

The Joy of Watching SpaceX's
Starship Booster Caught by
"Chopsticks"

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GAGAN is a monthly magazine about astronomy and space science published by **PSIT VYOMNAUTS** targeting amateur astronomers. Each issue includes astronomy news, spacelaunches, what's up in the sky every month, events and announcements done by the space team, astrophotographs and articles on astronomy and astrophysics submitted by readers for the general audience, and articles about historical missions and events of astronomy and more. This comes in an easy-to-understand, user-friendly style that's perfect for astronomers at any level.

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SPACE Insights Highlights of October 2024

1. Planetary Events:

- October 5: Venus at greatest eastern elongation, making it visible in the evening sky.
- October 28: Mars at opposition, offering prime viewing conditions for the Red Planet.

2. Meteor Showers:

- October 8-9: Draconid Meteor Shower, best viewed in the early evening.
- October 21-22: Orionid Meteor Shower, one of the most reliable annual meteor showers, peaking with potential rates of 20-25 meteors per hour.

3. Lunar Events:

- October 14: Full Moon, also known as the Hunter's Moon.
- October 29: New Moon, offering excellent dark sky conditions for stargazing.

4. Space Missions and Conferences:

- International Astronautical Congress (IAC): This annual event, held in October, brings together space agencies, industry leaders, and researchers to discuss the latest advancements in space exploration and technology.
- NASA's Artemis Program: Stay updated on the progress of NASA's Artemis program, aiming to return humans to the Moon and establish a sustainable lunar presence.

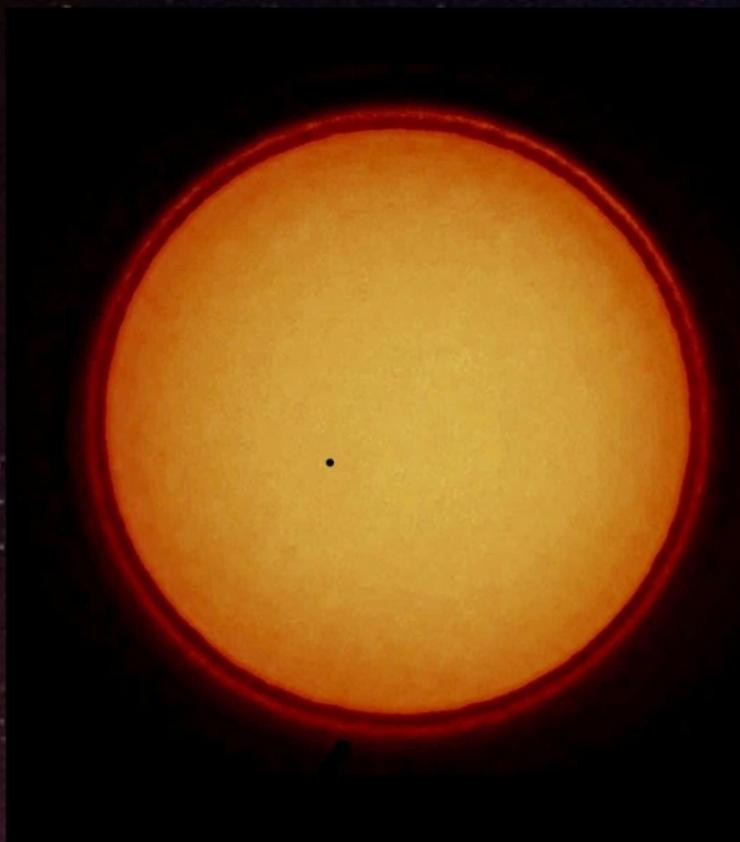
Solar Observation at PSIT Kanpur: A Safe Look at the Sun



Our club **PSIT Vyomnauts** recently hosted an exciting solar observation event from October 4th to 10th. Equipped with special solar eclipse glasses, participants were able to safely observe the Sun's surface and its dynamic activity.



The Science Behind Sunspots



PSIT
Kanpur

PSIT
VYOMNAUTS
FROM CLASSROOM TO COSMOS

We are celebrating
**WORLD SPACE
WEEK**

04 October -10 October

Visit **VYOMNAUTS CLUB** for free Solar Observation with Solar Glasses

Note: Visit during Lunch and bio break only

Venue: Main Building
Second Floor Incubation
Centre Cabin G

PSIT
STARTUP
AND INCUBATION
FOUNDATION

Sunspots are temporary phenomena on the Sun's surface that appear darker than the surrounding areas. They are caused by intense magnetic activity, which inhibits the flow of heat from the Sun's interior to its surface.

The Solar Cycle

The number of sunspots varies over an approximately 11-year cycle. During the solar maximum, the Sun's magnetic field is more active, and there are more sunspots. During the solar minimum, the Sun's magnetic field is less active, and there are fewer sunspots.



The club's expert members guided participants, answering questions and sharing their knowledge of solar physics. This event not only sparked curiosity but also fostered a deeper appreciation for the wonders of the cosmos. We're grateful to our dedicated members and faculty for making this event possible.

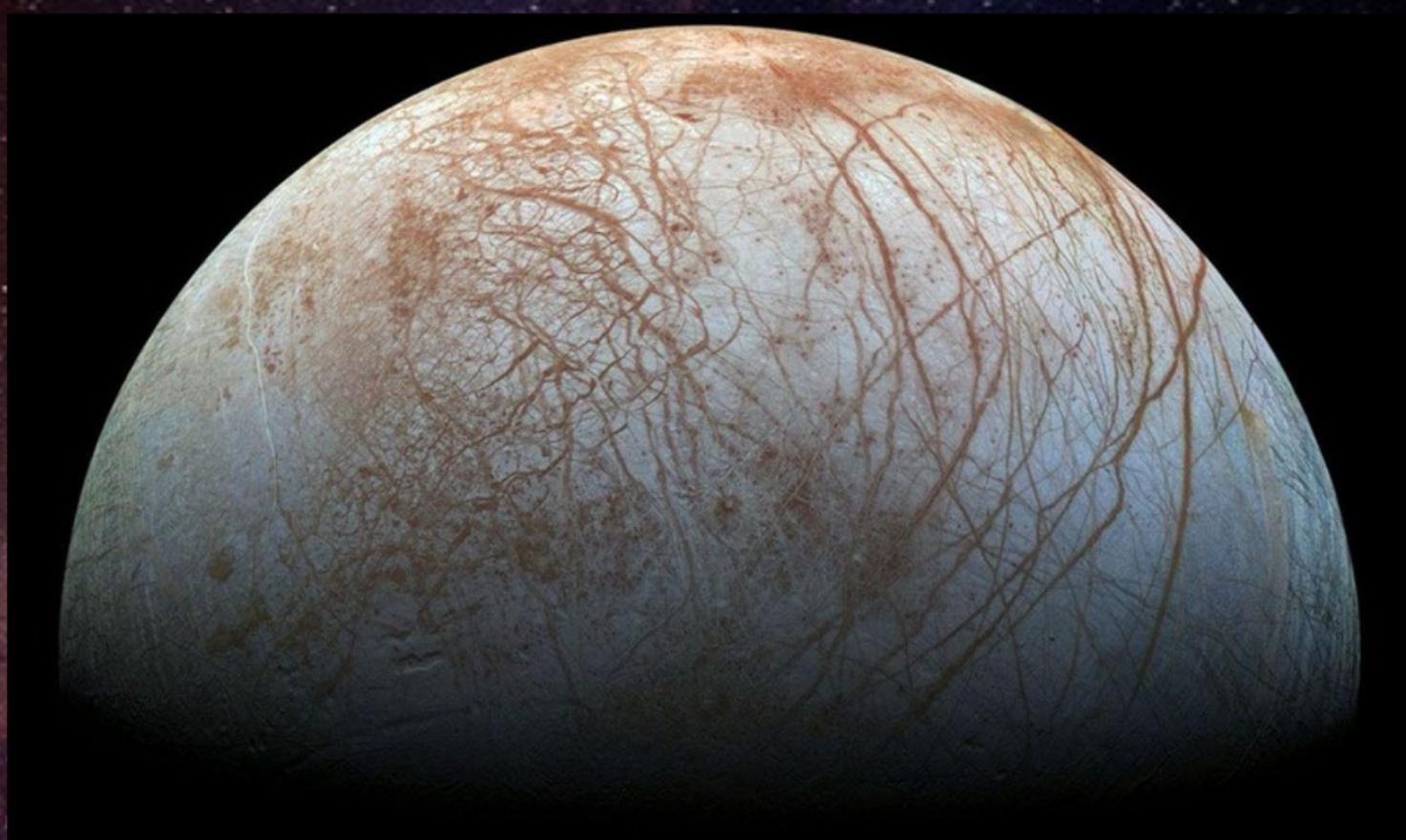
A Giant Leap Toward Exploring Jupiter's Icy Moon



NASA's ambitious Europa Clipper mission, aimed at unraveling the mysteries of Jupiter's icy moon Europa, will soon take flight aboard SpaceX's powerful Falcon Heavy rocket. Scheduled for October 2024, this launch represents a critical step in our quest to explore one of the most intriguing bodies in our solar system. Europa, with its icy crust and possible subsurface ocean, has long fascinated

The Europa Clipper Mission: Exploring the Unknown

Europa, one of Jupiter's four Galilean moons, is a prime candidate for the search for extraterrestrial life. Beneath its thick layer of ice, scientists believe there is a vast ocean of liquid water—an environment where microbial life might exist. NASA's Europa Clipper mission aims to confirm the presence of this ocean and study the moon's surface, internal structure, and potential for life.



The spacecraft will perform a series of 45 flybys of Europa, using a suite of scientific instruments to map its surface, analyze its icy shell, and probe the depth and salinity of the suspected ocean. This data will provide unprecedented insights into Europa's composition and whether it may host life in its hidden waters.

Why Falcon Heavy?

NASA selected SpaceX's Falcon Heavy, one of the most powerful rockets in the world, to launch the Europa Clipper mission. With its massive thrust capacity, Falcon Heavy is capable of delivering the large and heavy spacecraft into the right trajectory to reach Jupiter. The rocket, which combines the power of three Falcon 9 rockets, has already proven its capabilities in launching heavy payloads to orbit. The Falcon Heavy will propel the spacecraft on a journey that will take over six years to reach Jupiter. Once it arrives in 2030, Europa Clipper will orbit Jupiter and make close flybys of Europa, collecting valuable data during each pass.

Mission Goals

The primary goal of the Europa Clipper mission is to assess the habitability of Europa. Specific objectives include:

- Mapping Europa's surface: High-resolution imagery will help scientists understand the moon's geologic features, such as ridges and cracks in the ice.
- Probing the ice shell: Using radar, the spacecraft will measure the thickness of Europa's icy shell and determine the depth of its suspected ocean.
- Analyzing surface chemistry: Instruments will study the moon's surface composition, searching for signs of complex organic molecules that could suggest life's building blocks.
- Detecting signs of geological activity: Observing the surface for evidence of active processes such as geysers or ice plumes that might provide clues to subsurface conditions.

The Importance of Europa Clipper

Europa Clipper is one of NASA's most ambitious missions to date, as it seeks to answer some of the most profound questions about our solar system. By studying Europa, scientists hope to gain a better understanding of the icy moons that exist around many planets and the potential for life in environments far from the warmth of the Sun.

Collaboration Between NASA and SpaceX

The Europa Clipper mission also marks another milestone in the growing collaboration between NASA and SpaceX. With SpaceX's reliable and powerful Falcon Heavy rocket, NASA is able to conduct complex deep space missions with unprecedented efficiency and cost-effectiveness.

Looking Ahead

The launch of Europa Clipper aboard Falcon Heavy in 2024 will be a historic moment for both NASA and SpaceX. It will mark a significant advancement in our understanding of the outer solar system and the potential for life beyond Earth. As the mission embarks on its journey toward Europa, humanity edges closer to answering the age-old question: Are we alone in the universe?

ISRO Chief Somanath Wins 'World Space Award 2024' for Chandrayaan-3



In a momentous celebration of India's achievements in space exploration, Dr. S. Somanath, Chairman of the Indian Space Research Organisation (ISRO), was honored with the prestigious International Astronautical Federation (IAF) World Space Award 2024 for the successful execution of the Chandrayaan-3 mission. The award ceremony, held in Milan, Italy, recognized India's significant contributions to lunar exploration and its growing prominence in the global space community.

A Proud Moment for India

The award is not just a testament to ISRO's technological prowess but also a source of immense pride for every Indian. The successful landing of Chandrayaan-3 near the Moon's South Pole on August 23, 2023, marked India as the first nation to achieve this feat. This historic milestone has placed India in an elite group of countries capable of lunar landings, showcasing the nation's aspiration and technological capabilities on an international scale.

The recognition of Dr. Somanath's leadership and the entire Chandrayaan-3 team's efforts has ignited a sense of national pride and inspiration among the Indian populace. It has also boosted interest in space exploration and STEM fields across the country, encouraging a new generation of scientists and engineers to dream big and reach for the stars.

The World Space Award

The IAF World Space Award is the Federation's most prestigious award, presented for outstanding contributions in space science, space technology, space medicine, space law, or space management of exceptional impact to the world's progress in astronautics. The award acknowledges individuals or teams who have made exceptional contributions to the progress of space activities on a global scale.

Previous recipients of the award include notable figures such as Elon Musk, founder of SpaceX, and the James Webb Space Telescope Team, highlighting the award's significance in recognizing groundbreaking achievements in the field of space exploration.

Looking Ahead

With this award, ISRO and India have solidified their position as key players in the global space community. The success of Chandrayaan-3 has paved the way for future missions, including Chandrayaan-4 and the ambitious Gaganyaan manned space mission. Dr. Somanath's vision for increasing India's contribution to the global space economy and fostering international collaborations promises a bright future for India's space endeavors.

The World Space Award 2024 is not just a recognition of past achievements but a beacon of hope and inspiration for the future. It is a reminder that with determination, innovation, and collaboration, the sky is not the limit but just the beginning.

India Unveils Asia's Largest and World's Highest Gamma Ray Observatory in Ladakh



BCCCL

India has reached a remarkable milestone in space science and astrophysics by unveiling Asia's largest and the world's highest gamma ray observatory in Ladakh. This observatory, established at an altitude of over 4,500 meters above sea level, represents a monumental achievement for Indian science and technology and places the country at the forefront of high-energy astrophysics research.

This project reflects India's commitment to advancing our understanding of cosmic phenomena and contributes to the global scientific community's quest to explore the universe's mysteries.

What is the Gamma Ray Observatory?

Gamma rays are a form of electromagnetic radiation with the shortest wavelengths and the highest energy levels, produced by some of the universe's most extreme processes, such as supernova explosions, black hole mergers, and the decay of radioactive material in space. Observing gamma rays helps scientists investigate cosmic events and celestial objects that are difficult or impossible to observe in visible light.

The new gamma ray observatory in Ladakh is specially designed to detect and study these high-energy gamma rays. Observing gamma rays is particularly challenging due to their high energy, which means they do not reach the Earth's surface directly. Instead, they interact with molecules in the atmosphere, producing secondary particles. By analyzing these particles, scientists can infer information about the original gamma rays and the cosmic events that generated them.

Why Ladakh?

Ladakh's unique geography and high altitude make it an ideal location for a gamma ray observatory. The high altitude reduces atmospheric interference, allowing clearer observations of cosmic rays. Additionally, Ladakh has clear skies for most of the year, which is crucial for astronomical observations. The remote location minimizes light pollution and other environmental interferences, ensuring more precise data collection.

How Does This Observatory Work?

The gamma ray observatory in Ladakh is equipped with sophisticated instruments that detect the cascade of secondary particles produced when gamma rays collide with atoms in the Earth's atmosphere. These particles emit a faint glow known as Cherenkov radiation, which the observatory's telescopes capture. By analyzing this radiation, scientists can determine the energy, direction, and origin of the gamma rays.

This facility is expected to contribute significantly to gamma ray astronomy, enabling the study of phenomena such as:

- **Pulsars and Neutron Stars:** Compact remnants of supernova explosions that emit high-energy radiation.
- **Black Hole Activity:** Observing gamma rays emitted by black holes will enhance our understanding of how they interact with their surroundings.
- **Dark Matter:** Gamma ray observations can potentially provide clues about dark matter, an elusive substance that makes up a significant part of the universe.
- **Cosmic Rays:** Studying gamma rays is closely linked to understanding cosmic rays, which are high-energy particles that travel through space and sometimes reach Earth.

A Proud Moment for India

The gamma ray observatory in Ladakh is equipped with sophisticated instruments that detect the cascade of secondary particles produced when gamma rays collide with atoms in the Earth's atmosphere. These particles emit a faint glow known as Cherenkov radiation, which the observatory's telescopes capture. By analyzing this radiation, scientists can determine the energy, direction, and origin of the gamma rays.



The project also has a symbolic significance. For a country that has made significant strides in space exploration, including successful missions like Chandrayaan and Mangalyaan, this observatory showcases India's commitment to pushing the boundaries of space science. It inspires pride, not only for the scientific community but for all Indians who see their country taking bold steps to explore the universe.

Benefits Beyond Science

This observatory will not only advance scientific knowledge but also have far-reaching impacts on India's technological capabilities. The research and development involved in building and operating such an observatory require cutting-edge technology in optics, data processing, and electronics. These advancements could trickle down to benefit other fields, including communications, climate monitoring, and even defense.

Furthermore, this project puts India at the center of a global scientific community, fostering partnerships and collaborations with leading research institutions worldwide. It is an opportunity for Indian scientists to collaborate on international research projects and contribute to groundbreaking discoveries in astrophysics.

What's Next?

The gamma ray observatory in Ladakh is a stepping stone for more ambitious projects in the future. With this facility, India is now part of a select group of countries conducting high-energy astrophysics research. The insights gained from this observatory will help shape our understanding of the universe and could potentially lead to revolutionary discoveries in physics and cosmology.

India's scientific community has long had a vision of contributing to the understanding of the cosmos. The unveiling of this observatory marks a major step forward in realizing that vision.

The Joy of Watching SpaceX's Starship Booster Caught by "Chopsticks": A Leap for Humanity



It's not every day you witness a rocket booster returning to Earth, not to splash into the ocean, but to land gently in the arms of a pair of giant "chopsticks." Watching the SpaceX Starship booster get caught by this enormous structure sparks a sense of wonder and pure joy. It's not only a feat of engineering; it's a glimpse into a future where technology and sustainability intersect, promising new possibilities for space exploration and beyond.

A Technological Marvel and a Dream Realized

For years, the concept of reusable rockets seemed like a distant dream, too expensive or technically challenging to achieve. Rockets would burn through millions in resources only to be discarded into the ocean or left floating as space debris. But with SpaceX's innovations, particularly the catch-and-reuse method of the Starship booster, we're seeing a shift. The "chopsticks" method is part of SpaceX's plan to make space travel more sustainable and efficient, where every part of the journey is purposefully designed to be reused.

When we watch that booster descend with precision, captured by the chopstick arms, it's not just a successful landing—it's the culmination of years of ingenuity, persistence, and a drive to change the way we look at space travel. It's a moment that reminds us how far technology has come, transforming science fiction dreams into real-world achievements.

The Importance of Reusability for a Sustainable Future

SpaceX's focus on reusability in rockets, especially with Starship and its reusable boosters, represents a groundbreaking approach to sustainable space exploration. By reusing rocket stages, SpaceX not only reduces costs but also minimizes waste, conserves resources, and lessens environmental impact, aligning with the goal of caring for our planet while advancing space missions.

A Glimpse into the Future of Space Exploration



SpaceX's chopstick-catching technology for reusable rockets has far-reaching implications, making lunar, Martian, and even interstellar missions more feasible and affordable. Each successful catch brings us closer to frequent, cost-effective space travel and the vision of becoming a multi-planetary species. This achievement fuels excitement and reminds us of the limitless possibilities that lie ahead in space exploration.

Inspiring the Next Generation

Watching a rocket descend gracefully and be caught mid-air isn't just thrilling for those who understand the science behind it; it's inspiring for people of all ages. Imagine the excitement of young students who watch these historic moments, realizing that what once seemed impossible is happening right before their eyes. SpaceX's achievements motivate the next generation of scientists, engineers, and dreamers to pursue careers in technology and aerospace.

The Joy of Progress

As we watch the Starship booster be caught by the giant chopsticks, it's hard not to feel a swell of pride and joy. It's not just a technological win; it's a human victory. It represents progress, imagination, and the ability to think beyond what was once possible. Each landing, each launch, and each successful catch symbolizes our ability to adapt, innovate, and reach further.

Looking to the Stars

SpaceX's journey to develop reusable, sustainable rockets is more than a technological achievement—it's a promise to the future. We're moving toward a time when humanity can explore space as easily as we once explored distant continents. Watching the Starship booster return, caught with perfect precision, fills us with hope that the stars are not out of reach. With each catch, SpaceX brings us closer to the dream of a universe open to exploration, inviting us to look up and imagine the endless possibilities that lie ahead.

MEET THE ASTRONOMER

Neil deGrasse Tyson: A Cosmic Communicator



Neil deGrasse Tyson was born on October 5, 1958. He is an American astrophysicist, author, and science communicator. Because of his ability to take difficult scientific concepts and break them down into easily understandable terms, Tyson has become a household name, inspiring millions to look up at the stars.

A Passion for the Cosmos

Tyson's passion for the cosmos began when he was still a little boy. He spent hours gazing up at the night sky, fascinated by the celestial wonders above. It is this budding passion that drove him to pursue astrophysics, where he has made significant contributions to our understanding of the universe.

Sharing the Wonders of the Universe

He was one of the most gifted communicators of complex scientific ideas to broad audiences through his books, television shows, and public lectures that brought wonders of the universe to millions of people across the world. His modern re-imagining of Carl Sagan's classic series "Cosmos: A Spacetime Odyssey" earned him huge applause with its incredible visuals and fascinating storytelling.

A Science Champion

Tyson is one of the most vocal advocates for science education and scientific literacy. He believes that science can help solve the biggest problems on Earth, which is why he works very hard to promote scientific inquiry and critical thinking.

Whether it is talking about black holes, dark matter, or the future of space exploration, Neil deGrasse Tyson has a way of discussing science with passion that's quite infectious. Inspiring and educating, he's been one of the most influential science communicators of our time.

Want to Join the Cosmic Adventure??

Join the PSIT Vyomnauts Space Club and embark on an extraordinary journey into the cosmos! This club offers unique opportunities for space enthusiasts to dive into hands-on projects, participate in prestigious competitions like NASA's Rover Challenge, and gain industry connections through networking and mentorship. Members can engage in satellite-building, astrophysics workshops, and access internships with organizations like ISRO.

Vyomnauts also encourages creative expression through contributions to the space magazine Gagan and participation in cultural events. By joining, you'll help pioneer sustainable and ethical space exploration, working on projects to reduce space debris and innovate eco-friendly aerospace technology.

