

# Galactica

Astronomy and Space Science Magazine

## What's Inside?

SPACE Insights

Highlights From June 2024

Moon Phases And Planet Visibility

What's Awaiting in June 2024

Cultural Astronomy & Celestial Tales

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Historical Events Happened In June

June Born Legends

Train Your Brain

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

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# ABOUT SPACE



Legacy of 23 years



Pioneer Organization



1000+ Activities Developed



1000+ Schools Associated



1.5M+ Students Engaged



10K+ Outreach Events



10+ Cities Presence

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

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

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

## CMD's Message



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

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

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

## MD's Message

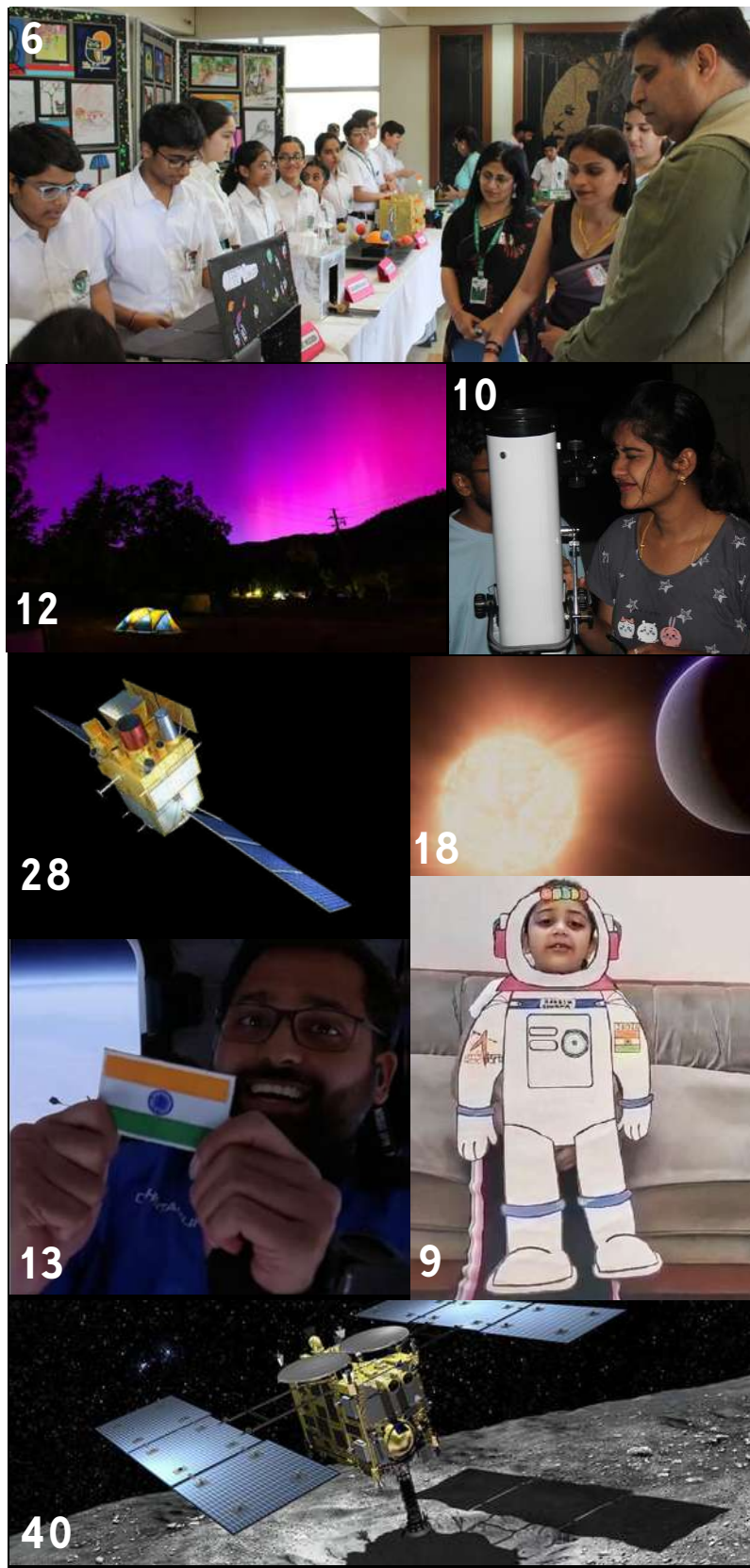


**Mr. Shivam Gupta,  
MD, SPACE**

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

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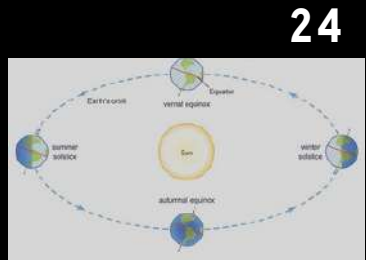
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# SPACE INSIGHTS

## SPACE INDIA AND THE AMERICAN CENTER COLLABORATE, RECOGNIZING A NEW ERA OF INDO-US RELATIONS



AMERICAN  
CENTER  
NEW DELHI

India and the United States are bound to initiate a groundbreaking journey with the launch of an astronomy and space science workshop series by SPACE India and the American Center, New Delhi. It aims at fostering space science and astronomy education at the grassroots level. This marks a significant milestone in the enduring saga of Indo-US relations, underscoring the depth and vitality of this historic partnership.

SPACE India conducted the inaugural workshop titled "Get Set, Make Hydraulic System for Space Applications" on May 13, 2024, at the American Center in New Delhi. It was tailored exclusively for students aged 13 to 18 and was provided free of charge.

Dr. Sachin Bahmba, Founder, Chairman & Managing Director of the Space Group, led the initiative with exceptional proficiency alongside his dedicated team. The participants were deeply engaged throughout the workshop, finding inspiration and rejuvenation in a series of informative and entertaining activities that underscored the interactive nature of learning.

The students understood the dynamism projected by the fluid mechanics. Equipped with this knowledge, they crafted astronomical models inspired by space, driven by foundational principles. This instilled a profound appreciation for space exploration. Participants unraveled hydraulics' fundamentals, and its applications in space, and navigated through problem-solving challenges.

The workshop offered hands-on engineering experiences such as constructing a working model of a space-inspired system and exploring real-world applications of hydraulics in space exploration.

***"The profound impact of the workshop was remarkable, with attendees gaining newfound appreciation and respect for the opportunities presented. Their enriched understanding will undoubtedly catalyze further exploration and discovery, opening doors to a world of possibilities previously considered beyond reach".***

***~ Dr. Sachin Bahmba (Founder, and CMD, Space Group)***

This marks the inception of an extraordinary journey. It promises to touch the lives of countless individuals, empowering them to explore both themselves and the wondrous realms that lie beyond.



# "ALL INDIA ASTEROID SEARCH CAMPAIGN (AIASC)- 2024"

## iASTRONOMER

SPACE has been nurturing young minds across India since many years, providing them with a unique opportunity to explore the cosmos. This remarkable journey has led to several groundbreaking achievements and discoveries of asteroids, all thanks to the enthusiasm and dedication of Indian school children. Initiated in 2010 by SPACE India, the AIASC now enters its remarkable 15th year, symbolizing a decade and a half of pioneering excellence. What began as an ambitious endeavor has etched a legacy of exemplary achievements, setting the standard for innovation and success in its wake. The AIASC has been instrumental in identifying celestial wanderers that were previously unknown: 2 Numbered Asteroid Discoveries, 76 Provisional Discoveries of Asteroids, 2 Special Discoveries, 11,325 Preliminary Discoveries of Asteroids, 62 Near-Earth Object Confirmations and 1636 Near-Earth Object Observations. The AIASC is not just a national initiative; it's an exclusive international forum for Indian students and amateur astronomers. Collaborating with the International Astronomical Search Collaboration (IASC), led by Dr. Patrick Miller of Hardin-Simmons University in Texas, SPACE India brings cutting-edge data analysis and specialized software to the forefront.

The 2024 campaign is running in two phases: Phase I: May 31st, 2024 to June 25th, 2024 and Phase II: July 1st, 2024 to July 26th, 2024; involving 600 teams with over 1200 participants in both the phases. 300 teams of phase 1 are already registered and trained with us including 15 teams i.e. 30 members from iAstronomer club (Online Astronomy club of Space India), while the other 300 teams will be trained in the upcoming phase 2 of the campaign. SPACE conducts training sessions using Astrometrica Software.

The All India Asteroid Search Campaign is an international science project exclusively for Indian school students and amateur astronomers. Participants gain access to datasets from the Pan-STARRS observatory in the USA, enabling them to hunt for asteroids. Importantly, all observations of Near-Earth Objects (NEOs) including asteroids and comets contribute to NASA Jet Propulsion Laboratory's NEO tracking programs, crucial for Earth's safety. SPACE India has successfully coordinated this prestigious campaign for the last 14 years, fostering a spirit of curiosity and discovery among the next generation of cosmic explorers.

The AIASC isn't just about discoveries; it's about hands-on learning and real-time research. Their observations contribute to the NASA Near-Earth Object (NEO) Program at the Jet Propulsion Laboratory in Pasadena, California. These budding astronomers have already confirmed discoveries of Main Belt Asteroids, adding to our understanding of the solar system. As SPACE India extends its invitation for the AIASC 2024, we invite young stargazers, dreamers, and cosmic enthusiasts to join this celestial quest. Who knows? The next numbered asteroid could bear your name! Let's continue unraveling the mysteries of the universe, one asteroid at a time.



**15**  
AIASC

## ALL INDIA ASTEROID SEARCH CAMPAIGN - 2024

**MOST PRESTIGIOUS PROJECT FOR STUDENTS**

in collaboration with  
**INTERNATIONAL ASTRONOMICAL  
SEARCH COLLABORATION (IASC)**

**Phase I - May 31<sup>st</sup> to June 25<sup>th</sup>, 2024**  
**Phase II - July 1<sup>st</sup> to July 26<sup>th</sup>, 2024**

**Project Collaborators:-  
Panoramic Survey Telescope and Rapid Response System  
(Pan-STARRS), Hawaii, USA**



Recording

You are viewing SPACE's screen

**SPACE**

## ALL INDIA ASTEROID SEARCH CAMPAIGN

**Prof. PATRICK  
MILLER, DIRECTOR,  
IASC**

Participants: 21

Chat

Share Screen

Unmute

Start Video

Stop Captions

Reactions

Apps

Whiteboards

Notes

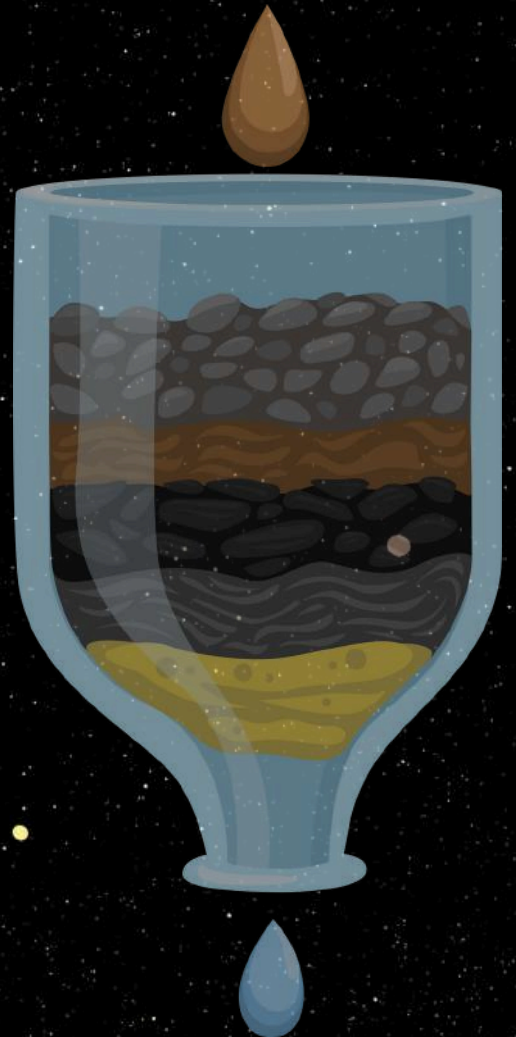
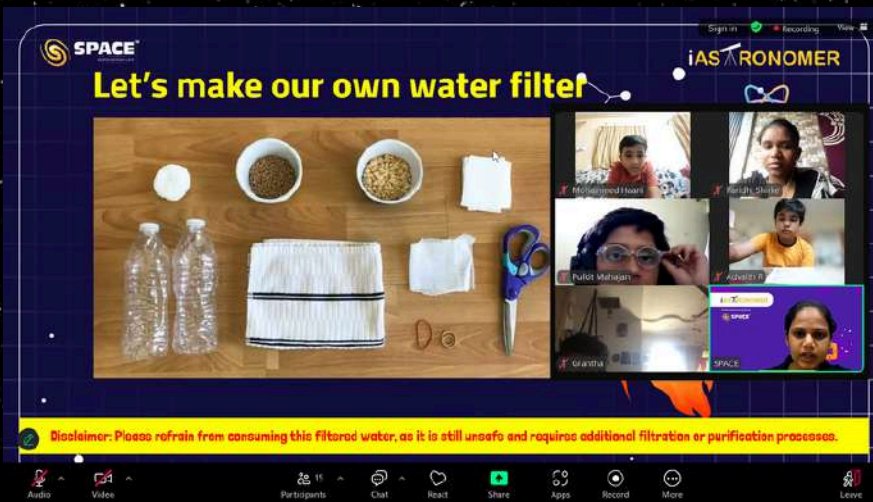
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# INSTRUMENTATION WORKSHOP



In an era where water conservation is more critical than ever, we recently hosted an enlightening online workshop titled "Instrumentation Workshop: Water Filter." Hosted by Miss Ilma Ansari, the workshop was designed to educate participants on the vital importance of water, the necessity of its conservation, and the intricate processes of water filtration. The workshop commenced with a comprehensive presentation that delved into the significance of water in our daily lives and the urgent need to conserve this precious resource. Attendees were introduced to various water filtration processes, including the sophisticated systems used by astronauts aboard the International Space Station (ISS) to ensure a clean water supply in space. One of the highlights of the workshop was the "Make Your Own Water Filtration System" segment. Participants were guided through the creation of a simple water filtration system using everyday materials. Each attendee made his/her water filtration system with a reusable plastic bottle by putting different layers of cotton, soil, sand, charcoal, and gravel within it. This basic hands-on activity not only demonstrated the principles of water filtration but also allowed participants to filter dirty water and witness the purification process firsthand. The session was not only educational but also highly interactive and enjoyable. Participants actively engaged in the process, sharing their experiences and showcasing their homemade water filtration systems. The workshop concluded with a sense of accomplishment and a newfound appreciation for the technology that makes clean water accessible to us, whether on Earth or in the vastness of space.

Overall, the workshop was a resounding success, leaving attendees empowered with the knowledge to appreciate and contribute to water conservation efforts. It was a reminder that each of us has the power to make a difference.





# WEBCAST: FULL FLOWER MOON

## iASTRONOMER

Space India's Ed-Tech team recently hosted an engaging webcast for iAstronomers, offering a virtual full moon observation experience. Using a powerful 6SE Celestron telescope, participants explored various lunar features. The event was hosted by Mrs. Kriti Jain, with iAstronomers T. Vetrivel and Kripita Srivastava serving as facilitators. They provided an educational and enjoyable session that combined informative presentations, live telescope views, and interactive activities. The evening began with a warm welcome from host Mrs. Kriti Jain followed by the presentation of T. Vetrivel giving an overview of the moon's geology.

After the presentation, Mr. Ashish Negi showcased the full moon using the 6SE Celestron telescope which provided incredibly clear and detailed views of the moon's surface. He further explained the working and benefits of using 6SE Celestron telescope in astronomical observations. The live viewing session was a highlight of the evening, allowing participants to see the moon's craters and other features up close. Facilitator Kripita Srivastava also contributed by showing the moon through a 70mm telescope. This allowed participants to compare the views from different telescopes and demonstrated that even smaller telescopes can provide impressive observations.

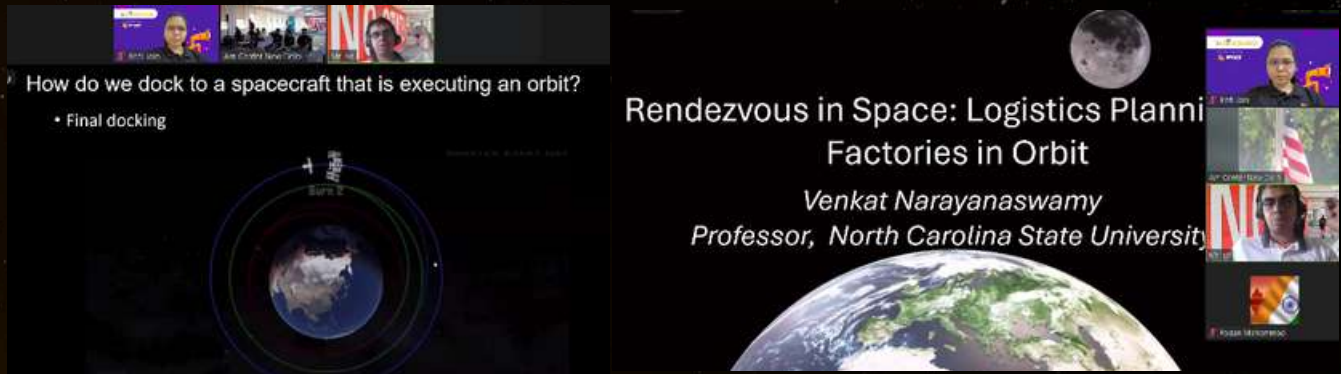
In addition to the live observations, host Mrs. Kriti Jain introduced a fun activity of the moon phase calendar. This interactive segment helped participants understand the different phases of the moon and how they change over time. To conclude the webcast, an interactive quiz was held which allowed participants to test their knowledge about the moon and the information shared during the session. It was a lively and fun way to reinforce learning, and participants enjoyed the challenge and friendly competition. Throughout the webcast, the hosts and facilitators maintained a dynamic and engaging atmosphere ensuring that all participants felt included and could easily follow along with the various segments of the webcast.

In conclusion, the full moon observation webcast by Space India's Ed-Tech team was a great success. The combination of amazing presentation, live telescope view, activity and quiz created a rich and memorable experience for all iAstronomers involved. The event not only showcased the beauty and complexity of the moon but also fostered a deeper appreciation for astronomy among the participants. The webcast left a lasting impression and inspired many to continue exploring the wonders of the night sky.



# WEBINAR: RENDEZVOUS IN SPACE

iAS  RONOMER



The American Center and Space India in Delhi recently hosted a captivating webinar featuring Dr. Venkat Narayanaswamy, a distinguished logistics and supply chain management expert. The event focused on the intricate topic of "Logistics Planning for Factories," specifically within the context of the burgeoning Orbit initiative. This initiative aims to revolutionize the logistics and manufacturing sectors by leveraging advanced technologies and strategic planning.

The webinar commenced with a warm welcome from Mr. Vikas of the American Center, who emphasized the importance of logistics in today's globalized economy. Dr. Narayanaswamy, with his extensive background in logistics and his current research on the Orbit initiative, provided a comprehensive lecture that was both educational and inspiring for the iastronomers attendees, which included industry professionals, academics, and students. Dr. Narayanaswamy began by explaining the basics of logistics planning, emphasizing its crucial role in optimizing manufacturing operations. He detailed how effective logistics planning involves the strategic coordination of procurement, transportation, inventory management, and warehousing.

A major highlight of the lecture was the Orbit initiative, which integrates space technology into logistics. Dr. Narayanaswamy described how satellites and orbits can be used to enhance logistics operations: Satellite Monitoring, Global Connectivity, Guidance, Navigation & Control and Satellite Docking. He discussed the importance of precise coordination in logistics. Just as satellites dock and transfer resources seamlessly in space, logistics operations must ensure the smooth transfer of goods at various stages of the supply chain to maintain efficiency and reduce downtime. Moreover, Dr. Narayanaswamy touched on the emerging space economy and its implications for logistics. He elaborated on how advancements in space technology and the increasing commercial activities in space are creating new opportunities for the logistics sector. This includes the potential for space-based manufacturing and resource extraction, which could drastically change supply chain dynamics and logistics planning on Earth. He shared several case studies to illustrate the practical applications of the Orbit initiative. These examples demonstrated how companies have successfully used satellite technology to streamline operations, reduce costs, and enhance customer satisfaction.

Following the lecture, an engaging Q&A session allowed attendees to interact directly with Dr. Narayanaswamy. Participants posed questions about the practicalities of integrating space technology into logistics, the cost implications, and the potential for small and medium-sized enterprises to adopt these innovations. The event concluded with a vote of thanks from Mr. Vikas, who expressed gratitude to Dr. Narayanaswamy for his enlightening presentation. Attendees left with a deeper understanding of how space technology can revolutionize logistics planning and practical strategies to implement in their organizations.

# SPACE EXTRAVAGANZA

Students of the UITS Programme at Delhi Public School, Greater Faridabad showcased ingenious working models based on the theme "Beyond Space" to parents and guests during the Scholar Badge Ceremony 2024. The event on 11 June 2024, highlighted creativity, innovation, and hard work, with students proudly presenting their projects. Held at the school, the exhibition testified to the students' dedication and the supportive environment fostered by the school. Dr. Sachin Bahmba, Founder and Chairman of Space Group of Companies and Guest of Honor, listened carefully as students explained each project and praised their efforts, especially given his background in the field of space. The working models spanned various subjects, showcasing diverse interests and talents. Students detailed the inspiration, creation process, and challenges they faced. As the event concluded, a sense of achievement was evident among the students. Their successful presentations, the result of weeks of hard work, inspired future projects. The event celebrated student ingenuity and underscored the importance of fostering creativity and practical skills.



# FANCY DRESS EVENT



Embark on a cosmic journey with our young space explorers, K.R. Mangalam World School Gurgaon recently hosted a spectacular space-themed fancy dress event, captivating the imagination of budding astronauts from classes 1 and 2. From shimmering stars to intergalactic heroes, the event was a dazzling display of creativity and enthusiasm as students donned their stellar costumes, bringing the mysteries of the universe to life. Amidst the twinkling lights and swirling galaxies, our little astronauts showcased their cosmic flair, inspiring wonder and curiosity in every corner of the galaxy!



# ASTROPORT

## INDIA'S MOST LOVED STARGAZING DESTINATION

Astroports are the first concept-based unique tourism destinations in India focusing on experiential learning. The strategically designed serene sites are located in nature's lap far away from the polluted cities with a heavy twinkling sky above.

They are located near popular tourist attractions to ensure the mesmerising experience of amusement, adventure & exposure in Astronomy learning and thus, making it a must-visit place for all ages/categories of travelers.

Astroports are built to provide not only the comforts and facilities of a 'conventional' tourist destination but also lead to exploring and learning through well researched and well-presented programs/activities.

Astroport hosts special events during meteor showers, eclipses, and other celestial occurrences. Witness these phenomena under expert guidance. Astroport represents a comprehensive effort to make astronomy more accessible and engaging on a global scale, by providing educational opportunities for everyone.

# Astroport's Celestial Challenge:



ARTICLE BY:  
**HARSHIT MANHAS**

**Astroport's Celestial Challenge: The Half Messier Marathon** last month saw guests and expert astronomers collaborating to hunt over 50 deep sky objects in a single thrilling night of discovery.

This event is perfect for both seasoned astronomers and enthusiastic novices, offering a unique opportunity to explore the wonders of the night sky. Discover, challenge yourself to spot stunning celestial treasures.

Equipped with telescopes and star maps, attendees scoured the night sky for galaxies, star clusters, and nebulae cataloged by the renowned astronomer Charles Messier.



This extraordinary event not only deepened participants' astronomical knowledge but also fostered a shared passion for the night sky's hidden treasures.

The Half Messier Marathon not only tested the participants' skills but also fostered a vibrant community of astronomy enthusiasts, making it a night to remember under the vast, twinkling sky.

## The Half Messier Marathon

Highlights included the breathtaking Andromeda Galaxy, the vibrant Pleiades star cluster, and the ethereal Orion Nebula. This fostered a sense of community and wonder, with enthusiasts sharing tips and marveling at the universe's splendor.

It helps amateur astronomers develop their skills in locating and observing deep-sky objects. Participants learn to navigate the night sky, use sky maps, and operate telescopes more effectively.

Our expert astronomers guided guests throughout the night during this event. Sat under blanket of stars and hunt down 50+ deep sky objects . Half Messier marathon took place on nights of 5th-9th May 2024.

Half messier marathon started at 1700 hours and gone till 5:00. The Half Marathon took place during no moon nights after every quarter. Guests learned astrophotography, telescope handling skills and various facts about celestial objects.

Guests experienced the sky through high tech world class telescopes. A few came with their own telescopes and equipments. The session is designed in such a way that a person will never feel boredom.

As the night will concluded, the glow of satisfaction evidenced on every face, marking this event as a memorable milestone in Astroport's celestial adventures.



**FEEDBACKS:** Saw Deep sky objects, It was wow, Telescope handling, we will recommend it 100%

# CELEBRATING NATIONAL ASTRONAUT DAY

Every year on May 5th, National Astronaut Day celebrates astronauts as true heroes, inspiring everyone to "reach for the stars." This special day is dedicated to sharing incredible astronaut stories and experiences, encouraging all to dream big and aim high.

Grade 2 students of K. R. Mangalam World School, Vaishali, embraced the spirit of the day with enthusiasm and creativity. Students dressed up as their favorite astronaut and recorded short clips explaining their chosen astronaut's achievements and why they admire them. The excitement was palpable as the young students transformed into space explorers, ready to share their knowledge and aspirations.

One student, dressed as Neil Armstrong, proudly recounted his historic moon landing in 1969. Another, in a colorful suit representing Kalpana Chawla, spoke about her inspirational journey as the first woman of Indian origin in space. The diversity of astronauts chosen reflected the students' broad interests and dreams.

In their clips, students not only shared fascinating facts but also expressed their own dreams of becoming astronauts. Their heartfelt words and bright eyes captured the essence of National Astronaut Day—encouraging everyone to dream beyond the limits and explore the vast possibilities of space.

National Astronaut Day was a memorable event, filled with inspiration and a sense of wonder. Our young students reminded us all that the sky is not the limit; it is just the beginning.



# MONTHLY TELESCOPIC OBSERVATION

SPACE ARCADE team conducted 2024's 5th Monthly Telescopic Experience session on the 18th of May 2024 in Chennai and Delhi.

People from various places joined the observation with their telescopes, binoculars, and other astronomical equipment. They learned and experienced the breathtaking view of the Moon and planet Beehive Cluster. 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, Planet Jupiter through the 8" Dobsonian telescope and Schmidt-Cassegrain telescope set up by the SPACE team.



Visit: [www.spacearcade.in](http://www.spacearcade.in)

## HIGHLIGHTS OF MAY 2024

# INDIA MAKES BREAKTHROUGH BY TEST-FIRING NEW 3D-PRINTED ROCKET ENGINE

India has revealed a breakthrough that could accelerate its quest to become a space-faring nation.

On May 9, the Indian Space Research Organization (ISRO) successfully conducted a hot-fire test of a liquid-fueled rocket engine developed with additive manufacturing (also known as 3D printing) technology.

The engine, which burns a hypergolic mixture of nitrogen tetroxide and monomethyl hydrazine, ran for 665 seconds, marking a significant milestone. The engine powers the upper stage of India's Polar Satellite Launch Vehicle.

ISRO stated that the innovative laser powder bed fusion technology utilized to manufacture the engine reduced the number of engine parts from 14 to a single piece. This removed 19 weld joints and considerably reduced the raw material utilization per engine.

The new procedure, for example, requires 30.2 pounds (13.7 kilograms) of metal powder, as opposed to 1,245 pounds (565 kg) of forgings and sheets required by the traditional method. ISRO claims that the new technology decreases overall production time by 60%.

The PSLV, which stands 145 feet (44 meters) tall, is one of India's workhorse launchers, alongside the LVM-3. The rocket can carry up to 3,860 pounds (1,750 kg) of payload into sun-synchronous polar orbits 370 miles (600 km) high.

The milestone will help the country increase its launch rate. India has ambitious goals for human spaceflight, including landing an astronaut on the moon and building a lunar outpost by 2047.



A PS4 engine, used in the upper stage of India's PSLV rocket, undergoes hot-fire testing on May 9, 2024. The engine was built using additive manufacturing, in a potential breakthrough for Indian rocket technology. (Image credit: ISRO)



# Northern lights from massive Solar Flares amaze skywatchers around the world.

An aurora show unlike any other is taking place in the night sky, as a historic northern lights display caused by severe solar storms paints the sky in stunning pinks, purples, and greens. In the United States, the northern lights (or aurora borealis), which are generally only seen in the Arctic area and northern Canada, were projected to be visible as far south as Alabama or Northern California, with NOAA officials reporting sightings even further south.

The powerful auroras were caused by a series of enormous solar flares and coronal mass ejections that erupted from the sun, blasting charged solar particles toward Earth.



The northern lights illuminate the night sky over a camper's tent north of San Francisco in Middletown, California on May 11, 2024. (Image credit: Getty Images)



Space.com Reference Editor Daisy Dobrijevic captured this view of the northern lights from Nottingham, U.K. on May 10, 2024. (Image credit: Daisy Dobrijevic)

The sun is currently at an extremely active phase of its 11-year solar cycle, known as solar maximum, during which solar flares and powerful coronal mass ejections can occur more frequently.

Such massive solar flares can cause radio blackouts, interfere with power systems on Earth, and pose a radiation risk to satellites and astronauts in orbit, according to NOAA officials, who added that NASA was monitoring the event to see if astronauts would need to take shelter deeper inside the International Space Station. As of early Saturday (May 11), NASA officials had indicated no need for such actions.

These particles blasted into Earth's magnetic field on Friday, causing a category G5 geomagnetic storm, the most powerful the planet has seen since the truly epic solar storms of Halloween 2003.

The reason for all this, well, there's been two sunspot clusters, one in the northern hemisphere of the sun, one in the southern hemisphere of the sun,". These sunspot groups, one of which is already 17 times the width of Earth, are releasing the most powerful solar flares seen since at least 2017.

In fact, NOAA SWPC experts reported that the sun produced another large X5.8 solar flare overnight on 10th May. X-class solar flares are the sun's most violent eruptions.



The Aurora Australis, also known as the Southern Lights, glow orange and red on the horizon over waters of Lake Ellesmere on the outskirts of Christchurch on May 11, 2024 in this photo by AFP and Getty photographer Sanka Vidanagama. (Image credit: Getty Images)

# Gopi Thotakura proudly displays Indian flag in space on board Jeff Bezos' Blue Origin

Holding up the Indian flag in space, Gopi Thotakura became the first tourist from India to travel on Blue Origin's NS-25 mission, which is being led by Amazon billionaire Jeff Bezos. For the first time since its suborbital rocket was grounded in 2022, Blue Origin relaunched its much-discussed space tourism business on Sunday, sending a six-person crew from West Texas to the edge of space.

The 30-year-old Thotakura initially raised a banner that said, "I am an eco-warrior for our sustainable planet," in a video that Blue Origin posted on social media. Then, inside the spacecraft, he declared, "India into space," holding up a little Indian flag. As they float inside the spacecraft and gaze out the window at Earth below, the six space travelers can be seen beaming with excitement.

After takeoff, the astronauts' capsule made its way back to Earth in around ten minutes. Ed Dwight, the first Black astronaut candidate from the United States in the 1960s, was the oldest space traveler on the Blue Origin voyage, at ninety years old. Jeff Bezos, the CEO of Blue Origin, having personally traveled to the edge of space in his space company's space tourist trip in 2021.

After Rakesh Sharma in 1984, Thotakura is the second Indian to travel into space as a space tourist. Gopichand Thotakura, an Andhra Pradesh native, is a pilot and aviator who learned to fly before getting his driver's license, according to Blue Origin. He now resides in Atlanta, Georgia in the US.



Coventry University in the United Arab Emirates awarded him a degree in Aviation Management and Operations. At Embry-Riddle Aeronautical University, he earned his bachelor's degree in aeronautical science. Preserve Life Corp., a global hub for applied health and holistic wellness close to Hartsfield-Jackson Atlanta International Airport, was co-founded by Thotakura.

Gopi Thotakura is the first Indian to go to space as a tourist aboard Amazon founder Jeff Bezos' Blue Origin NS - 25 mission. (Credits: thedefensenews)

# Space startup Agnikul Cosmos successfully launched Agnibaan rocket with 3D-printed engine.

After postponing the launch at least four times, the Indian space firm Agnikul Cosmos successfully launched its first sub-orbital test vehicle on Thursday, propelled by the first single-piece 3D-printed rocket engine ever.

On Thursday at 7:15 a.m., Agnibaan SOrTeD (Sub-Orbital Technology Demonstrator) launched on a mission that included numerous firsts. It is the first private startup launch in India, but it is also the second to use a private launchpad that the company has set up at Sriharikota, the nation's only spaceport that is now in service.

Engine components are usually made separately and assembled at a later time. Utilizing the 3D-printed manufacturing technique should reduce the time and cost of vehicle assembly during launch. The company wants to provide small satellites with reasonably priced launch services. The IIT Madras-incubated business created the launch vehicle, which also showcased India's first semi-cryogenic engine.

The engine, known as Agnilet, runs on oxygen that has been subcooled. The fuel for cryogenic engines, like the one in the upper stages of India's largest launch vehicle, LVM3, is gasses that have been liquefied at very low temperatures. The launch vehicle is intended to take off from any location using its mobile launchpad, Dhanush. Despite the fact that this was a suborbital launch, the vehicle can carry payloads up to 300 kg.

The goal of the mission was to ascend to a height of roughly eight kilometers before plunging into the ocean. By the end of the fiscal year, the company intends to carry out its first orbital launch, which will be capable of delivering satellites into an orbit around the planet. They intend to offer a regular launch during the upcoming year. This year, Skyroot, the other private launch company, is also expected to attempt its first orbital launch. Skyroot completed its maiden sub-orbital flight in 2022.

"The team has worked incredibly hard for thousands of hours, and this is the result." Srinath Ravichandran, co-founder and CEO of Agnikul Cosmos remarked, "We are fortunate to have gotten the chance and the complete support of IN-SPACe and ISRO to design and build original space capable gear in India."



Agnikul Cosmos successfully carried out a sub-orbital test-flight of its home-built 3D-printed semi-cryogenic rocket Agnibaan from its own launch pad at Sriharikota (Image Credit: Agnikul Cosmos)

# NASA-FUNDED PULSED PLASMA ROCKET CONCEPT AIMS TO SEND ASTRONAUTS TO MARS

Future deep space trips to Mars could be revolutionized by an inventive rocket technology, reducing the time it takes to reach the Red Planet down to a few months. Many obstacles stand in the way of the objective of landing humans on Mars, one of which being the rapid transportation of heavy cargoes to and from the planet. Depending on the exact placements of Earth and Mars, a round-trip flight utilizing current propulsion technology would take nearly two years.

Howe Industries is developing the Pulsed Plasma Rocket (PPR), a propulsion device that will be significantly more efficient than existing deep space propulsion techniques and allow a two-month journey between Earth and the Red Planet. In particular, the rocket will have a high specific impulse, or Isp—a gauge of an engine's thrust-generating efficiency.

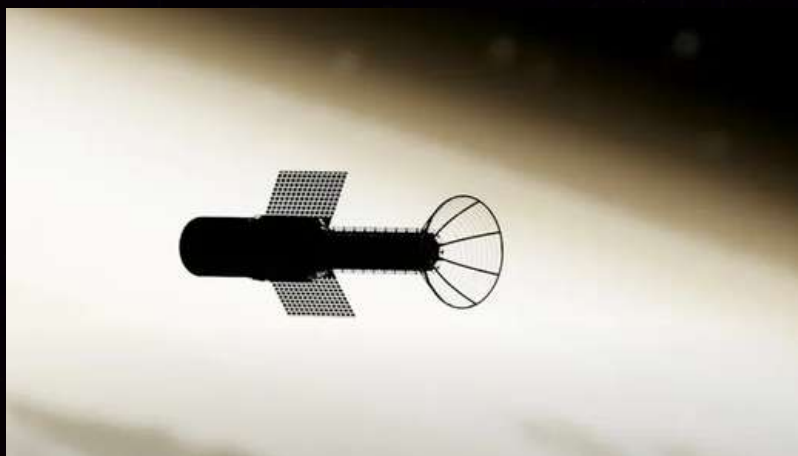
According to a NASA release, this technology may potentially make it possible for humans and freight to reach and depart Mars more quickly and efficiently than they currently could. The PPR, which is based on the idea of Pulsed Fission Fusion, generates thrust for spaceship propulsion using a fission-based nuclear power system that gets energy from the carefully regulated splitting of atoms. But compared to earlier ideas, the PPR is more compact, straightforward, and reasonably priced.

It may handle significantly heavier spacecraft, allowing for greater shielding to be placed to lessen a crew member's exposure to hazardous high-energy particles known as Galactic Cosmic Rays during long-duration spaceflight. This would enable further range missions.

"The exceptional performance of the PPR, combining high Isp and high thrust, holds the potential to revolutionize space exploration," the statement continues. "The system's high efficiency allows for manned missions to Mars to be completed within a mere two months."

After completing Phase I of the NASA Innovative Advanced Concept (NIAC) study, which examined the propulsion system's neutronics, spacecraft design, power system, and required subsystems, analysis of the magnetic nozzle capabilities, and benefits analysis, the PPR concept is now entering Phase II of the study.

In order to better safeguard crewed missions to Mars in Phase II, developers will build on the evaluations from Phase I to refine the engine design, carry out proof-of-concept studies, and design a spaceship concept. The PPR, which is only now accessible by robotic explorers, may eventually help NASA get closer to building a permanent base on Mars.



An illustration of Howe Industries' Pulsed Plasma Rocket (PPR) concept. (Image credit: Howe Industries via YouTube)

# China just sent a Secret Mini-Rover to the far side of the moon on its Chang'e 6 sample-return probe

The China Academy of Space Technology (CAST) launched an autonomous Long March 5 rocket into space on Friday, May 3. This marked the commencement of the nation's Chang'e 6 mission, which seeks to be the first-ever endeavor to gather samples from the secret far side of the moon and transport them to Earth.

A lunar lander, the primary payload of the rocket headed for the moon, is scheduled to settle on Earth's biggest satellite sometime in early June. Similar to the Chang'e 5 mission, which successfully returned lunar samples to Earth several months after landing a spacecraft on the moon in 2020, the spacecraft will gather samples from the moon's surface there and then rocket them back to Earth in a return module.

It's unclear what the putative rover's main mission on the moon is. The Shanghai Institute of Ceramics, which supplied a number of parts for the Chang'e 6 mission, did, however, later translate a statement to show that it possesses an infrared imaging spectrometer, though it is unknown what it is used for. The robot's mission will probably not last long because of its size and the conditions it will encounter on the moon, according to SpaceNews.



A close up of China's tiny moon rover on the side of the Chang'e 6 sample return mission bound for the far side of the moon. (Image credit: CASC)



The Chang'e 6 lander and its newly revealed rover were aboard a Long March 5 rocket that launched May 3

As part of the Chang'e 4 mission, which was the first to safely land a spacecraft on the far side of the moon, CAST already has the Yutu-2 rover on the moon. It was launched in 2019 and is now stationed there. Notable discoveries made by Yutu-2 thus far include the finding of tiny glass spheres on the lunar surface.

China has shocked the globe with unidentified payloads on previous occasions. According to SpaceNews, a number of spacecraft, including a Mars orbiter and the Zhurong Mars rover, dropped covert mini-cameras to allow people to shoot selfies on or near the Red Planet during China's Tianwen-1 mission to Mars in 2021.

A Chinese rocket carrying an unidentified payload crashed into the moon's surface in 2022, and CAST has previously been coy about other activities, such as the death of the Zhurong Mars rover. CAST plans to begin testing a new class of huge reusable rocket next year, with the ultimate objective of landing humans on the moon by 2030. Like with the new rover, not many facts are known about this expedition, though.

# DNA Polymerase Enzymes Make More Errors in Zero Gravity, Study Finds

A recent study reveals that an enzyme in the bacterium *E. coli* made more errors copying synthetic DNA in zero gravity compared to normal gravity. This finding, published in *Frontiers in Cell and Developmental Biology*, suggests that enzymes might behave differently in space, raising concerns about their role in maintaining DNA integrity during spaceflight.

Aaron Rosenstein, the lead author and a bioengineering graduate student at the University of Toronto, emphasized the need for further research into enzymes crucial for life and survival. Susan Bailey, a radiation cancer biologist at Colorado State University who did not contribute to the study, noted the importance of understanding how space conditions affect enzymes like polymerases, which are involved in DNA maintenance.

Long-term space missions are known to impact astronauts' health, causing muscle atrophy, bone density loss, vision problems, and potential brain damage. Astronauts are also exposed to space radiation, which can break DNA strands or cause mutations, increasing the risk of cancer and degenerative diseases. While the effects of microgravity on DNA are less clear, Rosenstein's study aimed to investigate this by focusing on DNA polymerases—enzymes that copy and repair DNA.

Rosenstein conducted his experiment aboard a "vomit comet," a plane that simulates zero gravity through a series of steep ascents and dives. During 20-second periods of weightlessness, Rosenstein activated a robotic setup to mix a polymerase with synthetic single-stranded DNA, then halted the reaction as normal gravity resumed. The data revealed that the polymerase with proofreading capabilities made slightly more errors in zero gravity, though not always statistically significant. However, polymerases without proofreaders made even more mistakes, indicating the proofreaders' role in correcting additional errors.

Bailey pointed out that the study's immediate relevance to astronaut health is limited, given the brief exposure to zero gravity and the use of a bacterial polymerase. Human cells have multiple polymerases and robust error-correction mechanisms. Rosenstein acknowledged the need for further studies to confirm these effects in human cells and understand their significance.

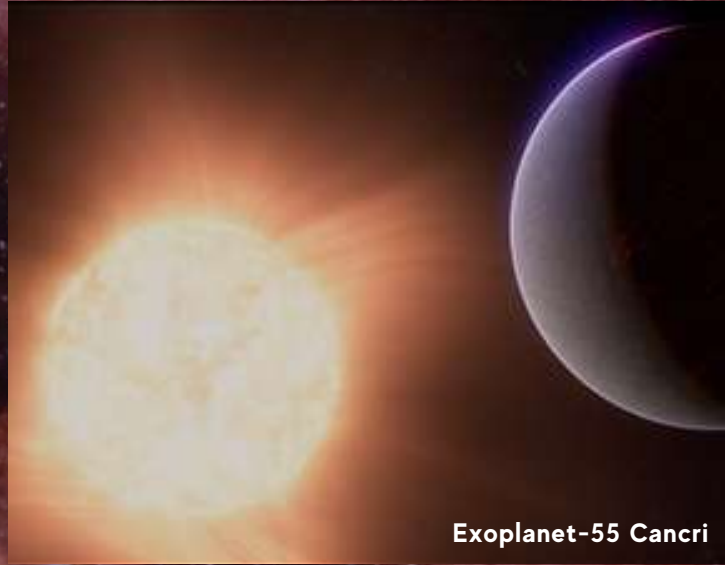
Bailey also suggested that if polymerases are affected by microgravity, it could impact telomeres—DNA segments linked to aging. Telomerase, a polymerase that copies telomeres, might be influenced by space conditions, supporting the idea that spaceflight could affect human aging processes.

Overall, this research highlights the potential risks of DNA replication errors in space, underscoring the importance of further investigation to ensure astronaut health on long-duration missions.

## FROM THE EYES OF WEBB – MAY 2024

### Webb Hints at Possible Atmosphere Surrounding Rocky Exoplanet

Researchers using NASA's James Webb Space Telescope have potentially detected atmospheric gases around 55 Cancri e, a hot rocky exoplanet 41 light-years from Earth. This is the strongest evidence so far for an atmosphere on a rocky planet outside our solar system. Renyu Hu from NASA's Jet Propulsion Laboratory, the lead author of a paper in Nature, emphasized that Webb is enabling new science by characterizing rocky planets. 55 Cancri e, also known as Janssen, orbits very close to its star, making its surface likely molten.



**Exoplanet-55 Cancri**

Previous studies suggested a volatile-rich atmosphere, and Webb's data supports this, showing temperature variations and spectral features indicative of such an atmosphere.

### JWST Cracks Case of Inflated Exoplanet



**Exoplanet-WASP-107 b**

Researchers using NASA's James Webb Space Telescope and Hubble Space Telescope have found that the warm gas-giant exoplanet WASP-107 b has surprisingly little methane in its atmosphere. This suggests the planet's interior is much hotter and its core more massive than previously thought. The high temperature is likely due to tidal heating from its slightly non-circular orbit. This discovery helps explain WASP-107 b's "puffy" appearance without extreme formation theories. The findings, made possible by Webb's sensitivity, provide insights into the puffiness of other low-density exoplanets, potentially solving a longstanding mystery in exoplanet science.

Two independent teams of researchers think they've figured it out. Data from Webb, combined with prior observations from Hubble, show that the interior of WASP-107 b must be a lot toastier than previously estimated. The unexpectedly high temperature, which is thought to be caused by tidal forces that stretch the planet like silly putty, can explain how planets like WASP-107 b can be so floofy, possibly solving a long-standing mystery in exoplanet science.

# Galaxies Actively Forming in Early Universe Caught Feeding on Cold Gas

The James Webb Space Telescope (JWST) is uniquely capable of detecting and studying galaxies that formed when the universe was just a few hundred million years old, thanks to its infrared capabilities. A Danish research team analyzing JWST archival data discovered three such distant galaxies, surrounded by dense gas predominantly composed of hydrogen and helium. This gas, which will eventually fuel star formation, indicates that these galaxies are still in the early stages of development.

Lead author Kasper Heintz noted that without Webb, observing these early galaxies would be impossible. The galaxies appear as faint red smudges in Webb's images, with spectra revealing significant amounts of neutral hydrogen gas. This suggests the assembly of hydrogen into galaxies, which will later cool and form new stars. During the Era of Reionization, several hundred million years post-Big Bang, the universe's gas was opaque, only becoming transparent about 1 billion years after the Big Bang due to the ionizing effect of stars.

The study found that these galaxies are primarily composed of young stars, as indicated by large gas reservoirs. Researchers aim to further explore the gas's distribution and composition and build larger samples to better understand these early cosmic structures. Webb continues to exceed its mission goals, making unprecedented discoveries in early galaxy formation.



This illustration shows a galaxy forming only a few hundred million years after the big bang, when gas was a mix of transparent and opaque during the Era of Reionization. Data from NASA's James Webb Space Telescope shows that cold gas is falling onto these galaxies. NASA, ESA, CSA, Joseph Olmsted (STScI)



# WHAT'S UP IN THE SKY - JUNE 2024

## LUNAR CALENDAR

## MOON CALENDAR

### JUNE 2024

### IMPORTANCE OF MOON PHASES FOR STARGAZERS

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

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



### PLANETS VISIBILITY

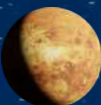
#### Mercury

Superior conjunction 14 June, Best in the evening sky at the end of June, seen shining at mag. -0.5, located 10° east of Venus.



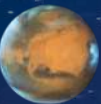
#### Venus

Morning planet, unlikely to be seen this month.



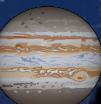
#### Mars

Improving morning planet, rises nearly three hours before sunrise at the end of June.



#### Jupiter

Improving morning planet, close daylight conjunction with Mercury on 4 June.



#### Saturn

Lord of rings planet is poorly visible in the morning sky in the month of June.



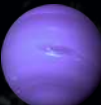
#### Uranus

The ice giant is not visible in the month of June.



#### Neptune

Windy planet of our solar system is not visible this month.



### BRIGHT DEEP SKY OBJECTS

The Hercules Globular Cluster, also known as the Great Globular Cluster in Hercules (Messier 13), will reach its zenith in the sky with a magnitude of 5.8. Sighted only from latitudes north of 33°S, M13 is one of the brightest star clusters in the Northern Hemisphere. A little telescope or a pair of binoculars can be used to see globular clusters.



In the constellation Scorpius, the Ptolemy Cluster (Messier 7) will be seen at a brilliant magnitude of 3.3. Southern Hemisphere latitudes south of 35°N will provide the greatest views of it. Ideally, you should view the cluster about midnight local time. The Ptolemy Cluster can also be attempted to be seen with the unaided eye under dimly lit sky.

Three times the visible size of the Full Moon, the Lagoon Nebula (Messier 8) is a massive emission nebula. It can be seen in the Sagittarius constellation. M8 will be visible in June at a magnitude of 5.8, with latitudes south of 45°N providing the finest views in the Southern Hemisphere. It will ascend to the highest point in the sky at midnight.



See the Butterfly open star cluster (Messier 6), which has a brightness of 4.2, in the Scorpius constellation. The best views will be obtained by Southern Hemisphere observers; nevertheless, latitudes much north of 37°N will not show the cluster. M6 will be visible through the night in June.

# Jupiter's Mythical Legacy: Stories of the King of Gods Across Cultures

Jupiter, known for its immense size and bright presence in the sky, has inspired numerous myths and stories across various cultures. Here are ten mythical stories related to Jupiter from different cultures around the world:

## Roman Mythology:

**Jupiter:** In Roman mythology, Jupiter is the king of the gods, analogous to the Greek Zeus. He is the god of sky and thunder, wielding a thunderbolt. He overthrew his father Saturn and ruled over the heavens.

## Greek Mythology:

**Zeus:** In Greek mythology, Zeus is the counterpart of Jupiter, ruling Mount Olympus and governing the sky and weather. Famous myths include his numerous affairs, leading to the birth of many gods and heroes, such as Hercules and Perseus.

## Norse Mythology:

**Thor:** Though not directly equivalent to Jupiter, Thor is the Norse god of thunder, similar to Jupiter's association with thunder and the sky. Thor wields the mighty hammer Mjölner and is a protector of mankind, battling giants and monsters.

## Hindu Mythology:

**Brihaspati:** In Hindu tradition, Brihaspati is the deity associated with Jupiter. He is the guru of the gods, a teacher and priest who represents wisdom and eloquence. He plays a significant role in the stories of the gods, advising them in their battles against demons.

## Mesopotamian Mythology:

**Marduk:** In Babylonian mythology, Marduk, the chief deity, has attributes similar to Jupiter. He is associated with creation and justice, famously defeating the chaos monster Tiamat and establishing order in the universe.



**Chinese Mythology:**

**Suixing:** In Chinese astronomy, Suixing (Jupiter) is associated with the wood element and is considered an auspicious star. It is linked to the god Suiren, who discovered fire, and its movements were used in imperial astrology to predict the future.

Mayan Mythology:

**K'uk'ulkan:** The Mayan feathered serpent god K'uk'ulkan is sometimes associated with the planet Jupiter. This deity is linked to creation, the wind, and rain, playing a crucial role in agriculture and the Mayan calendar system.

Incan Mythology:

**Illapa:** Illapa, the Incan god of thunder, weather, and war, can be linked to Jupiter. He is often depicted as a man wielding a club and stones, controlling the rain and storms essential for agriculture in the Andean highlands.

Egyptian Mythology:

**Amun-Ra:** Amun-Ra, the chief deity of the New Kingdom, combines the attributes of Amun (hidden god) and Ra (sun god). Though not directly Jupiter, his supreme status and association with the sky and creation have parallels with Jupiter's role in other cultures.

Japanese Mythology:

**Takeminakata:** In Shinto beliefs, Takeminakata is a god of wind, agriculture, and warfare, sometimes associated with the planet Jupiter. He is known for his strength and rivalry with other gods, similar to Jupiter's combative and kingly nature.

These stories reflect Jupiter's diverse influence on mythologies worldwide, symbolizing power, wisdom, and natural forces across different cultures.





Image credits: By Mr. Imhotep

## The Dawn of Observational Astronomy

In the 1960s, Egypt was planning a major dam project that would, once filled, wash away key archaeological sites. Thus, the United Nations Educational, Scientific and Cultural Organization (UNESCO) stepped in to relocate these sites while searching for previously undiscovered sites. Fred Wendorf took, a prominent archaeologist, took advantage of the opportunity to hunt for the origins of pre-Pharaic Egypt away from the Nile River.

800 km south of Cairo, near the edge of the Al Wadi Al Gadid Desert, Wendorf took and his team discovered Nabta Playa: an ancient stone monument from the Egyptian Neolithic period, the final period of the stone age during which ancient humans were transitioning from a hunter-gatherer lifestyle to a more settled one. The period lasted for different lengths of time in various regions, with the Egyptian Neolithic period lasting approximately from 8500 BCE to 5000.

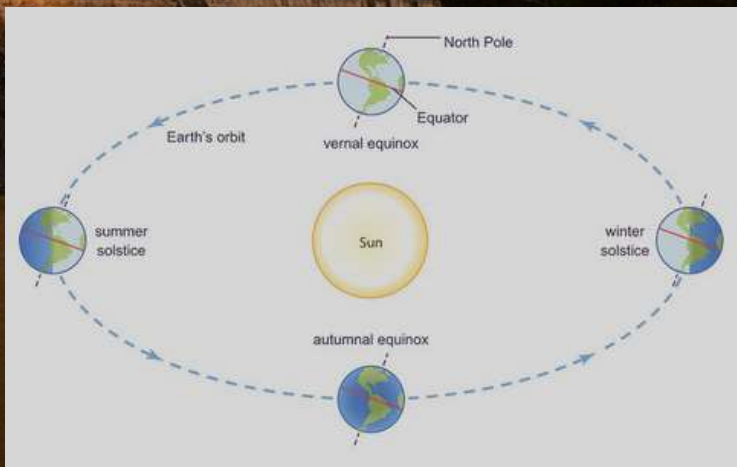
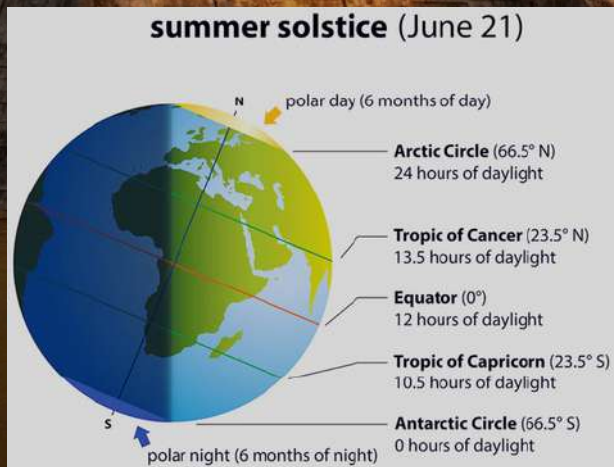
Initially, the stone structures of Nabta Playa were thought to have naturally formed. However, the geography of the region did not support this assumption. During the Neolithic era, due to a different climate in the region, Nabta Playa was a closed lake basin. Any stone that naturally occurred in the lake would be destroyed. Thus, the ancient humans purposefully place the megalithic structure of Nabta Playa around 7500 BCE. This is one of the earliest sites from the Egyptian Neolithic period.

When archaeologists sought to understand why, they realized that Nabta Playa was an astronomical observatory aligned to Arcturus, Orion's Belt, Sirius and Alpha Centaurus during an era when there was no pole star. This makes Nabta Playa the world's oldest observatory even though the main structure is a stone circle that was only four meters in diameter, relatively small compared to future structures. Through the reflection of the dark waters, the ancient humans could identify the approach of the summer solstice which marked the arrival of the summer rains. Meanwhile, the reflection of the stars during the night aided in travel across the featureless area. This was increasingly important during the transitional period when the region was slowly drying up.

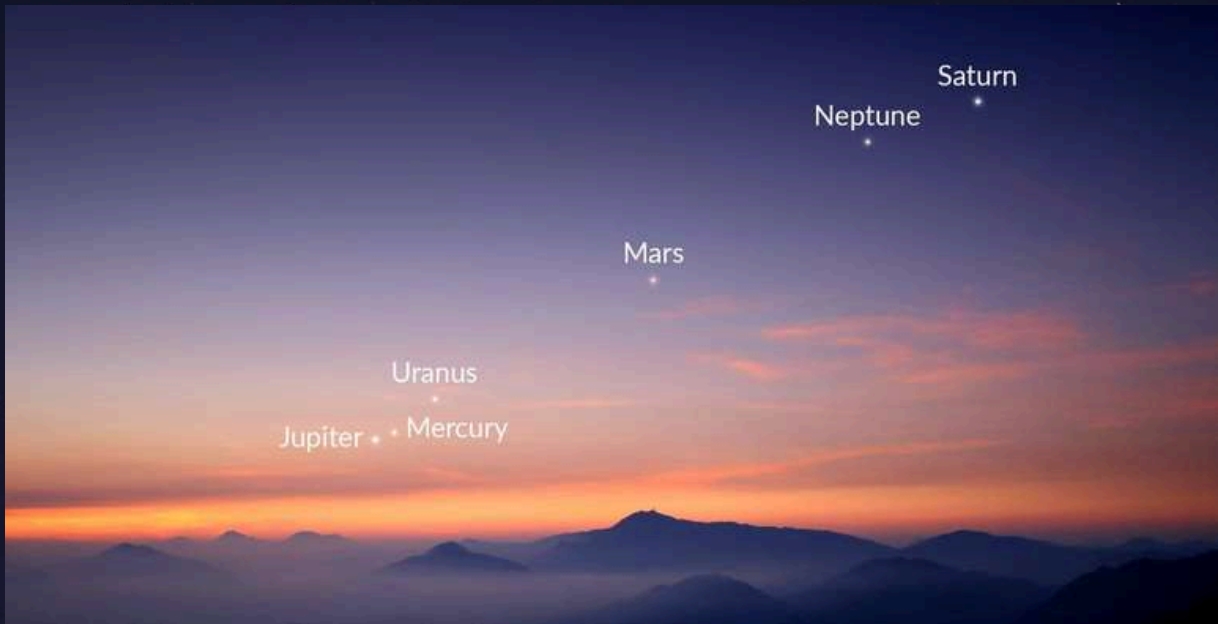
Around 5000 years ago, the desert took over the region due to climate change. The large bodies of water that littered the region started drying up, leading to a collapse of the civilisation, as people left en masse due to the lack of water. Archaeologists believe that the people made their way towards the only source of water in the area, the Nile River. The Nabta Playa, the other stone megalithics and their people may have been the origins of the Pre-Pharaic Egypt that Fred Wendorf sought.

# ASTRONOMICAL EVENTS - JUNE 2024



















## June solstice



# PLANETARY ALIGNMENT



\*All the alignments in the infographic are shown as seen from the Northern Hemisphere.

Planet	Magnitude	Visibility	Constellation
 Mercury	-1.0		 Taurus
 Jupiter	-2.0		 Taurus
 Uranus	5.8		 Taurus
 Mars	1.0		 Pisces
 Neptune	7.9		 Pisces
 Saturn	1.2		 Aquarius

# CONJUNCTIONS FOR THE MONTH

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

## Conjunction of Moon and Mars

On June 3rd, the red Planet Mars will meet the moon in the constellation Pisces. the pair will be visible in the dawn sky, rising 2 hours & 35 minutes before the Sun and reaching an altitude of 25° above the Eastern horizon. Mars will be at a magnitude of 1.0 & the moon will have a magnitude of -10.7.



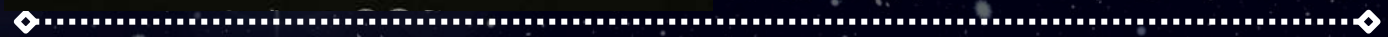
Place: New Delhi/ Date: 3rd June / Time:03.30 a.m.



Place: New Delhi/ Date: 4th June / Time:05.00 a.m.

## Conjunction of Mercury and Jupiter

On June 4th, the swift planet Mercury and the gas giant will have the closest approach in the dawn sky just before the sunrise. Jupiter will be at mag -2.0, and Mercury at mag -1.1, both in the constellation Taurus.



## Conjunction of Moon and Saturn

On June 28th, the ringed planet Saturn and the Moon will have the closest approach in the dawn sky & reaching an altitude of 54° above the Southern horizon. The Moon will be at mag -12.2, and Saturn at mag 0.8, both in the constellation Aquarius.



Place: New Delhi / Date: 28th June / Time: 12.30 a.m.

# ROCKET LAUNCHES IN JUNE 2024

## GALACTIC-07

**Date:** June 8, 2024 **Rocket:** SpaceShipTwo

**Agency:** Virgin Galactic **Country:** USA

**Launch Site:** Mojave Air and Space port, California, USA

**Purpose:** SpaceShip Two is a suborbital spacecraft. It is a commercial spaceflight carrying a researcher of Axiom space which will conduct many physiological experiments.

Moreover, UC Berkely and Purdue University will have their payloads aboard conducting experiments related to 3 D printing and studying propellant slosh for spacecraft propulsion applications respectively.

It is capable of carrying up to 25,000 kilograms to Low Earth Orbit and about 14,000 kilograms to Geostationary Transfer Orbit. These capabilities position the Long March 5 on par with heavy-class vehicles like the American Delta IV Heavy, underscoring China's advancements in space launch technology.



## THEOS-2A

**Date:** Expected in June, 2024 **Rocket:** PSLV

**Agency:** GISTDA, Thailand **Country:** Thailand

**Launch Site:** Satish Dhawan Space Centre, India

**Purpose:** THEOS-2A mission, also known as THEOS-2 SmallSAT, is part of Thailand's Earth observation program. It is a microsatellite weighing approximately 100 kg, designed to enhance Thailand's capabilities in high-resolution land observation and video recording. It is developed by Surrey Satellite Technology Ltd (SSTL) in the UK, with significant involvement from Thai engineers as part of an extensive knowledge transfer and capacity-building program.

This program aims to enable Thai engineers to design, manufacture, integrate, and test similar satellites independently in the future, thereby bolstering the country's space technology capabilities.

It will be placed in a sun-synchronous orbit at an altitude of 590 km. The satellite is expected to significantly contribute to urban planning, infrastructure monitoring, disaster management, and other socio-economic applications in Thailand.







## PREFIRE 2

**Date:** Expected In June, 2024 **Rocket:** Electron Rocket  
**Agency:** NASA **Country:** USA **Launch Site:** Launch Complex 1 – Pad B Mahia, New Zealand.

**Purpose:** PREFIRE stands for Polar Radiant Energy in the Far-InfraRed Experiment. This is the second mini satellite of the PREFIRE mission. As most of the heat from Sun is received at near equator regions and it travels to the polar regions through air and ocean currents moving towards the space.

Less studies have been conducted in this area, so the aim of the mission is to provide insights into Earth's changing climate by examining the heat dissipation through the polar regions. The analysis of the data retrieved from the mission will help to better forecast the effects of rising heat on sea level and climate change.

## SVOM

**Date:** 24 June, 2024 **Rocket:** Long March 2C rocket  
**Agency:** China National Space Administration (CNSA), Chinese Academy of Sciences (CAS) and the French Space Agency (CNES)  
**Country:** China & France  
**Launch Site:** Xichang Satellite Launch Center, China

**Purpose:** The Space Variable Objects Monitor (SVOM) mission is an international collaboration between France and China aimed at detecting and studying gamma-ray bursts (GRBs) and other high-energy astrophysical phenomena. GRBs are among the most energetic events in the universe.

The mission will conduct observations across various wavelengths, including gamma-rays, X-rays, visible light, and infrared. Beyond GRBs, SVOM aims to study other transient and variable astrophysical objects, such as supernovae, tidal disruption events, and active galactic nuclei. The four important instruments of the mission are – The ECLAIRs telescope, the Microchannel X-ray Telescope, the Gamma Ray Burst Monitor and Visible Telescope.



## ALOS-4 (Daichi 4)

**Date:** June 30, 2024 **Rocket:** H3 F3: Flight No.3  
**Agency:** JAXA **Country:** Japan **Launch site:** Yoshinobu Launch Complex, JAXA Tanegashima Space Center

**Purpose:** The Advanced Land Observing Satellite-4 (ALOS-4) is a satellite equipped with the PALSAR-3, a phased array type L-band synthetic aperture radar, for observing the Earth's surface. The radar images can be captured during day and night as it does not require sunlight. Moreover, it is weather independent too as the radio waves can enter through the clouds also. It will utilize these advantages for observing and monitoring disaster-hit areas, forests, and sea ice. Additionally, it will explore new areas such as monitoring infrastructure displacement.



# SPACE X LAUNCHES-JUNE 2024

## POLARIS DAWN

**Date:** Mid 2024 **Rocket:** Falcon 9 **Agency:** Space X  
**Country:** USA **Launch Site:** SLC-40, Cape Canaveral Space Force Station, Florida

**Purpose:** Polaris Dawn mission is first of its own kind which aims at promoting human space flight capabilities as well as for other causes here on Earth. Moreover, this will be a five day mission and Space X's first-ever commercial extravehicular activity (EVA) or spacewalk 700 km above Earth with SpaceX-designed extravehicular activity (EVA) spacesuits, upgraded from the current intravehicular (IVA) suit. Taking use of Falcon 9 and Dragon's maximum capabilities, this mission will travel higher than any previous Dragon mission, with the goal of reaching the highest Earth orbit ever flown. Polaris Dawn is a research spacecraft that is orbiting parts of the Van Allen radiation belt. Its primary goal is to gather more information on how space radiation and spaceflight affect human health.



## GOES U

**Date:** June 25, 2024 **Rocket:** Falcon Heavy  
**Agency:** Space X **Country:** USA **Launch Site:** LC-39A, Kennedy Space Center, Florida

**Purpose:** GOES (Geostationary Operational Environmental Satellites) U is a geostationary weather satellite, a collaborative program between NASA and NOAA. It is the fourth and the last satellite of this series to be launched by Space X. It will be located 22,300 miles above equator to primarily observe the weather and environmental conditions over USA.

Further it will deliver essential data on atmospheric, hydrologic, oceanic, climatic, solar, and space conditions. This advanced monitoring capability will enhance the detection and tracking of environmental phenomena, thereby safeguarding public safety, protecting property, and supporting the USA's economic health and prosperity.



## STARLINK GROUP

**StarLink Group 7-19/20/21/22/23/24/25/26/27/30 | Starlink Group 8-3 | Starlink Group 8-4 | Starlink Group 8-5 |**

Starlink is a satellite internet constellation project developed by SpaceX, with the goal of providing high-speed internet access to underserved and remote areas globally. Satellite Deployment: SpaceX regularly launches batches of Starlink satellites into orbit aboard its Falcon 9 rockets. Each batch typically contains dozens to hundreds of satellites.

**\*\*Note: Launch dates of missions are scheduled to be launched in June 2024 but may subject to change.**

# If Earth Had an Atmosphere Like Venus

Vetrivel, Club student

At a distance of 108 million Km from the Sun, Venus is the second closest planet to the Sun. So, it shouldn't come as a surprise that the planet of love is a broiling hot inferno. On its surface, temperatures soar beyond 460-degree C. And the atmosphere is dense with Carbon-di-oxide & clouds of sulfuric acid, causing Venus to have a surface pressure nearly 100 times that of Earth. This would make it feel like you're living approximately 900 m underwater. But astronomers suggest things weren't always this way. A long time ago, Venus might have had a climate not so different from our own. There might even have been oceans. Yeah, you heard that right. Big, watery oceans. But those days are long back. Over time, the planet's atmosphere built up excessive amount of CO2 and other gases, trapping heat from the Sun and paving the way for a runaway greenhouse effect. Now, the planet has essentially become an apocalyptic wasteland. This was the catastrophic endgame of global warming for Venus. There was so much heat trapped that the surface temperature just kept rising. Any and all water in the planet's ancient oceans would have boiled away, leaving nothing but a scorched hellscape.

Now, it's happening here on Earth, and there's nothing you can do to stop it. Earth's average global temperature is approximately 15-degree C. So, assuming this atmospheric transformation happened overnight, from one day to the next, the temperature would jump by several hundred degrees. I don't understand how you slept through that. Now, in reality, it's impossible for this transformation to happen in an instant, but that's the nightmare, you've woken up you. And you'd better be ready to act fast if you want to have any chance of surviving. As I mentioned before, the temperatures wouldn't be the only lethal ingredient in the air. You wouldn't be able to breathe.

The atmosphere would be comprised mostly of carbon-di-oxide and clouds of sulfuric acid. Hopefully, you've got some sort of gas mask on-hand. That's because, with each breath, you'd risk getting severe chemical burns to your internal tissues. And we haven't even gotten to the crushing pressure of the atmosphere around you. I hate to break it to you, but you'd likely get crushed to death before you even experienced the temperature. But today would be the luckiest day of your entire life. Yeah, like an expert. You'd be prepared for anything with highly advanced protective suit right next to your bed. Putting this on, you'd be safe from the heat and the intense pressure and well equipped with a breathable supply of oxygen. Hopefully, your friends and family did the same because if you left your house to check out what kind of effect the atmosphere is having on the planet, get ready for some apocalyptic sights.

The once-clear blue sky would now be a thick, oppressive canvas of yellow with massive clouds of sulfuric acid. Even though they'd block out most of the Sun, well, this wouldn't do anything to mitigate the oven-like conditions on the ground. If you have a well-landscaped front lawn a garden, well, you can kiss that goodbye. Even the trees lining your street, once green and full of life, would crumble at your touch. And it would be like this everywhere. Forests, which used to be the lungs of our planet, would be reduced to desolate landscapes of blackened tree skeletons. Birds would fall out of the sky, land animals would gasp their last breaths, and even fish would bubble out of the sea.

Bodies of water all over the planet would be at their boiling point. This would make for a devastating image of the future. And believe me when I say be prepared for nothing to get better anytime soon. Or ever. If Earth's atmosphere were to stay like this, over time, you'd watch the planet transform into being completely inhospitable. Oceans, lakes, and rivers would continue to boil until they were bone-dry, leaving only the skeletons of the sea creatures that once populated them. And with enough time, even the things that used to symbolize humanity's achievements would become grotesque sculptures of what they once were. Of what they once were.

The relentless heat and pressure would wrap buildings and melt glass. Bridges would collapse into the empty riverbeds they used to span. Roads would become cracked and undrivable. Not that you'd be able to manage to get far in a vehicle anyway. Your car would be subject to the same conditions. There's a good chance your tires would just melt away right underneath you. Your only chance of survival in the particularly unforgiving atmosphere would be to head underground. You and whoever else has survived this disastrous event would need to build subterranean shelters in the planet's crust.

These underground habitats would need to protect you from the heat above, but more importantly, recreate the breathable atmosphere. With the right design, you might even power them entirely by harnessing geothermal energy from the planet's core. But other than the humans and other animals' species we'd save by bringing them into these shelters, life would effectively vanish off the surface of the planet. Earth, as we knew it, would be gone forever. And there'd be little hope of getting it back. I mean, look at Venus.

Do you think we'll be living there anytime soon? Scientists think the only chance of us living on that planet would be to build above it and live in air balloons in the sky. Could we do that on Earth? Well, in theory, yeah but this scenario happened too fast for us to be able to react in time. What's really terrifying here is the fact that Venus used to be a planet with a comfortable atmosphere that was full of water. With Earth getting warmer and warmer each year, are we on a crash course to become just like this terrifying death planet? Well, obviously, we won't be exactly like Venus for a number of reasons. One of the main ones is that we're too far away from the Sun to reach temperatures of over 460-degree C (870-degree F). But that's not to say that Earth won't become uninhabitable as it heats up. Humans, animals, and every other species of wildlife will need to find new ways to live on this big blue marble. And maybe climate change, forest fires, pollution, and overall conditions will just get so bad for us humans that we'll be forced to leave Earth.

# NAVIGATING SPACE TECHNOLOGY: EDUCATIONAL INSIGHTS FROM CANSAT PROJECT

Pooja G, |Astronomer

In the realm of educational space technology, the CanSat designing program is pioneering an innovative approach to teaching the principles and applications of space science. A CanSat, a type of sounding rocket payload, acts as a miniature satellite, encapsulating the essential components and functions of larger satellite systems. These compact devices, often launched to altitudes of approximately one kilometre via rockets or dropped from platforms such as drones or captive balloons, provide invaluable hands-on experience in space technology and engineering. A recent initiative highlights this educational innovation. A team of five engineering students from Sri Sairam Engineering College, including myself, Pooja, embarked on a CanSat development project to advance our understanding and skills in space technology. Guided by the institution's faculty and the space startup Hyoristic Innovation, our diverse team pooled expertise from various engineering disciplines to design and build the CanSat.

## Key Requirements for CanSat Development

- **Payload:** The primary mission objective, which includes periodic space photography and weather prediction.
- **Electrical Power:** Ensuring a reliable power supply, typically through a Li-po battery.
- **Mechanical Structure:** The physical framework, often designed using SOLIDWORKS for detailed planning and prototyping.
- **Communication:** Establishing a robust communication link, facilitated by an antenna such as the Yagi Uda Antenna.
- **Control:** Managing the system's operations through suitable microcontrollers and communication protocols.

The design process began with soldering a PCB board with test sensors using EasyEDA software. The payload for our CanSat aimed to make discoveries, capture periodic images of space for analysis, and provide weather prediction capabilities. Following extensive research, we selected appropriate microprocessors, microcontrollers, and microcomputers. This process included evaluating various communication protocols such as UART, SPI, I2C, and CAN. Stringent selection criteria for the microcontrollers were applied, focusing on operational temperature range (-40 to +80 degrees Celsius), space-grade qualifications, number of I/O ports, supported communication protocols, and power consumption.

Key sensors selected for the CanSat's mission included:

- **BMP180:** For measuring pressure, temperature, and altitude.
- **MPU6050:** For measuring gyro and acceleration.
- **Magnetometer:** For measuring the magnetic field.
- **Camera Module:** For capturing images.
- **GPS:** For satellite-based navigation.

We built the prototype using the mbed NXP LPC1768 microcontroller, which was then coded and assembled. Both ground and satellite stations were equipped with necessary sensors, and coding was done using Arduino software. The Yagi Uda antenna, known for its efficiency and consisting of parallel resonant elements, was selected for ground-station satellite communication. The mechanical structure of the CanSat was designed using SOLIDWORKS, facilitating detailed planning, visual ideation, modelling, feasibility assessment, prototyping, and project management. The final CanSat system included a power system (Li-po battery), sensing system, telemetry system, and the main structural framework.

Additionally, a parachute system was assembled, and a drop test was conducted from the college terrace. Data collected during this test was stored in the onboard memory card for subsequent analysis. The data gathered from the CanSat was analyzed using advanced tools such as GMAT, Fldigi, and SatNOGS. GMAT (General Mission Analysis Tool), an open-source space mission analysis software developed by NASA, has been utilized in missions like LCROSS and OSIRIS-REx. Fldigi (Fast Light Digital) is an open-source program enabling two-way data communication via a computer's sound card, commonly used by amateur radio operators. SatNOGS (Satellite Networked Open Ground Station) is a platform aimed at creating a network of satellite ground stations, offering both free software and open-source hardware.

This CanSat project exemplifies a practical approach to learning space technology, combining theoretical knowledge with hands-on experience. Through the development and testing of the CanSat, we gained valuable insights into the intricacies of satellite systems, preparing us for future endeavours in space exploration. The program not only advances educational space technology but also fosters innovation and practical skill development, equipping the next generation of engineers for the challenges of space exploration.

# BINOCULAR BASED ASTRONOMY

Kaushik, Space Arcade

Hello all, My Name is Kaushik, am working in IT Sector and Astronomy is my passion. I wish to share my experiences with Binoculars based Night sky observations as follows.

Binoculars are intermediate between our Naked Eyes and Telescope observation. Binoculars are low cost (Below 10,000 ₹), quick, require no setup, easy to carry and gives a trailer of Planetary, Comet or deep sky objects which can be seen by Telescope. Binocs are good for objects giving wider field of View of 3 to 5 degrees and causes less eye strain than telescopes. 8x(magnification) 50(mm aperture), 10x 50, 12x 60 sizes can be hand held comfortably and still give good views into night sky while 15x 70 or 25x 100 sizes can either be hand held or require tripods for steady holding for some users. Potential disadvantage could be improper alignment or Colour Achromatism which needs to be verified while buying. I have been using Binoculars for 10 years to observe the night sky before I recently purchased a Telescope few months ago from Space Arcade Chennai shop. I have used Celestron 10x 50 and 15x 70 mm Binoculars and still continue to do so. The Observations from a Binocular, Telescope or other devices depends on following factors,

- The Bortle Scale of Pollution in night sky.
- Skill of observer.
- Weather conditions.

My observing highlights with 15X 70 binocular are as follows,

Solar System observations:

- Craters and day-night terminator line on Crescent Moon.
- Crescent of Venus.
- Views of Comet Neowise with its tail in 2020, or other bright comets as they appear.
- Jupiter as a disk and its 4 Galilean Moons.
- Uranus and Neptune (Otherwise Not visible to naked Eyes).
- Perihelion Mars like a disc.

Deep sky objects.

- Orion Nebula.
- Pleiades & Hyades reflection nebula.
- Beehive Cluster.
- Andromeda Galaxy (otherwise not visible from Bortle 7 skies).
- Sombrero Galaxy (M104).
- Milky way and messier objects M7, M8, M20 in Scorpius- Sagittarius (need for Bortle 7 sky).
- M 81 & 82 in Ursa Major.

# SuperNova: A Probe for Neutrino Self-Interactions

Himanshu Kumar, Professor

Supernovae: An Astrophysical Lab for  $\nu$  SI (Self-Interacting Neutrinos)



Neutrinos are standard model particles which we understand very little and this is due mostly to its interaction being very weak with other SM particles. Neutrinos play a significant role in the evolution of the universe, seeing that they are expected to provide 40% of the energy density during the radiation era. These interactions could be beyond the  $SU_3 \times SU_2 \times U_1$  model. Beyond this, very little is known about the interactions among the neutrinos i.e. their self-interactions. According to the SM predictions, the neutrino self-interactions are weak enough to be measurable in any of the current experimental capabilities. So, this leaves open the possibility of beyond SM interactions at various energy scales. Throughout the cosmology and astrophysics, we have a multitude of possibilities to probe the self-interactions of the neutrinos. The theoretical motivation to probe such interactions comes from inclusion of neutrino masses and connections to the dark matter.

Supernovae exploration can greatly enhance the possibility of probing this beyond SM physics i.e. the self-interactions of the neutrinos. In the core-collapse supernovae, the density of the neutrinos is very high and  $\nu$  SI becomes important. A supernova begins with electron capture by nucleons and photo-dissociation, which leads to the collapse of star mass enough to support the gravitational forces and the end result is a proto-neutron star and huge gravitational energy of core collapse, almost all released as neutrinos. The lack of very deterministic parameters makes the experimental exploration difficult in such a scenario. Recently, certain findings have revived hope for the probing of SI in supernovae environment [1].

The high abundance of neutrinos in core-collapse supernovae gives an ideal environment to probe neutrino self-interactions. The strength of the coupling of SI can alter their mean free paths and thereby enhancing power on small scales and shifts in the acoustic peaks of the CMB. Also, it can change the epochs of radiation to matter domination and significantly affect matter clustering in the universe [2]. The SNe's carrying very high energy neutrinos can interact with the cosmic background of neutrinos, in case of SI, thereby developing characteristic energy dependent features in their observed energy distribution.

The studies of the energy distribution pattern of SNe passing through cosmic background neutrinos can help fix better competitive limits on the energy of strong SI. It is to be noted that upper limits on the coupling strength of the mediators through which secret neutrino interactions can occur have been put in the range 1–100 MeV [3]. Studying the time delay between SNe and the decay of a neutron star can give important clues to the strength of neutrino self interactions. Any SI would be indicated as a dip in the energy spectrum of SNe passing through cosmic background neutrinos. The neutrino signal detected in SNe with SI would differ in their duration depending upon whether the neutrino discharge is burst type or fluid flow. With the advances in neutrino detection in SNe's, neutrinos of all flavors could be detected in the next SNe detected. It is to be noted that the only SN detected till now is SN 1987A. The detection of SI can also possibly resolve the current discrepancy in the local measurement of Hubble constant and those obtained by analyzing the CMB data..

#### References

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# Homogeneity of the Universe: Is the Universe Homogeneous?

Souryadeepta Majumdar, *IAstronomer*

The manipulation of the universe in current era works on the established Lambda Cold Dark Matter 'concordance' (CDM) model. On this model, two major assumptions are made along with the assumption of valid Copernican Principle (CP). The two major assumptions are Homogeneity and Isotropy across the universe. Homogeneity, as the name suggests, is the uniformity of the universe as seen from different perspectives or angles. This factor, itself is derived from isotropy of the universe and hence, if we consider that isotropy is existing in the universe, then homogeneity will also exist. Even if the observations from the Cosmic Microwave Background (CMB) and galaxy distributions often confuse astronomers by showcasing homogeneity, however, there have been evidences that show that the universe may not be homogeneous throughout. Here, a brief introduction to homogeneity is provided, and further a discussion of the fact that if the universe is heterogeneous (i.e., not homogeneous) then how does it differ from the current model of the universe.

The proposal of homogeneity dates back to the era of Galileo (16th century), where he proposed what is known as Homogeneity of Physical Law which removes the differences in the two different realms of Physics set by Aristotle, namely the terrestrial (or earthly) realm and the celestial (or heavenly) realm. Later, the Cosmological Principle (17th century) was established by Isaac Newton, which stated that, if the universe is observed from a sufficiently large scale, the properties are the same for all the observers. The Cosmological Principle, as continued from the Homogeneity of Physical Law, clubbed with the CP (16th century), which stated that no one is in a special point in the universe and every observer has a general observing point in this universe. This together formed the Homogeneity of the universe. Today, with modern cosmology and shift to dark matter from the traditional baryonic matter, we have come across several cosmological outputs such as expansion rate of the universe, origin of the universe, galaxy distribution and so on. However, a limitation to the practical proof of existence to this phenomenon is that, we cannot observe homogeneity directly.

What we see is in a telescopic survey or observation is a two-dimensional projection of a three-dimensional object, lying on a four-dimensional system. Although, the main for not being able to observe homogeneity directly is that, we observe from the light cones that we receive on our end (i.e., light from the source converge towards us and forms a conical cavity, where the tip of the cone is the point where we see the image) and this light cone is what is known as past light cone. This means that, what we see is the past state of that object and hence is not the perfect state of its distribution. Hence, one cannot judge existence of homogeneity directly practically.

However, the lambda of the CDM model has been obtained from non-cosmological observations and isotropy in the space-time geometry is obtained. This establishes the fact that universe is the same throughout from all directions and hence this also approves homogeneity in the universe. Throughout this part, all we get to understand is universe is accepted as homogeneous and although it cannot be directly proven as homogeneous, there are supporting theories that actually prove it to be homogeneous. Now, with the establishment of the modern cosmology, came another viewpoint: what are the aspects that define the heterogeneity of the universe? Simplifying the question, it is finding the answer to the fact that, to an extent, the universe is homogeneous; but at the same time, if we cross that scale of extension, we find a heterogeneous universe where we see variations in gravitational waves and clusters and galactic diversity across.

As per the recent researches, the cosmological model that approves isotropy and homogeneity is a highly successful model with accurate outputs. If we consider the current model, we have a very beautiful and symmetric universe which is accelerating its increment at a rate of  $73.24 \pm 1.74$  (km/s)/Mpc. However, if we scale it to heterogeneity and observe the variations, we find a non-uniform expansion rate of the universe, with a concept of varying space-time geometry across different angles. The heterogeneous model sounds more comprehensive and realistic to several cosmologists around; however, the homogeneity model provides accuracy and physical and statistical belief on the predictions made till date. So, we can claim the universe to be homogeneous to some extent, but the proceedings has clarified that soon a limit will show up that distinguishes the extent to which universe can be considered homogeneous and heterogeneous henceforth.

# SPACE-TIME CONTINUUM FROM THE PERSPECTIVE OF A SCHOOL STUDENT

Sanchayan Sarkar, Astronomer

There are many fascinating objects out there in the vacuum of space. One of those fascinating objects is the wormhole. Though it is still a theoretical object but it opens many possibilities that may change our conception of the space. So, first to understand the concept of wormholes we must come home to about some related fields. At first let's understand the concept of the spacetime. In 1908, mathematician Hermann Minkowski proposed the concept of spacetime. The spacetime continuum is presented in the following way-

"The three-dimensional quantity of space (combination of length, breadth, and height) along with the one-dimensional time blends with each other to form the single four-dimensional continuum called the spacetime." Now to explain the spacetime in the coordinate system Einstein had followed the following way in a chapter of the Einstein's theory of relativity he has explained the concept of coordinate systems. There he has represented the coordinate system of our world that is 3D using a number a coordinate which respectively are-  $x$ ,  $y$ , and  $z$ . But when representing the spacetime in the coordinate system he has maintained a unique way that is- as it is not possible for us to think of a 4D coordinate system Einstein has taken  $x$  and  $y$  as a single coordinate and  $z$ ,  $t$  respectively as the other two. When there's no object situated on the spacetime it runs flat and behaves like a flat stretched fabric. But when an object is situated on the fabric of the spacetime continuum it bends the spacetime and forms a curvature on the fabric of the spacetime. And when any object comes close to the curvature it tends to fall towards the source of the curvature due to the presence of a force due to the curvature of spacetime and even falls if the mass of it is not enough to oppose the force. This force is known as the gravitational force.

The amount of curvature that will occur depends on the amount of mass of the object. If the mass of the object is greater then the amount of curvature on the spacetime will be greater and so the amount of gravity. Once we have discussed about the spacetime it is the time to know about blackholes and whiteholes. I previously told that, if the mass of the object is greater then, the amount of curvature on the spacetime will be greater and so the amount of gravity. And we know that if one object is having huge mass then obviously it will have huge size. But as the blackholes are the densest object in the whole universe a lot of mass is compressed in them thus leading to the production of huge amount of gravity and guess what blackholes have a great gravitational pull on the surface. Blackhole are formed from dead stars but their gravity is stronger than their previous form at their surface because of the intense density which yields to form an escape velocity that even light cannot reach. Even the fastest physical object in the universe light cannot escape it. As light also follows spacetime so it enters the blackhole but is not able to reach the escape velocity of it.

The different parts of the blackhole are event horizon and singularity. The event horizon is the boundary of the blackhole from where nothing can escape. If you reach the speed limit of the universe(light speed) then also you will not be able to return. Secondly the singularity, the singularity is the point of no return here large amount of matter is compressed into infinitely small space. But the whitehole is the completely opposite of a blackhole. If anything cannot escape blackhole then nothing can enter it. Now let us come to the theoretical world of wormholes. So, we have discussed about the fabric of the spacetime. Now if we fold that spacetime and join the upper layer and the lower of that fold with a tunnel then that tunnel is called the wormhole. In easier words, if we fold the spacetime and where there is a blackhole in the upper part and whitehole in the lower one and we connect the two with a theoretical tunnel then that tunnel along with that blackhole and whitehole is called the wormhole. Wormhole is a way to go from a place in the universe to another place or universe faster than the light speed.

But wormholes are shortcuts that make something far away closer, even time! So, let's dive into the further studies of space and discover new ways to change the text books.



# VISUAL ARTS FROM SPACE ASSOCIATED ASTRONOMERS



Moon Captured by T. Vetrivel, lastronomer



Zoomed view of Moon captured by NPS students.

# ASTROPHOTOGRAPHS BY SPACE



Milkyway arm Captured by Mr. Ranjith Kumar E, Team Lead, Education - Chennai, STEPL.

# Happy Birthday

## Eugene Newman Parker

Eugene Newman Parker (10 June 1927 - 15 March 2022), an American solar and plasma physicist from Houghton, Michigan, revolutionized our understanding of the solar system. Best known for proposing the solar wind and the Parker spiral magnetic field in 1958, his theories were later confirmed by spacecraft. In 1987, he suggested nanoflares as a solution to the coronal heating problem. NASA's Parker Solar Probe, launched in 2018, honors his work and provides insights into the Sun's atmosphere. Beyond his groundbreaking research, Parker inspired many as an educator and received numerous accolades, including the National Medal of Science. His legacy continues to illuminate astrophysics.



## Carolyn S. Shoemaker

Carolyn S. Shoemaker (24 June 1929 - 13 August 2021) was an American astronomer renowned for her contributions to the study of comets and asteroids. Born in Gallup, New Mexico, she co-discovered Comet Shoemaker-Levy 9, which famously collided with Jupiter in 1994, the first observed collision of two solar system bodies. Working with her husband, Gene Shoemaker, and David H. Levy, she discovered over 800 asteroids and 32 comets. Her meticulous work earned her acclaim in the scientific community and reshaped our understanding of the solar system. Shoemaker's legacy continues to inspire astronomers, emphasizing perseverance and passion in exploring the cosmos.

## Charles Messier

Charles Messier (26 June 1730 - 12 April 1817) was an 18th-century French astronomer famed for his catalog of celestial objects. Born in Badonviller, France, he earned the nickname "the comet ferret" for his comet pursuits. Published in 1774, this compendium of 110 celestial objects, including the famous Andromeda Galaxy and the Orion Nebula, revolutionized astronomy, serving as a comprehensive guide for astronomers and amateur stargazers. This catalog revolutionized astronomy by distinguishing permanent celestial objects from transient comets, significantly enhancing our understanding of the universe's structure.



# Happy Birthday

## John Couch Adams



John Couch Adams (5 June 1819 - 21 January 1892) was a British mathematician and astronomer known for predicting Neptune's existence and location in 1845 by analyzing irregularities in Uranus's orbit. Concurrently, French astronomer Urbain Le Verrier made similar calculations, leading to Neptune's discovery in 1846. Born in Cornwall, Adams excelled in mathematics and studied at St John's College, Cambridge. Beyond Neptune, he studied the Moon's motions, planetary perturbations, and the Leonid meteor showers. His pioneering work in celestial mechanics earned him numerous accolades, including the Royal Astronomical Society's Gold Medal. Adams is recognized as one of the 19th century's leading astronomers.

## Bruce McCandless II

Bruce McCandless II, originally named Byron Willis McCandless (8 June 1937 - 21 December 2017) was a pioneering astronaut known for becoming the first person to fly untethered in space using the Manned Maneuvering Unit (MMU) during the 1984 STS-41-B mission. Born in Boston, he was an American Navy officer, aviator, electrical engineer, and NASA astronaut. His untethered flight symbolized humanity's drive for exploration. McCandless also contributed to space exploration by aiding in the development of crucial technologies and serving on STS-31, the mission that deployed the Hubble Space Telescope. Renowned for his humility and dedication, McCandless left a lasting impact on the history of space exploration.



## Giovanni Cassini



Giovanni Cassini (8 June 1625 - 14 September 1712), an Italian-born astronomer, made significant 17th-century contributions to astronomy. He mapped Jupiter's moons' orbits, discovered four of Saturn's moons (including Iapetus and Rhea), observed the Cassini Division in Saturn's rings, and accurately determined Saturn's rotational period. His meticulous observations laid the groundwork for future astronomical discoveries and advanced our understanding of the solar system. Cassini's dedication and passion for astronomy exemplify the spirit of exploration and curiosity, inspiring scientists to this day. His legacy endures as a cornerstone of our knowledge about the cosmos.

# HISTORICAL EVENTS HAPPENED IN JUNE

## THE TUNGUSKA EVENT

On the morning of 30 June 1908 (N.S.) enormous explosion that is estimated to have occurred at 7:14 AM plus or minus one minute, at an altitude of 5-10 km (15,000-30,000 feet), flattening some 2,000 square km (500,000 acres) and charring more than 100 square km of pine forest near the Podkamennaya Tunguska River in central Siberia (60°55' N 101°57' E), Russia. The energy of the explosion is estimated to have been equivalent to the explosive force of as much as 15 megatons of TNT—a thousand times more powerful than the atomic bomb dropped on Hiroshima, Japan, on August 6, 1945.

The explosion is generally attributed to the air burst of a meteoroid or asteroid. It is classified as an impact event, even though no impact crater has been found; the object is thought to have disintegrated at an altitude of 5 to 10 kilometers (3 to 6 miles) rather than to have hit the surface of the earth.

### EFFECT OF THE IMPACT



The Tunguska event is the largest impact event on Earth in recorded history. Studies have yielded different estimates of the meteoroid's size, on the order of 60 to 190 meters (200 to 620 feet), depending on whether the body was a comet or a denser asteroid.

It is estimated that the Tunguska explosion knocked down some 80 million trees over an area of 2,150 km<sup>2</sup> (830 sq mi) and that the shock wave from the blast would have measured 5.0 on the Richter magnitude scale. An explosion of this magnitude would be capable of destroying a large metropolitan area, but, due to the remoteness of the location, no human fatalities were officially documented. Several reports have indicated that two people may have died in the event; however, these deaths remain unofficial. This event has helped to spark discussion of asteroid impact avoidance.



(Image credits: NASA)

# HAYABUSA RETURNS HOME

On 13th June, a space capsule and spacecraft reenter Earth's atmosphere and fall back to Earth. An international team of scientists kept a close eye on the descent. As expected, the spacecraft, disintegrated and incinerated during re-entry, while the heat-shielded capsule landed safely, via a parachute, in the South Australian outback where four separate teams were ready to retrieve it.

Hayabusa, after a 7-year journey has returned home.

A joint ISAS (now JAXA)-NASA-Australia, Hayabusa, at the time known as MUSES - C, launched from the Kagoshima Space Center, Uchinoura, Japan on 9th May 2003. After launch, the spacecraft's name changed to Hayabusa, the Japanese word for peregrine falcon, an allusion to the hovering manner that the spacecraft would adopt when collecting samples.



An artists concept of Hayabusa collecting the sample

Hayabusa was a technology demonstration mission. It was to prove JAXA's capabilities in sending a spacecraft to an asteroid, collecting a sample from it and successfully returning the sample to Earth.

In September 2005, Hayabusa rendezvoused with the Near Earth Asteroid Itokawa. For two and a half months, the spacecraft observed the asteroid. It collected data on the asteroid's shape, terrain, mineral distribution, gravity and its ability to reflect the sun's rays. In November 2005, Hayabusa briefly touched down on Itokawa's surface. Spacecraft have previously landed on asteroids, but this was the first attempt to collect an asteroid's surface material. Hayabusa successfully collected less than one gram of material to be studied.

In January 2007, Hayabusa departed Itokawa and started its journey home. Upon its return, the space capsule's journey, which was to mark the first attempt at sampling an asteroid's surface material, was successfully completed.

Hayabusa was succeeded by Hayabusa 2 which launched on 3rd December 2014. Hayabusa 2, like Hayabusa, was to study an asteroid, collect samples and bring it back to Earth. The spacecraft studied the asteroid Ryugu and is currently on an extended mission to asteroid 1998 KY26.

# VOSTOK'S FINAL FLIGHT

On an unremarkable afternoon, the final flight of the Vostok programme launched from the Baikonur Cosmodrome. Vostok 6's left the ground with no difficulties, and inside its 2.3-meter-wide pressurized cabin, strapped down, sat Valentina Tereshkova. On 16th June 1963, the Russians sent the first woman and civilian to space.

Valentina Tereshkova was born in Maslennikovo, a village in the Yaroslavl region of Russia. She received little formal education and was interested in parachuting. Her parachuting skills caught the attention of Soviet space officials who were recruiting women to be cosmonauts. She was 26 years old during her flight. She is one of the youngest people to travel to space, and to date she is the only female cosmonaut to travel alone to space.



Tereshkova spent almost three days in space. During this time, she communicated with the Soviet leader by radio, while her image broadcasted across the country. She kept detailed logs of the mission and collected data on her body's reaction to spaceflight. She also captured images of the Earth, photographing the terrestrial cloud cover and landmasses beneath her flight path. Later, her photos helped in identifying the aerosol layers on the planet.

After completing 48 orbits around Earth, Vostok 6 reentered Earth's atmosphere. Like all the previous Vostok flights, Tereshkova had to eject. She landed safely, and near her landing site, a statue of Tereshkova stands.

Vostok 6 was the 12th human spaceflight in history. The mission was a political triumph for the Soviet Union, as the time of the single mission was longer than all of NASA's Project Mercury astronauts' time in space combined.

Since her only flight to space, several more women around the globe have crossed the Karman line. Some have commanded space missions, helmed space stations, made spacewalks, and spent more than a cumulative year of their lives in orbit.

Currently, Valentina Tereshkova is the only surviving cosmonaut from the Vostok programme.

# WORLD'S FIRST BALLISTIC MISSILE

On 20th June 1944, the Nazi Party tested their V2 rocket with a vertical launch. Nearly reaching 175 kilometres above the Earth's surface, the weapon successfully crossed the Kármán line. Nazi Germany sent the first object to space, in their quest for vengeance. The full name of the rocket Vergeltungswaffe 2 meant Vengeance Weapon or Retaliation Weapon 2. The Nazis planned to attack Allied cities with the weapon in retaliation for the Allied forces attacking their cities.

The V2 rocket, the world's first large-scale liquid-propellant rocket, was designed and developed by Wernher von Braun between 1936 and 1942. Measuring 14 meters long and 1.6 meters wide, with the ability to carry 900 kilograms of explosives, it was the most advanced rocket in the world at the time. It was also the world's first long-range guided missile.

The V2 rocket was equipped with a guidance system, improving its accuracy. Its ability to travel at supersonic speed and impact without audible warning led to the deaths of approximately 9000 civilians and military personnel. Additionally, the rockets were made from slave labour and at least a further 12,000 labourers and concentration camp prisoners died during the production of the weapon.

The V2 has two legacies. One of death and destruction while the other is the basis of the design for rockets that took people to space. In a world where liquid fuel is still the propellant of choice for space missions, we are still living in the age of the V2.

Wernher von Braun, the man who designed the V2 rocket, also designed the rocket that took the first American to space and the first astronaut to the moon, all while utilising the technology of the deadly weapon that decades previously murdered 1000s.

May in all its glory, we celebrated every Spacian to recognize their achievements, milestones, and personal growth, as each of them played a vital role in the progress of the Space group to greater heights. It was a day filled with joy, appreciation, and personal experiences shared by Spacians.

The event commenced with a welcoming address by Ms. Stuti Bhatia, Executive – Public Relations, who introduced the theme of the celebration. Following this, Mr. Ankit Kumar Singh, Director of Programs and Planning at SPACE Foundation, delivered an exceptional speech. He captivated all the Spacians with personal anecdotes from his experiences at SPACE, serving as an icebreaker and encouraging others to share their cherished stories. Team members from various locations who joined virtually contributed by sharing humorous tales, spreading smiles and laughter among everyone present.



Following that, the agenda moved on to announcing birthdays, work anniversaries, and welcoming new joiners. The highlight of the event was the announcement of the Spacian of the Month, with hearty congratulations extended to Ms. Tanya Maheshwari, Educator – Education for her outstanding contribution. During April, as we celebrated Global Astronomy Month, she conducted an impressive total of 26 activities, including the Earth Day Campaign. Demonstrating her deep passion for astronomy, she showcased remarkable organizational skills by flawlessly executing all planned sessions. Her dedication, hard work, and proficient documentation and design skills have set a high standard for her colleagues. She truly exemplifies the qualities of an outstanding educator and an invaluable team member.



The celebration extended with a cake-cutting ceremony, followed by a delicious lunch and refreshments. The event further included engaging games such as "Decode the Spacian" and "Mimic Madness," hosted by Ms. Rishita Sharma, Educator and Ms. Sandeep Kumar Khare, Educator fostering team spirit, boosting morale, and leaving all participants with smiles.

### **Intern's Point of View- Ms. Sherli Gautam**

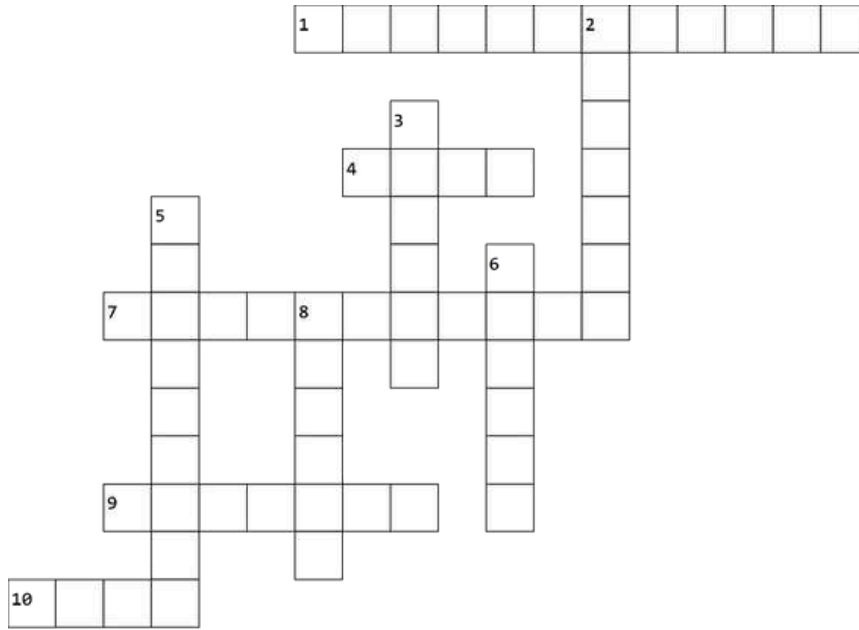
"As an Outreach intern at SPACE India, the warmth I received since day one puts a memorable impact on my journey that has allowed me to grow both personally and professionally. The opportunity to work alongside talented individuals, engage in challenging projects, and contribute to meaningful initiatives has been great. I am deeply grateful for the guidance, mentorship, and encouragement I've received from everyone in the organization. The dedication of this Organization making a positive impact on society has left a lasting impression on me."

Here's to every member of our team - the cornerstone of our shared achievements. Let us acknowledge and celebrate our individual and collective contributions, today and always.



# TRAIN YOUR BRAIN

## CROSSWORD



**Across**

1. Which Mars rover has been serving as a communications relay for Ingenuity?
4. According to Einstein's theory, what bends the fabric of space and time?
7. Who was the first American to go to space?
9. What theory introduces the concept of the expanding universe
10. What did NASA send to Voyager 1 to identify the root of the problem?

**Down**

2. Where is Stonehenge located?
3. What is the parent comet of Eta Aquarids?
5. Who was the first American woman to fly in space?
6. dioxide What is the primary gas in Venus's atmosphere?
8. what was the first space station operated by USA?

## ASTRONOMY WORD PUZZLE

Find the constellations from the mixed letters and mark them.

### CONSTELLATIONS

U	P	R	O	J	A	M	A	S	R	U	T	I	T
T	U	C	A	N	A	O	S	I	U	U	A	T	R
S	E	S	S	C	U	T	U	M	S	E	S	I	O
A	S	O	V	I	R	G	O	S	L	S	C	T	R
L	E	E	N	E	S	E	R	P	E	N	S	N	S
U	X	O	A	M	U	L	U	C	I	T	E	R	R
C	T	T	A	U	R	U	S	L	A	L	R	T	I
E	A	Y	S	V	O	L	A	N	S	T	Y	L	A
P	N	A	M	R	M	U	A	S	S	M	A	C	N
L	S	C	A	L	E	V	U	C	U	S	L	U	O
U	S	U	U	S	N	L	A	O	P	Y	X	I	S
V	S	C	U	L	P	T	O	R	I	N	U	R	U
C	V	L	U	M	U	L	U	G	N	A	I	R	T
P	N	M	U	I	P	O	C	S	E	L	E	T	O

- TAURUS
- VELA
- URSA MAJOR
- SEXTANS
- RETICULUM
- SCULPTOR
- TRIANGULUM
- SCUTUM
- PYXIS
- SERPENS
- VIRGO
- VOLANS
- VULPECULA
- TELESCOPIUM
- TUCANA

Answers for last month puzzles.



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

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JUNE 2024 | VOLUME 3 | ISSUE VI

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