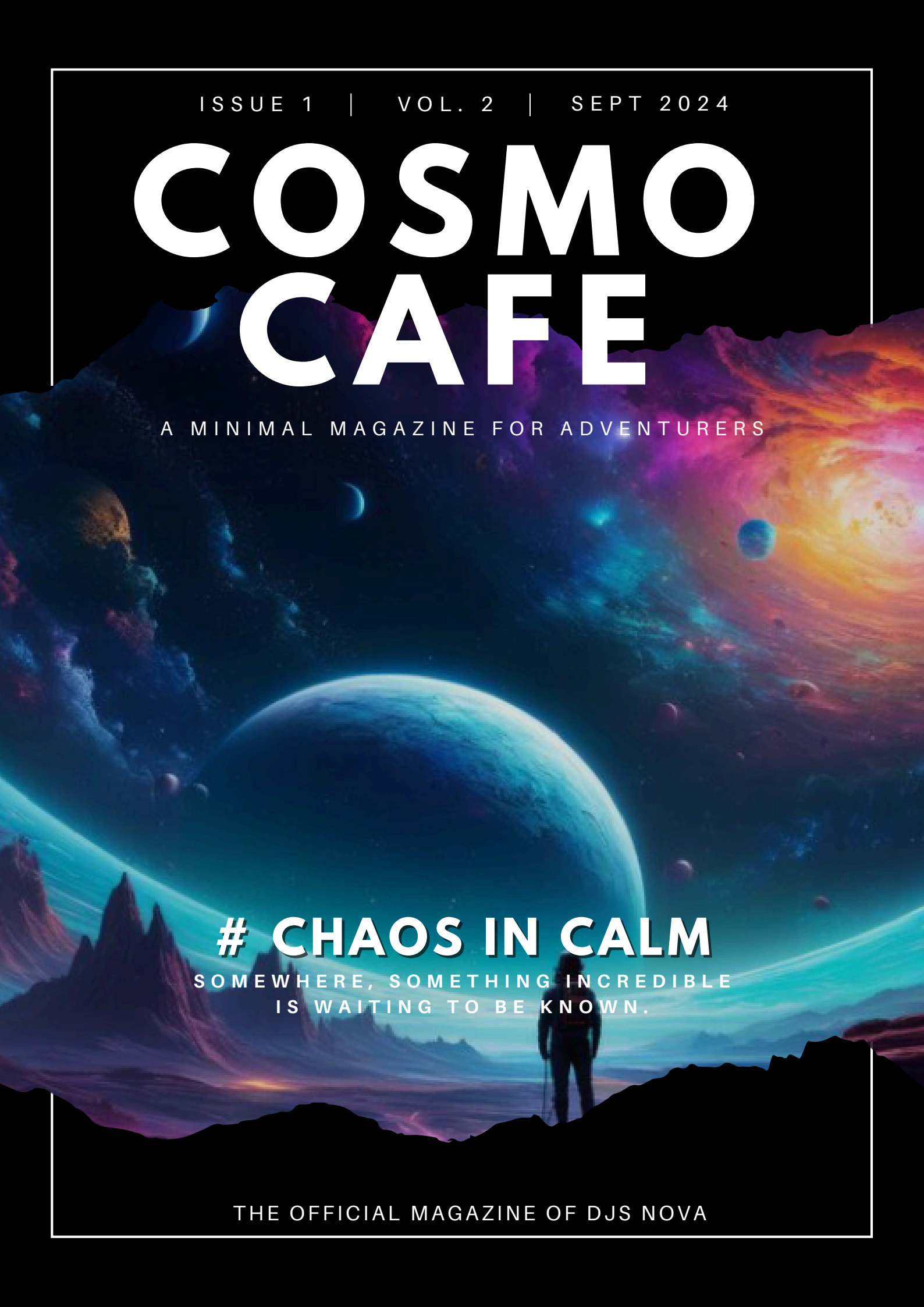
ISSUE 1 | VOL. 2 | SEPT 2024

COSMO CAFE

A MINIMAL MAGAZINE FOR ADVENTURERS



CHAOS IN CALM

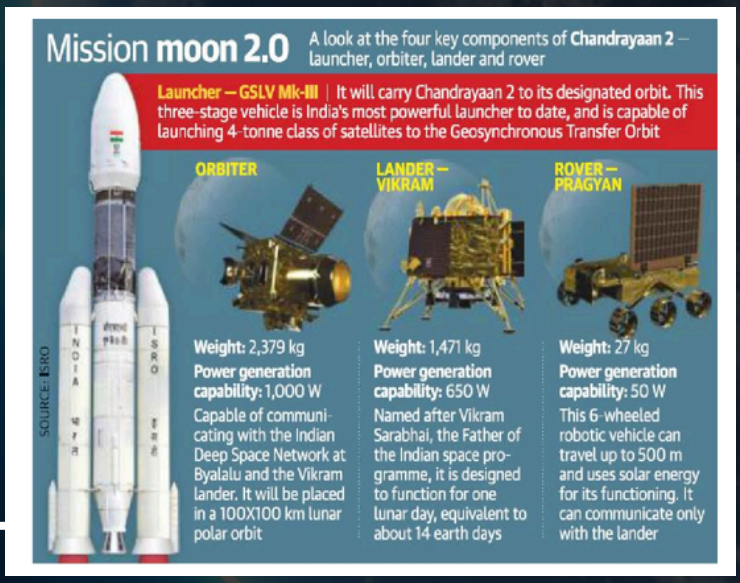
SOMEWHERE, SOMETHING INCREDIBLE
IS WAITING TO BE KNOWN.

THE OFFICIAL MAGAZINE OF DJS NOVA

INDIA'S MOON MISSION:THE CHANDRAYAAN PROGRAMME

CHANDRAYAAN-2: A NEW FRONTIER

Space Exploration and Innovation being the heart of Chandrayaan missions, after Chandrayaan-1, a follow-up complex mission Chandrayaan 2 was established by ISRO with the goal of exploring the south pole of the Moon and to quest for lunar water. Evidence for water molecules in the craters discovered by Chandrayaan-1, required further studies on the extent of water molecule distribution on the surface, below the surface and in the tenuous lunar exosphere to address the origin of water on Moon. Hence, Chandrayaan-2 aims for enhancing our understanding of the Moon, stimulate the advancement of technology, inspire future generations

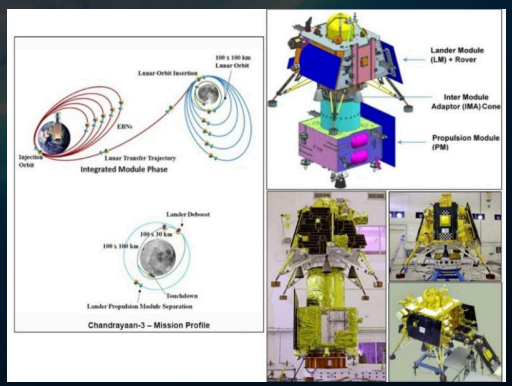


MISSION COMPONENTS AND LAUNCH

Unlike Chandrayaan-1, Chandrayaan-2 attempted to soft land its Vikram module on the lunar surface and deployed a six-wheeled Rover, Pragyaan on the Moon along with its Orbiter to carry out several scientific experiments and to widen scientific objectives of Chandrayaan 1. The spacecraft was launched from the second launch pad at the Satish Dhawan Space Centre on 22 July 2019 by a GSLV-III rocket. After a series of Earthbound manoeuvres, the spacecraft entered into Lunar Transfer Trajectory (LTT) on August 14th 2019. Lunar Orbit Insertion (LOI) manoeuvre was performed on August 20th,

PAYLOAD INSIGHTS: ADVANCED INSTRUMENTS

The Chandrayaan-2 orbiter was orbiting the Moon on a polar orbit at an altitude of 100 km having an approximate launch mass of 2379 kg. It carries eight scientific instruments as payload; two of which are improved versions of those flown on Chandrayaan-1. The orbiter, which is still active has the following payloads: The high resolution Terrain Mapping Camera-2 (TMC-2) is a continuation of TMC-1 used for topographic coverage and to measure radiations on Moon's surface. Using the large area X-ray Spectrometer, CLASS, the probe has spotted and mapped sodium on the Moon.



VIKRAM AND PRAGYAAN: PIONEERING DUO

Vikram Lander and Pragyaan Rover were designed to function for one lunar day, which is equivalent to about 14 Earth days. The combined mass of the lander and rover was approximately 1,471 kg. The lander's propulsion system consisted of 8 thrusters for attitude control and 5 liquid main engines. It carried 4 instruments as payload. The 6-wheeled Pragyaan rover would have operated on solar power and used Stereoscopic camera-based 3D vision. It carried 4 instruments as payload to determine the abundance of elements near the landing site. It was supposed to touch down 600 kms away from the lunar south pole.

LANDING ATTEMPT

While orbiting the moon in a 100 km lunar polar orbit, on September 02, 2019, Vikram Lander was separated from the Orbiter in preparation for landing. On September 6 2019, Vikram Lander descent was as planned and the initial descent was considered within mission parameters, passing critical braking procedures as expected, but the lander's trajectory began to deviate and we lost contact with the lander.

ANALYZING SETBACKS

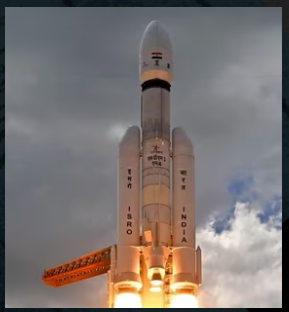
The major reason for hard landing was that the 5 engines employed for retardation developed higher thrust accumulating differential errors beyond expectations along with inability of the lander to turn due to software issues and small landing site. The orbiter part of the mission remains operational for its seven-year mission to study the Moon.

CHANDRAYAAN-3 ON THE HORIZON

Drawing upon lessons from past setbacks and to enhance the precision and reliability of the landing process, ISRO remarked significant advancement in their technology by improvising systems like Navigation, Communication, Data Utilization and Software by Rigorous Testing and Contingent Planning in yet another ambitious lunar exploration venture, Chandrayaan 3.

UNVEILING THE FUTURE- WHAT'S BEYOND?

Chandrayaan-2's journey, with its triumphs and setbacks, fuels India's relentless pursuit of lunar exploration, setting the stage for even greater achievements in the cosmos. To know more about ISRO's commitment to innovation and progress, stay tuned for our next edition where we shall delve into Chandrayaan 3's insightful world exploring its aftermath and discover ongoing lunar missions.



~ BY SHRUSHTI JAIN

ASTROARCHAEOLOGY: UNEARTHING COSMIC QUESTS

"INDIA'S ANCIENT MONUMENTS ARE NOT MERELY EDIFICES OF STONE; THEY ARE PAGES IN THE HISTORY OF ASTRONOMY, INSCRIBED WITH THE SCIENTIFIC GENIUS OF A BYGONE ERA."

~DR. B.V. SUBBARAYAPP

PRELUDE

Across the vast expanse of human history, our ancestors gazed upwards, their eyes drawn to the celestial wonders that illuminated the night sky. From the earliest civilizations, these observers sought to unravel the mysteries of the cosmos, meticulously tracking the motions of celestial bodies and integrating their findings into the very fabric of their societies. This profound intertwining of astronomy and archaeology is the realm of astroarchaeology, a field that unveils the profound cosmic connections that shaped ancient cultures.

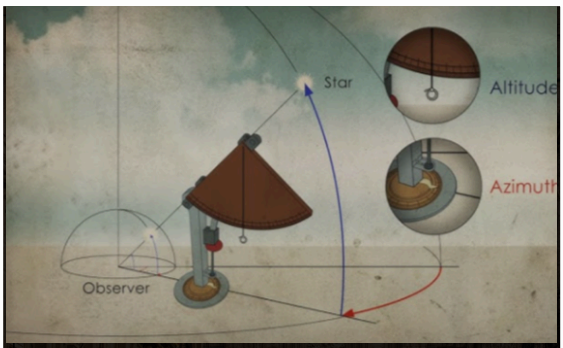
WHAT IS ASTROARCHAEOLOGY

Astroarchaeology, also known as archaeoastronomy, is an interdisciplinary field that bridges the realms of archaeology, astronomy, and anthropology. It explores how ancient peoples understood and utilized astronomical phenomena, revealing the pivotal role the sky played in their cultures, beliefs, and daily lives.

INSTRUMENTS OF ANCIENT INDIA

SHANUKA YANTRA

Ancient Indian ingenious astronomers employed instruments and methodologies to study celestial objects and phenomena with remarkable precision. The Shankhu Yantra used shadow lengths to determine latitude.



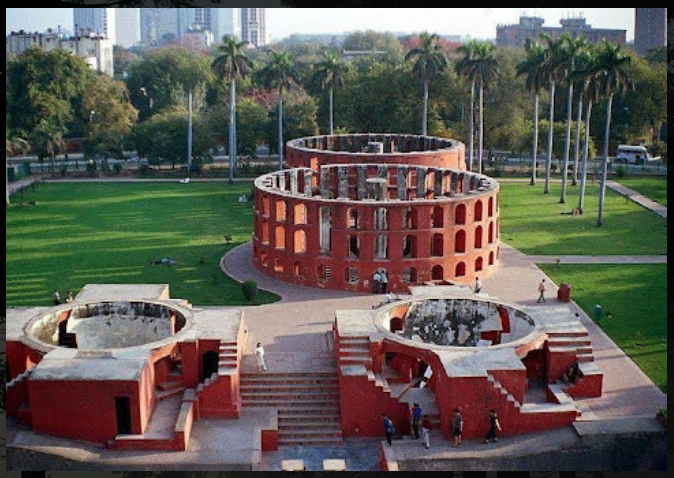
NADI VALAY YANTRA

The Nadi Valay Yantra mapped celestial coordinates using a circular ring aligned to the celestial equator, and simple sundials were constructed by tracking the motion of gnomon shadows throughout the day and year.

HISTORY

In India, the legacy of astroarchaeology stretches back to the Indus Valley Civilization, where artifacts and urban planning suggest a rudimentary understanding of astronomy dating back to before 1500 BCE. This early interest in celestial observations laid the foundation for the Vedic Period (1500-500 BCE), during which the Rigveda, one of the oldest known texts in any Indo-European language, contained hymns that referenced astronomical phenomena, guiding rituals and calendars.As astronomical studies evolved into a formal discipline, texts like the Sulba Sutras incorporated geometric principles believed to have astronomical alignments, while the Jyotisha Vedanga provided detailed calculations for predicting lunar and solar movements. The Classical Period (500-1600 CE) witnessed major advancements driven by scholars like Aryabhata and Brahmagupta, including breakthroughs in trigonometry, eclipse calculations, and planetary motion theories.

ANCIENT MYSTERIES REVEALED



JANTAR MANTAR

One of the most remarkable astroarchaeological sites in India is the Great Stupa at Sanchi. Its outer balustrade, with its 120 posts arranged in quadrants and crossbars representing days in a lunar year, encoded astronomical knowledge. The number of posts (108) corresponded to an important astronomical number.

GREAT STUPA

Jantar Mantar observatories, where instruments were designed to observe celestial events in different coordinate systems, allowing for accurate naked-eye observations, measurements, and predictions of astronomical phenomena like eclipses and planetary motions.

CLOSURE

While astroarchaeology has its roots in the late 19th and early 20th centuries, the field has evolved into a rigorous discipline, employing precise surveying tools, computer simulations, and statistical analysis to assess astronomical alignments. As we continue to unravel the cosmic connections of ancient civilizations, astroarchaeology not only preserves our cultural heritage but also serves as a bridge between the celestial realms and our terrestrial existence, reminding us of the enduring human fascination with the stars that have guided our journey through the ages.

~ BY SHAURYA CHATURVEDI

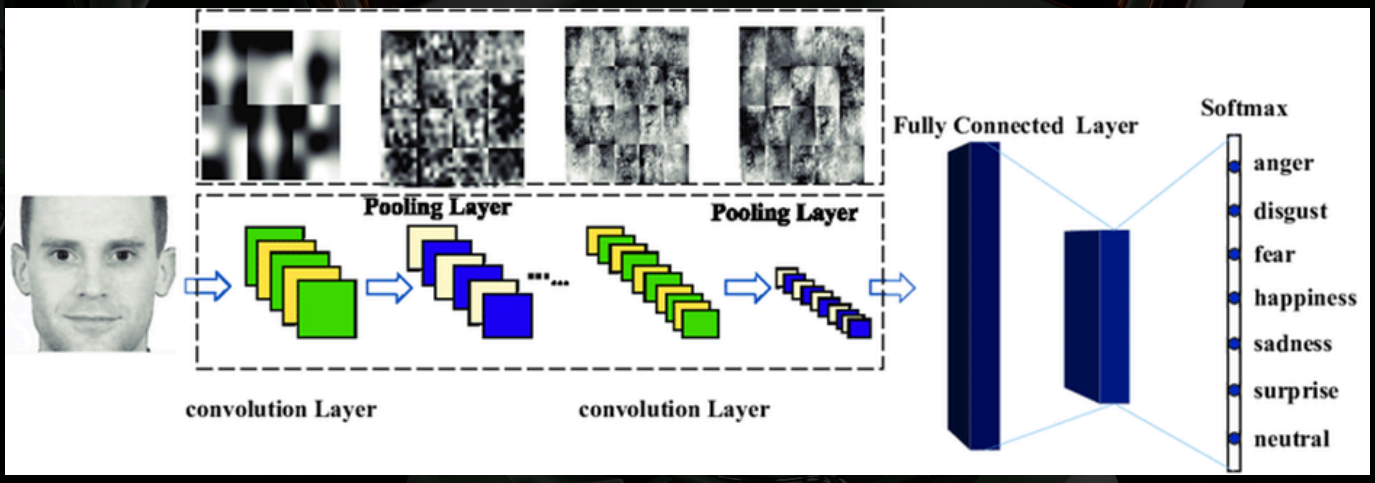
HOW AI IS CHANGING ASTRONOMY

In 1990, the Hubble Space Telescope was launched into space, capturing amazing images of the universe. It showed us stunning pictures of nebulae and distant galaxies, giving us a new look at the cosmos. But with all the data Hubble sent back, astronomers quickly realized they needed help to analyze it all. This is where artificial intelligence stepped in, becoming a valuable partner in exploring the universe.

THE NEED FOR HELP

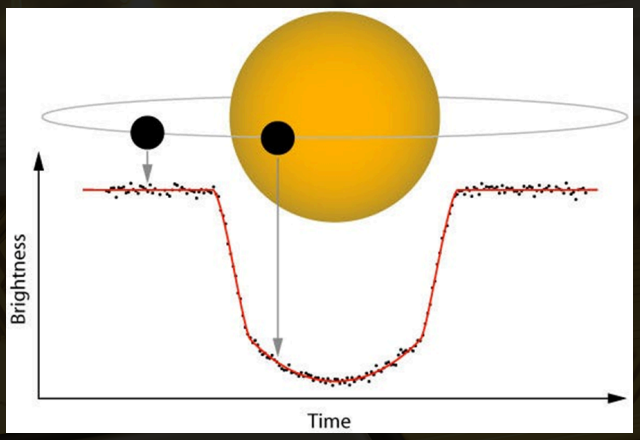
Astronomy has always relied heavily on data, and the invention of the telescope greatly expanded the amount of information available. With advanced telescopes and satellites like the Sloan Digital Sky Survey and the Kepler Space Telescope, the data produced became too vast for humans to manage alone. AI, particularly Convolutional Neural Networks (CNNs), became essential. These networks, ideal for image recognition, were trained to identify stars, galaxies, and other celestial objects, and to spot anomalies. CNNs automatically learn spatial hierarchies of features from images, often using feature extraction methods like the Canny edge detection algorithm. This AI assistance saved astronomers significant time, allowing them to focus on analyzing their findings.

AI IS THE NEW ELECTRICITY



FINDING NEW WORLDS

AI's role quickly grew from sorting data to discovering new things. One big breakthrough was in the search for exoplanets, which are planets outside our solar system. The Kepler Space Telescope collected a huge amount of data on star brightness. To analyze this data, AI models such as Recurrent Neural Network and Long Short-Term Memory networks were used. Initially RNNs faced vanishing gradient problem but ML researchers invented LSTM for over coming that problem. These models are excellent at processing sequences of data, making them perfect for studying the light curves of stars over time.Using these AI techniques, researchers found many exoplanets, including some that were missed in earlier searches. This helped us learn more about the variety and complexity of planetary systems in the universe.



THE DARK UNIVERSE

While we can see many things in the universe, most of it is invisible—like dark matter and dark energy. These make up most of the universe but don't emit light. To find them, scientists look at how they affect visible matter, which requires complex models and simulations.AI is very useful here. By comparing real data with models, AI helps identify where dark matter might be and how dark energy affects the universe's expansion. This involves using Bayesian networks and Markov Chain Monte Carlo methods to handle the probabilistic aspects of these models. Generative Adversarial Networks are also employed to simulate and compare large-scale structures of the universe, which helps in understanding the influence of dark matter and dark energy.

THE FUTURE OF AI IN ASTRONOMY

From 2022, when a simple Q&A chatbot was launched by Open AI, to the present, in 2024, when text-to-video, AI surgery, and AI voice cloning and huge unimaginable technologies were developed in short amount of time, AI has made drastic changes in almost every field. That day is not far when AI detects something beyond our imagination—an anomaly, a signal hinting at extraterrestrial intelligence, or AI detects an anomaly that defies all known physics laws. The AI will also revolutionize astronomy with unheard, unimaginable, and exciting advancements.

~ BY PRATHMESH RAUT

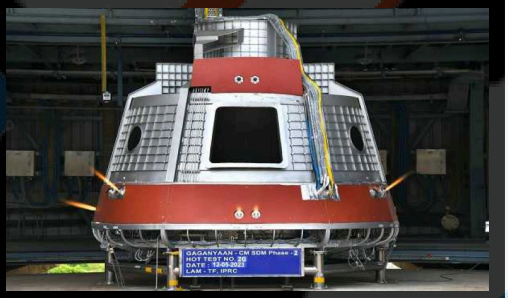
MISSION GAGANYAAN

INTRODUCTION

We all know that Rakesh Sharma, the first Indian to travel to space, did so under the Soviet Union's Soyuz T-11 mission in 1984. Kalpana Chawla, an Indian-American astronaut, went to space twice with NASA, but neither were missions under ISRO.Gaganyaan will be India's first crewed space mission by ISRO,which is set for late 2024 or early 2025 launch. If successful, it will mark India's first manned spaceflight and make India the fourth country to send astronauts into space. The mission will involve a crew of four astronauts. However, only three of these astronauts will be on the actual spaceflight to low-earth orbit.

PROGRESS

1. On July 5, 2018, ISRO conducted its first-ever Pad Abort Test, a critical 4-minute test of the launch abort system. This test simulated a rocket blast on the launch pad to analyze the Crew System's (CS) response and it successfully separated from the launch vehicle and landed safely without any damage.
2. On November 18, 2022, ISRO conducted the second stage of testing for the mission, focusing on the parachutes' weight-bearing capacity. This test, known as the Integrated Main Parachute Airdrop Test (IMAT), involved dropping the crew module from a height of 2.4 km using an Indian Air Force IL-76 aircraft. As the module descended, the parachutes deployed automatically, allowing it to land gently without damage.



1. The finkal test, held on October 21, 2023, combined elements of previous tests to ensure crew safety. ISRO launched the crew system from a height of 17 kms. This test was done by a normal rocket launch. Once the rocket reached a speed of 1.25 Mach, an emergency situation was simulated. This was done to check how the CS would react to any defaults after the launch of the rocket.The crew system detected the emergency, detached from the rocket, and began its descent.
2. On February 13, 2024 ISRO successfully completed key tests for the Gaganyaan mission's CE20 cryogenic engine, which powers the LVM3 rocket. In this test, four engines underwent extensive testing, exceeding the required duration to ensure safety and reliability. ISRO also finished tests on the engine for the first unmanned Gaganyaan mission.

FUTURE

Further, an uncrewed mission to test flight parameters is scheduled in Q2 2024.First orbital test flight of Gaganyaan capsule carrying Vyommitra in July 2024.Second orbital test flight of Gaganyaan capsule in December 2024.Third orbital test flight of Gaganyaan capsule in mid 2025.Advanced systems for oxygen, pressure, and temperature control. Includes abort systems for emergency separation from the launch vehicle.GSLV Mk III (LVM-3) will be used for the mission.Dedicated mission control centers to monitor and support the flight.Aims to position India as a major player in human spaceflight.Paves the way for future missions, including potential lunar exploration.Inspires youth and fosters interest in STEM fields.Enhanced telemetry and tracking systems to ensure real-time monitoring and communication with the spacecraft.Plans for recovery operations to safely retrieve the capsule and crew post-mission.Advanced thermal protection systems to shield the capsule during re-entry into Earth's atmosphere.

SAFETY PRECAUTIONS

To ensure the success of the Gaganyaan mission, ISRO will send a humanoid robot named Vyomitra into space soon. This female robot, meaning "sky friend," is designed to simulate human functions and will be used to study the effects of space on the human body. Vyomitra's mission will be the final stage before sending astronauts, helping scientists understand the impact of radiation and extreme space conditions on humans.

~ BY ARYAN MANDAVIYA

SPACE ENTREPRENEURSHIP

"SPACE ENTREPRENEURSHIP REFERS TO THE VENTURES RELATED TO THE EXPLORATION, DEVELOPMENT, AND COMMERCIALIZATION OF OUTER SPACE"

LAUNCH SERVICES AND SPACE TOURISM

Companies that provide launch services for satellites, cargo, and exciting space travel opportunities for civilians.These companies design, build, and operate launch vehicles to transport payloads into space.
Space tourism is an emerging industry where companies are working to make space travel accessible to individuals.Leading the charge are firms like SpaceX, Blue Origin, and Virgin Galactic.These companies are developing cutting-edge technology and infrastructure.

SPACE MINING AND SPACE HABITAT DEVELOPMENT

Exploration and utilization of space resources.
Mining asteroids for precious metals.Extracting water from celestial bodies for use in space.Utilizing rare minerals for advanced technology manufacturing on Earth. exploration and habitation.
Efforts to design and build habitats for humans in space.
Enabling long-term space missions.Goals include establishing colonies on the Moon and Mars.Developing sustainable life support systems for space habitation.

ORBITAL SERVICES AND INDIA'S SPACE INDUSTRY

Involves services provided in orbit, such as satellite servicing, refueling, and space debris removal.
Renowned for its cost-effectiveness and remarkable achievements.ISRO made history with the Mars Orbiter Mission (Mangalyaan) and Chandrayaan-2.Highlighting India's innovative and efficient approach to space exploration.ISRO is gaining global recognition and solidifying India's position as a key player.

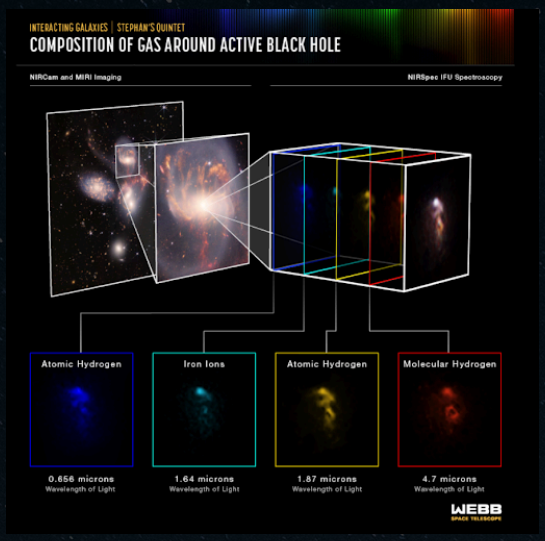
CONTRIBUTIONS OF INDIAN AEROSPACE START-UPS

a)Satellite Imagery: Captures detailed images for environmental monitoring and agriculture.
b)Data Analytics: Uses AI and machine learning to provide meaningful insights for various industries.
a)Propulsion Technologies: Enhances the efficiency and maneuverability of satellites with electric and chemical propulsion systems.
b)Extends satellite lifespan and allows for precise orbit adjustments.

~ BY DHAVIT GANDHI

JAMES WEBB SPACE TELESCOPE: A NEW ERA IN ASTRONOMY

The James Webb Space Telescope (JWST), launched in December 2021, is a testament to human ingenuity and our relentless pursuit of knowledge about the universe. As the most powerful space telescope ever built, JWST boasts revolutionary infrared technology that allows it to peer deeper into space and time than ever before. Let's explore the groundbreaking capabilities of JWST and its potential to unlock the cosmos's hidden secrets.



A TECHNOLOGICAL MARVEL

JWST is a collaborative project between NASA, the European Space Agency (ESA), and the Canadian Space Agency (CSA). This international endeavor represents decades of planning, engineering, and cutting-edge scientific innovation. The telescope itself is a marvel of engineering, featuring a massive 6.5-meter (21.3-foot) primary mirror, the largest ever deployed in space. This immense mirror, composed of 18 hexagonal segments made of beryllium, is lightweight yet incredibly sturdy, allowing JWST to collect faint infrared light with unprecedented sensitivity.

A NEW ERA OF DISCOVERY

Since its launch, JWST has already begun delivering on its promise of revolutionary discoveries. In July 2024, JWST captured the deepest and most detailed infrared image of the universe ever taken, known as "Webb's First Deep Field." This image revealed a multitude of faint galaxies, some dating back billions of years, providing invaluable insights into galaxy formation and evolution. Image of Webb's First Deep Field.

LOOKING FORWARD

The James Webb Space Telescope is ushering in a new era of astronomical discovery. As scientists continue to analyze the vast amount of data collected by JWST, we can expect groundbreaking revelations about the universe's origins, the formation of galaxies and stars, and the potential for life beyond Earth. JWST is a testament to human curiosity and our ongoing quest to understand the vast and awe-inspiring cosmos.

~ BY ARHAM BAFNA

WORD SEARCH ?

- 1)THE LARGEST MOUNTAIN IN THE SOLAR SYSTEM
- 2)WHICH IS THE SMALLEST JOVIAN PLANET?
- 3)WHAT IS SUN MOSTLY MADE OF?
- 4)____ BELT IS A DOUGHNUT SHAPED REGION BEYOND THE ORBIT OF NEPTUNE
- 5)WHICH PLANET HAS A PROMINENT HEXAGONAL STORM AT ITS NORTH POLE?
- 6) WHICH MOON OF SATURN HAS A THICK ATMOSPHERE PRIMARILY COMPOSED OF NITROGEN?
- 7)WHICH JUPITER'S MOON CONTAINS OXYGEN?
- 8) WHICH MOON OF NEPTUNE IS NAMED AFTER A GREEK WATER DEITY?
- 9) WHAT IS THE NAME OF THE LARGEST KNOWN ASTEROID IN THE ASTEROID BELT?
- 10) WHICH MOON OF SATURN IS KNOWN FOR ITS GEYSERS ERUPTING FROM ITS SOUTH POLAR REGION?

N	O	I	M	T	N	K	K	R	E	T	U	P	O
C	L	S	T	S	U	P	S	D	T	C	N	E	L
T	O	S	E	U	N	K	U	I	P	E	R	N	Y
I	E	N	C	E	L	A	D	U	S	C	D	U	M
T	N	T	G	T	P	E	E	N	E	A	Y	T	P
A	G	L	R	O	E	S	U	I	E	G	S	P	U
N	E	G	O	R	D	Y	H	H	A	T	O	E	S
A	O	E	P	P	E	O	R	N	P	N	S	N	M
D	D	U	O	O	Y	U	Y	M	T	A	N	S	O
E	T	S	D	L	D	M	L	O	T	I	E	E	N
U	O	Y	E	N	E	S	E	U	E	N	G	S	S
S	C	E	R	D	N	E	R	A	I	D	H	E	A
E	N	L	E	E	D	N	K	S	U	L	R	U	T
C	E	R	E	S	C	D	U	H	R	I	E	D	A

CROSSWORD ?

1)WHICH SPACECRAFT TOOK THE FAMOUS PALE BLUE DOT IMAGE?

2) WHAT IS THE NAME OF THE FIRST PRIVATELY-FUNDED SPACECRAFT TO REACH ORBIT?

3) WHICH TELESCOPE LAUNCHED BY NASA IN 2021 CAPTURES IMAGES IN INFRARED?

4)WHAT IS THE NAME OF INDIA'S ON-GOING SERIES SPACECRAFT LAUNCHED TO STUDY MOON?

5)WHICH WAS THE FIRST SUCCESSFULL INTERPLANETARY SPACECRAFT?

6) WHICH SATELLITE HAS BEEN CRASHED DELIBERATELY ON SATURN IN 2017?

7) WHAT IS THE NAME OF THE LANDER USED IN INDIA'S CHANDRAYAAN-2 MISSION?

8)WHICH SATELLITE IS JOINTLY BUILD BY NASA AND ISRO AND SET TO LAUCH IN 2024 ?

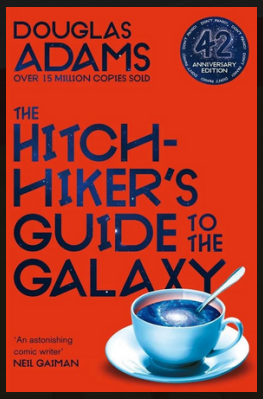
9) WHICH SPACECRAFT FIRST LANDED HUMANS ON THE MOON?

10) WHAT IS THE NAME OF INDIA'S FIRST INTERPLANETARY MISSION?

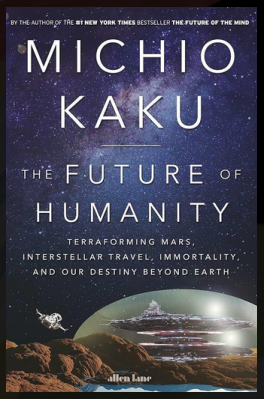
MOVIES & BOOKS

FIRST MAN

CLOSE ENCOUNTERS OF THE THIRD KIND



THE HITCHHIKER'S GUIDE TO THE GALAXY



THE FUTURE OF HUMANITY

ASTRONOMICAL EVENTS

UPCOMING EVENTS :

1.) 3 SEPT- 2024 : NEW MOON

THE NEW MOON ON SEPTEMBER 3, 2024 AT 7:25 AM IN NEW DELHI, INDIA IS ALSO A NEW MOON IN VIRGO. DURING A NEW MOON, THE MOON IS POSITIONED BETWEEN THE EARTH AND THE SUN, SO THE SIDE OF THE MOON FACING EARTH RECEIVES NO DIRECT SUNLIGHT. INSTEAD, IT'S LIT BY DIM SUNLIGHT REFLECTED FROM EARTH.

2.) 18 SEPT- 2024 : PARTIAL LUNAR ECLIPSE

PARTIAL LUNAR ECLIPSE (SEPTEMBER 17–18, 2024): THIS MORE SIGNIFICANT EVENT WILL SEE ABOUT 9% OF THE MOON COVERED BY EARTH'S SHADOW. THE PARTIAL ECLIPSE WILL BE VISIBLE ACROSS THE U.S. AND CANADA, WITH THE BEST VIEWING TIME AROUND 10:44 PM EDT (7:44 PM PDT).

3.) 22 SEPT -2024: SEPTEMBER EQUINOX

THE SEPTEMBER EQUINOX MARKS THE BEGINNING OF FALL IN THE NORTHERN HEMISPHERE AND THE FIRST DAY OF SPRING IN THE SOUTHERN HEMISPHERE. IN 2024, THE EQUINOX WILL OCCUR ON SEPTEMBER 22, AT 12:44 GMT (8:44 A.M. EDT).DURING THE EQUINOX, DAY AND NIGHT ARE NEARLY EQUAL IN LENGTH ALL OVER THE WORLD.

OUR SOCIALS

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