PSIT
Kampur

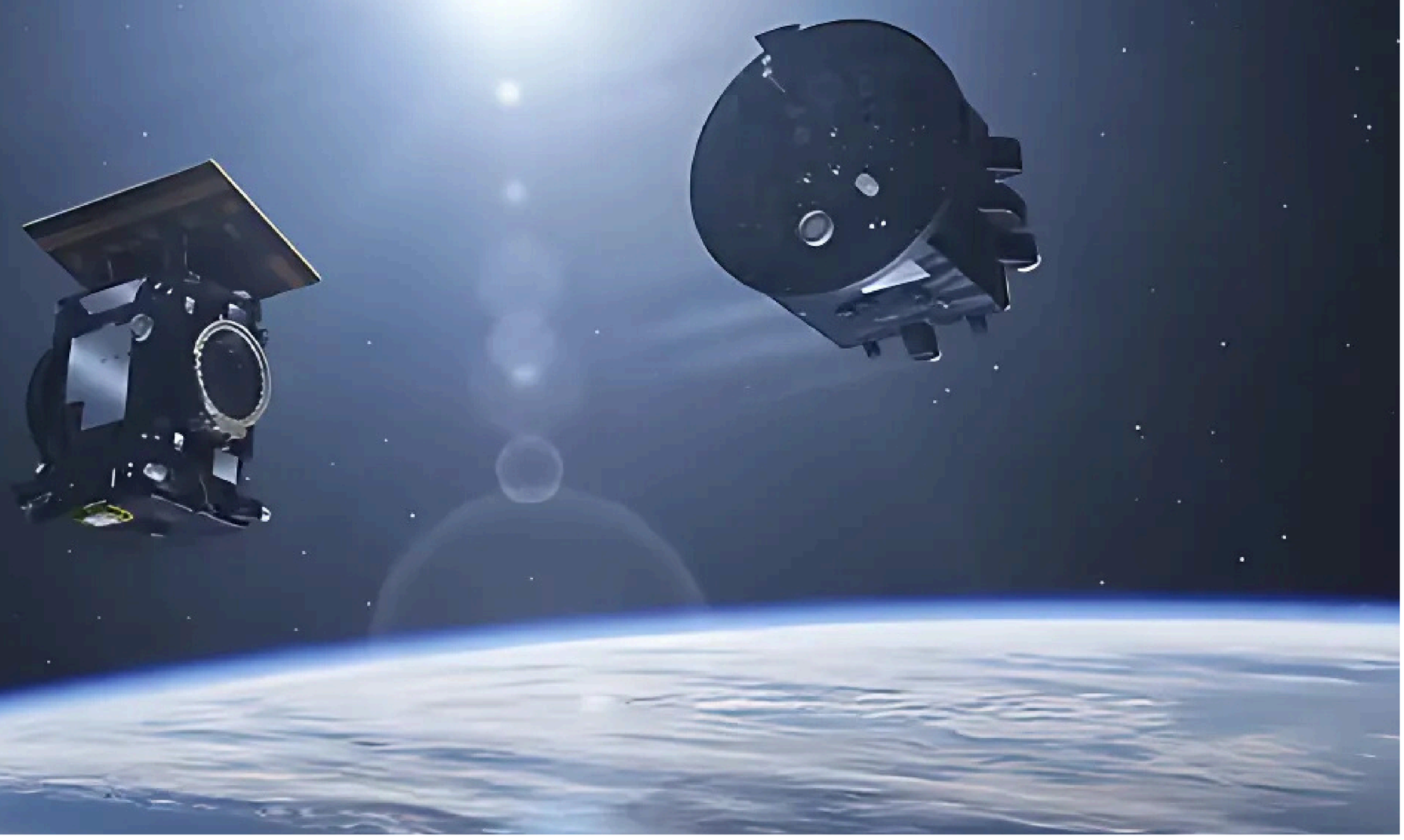
FROM CLASSROOM TO COSMOS
PSIT VYOMNAUTS

PSIT STARTUP AND INCUBATION FOUNDATION

GAGAN

Vol.4
January 2025

A Cosmic Ballet | Proba 3- ISRO to eclipse the sun to explore its secrets.



GAGAN

January 2025

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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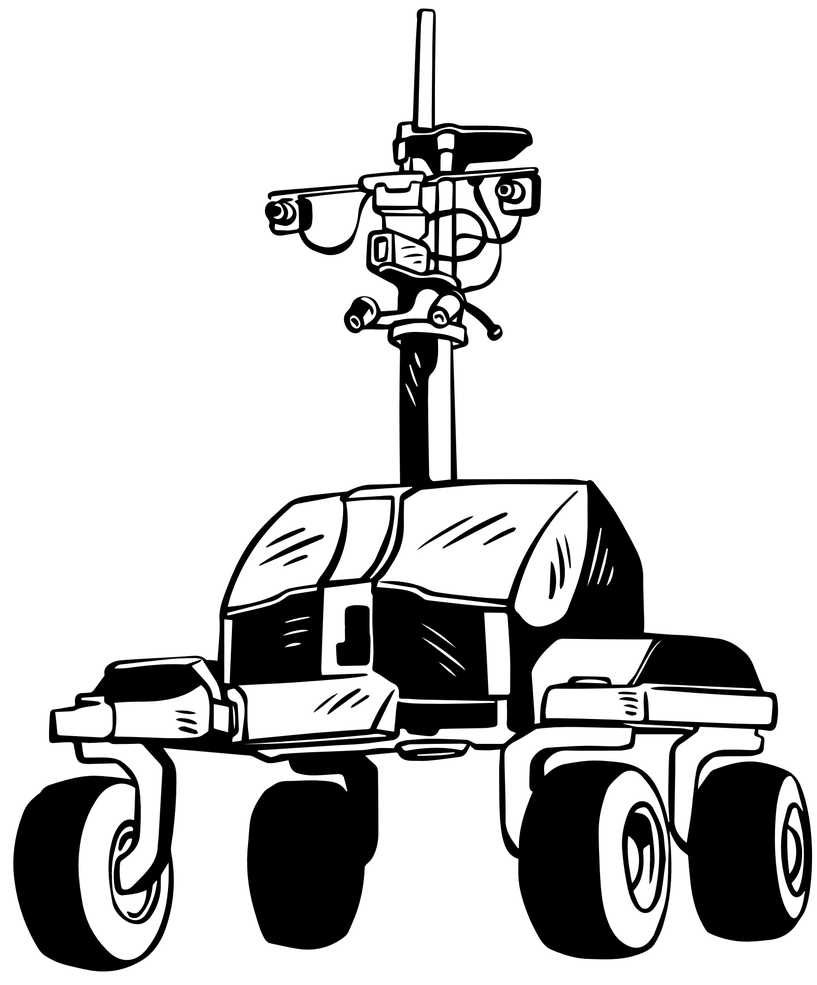

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Space Insights: Highlights of December 2024

Planetary Events

- **Jupiter at Opposition (December 13):** Jupiter will be at its closest point to Earth, appearing larger and brighter in the night sky. This presents an excellent opportunity for astronomers and stargazers to observe the planet's details.

Meteor Showers

- **Geminid Meteor Shower (December 13-14):** One of the most reliable and prolific meteor showers of the year, the Geminids can produce up to 120 meteors per hour at their peak. This makes it a must-see event for any skywatcher.

Lunar Events

- **Full Moon (Cold Moon) (December 12):** The December Full Moon, traditionally known as the Cold Moon, will illuminate the night sky
- **New Moon (December 26)**: The New Moon phase offers ideal conditions for stargazing and deep-sky observation due to the absence of moonlight. This is an excellent time to observe faint celestial objects like galaxies and nebulae.

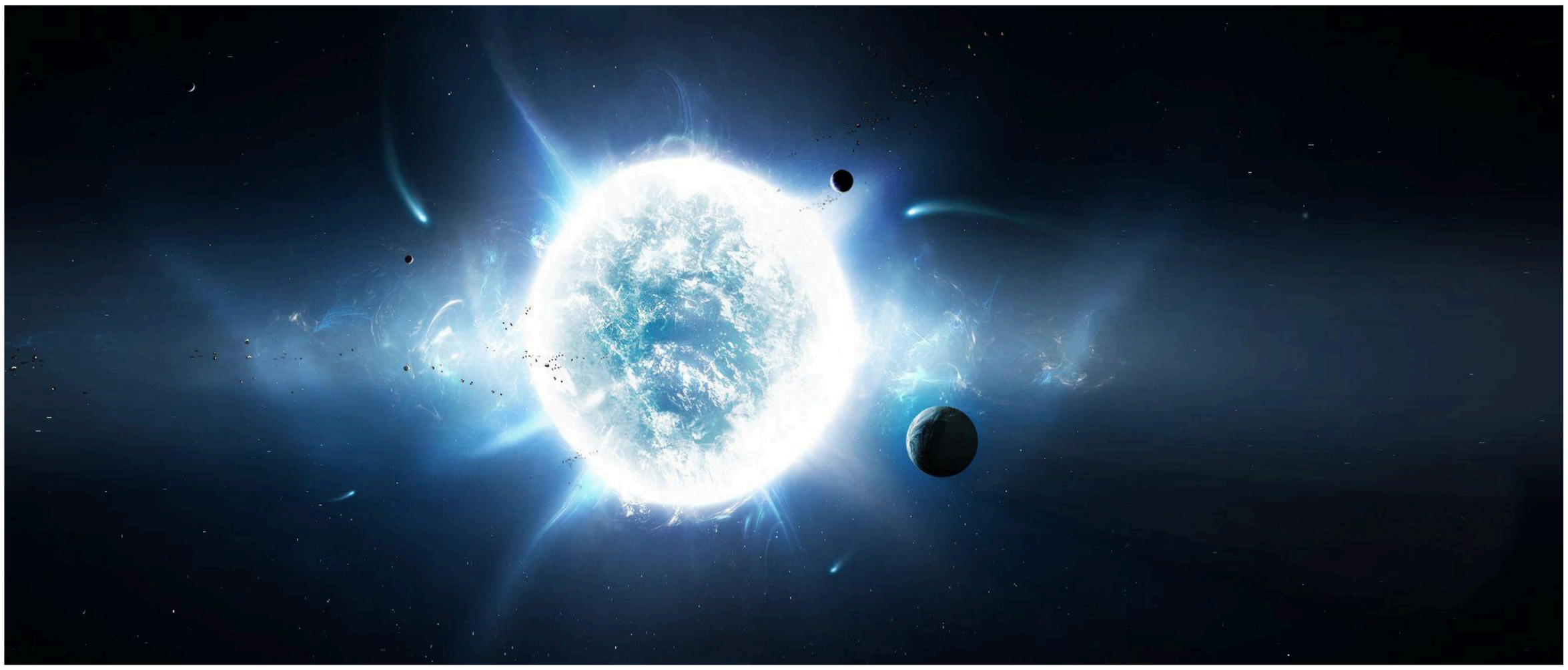
The Birth of a Star: By Star Itself

Starting with my birth...In the quiet, cold embrace of a nebula, I was born. A swirling cloud of gas and dust held the seeds of my existence. For eons, I lay dormant, an unseen promise in the fabric of the cosmos. But then, gravity called to me—a relentless force pulling fragments of me closer and closer until my core ignited with light. I was no longer a whisper; I was a star, yayy!!

My early days were chaotic. The fusion of hydrogen in my core sent waves of energy rippling outward, a constant battle against the gravity that sought to collapse me. This delicate balance, this cosmic tug-of-war, became the rhythm of my life. I shone fiercely, a hope in darkness, giving warmth and light to the worlds that formed in my orbit.

As I grew, I was amazed at the beauty around me. Planets, moons, and asteroids in my gravitational pull. Some bore oceans and life. Others remained barren, silent witnesses to my brilliance. I watched over them all, like a silent guardian in the heavens.

But time, even for a star, is finite. My youthful hydrogen began to diminishing steadily , replaced by heavier elements born in the fiery furnace of my core. I grew older and larger, swelling into a red giant. My light, once steady and strong, now carried the hues of crimson and gold, a fiery testament to the transformation within me.



It was a pleasant as well a painful time for me. The worlds that had once orbited so closely now faced my growing warmth. Some were burned, their surfaces transformed into molten wastelands. Others drifted further away, seeking refuge from my fiery embrace. Still, I burned on, knowing that my end was drawing near.

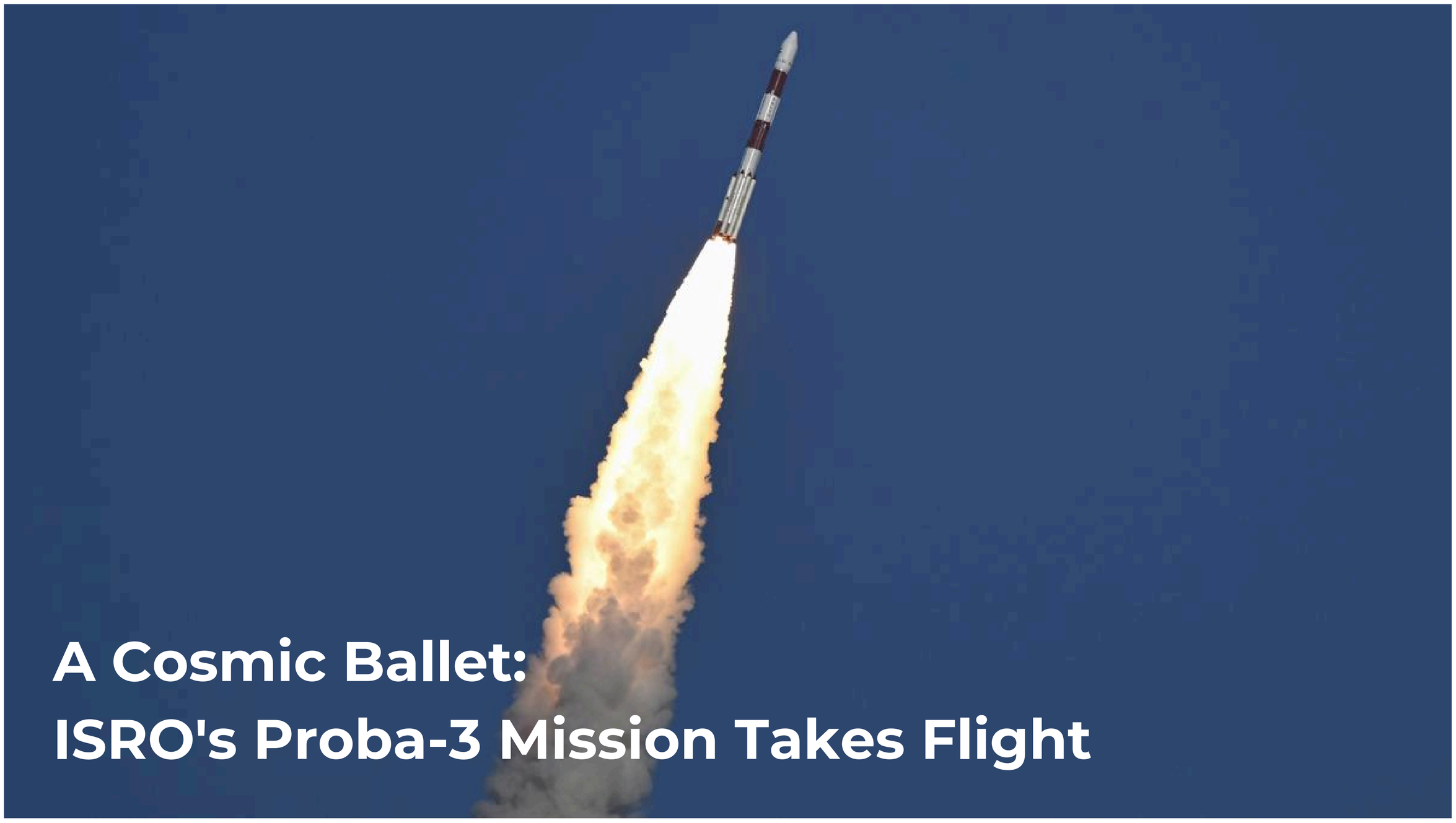
And then, the moment came. My core, unable to sustain the immense pressures, collapsed in on itself. The weight of my existence crushed me into an explosion of unimaginable power—a supernova. In my death, I became a spectacle of light, a cosmic firework visible across the galaxy.

But this was not the end of my story. My explosion scattered elements furnaced in my core—iron, gold, and oxygen—across the universe. These fragments, the physical remains of my being, would become the building blocks for new stars, new planets, and perhaps even new life.

In my place, a neutron star was born, small but dense, a final chapter to my tale. Or perhaps I might have become a black hole, a gateway to the most mysteries thing of the universe, right ?

As I fade, I find peace in knowing that my existence was not in vain. I was a creator, a giver of life, as well as a storyteller in the narrative of the cosmos. And though I am gone, the light I once cast will travel for ages, a reminder that even stars leave legacies of their own

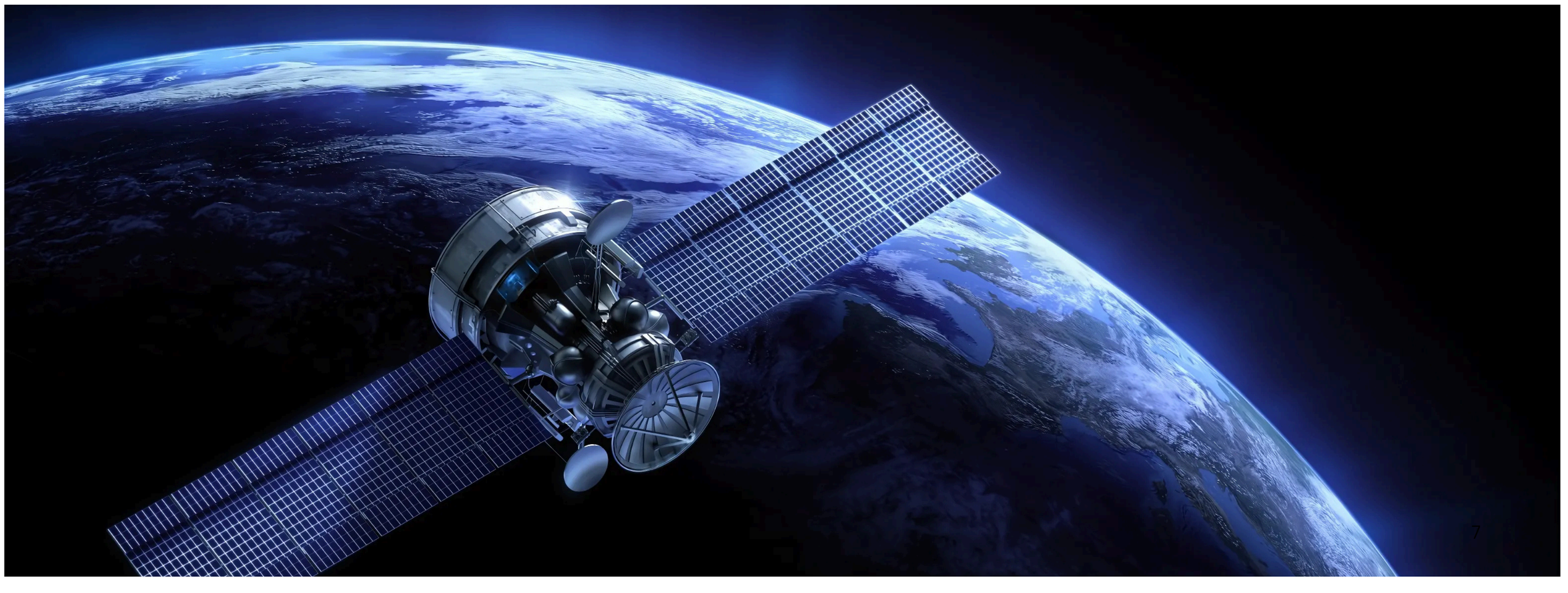
ASTRO-INK WINNER:
Akanksha Dwivedi
(CS-AIML 1A)



A Cosmic Ballet: ISRO's Proba-3 Mission Takes Flight

The **Indian Space Research Organization (ISRO)** has once again showcased its exceptional capabilities with the successful launch of the European Space Agency's (ESA) Proba-3 mission on December 5, 2024. The PSLV-C59 rocket precisely deployed the Proba-3 spacecraft into its designated orbit, marking a significant milestone in international space collaboration.

A **Solar Spectacle Proba-3**, a groundbreaking mission, is designed to study the Sun's corona and solar wind. This innovative mission employs a unique formation flying technique: two spacecraft, Coronagraph Spacecraft (CSC) and the Occulter Spacecraft (OSC), will fly in precise formation, creating an artificial eclipse.

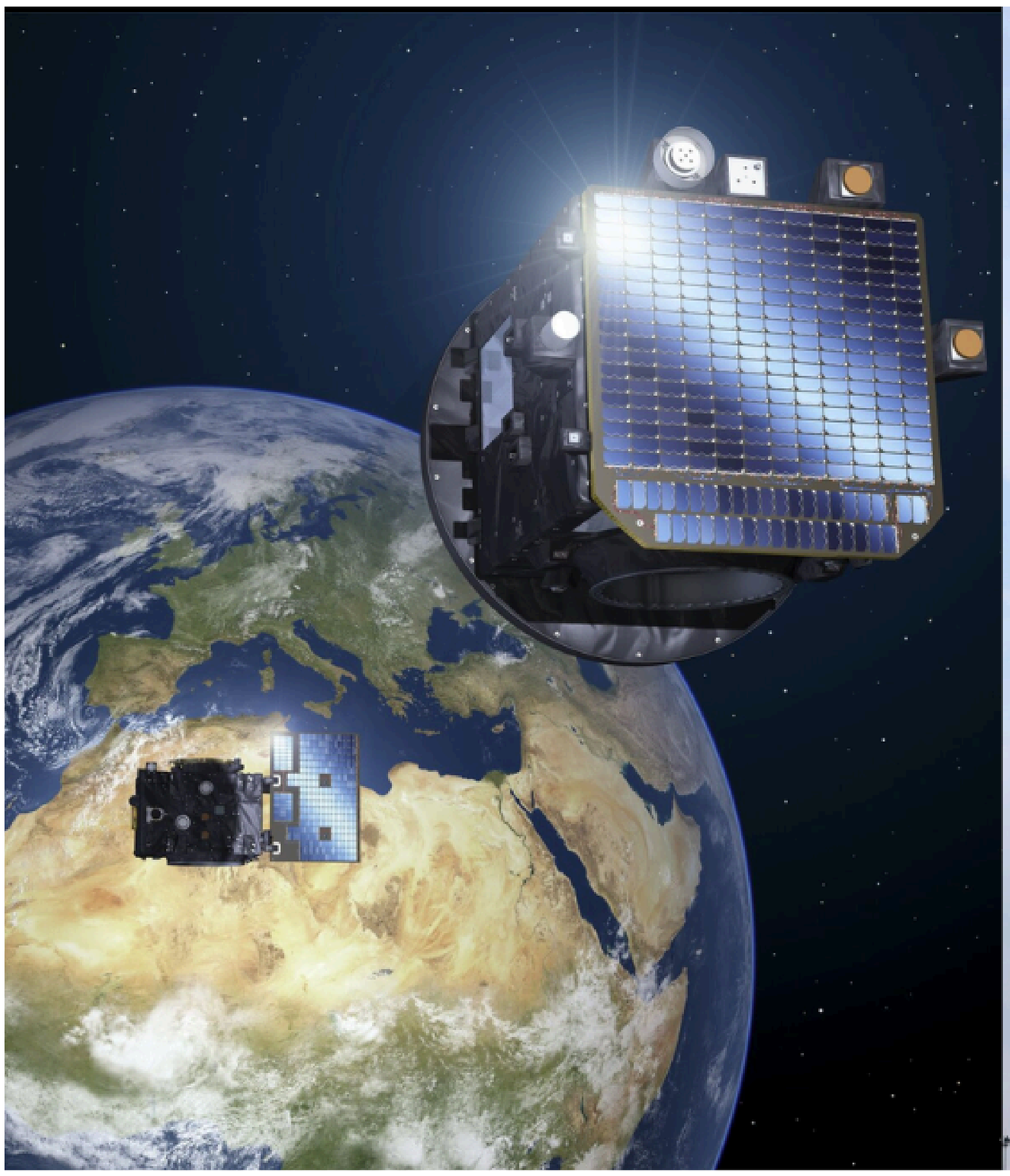


Unveiling the Sun's Secrets By studying the Sun's corona, scientists aim to gain deeper insights into:

- **Solar flares:** These explosive events can release immense amounts of energy and particles.
- **Coronal mass ejections (CMEs):** These massive eruptions of solar material can disrupt Earth's magnetic field and impact satellite communications.
- **Space weather:** Understanding these solar phenomena is crucial for predicting and mitigating space weather events that can affect our technology-dependent society.

A Global Collaboration The Proba-3 mission is a testament to international cooperation in space exploration. By combining the expertise of ISRO and ESA, scientists from around the world will have access to valuable data that will advance our understanding of the Sun and its impact on Earth.

As we eagerly await the scientific discoveries that will emerge from this mission, we can look forward to a future where India plays a leading role in shaping the destiny of humanity in space.



A Cosmic Close Call: Asteroid 2024 XW15

Imagine a silent celestial visitor, a giant rock hurtling through space, making a close approach to Earth. This was the reality on December 13, 2024, when the asteroid 2024 XW15 zipped past our planet.

While this particular asteroid posed no threat, it serves as a stark reminder of the constant cosmic activity surrounding our planet. NASA's vigilant monitoring systems keep a watchful eye on these near-Earth objects (NEOs), ensuring our safety.

Why Track Asteroids?

- **Potential Impact Risks:** Large asteroids can pose a significant threat to Earth.3 By identifying and monitoring these objects, scientists can assess their potential impact and develop strategies to mitigate risks.
- **Scientific Discovery:** Asteroids are remnants of the early solar system. Studying them can provide valuable insights into the formation and evolution of our planet and the universe.
- **Resource Potential:** Some asteroids may contain valuable resources, such as minerals and water, which could be exploited in the future.

As we continue to explore the cosmos, it's essential to remain vigilant and invest in technologies that can safeguard our planet from potential threats.

ISRO Makes History: Successful Space Docking Experiment

Sriharikota, India - In a momentous achievement for India's space program, the Indian Space Research Organisation (ISRO) successfully conducted its first-ever space docking experiment on **December 30, 2024.** The mission, aptly named "SpaDeX" (Space Docking Experiment), involved two spacecraft launched together aboard a PSLV rocket, autonomously rendezvousing and seamlessly docking in orbit.

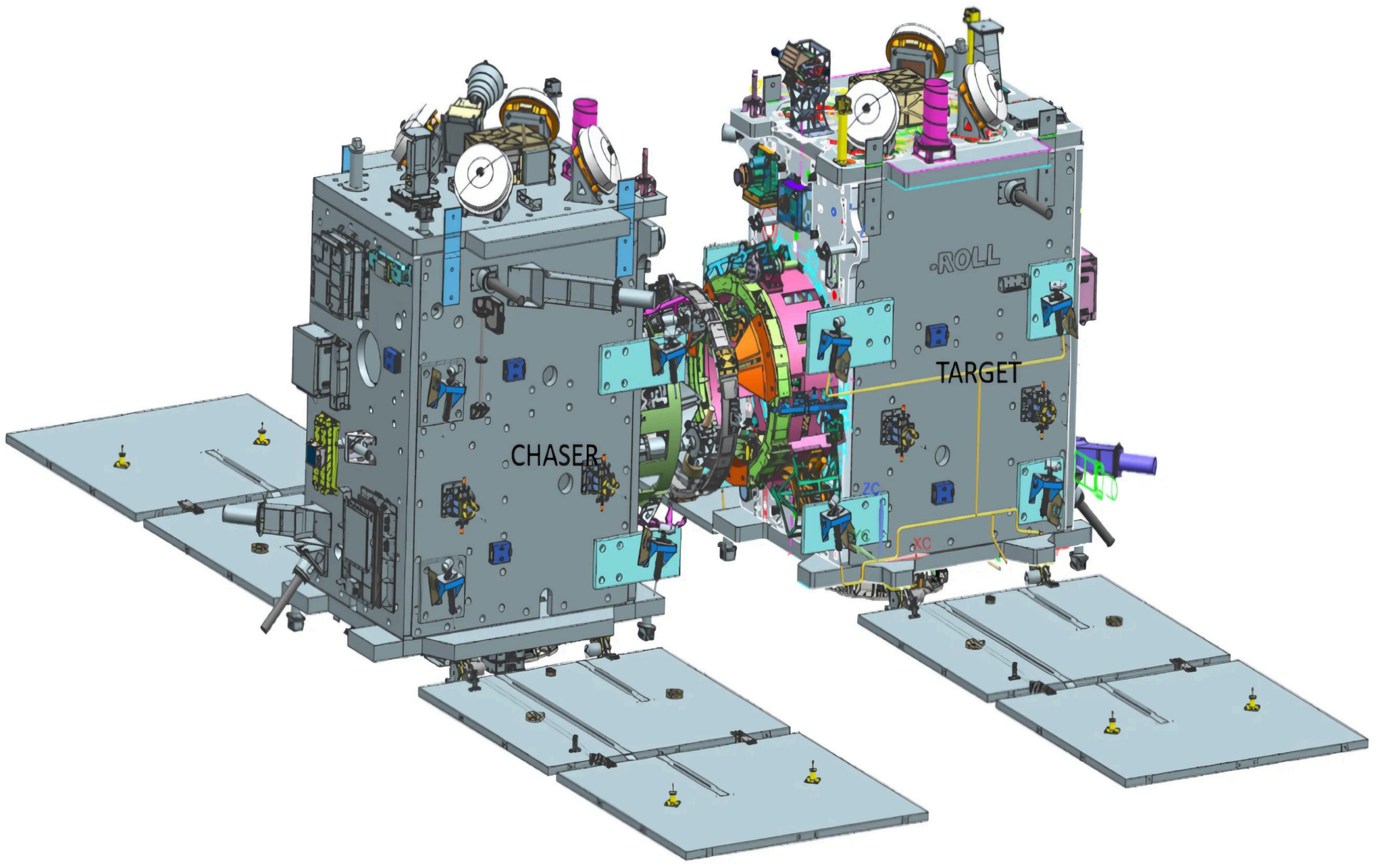
This groundbreaking feat catapults India into an elite club of nations with advanced space docking capabilities, joining a select few who have mastered this complex technology. SpaDeX paves the way for a new era of Indian space exploration, unlocking a vast array of possibilities:

- **Revolutionizing Satellite Servicing:** Imagine a future where aging satellites can be repaired, refueled, or upgraded in orbit, extending their lifespan and maximizing their utility. SpaDeX technology makes this a reality, promising significant cost savings and improved operational efficiency.

- **Building a Robust Space Infrastructure:** This achievement lays a strong foundation for the development of a future Indian space station. SpaDeX technology will be instrumental in assembling, maintaining, and expanding this ambitious project, marking a significant step towards a permanent human presence in space.

- **Embarking on Deep Space Missions:** Docking capabilities are paramount for complex interplanetary missions. SpaDeX technology will enable the transfer of crew and cargo between spacecraft, facilitating long-duration missions to the Moon, Mars, and beyond.

The SpaDeX mission was a testament to meticulous planning and flawless execution. The "Chaser" spacecraft, equipped with sophisticated guidance, navigation, and control systems, autonomously navigated through the vastness of space, closing in on the "Target" spacecraft with pinpoint accuracy. The subsequent docking maneuver was a symphony of precision engineering, culminating in a secure and stable connection between the two spacecraft.



The successful demonstration of undocking further solidified the robustness of this groundbreaking technology.

This historic achievement is a resounding testament to the dedication, ingenuity, and unwavering commitment of the entire ISRO team. It serves as a powerful symbol of India's growing prowess in space exploration, inspiring a new generation of scientists and engineers to reach for the stars.

Reaching for the Stars: Exploring Space Careers and Education

The space industry is no longer a distant dream; it's a vibrant and rapidly growing sector teeming with exciting career opportunities. Gone are the days when "astronaut" was the only space-related profession imaginable. Today, the industry demands a diverse range of skills across various disciplines, offering a universe of possibilities for those with passion, dedication, and a thirst for exploration.

A Universe of Career Opportunities:

- **Engineering:** Aerospace engineers are the architects of space, designing and building spacecraft, satellites, and launch vehicles. But the need for engineering expertise extends beyond aerospace. Mechanical, electrical, and software engineers play crucial roles in every aspect of space exploration, from developing cutting-edge propulsion systems to designing sophisticated robotic systems for planetary exploration.

- **Science:** Astronomers, astrophysicists, and planetary scientists delve into the mysteries of the cosmos, conducting research, analyzing data, and expanding our understanding of the universe. From studying distant galaxies to searching for life beyond Earth, these scientists are at the forefront of groundbreaking discoveries.

- **Technology:** The space industry thrives on innovation. Data scientists, computer scientists, and software developers are essential for managing the vast amounts of data generated by space missions. They develop sophisticated algorithms for image processing, mission planning, and autonomous navigation, pushing the boundaries of artificial intelligence and machine learning.

- **Business & Management:** Behind every successful space mission lies a strong team of business professionals. Project managers, business analysts, and financial experts are crucial for managing budgets, overseeing operations, and ensuring the financial viability of space programs and companies.

- **Law & Policy:** As space exploration expands, the need for legal and policy expertise grows. Space lawyers specialize in international space law, addressing issues such as space debris mitigation, resource utilization, and the commercialization of space. Policy analysts work on developing regulations and guidelines for space activities, ensuring safe and sustainable exploration.
- **Communications & Education:** Inspiring the next generation of space explorers is paramount. Science communicators, educators, and journalists play a vital role in sharing the wonders of space with the public, translating complex scientific concepts into engaging stories, and fostering a passion for space exploration in young minds.

Paving the Path to Space: Educational Opportunities

Pursuing a career in the space industry requires a strong foundation in STEM (Science, Technology, Engineering, and Mathematics). Here are some key educational pathways:

- **Undergraduate Studies:** Degrees in aerospace engineering, astrophysics, physics, computer science, and related fields are highly sought after. Many universities offer specialized space studies programs or minors, providing students with focused knowledge and valuable connections.
- **Graduate Studies:** Master's and Ph.D. degrees provide advanced knowledge and research opportunities, allowing students to delve deeper into their chosen field and contribute to cutting-edge research.
- **Internships:** Internships at space agencies (like NASA, ISRO), research institutions, and private space companies provide invaluable hands-on experience. These opportunities allow students to apply their theoretical knowledge, gain practical skills, and build valuable professional connections.
- **Volunteer Opportunities:** Engaging in volunteer activities related to space exploration, such as participating in citizen science projects, volunteering at planetariums, or assisting with local astronomy clubs, can enhance your skills, build valuable connections, and foster a passion for space.

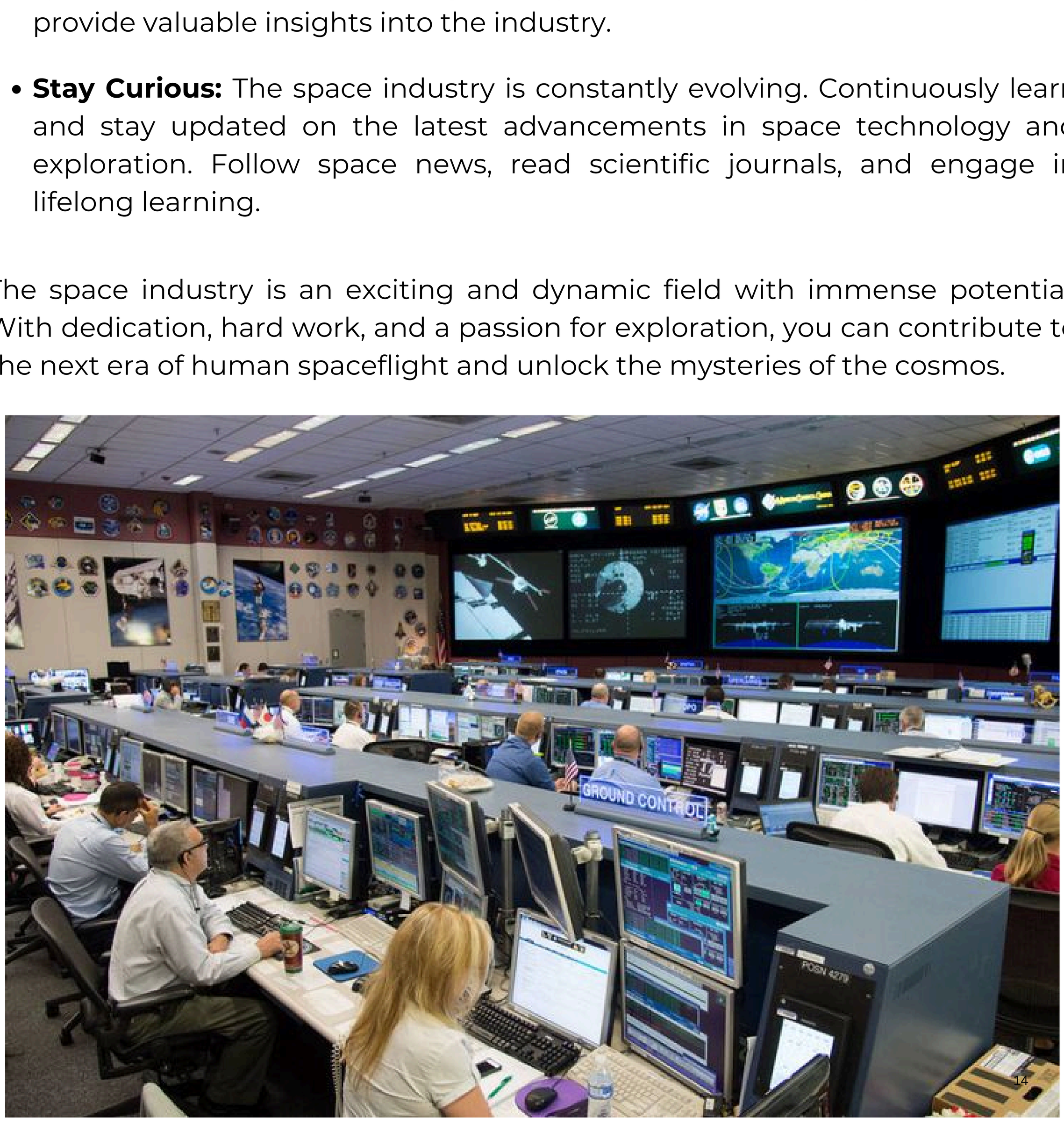
Beyond Academics:

- **Develop Essential Skills:** Cultivate strong analytical, problem-solving, and communication skills. These skills are essential for success in any field, and particularly valuable in the fast-paced and dynamic space industry.

- **Build a Strong Network:** Attend industry events, connect with professionals on platforms like LinkedIn, and participate in online communities related to space exploration. Networking can open doors to new opportunities and provide valuable insights into the industry.

- **Stay Curious:** The space industry is constantly evolving. Continuously learn and stay updated on the latest advancements in space technology and exploration. Follow space news, read scientific journals, and engage in lifelong learning.

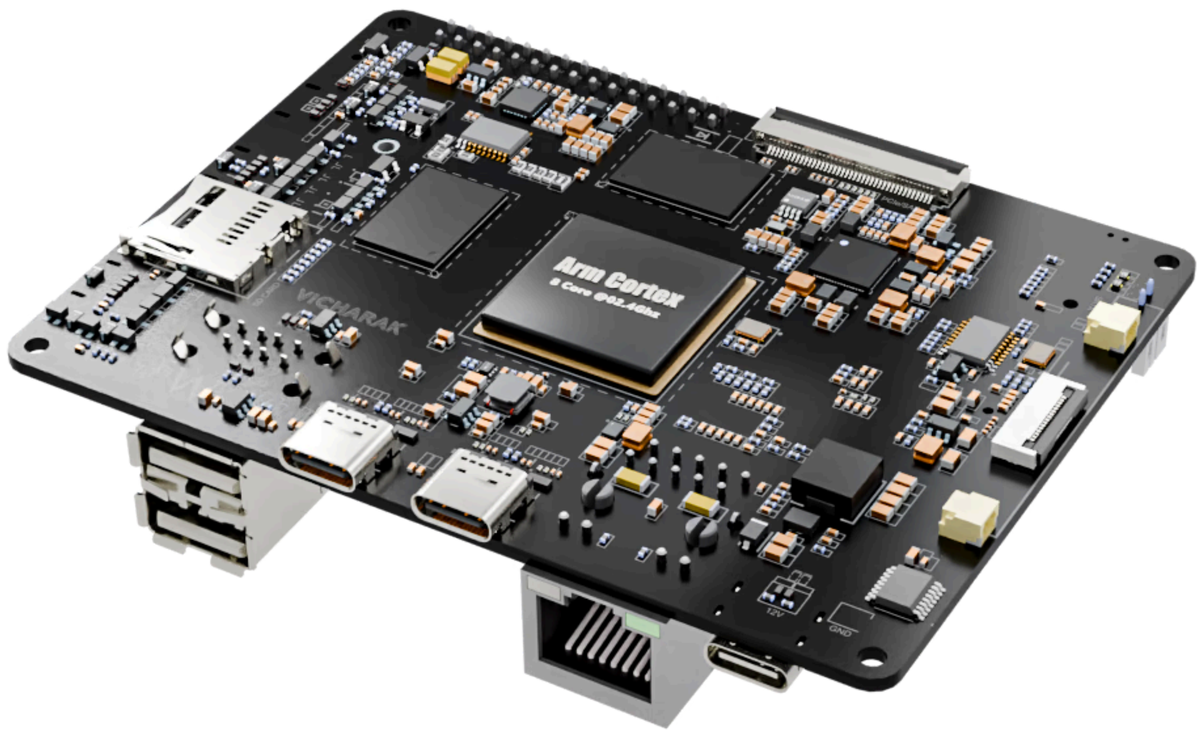
The space industry is an exciting and dynamic field with immense potential. With dedication, hard work, and a passion for exploration, you can contribute to the next era of human spaceflight and unlock the mysteries of the cosmos.



Vicharak Axon: Indian Microcontroller

The Axon is a single-board computer (SBC) developed by Vicharak, an Indian company specializing in computing solutions. Powered by the Rockchip RK3588 System on Chip (SoC), Axon is engineered to cater to a diverse audience, including software developers, researchers, hardware designers, and AI enthusiasts.

Key Features:



- **High-Performance Processing:** Equipped with an octa-core CPU, Axon delivers robust performance suitable for application development, AI-driven software, and complex computations.

- **Advanced GPU and NPU:** The integrated ARM Mali-G610 MP4 GPU supports high-definition video output and 3D rendering, enhancing gaming and multimedia experiences. Additionally, the built-in Neural Processing Unit (NPU) offers up to 6 TOPS (tera operations per second), facilitating efficient AI and machine learning applications.

- **Versatile Connectivity:** Axon features multiple interfaces, including HDMI, USB-C, MIPI CSI for camera inputs, and GPIO headers, enabling seamless integration with various peripherals and supporting diverse project requirements.

- **Extensive Memory Options:** Supporting up to 16GB of 64-bit LPDDR4X RAM, Axon allows for smooth multitasking and handling of memory-intensive applications.

- **High-Speed Wireless Communication:** With integrated Wi-Fi 6 and Bluetooth 5.2, Axon ensures fast and stable wireless connectivity, essential for IoT projects and smart home solutions.

MEET THE ASTRONOMER

Johannes Kepler: The Man Who Unraveled the Celestial Dance Born on December 27, 1571, Johannes Kepler, a brilliant mind, forever changed our understanding of the cosmos. His groundbreaking laws of planetary motion, derived from meticulous observations and mathematical analysis, shattered the long-held beliefs about the universe.

Kepler, a child of wonder, was captivated by the celestial ballet. Hours spent gazing at the night sky ignited a lifelong passion. Through tireless work, he discovered that planets orbit the Sun in elliptical paths, not perfect circles as previously thought. His laws also revealed a harmonious relationship between a planet's orbital period and its distance from the Sun.

Kepler's legacy extends far beyond his time. His work inspired generations of scientists, including Isaac Newton, whose laws of motion and gravity built upon Kepler's foundation. Today, as we explore the vastness of the universe, we stand on the shoulders of giants, including Kepler, whose insights continue to shape our understanding of the cosmos.

What would our understanding of the universe be like without Kepler's groundbreaking discoveries?

By unraveling the celestial dance, Kepler's work has paved the way for countless scientific advancements, from the launch of satellites to the exploration of distant planets. His enduring legacy serves as an inspiration to all who seek to unlock the secrets of the universe.

INTERESTING SPACE FACTS

- **Planets Can Rain Diamonds**

  On planets like Neptune and Uranus, extreme pressure turns carbon into diamonds, which may fall as rain deep within their atmospheres. These "diamond rains" are caused by the unique chemistry and conditions in these ice giants.

- **A Moon of Saturn Has Geysers of Ice**

  Saturn’s moon Enceladus has a subsurface ocean and erupts water-ice geysers into space. These geysers shoot so high that they replenish Saturn’s E-ring, the planet's outermost ring.

- **Detection of the Slowest-Spinning Neutron Star**

  In June 2024, astronomers identified ASKAP J1935+2148, the slowest-spinning neutron star ever recorded, completing a rotation once every 54 minutes. This discovery challenges existing models of neutron star formation and behavior, prompting further research into these dense stellar remnants.

- **Discovery of 'Nuclear Pasta' in Neutron Stars**

  Recent studies have revealed the existence of 'nuclear pasta,' a substance formed from the remnants of dead stars. This material is extraordinarily strong, being 10 billion times stronger than steel, and provides insights into the extreme conditions within neutron stars.

Want to Join the Cosmic Adventure??

FROM CLASSROOM TO COSMOS

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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.

Scan to connect with PSIT Vyomnauts