the planet while scientists determined another landing site. The initial landing site, Cydonia, was selected by going through photos captured from Mariner 9's mission. However, photos captured by Viking-1, which had better resolution, showed a terrain more dangerous than the original anticipation. Finally, Utopia Planitia was selected as Viking-2's landing site for its safety merit and scientific potential.

Upon selection of the landing site, the lander separated from the orbiter and touched down safely on 3rd September 1976, approximately 6500 km from Viking 1. Viking 2 became the second object that successfully landed on Martian soil.

At an initial glance, the landing site of Viking-2 looked much rockier than Viking 1's. In pictures sent, scientists noted that the lander appeared tilted, leading to speculation that it touched down on a rock. Over time, scientists determined that these rocks were either broken up bits from an ancient lava flow or piles of rubble that got ejected after a crater formed nearby.

Initially given a 90-day lifetime, Viking-2's lander and orbiter operated past this date. The lander spent more than three years taking pictures of the surrounding area while analysing the regolith in front of it.





At the same time, the orbiter took photos of Martian features from above, revealing impact craters on Mars having more complex ejecta patterns than expected. These patterns appeared in layers and included features such as scraps and ridges.

Due to Viking-1's seismometer not working, the seismometer on the Viking-2 lander became important. It measured Marsquakes on the Martian surface, allowing scientists to approximate the thickness of the Martian crust. Estimates place the thickness between 14 - 18 km, which is thicker than Earth's oceanic crust yet thinner than Earth's continental crust. The instrument's sensitivity surpassed scientists' expectations, being able to measure wind pressure, leading to the discovery that there are cold fronts on Mars.

The Viking-2 program eventually ended on 12th April 1980, when the lander stopped transmitting data. By then, the orbiter's operations had been terminated (24th July 1978) due to a series of leaks. By the end of both Viking missions, 97% of Mars was mapped by the twin Viking Orbiters. Additionally, data collected from these missions are still analyzed and interpreted today. Unfortunately, the landers did not find any traces of life. They did find all the elements essential to life on Earth: carbon, nitrogen, hydrogen, oxygen, and phosphorus.



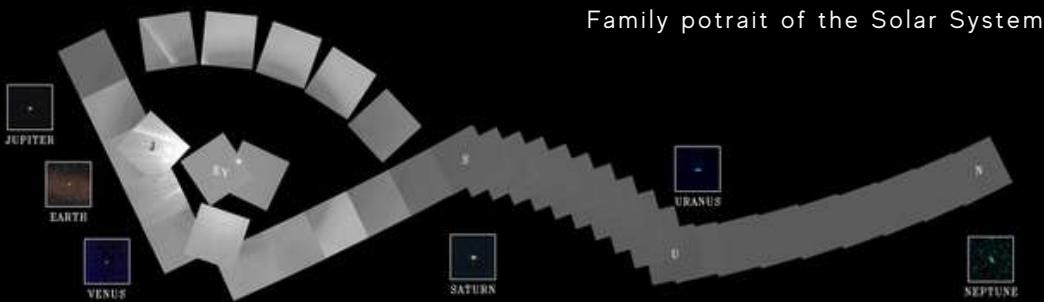
Viking-2 on the Martian Surface

# LAUNCH OF VOYAGER 1

In the Summer of 1965, scientists at NASA calculated that if a spacecraft was launched in the late 1970s, it would be able to visit all four outer planets due to a rare planetary alignment that occurs every 176 years. Conceptualized in 1972 as Mariner Jupiter/Saturn 1977, the original plan of the mission was to build upon the heritage of earlier Mariner spacecraft, which flew by Venus, Mars, and Mercury by doing a flyby of Jupiter and Saturn. Months before its launch, the program was renamed Voyager.

Onboard a Titan rocket, Voyager 1 launched on 5th September 1977 from Launch Complex 41 at Cape Canaveral, Florida. This happened 16 days after its twin Voyager 2 left Earth's orbit. Even though Voyager 1 launched later, scientists calculated that it would reach the outer planets earlier as it would travel a faster route and thus got the designation '1'. True to calculations, in December 1977, Voyager 1 overtook Voyager 2.

Voyager 1 did flybys of Jupiter, Saturn, and Saturn's largest moon Titan. The space probe studied the weather, magnetic fields, and rings of the two gas planets and provided detailed images of their moons.



The flyby of the two gas giants resulted in spectacular images that furthered the understanding of the planets and their moons. This included learning about Io being a volcanic world, 2 new Jovian Moons, Thebe and Metis, and Jupiter's atmosphere being more turbulent than previously estimated. At Saturn, Voyager found five new moons, a ring system composed of thousands of bands, a new ring system (the G-ring), and more. Voyager 1 also photographed several Saturnian moons: Titan, Mimas, Enceladus, Tethys, Dione, and Rhea.

However, as the Titan fly-by has specific requirements, Voyager 1 could not be directed to Uranus and Neptune.

After its encounter with Saturn, Voyager 1 continued its path to escape to the solar system, moving at a rate of 3.5 AU a year. On its way out, Voyager 1's camera was pointed to the solar system, and 60 images of the solar system were captured. A solar system portrait. All planets, except for Mercury and Mars, were photographed. One of these photos is the famous "Pale Blue dot" which shows Earth from 40.5 AU from our Sun.



The Golden Disk

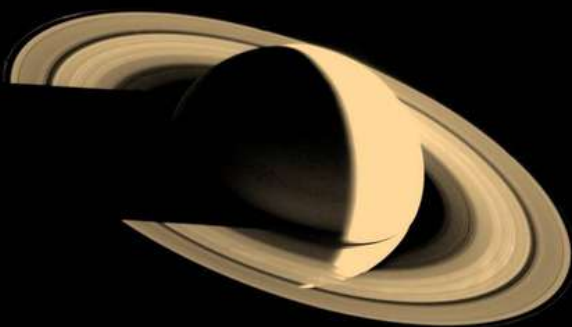
On 1st January 1990, Voyager 1 and Voyager 2 were declared to be part of the Voyager Interstellar Mission (VIM). The mission's aim was to explore beyond the gas giants, at the outer limits, and beyond the Sun's sphere of influence. A specific goal of the mission included the collection of data as the spacecraft transitioned from the heliosphere – the region of space dominated by the Sun's magnetic field and solar field – to the interstellar medium.

As Voyager 1 continued its journey, on 17th February 1998, it became the most distant human-made object in existence, passing further than Pioneer 10. Six years later, on 18th December 2004, Voyager scientists announced that Voyager 1 had reached termination shock after which it had entered the heliosheath. Almost eight years later, on 25 August 2012, Voyager exited the heliosphere and began measuring the interstellar environment.

In anticipation of this, before Voyager left Earth's orbit, a 30 cm diameter gold-plated copper disk was added, the golden disk. The disk carried a message for potential extra-terrestrials who might come across the spacecraft as well as the location of Earth.

The Voyager missions are a testament to human engineering. At the time of publication, they have been operating for 46 years. The information provided on the uncharted territory has helped scientists gain a better understanding of energy and radiation in space. This is important as we can develop better protection from radiation for future missions and astronauts.

Currently, both spacecraft are still sending scientific information about their surroundings through the Deep Space Network, or DSN.



Saturn



The Pale Blue Dot

# DISCOVERY OF MIMAS

On 17th September 1789, English astronomer, William Herschel, pointed the 40-foot telescope, with its 48-inch aperture, he built towards the night sky and discovered Mimas. He initially mistook Mimas as a star, but further examinations led him to realize that he had discovered the seventh satellite of the ringed planet, Saturn. Herschel's son, John, named Mimas after a giant from Greek Mythology.

The smallest and innermost major regular moon of Saturn, Mimas, after one of the Giants from Greek Mythology.

Mimas, known as Saturn 1, is Saturn's smallest and innermost major regular moon. With an approximate diameter of 400 km, Mimas is the smallest astronomical body that is somewhat round due to its gravity. Additionally, Mimas has an average density of 1.15 g/cm<sup>3</sup> indicating that the composition of Mimas is mostly water with a small amount of rock.

From Earth's surface, Mimas looks like a little dot. For centuries, that was the only view we had. Voyager missions and their flyby of the Saturnian system changed that. Most of our current knowledge, approximately 90%, of the satellite is from data collected by the twin Voyager spacecraft.

The surface of Mimas is frozen and saturated with impact craters. The sizes of the craters range in size, some of which are greater than 40 km in diameter. However, the craters in the South Pole region of Mimas are generally 20 km in diameter or less. This suggests that melting or other resurfacing processes have occurred there.

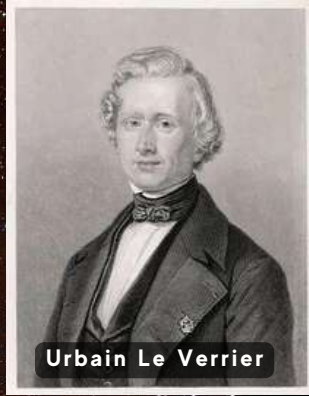
The most distinguishable feature on Mimas's surface is a giant impact crater named Herschel after William Herschel. The crater has a diameter of 130 km across which is a third of the planet's diameter. Its outer walls are 5 km high, while its central peak is 6 km high. There is a possibility that the impact that created this crater nearly destroyed Mimas, while shockwaves may have caused the fractures, or chasma, seen on the opposite side.

Mimas's surface is a mystery. It is closer to Saturn and has a more eccentric orbit than Enceladus, yet its surface appears to be solid. This is contrary to the assumption that the higher tidal heating that Mimas should experience would result in liquid water reaching its surface. The heavily cratered surface disagrees with this assumption as it is evidence that the frozen surface has persisted long enough to preserve the craters. This paradox has brought about the Mimas Test. In the test, any theory that can explain the partially thawed water of Enceladus must be able to explain the frozen surface of Mimas simultaneously.

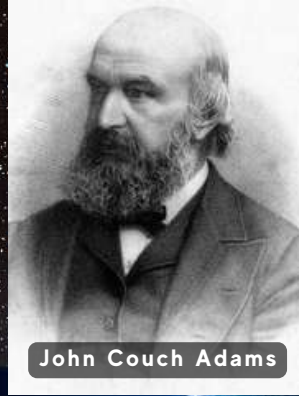


**William Herschel**

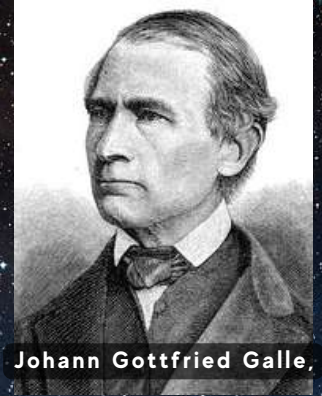
## DISCOVERY OF NEPTUNE



Urbain Le Verrier



John Couch Adams



Johann Gottfried Galle

The story of Neptune's discovery intertwines with the puzzling irregularities in Uranus' orbit that confounded Newton's law of Gravity. This led to the mathematical prediction of Neptune as a distant, unseen planet that explained these anomalies. On September 24, 1846, astronomer Johann Gottfried Galle observed Neptune, confirming its existence and validating Newton's gravitational theory.

Astronomers Urbain Le Verrier and John Couch Adams independently forecasted Neptune's presence. Galle, guided by Le Verrier's calculations, spotted the planet slightly deviated from its predicted position. Neptune's revelation was followed by the discovery of its largest moon, Triton, by William Lassell.

Ironically, Neptune had been spotted earlier by Galileo Galilei in 1612, but its slow motion against the starry backdrop masked its identity. It wasn't until telescopic advancements that Neptune's true nature emerged.

As the solar system's fourth-largest planet, Neptune rests 30 astronomical units (A.U.) from the Sun. Its enigmatic features include swift winds despite minimal heat and a peculiar magnetic field. With just one mission, Voyager 2 in 1989, Neptune remains mysterious, raising countless unanswered questions. Its core resembles Earth's, encased in a slushy mixture and thick atmosphere. The planet's distinctive blue hue arises from methane's light-absorbing qualities. Moreover, Neptune boasts irregular rings, composed of dust clumps known as arcs.

# TRAIN YOUR BRAIN

## CROSSWORD



**ACROSS**

**DOWN**

- |   |              |   |
|---|--------------|---|
| <p>5. What happens when charged particles from the sun interact with ions in the upper atmosphere?</p> <p>7. Name the ISRO's first mission to the Sun.</p> <p>8. The bright patches surrounding sunspots are?</p> <p>9. Areas that appear dark on the surface of the Sun are?</p> <p>10. NASA's first space probe to study the sun?</p> | <p>.....</p> | <p>1. What is the name of the oldest solar observatory?</p> <p>2. The outermost layer part of the sun's atmosphere is called?</p> <p>3. The grainy appearance of the solar photosphere is called?</p> <p>4. The visible layer of the sun is called?</p> <p>6. A sudden explosion of energy caused by tangling, or crossing of magnetic field lines near sunspots is ?</p> |
|---|--------------|---|

## ASTRONOMY WORD PUZZLE

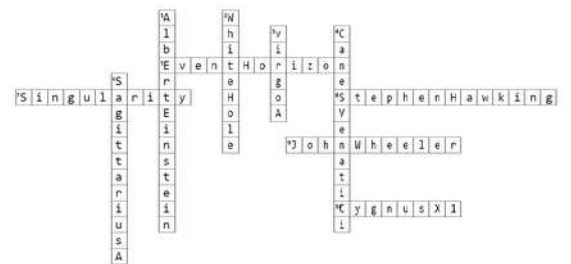
Find the names of the famous Missions of NASA from the mixed letters and mark them.

Answers for last month puzzles.

### NASA SPACE MISSIONS

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

- MESSENGER
- SPACESHUTTLE
- PROJECTGEMINI
- CASSINI
- ARTEMIS
- NEWHORIZONS
- VIKING
- JWST
- APOLLO
- PIONEER
- DART
- VOYAGER
- SKYLAB
- PARKERPROBE
- JUNO



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



# FUTURE OF NATION, POWER OF YOUTH

Embarking on the 77th glorifying Independence Day, our esteemed leader, Mr. Shivam Gupta, CEO; MD (Space Group), Mr. Pankaj Gupta, CFO (Space Group), and Ms. Avani Patwa, CEO (Space Technology; Education Pvt. Ltd.) hoisted the Indian flag in honor of the valiant freedom fighters, a collective heartbeat echoed in the symphony of pride and gratitude.

Space is an integral part of India's development and has a continuous legacy in the education sector. To have a patriotic touch, the art of hand painting was done highlighting the tri-color hues representing courage, truth, growth, and limitless potential - a reflection of the soaring spirit of Space India.

**Embracing the Future: Women as Pillars of Strength** - Women are associated with tenderness, unending love, and strength in Indian culture. Our female leaders, Ms. Avani Patwa, CEO (Space Technology; Education Pvt. Ltd.), Ms. Manalee Deka, Assistant Director (Education, Space Technology; Education Pvt. Ltd.), and Ms. Pubali Dutta, Manager (Human Resources, Space Group), embodies all of these and more with their never-ending efforts, enthusiastic personalities, and the magical aura they carried to turn every small task into a big success. As we gaze into the horizon, we are confident that the women of Space India are poised to shape the future of the new India.

Global trends in gender diversity on corporate boards show that strong female leaders enjoyed higher returns and superior average valuation compared to companies without robust female leaders. Space Group of Companies has close to 36% of women and 64% of males in the workforce. Hence, the ratio is 9:16. The average age of Spacians is 30 years. This year, we are hiring more STEM talent, especially those from strong science and astrophysics backgrounds. In the coming quarters, STEM talent hiring is going to increase.

## HR Initiatives-

- Conceptualizing Learning and Development wing.
- Strategic employee engagement.
- Revamping and Crystalizing processes and policies respectively.

## INDEPENDENCE DAY CELEBRATION

28105 days of Independence-Independence Day reminds every Indian of the start of a new era of freedom, courage, and sacrifices, and to commemorate this era, we decided to fly kites to honor the efforts of our great freedom fighters in providing us with a free sky to live and breathe in. We concluded our day with a stirring patriotic movie that evokes patriotic feelings in all Spacians. As the screen painted tales of valor and sacrifice, it kindled a sense of unity and love for our nation, binding us closer as we reflected on the values that define us.

चाँद पर तिरंगा - Space India was resounding with the rhythmic beats of the dhol in the success of Chandrayaan-3's soft landing on the south pole of the Moon with the boli -

**बारी बरसी खाटन गया सी खट्टु के ले आना पान,  
भंगड़ा ता सजदा जद मून ते पहुँचा चंद्रयान ||**





**Spacian of the Month - Ms. Vinita Yadav, Team Lead - Education**

In her role as a valuable mentor, Vinita has been a guiding light for the UITS educator team, skillfully nurturing their growth and shaping them into future mentors themselves. Her influence extends beyond mentoring, as she has played a pivotal role in orchestrating Clubs/Workshops, arranging demonstrations, and facilitating multiple rounds of interviews for the HR Department.

**Special Recognition**

Ms. Sruthi Suresh, Educator - Education

We extend special recognition to Ms. Sruthi Suresh for her remarkable achievement in having her photograph of the LVM3-M4 launch carrying Chandrayaan-3 featured as NASA Astronomy Picture of the Day (APOD) on July 19, 2023. The entire organization deeply appreciates her efforts and takes pride in this accomplishment.

**Promotion in the House**

Mr. Neetin Gussain has been promoted to the Chief Executive Officer (CEO) of the Space Group's - Astrotourism India Pvt. Ltd. This marks an internal identification of talent, hard work, and leadership that Mr. Gussain has been promoted from Vice President (Sales), Space Technology; Education Pvt. Ltd. to a new designation.

Over the course of his 10+ years of commitment and loyalty to Space Group, Mr. Neetin Gussain has made significant contributions to his position as vice president by creating new business prospects for Space in all areas, holding strong PR with our clients, and managing the Sales team.



**Intern's Perspective**

"Being a part of the SPACE India team as a Legal Trainee has been an incredible experience. I'm truly impressed by the organization's pioneering role in space education, which holds immense potential to enhance India's demographic dividend. The knowledge I've gained during my time here is invaluable, and I'll cherish this experience for a lifetime." - by Ms. Madhulika Tyagi



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