

THREE GORGES ANTARCTIC EYE



- It is a **2-metre radio/millimeter-wave telescope**, located at **Zhongshan Station**, Antarctica.
- It builds upon China's earlier achievements, such as the **Antarctic Survey Telescopes (AST3)**.
- **Purpose:** Studying interstellar gas (hydrogen and ammonia), star formation.
- **Challenge overcome:** Built to withstand Antarctica's extreme cold and strong winds.
- **Developed by:** China Three Gorges University and Shanghai Normal University.

Related Observatories

Observatory	Country	Purpose
INO (India-based Neutrino Observatory)	India	Located in Theni, Tamil Nadu , to study solar and atmospheric neutrinos . Jointly funded by DAE and DST .
IceCube Neutrino Observatory	USA (S. Pole)	Located at Amundsen–Scott South Pole Station , it studies cosmic neutrinos using deep ice as a detector.
JUNO (Jiangmen Underground Neutrino Observatory)	China	Will become operational in late 2025 , studying neutrinos from Earth and sun , ahead of US's DUNE .
DUNE (Deep Underground Neutrino Experiment)	USA	Will be operational around 2030 , focuses on neutrino oscillation and supernova bursts .
TRIDENT (Tropical Deep-sea Neutrino Telescope)	China	Positioned in the South China Sea , aims to study deep-sea neutrino activity .

MEGALITHS



- A **Megalith** is a **large stone** used in the construction of **prehistoric monuments**, either alone or with other stones.
- They were constructed for:
 - **Burial purposes** (sepulchral)
 - **Commemorative rituals** (non-sepulchral)
- Most **Indian Megaliths date to the Iron Age: 1500 BCE to 500 BCE**
- Some megalithic sites even **precede the Iron Age**, extending back to **2000 BCE**

Types of Megalithic Monuments

- **Burial Types:**
 - **Dolmenoid cists** – box-shaped stone burial chambers
 - **Cairn circles** – circular arrangements of stones marking burial spots
 - **Capstones** – mushroom-shaped stones mostly found in **Kerala**
 - **Urns or Sarcophagi** – made of **terracotta**, often used for cremated remains
- **Non-burial Types:**
 - **Menhirs** – **upright memorial stones**, typically not used for burials

Major Megalithic Sites in India

Region	Notable Sites
Kerala	Thrissur, Kunnattur, Manimoola, Muniyara
Tamil Nadu	Adichanallur, Kodumanal, Perumbair, Sanur
Karnataka	Brahmagiri, Hallur, Maski, Hire Benkal, Chandravalli
Andhra Pradesh	Nagarjunakonda
Maharashtra	Junapani, Mahurjhari, Khapa, Naikund
Uttar Pradesh	Koldihwa (Belan valley), Banda, Mirzapur, Prayagraj, Varanasi

Jharkhand	Seraikala
Uttarakhand	Deodhoora (Almora district)
Jammu & Kashmir	Burzahom, Waztal, Brah

Artefacts Recovered from the Site

- These artefacts were found during **excavation works** under the **Jal Jeevan Mission**, which involved **digging trenches for water pipelines**.
- Key items recovered include: a **Black ware pot**, **Five four-legged jars**, **Pots of different sizes**, **Clay utensils** that resembled lids of **large vessels**, an **iron stove stand with three support stones** and **iron tools** resembling **penknives**
- **Megalithic Structures Identified Nearby**
 - A local stone monument called **Pathaya Kallu** is believed to be a **Megalithic-era burial site**.
 - Similar stone burial chambers in the region are known by **folk names** such as: **Pandava Guha**, **Peerangi Guha**, **Muniyara**, **Swamikundu** and **Kalpaththayam**.

POEM-4



- **POEM-4**, or **PSLV Orbital Experiment Module-4**, is a **space research platform** developed by **ISRO** that **utilizes the spent fourth stage (PS4)** of the **PSLV rocket** as an **orbiting experimental module** in space.
- It is part of the **SpaDeX (Space Docking Experiment)** mission and represents the **fourth deployment** of the **POEM series**, following **POEM-3**.
- **POEM-4** has a **three times larger payload capacity** than its predecessor, **POEM-3**, marking a **major advancement** in reusing upper rocket stages for scientific research.

- **Total of 24 payloads** were hosted on POEM-4: 14 payloads from ISRO and 10 payloads from non-government entities (NGEs) including start-ups and academic institutions
- **Notable payloads include:**
 - **Walking Robotic Arm (RRM-TD):** A robotic manipulator capable of inchworm-like motion, aimed at enabling inspection and servicing tasks in space.
 - **Debris Capture Robotic Manipulator:** Developed by **Vikram Sarabhai Space Centre (VSSC)**, this innovation assists in **space debris collection** and manipulation, aligning with global efforts in space clean-up.
 - **Gradient Control Reaction Wheel Assembly (RWA):** Designed by **ISRO Inertial Systems Unit (IISU)**, this system enhances attitude control and stabilization of the POEM platform using reaction wheels.

Launch and Mission Details

- **POEM-4 was launched on December 30, 2024**, aboard **PSLV-C60**, which also carried **twin SPADEX satellites** to a **475 km altitude**.
- After satellite deployment, the **PS4 upper stage was reconfigured as POEM-4** and continued in a **nearby orbit**, serving as an experimental platform.
- POEM-4 was then **de-orbited** by restarting its engine and brought to a **circular orbit at 350 km altitude** with a **2° inclination**.
- The stage was **passivated** (leftover fuel vented) to **prevent accidental break-up** and ensure **safe operations in orbit**.

TOPOLOGICAL MATERIALS



- **Topological materials** are substances that **exhibit different physical properties on their surface and in their interior**.
- These materials may behave like a **metal on the outside** (conducting electricity) but like an **insulator on the inside** (not conducting electricity).

- The term "**topological**" refers to the **unique geometric and quantum properties** of the material, which remain unchanged even if the shape of the material is distorted.
- **Discovered in the latter half of the 20th century**, these materials represent a new class of quantum matter.
- **Nobel Prize in Physics (2016)** was awarded to scientists (David Thouless, Duncan Haldane, and Michael Kosterlitz) for their theoretical discoveries in this field.

How do they work?

- These materials exhibit a **metallic surface (conducting electrons freely)** while maintaining an **insulating core (electrons remain localized)**.
- This strange duality arises from **quantum mechanical effects**, especially the **topology of electronic band structures**.
- The behaviour is deeply rooted in the principles of **quantum mechanics**, where **electron spin and momentum** interplay due to a phenomenon called **spin-orbit coupling**.
- The **interaction of light and matter**, the **collective behavior of electrons**, and **phase transitions** are governed by quantum principles.
- The **UN declared 2025 as the International Year of Quantum Science and Technology**, marking **100 years since the foundation of quantum mechanics**.

Why do Metals and Insulators differ?

- In **metals**, **electrons are free to move** — like a **soup of charge**, allowing **conduction of electricity and heat**.
- In **insulators**, electrons are **bound tightly** to their atoms and **do not move freely**, hence they **do not conduct electricity**.
- When **light (an electromagnetic wave)** hits these materials:
 - In **metals**, **electrons move collectively** and reflect light.
 - In **insulators**, **electrons move individually**, allowing light to **pass through**.



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DIGITAL THREAT REPORT 2024



- It is a collaborative effort by **SISA (Strategic Information Services Agreement)**, a global cybersecurity company, in collaboration with the Computer Emergency Response Team (**CERT-In, Ministry of Electronics and Information Technology**) and **CSIRT-Fin**.
- It offers an in-depth analysis of the growing cybersecurity risks in India's **Banking, Financial Services, and Insurance (BFSI)** sector.
- Built on frontline threat intelligence and real-world incident data, the report outlines a unified view of the cyber threat landscape and the shifting dynamics of digital security in an era of rapid technological transformation.

Key Highlights from the Report:

- **Social Engineering on the Rise:** Business Email Compromise (BEC) and phishing attacks have become more precise and damaging, targeting BFSI institutions with tailored tactics that bypass traditional security barriers.
- **Supply Chain Vulnerabilities:** Breaches through third-party vendors and open-source software have introduced threats at scale, underlining the need for stricter vendor risk management.
- **Compliance Evolution:** Regulatory frameworks are moving toward harmonization, transforming compliance from a rigid obligation into a strategic tool that can drive growth, improve operations, and build cyber resilience.
- **Persistent Control Gaps:** Misconfigurations, over-privileged access, and weak access controls continue to plague even the most security-conscious organizations.
- **AI-Powered Threats:** With artificial intelligence being leveraged by both defenders and attackers, the report warns of a future dominated by highly personalized, large-scale cyber attacks driven by AI technologies.



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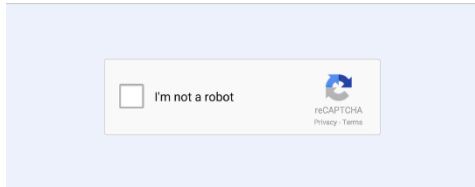
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CAPTCHA



- CAPTCHA stands for the **Completely Automated Public Turing test to tell Computers and Humans Apart**.
- The term **“Turing test”** is central to CAPTCHAs.
 - A **Turing test** evaluates a computer’s capacity to simulate human behavior.
 - In 1950, Alan Turing, an early pioneer of computing and artificial intelligence (AI), created the Turing test.
 - A computer program “passes” the Turing test if its actions throughout the test cannot be distinguished from that of a person, i.e., if it behaves as a human would.
 - A **Turing test** is not based on answering questions correctly; rather, it is **concerned with how “human” the responses seem**, irrespective of whether they are accurate.
- CAPTCHAs **provide challenges that are difficult for computers to perform but relatively easy for humans**.
- For example, a CAPTCHA may ask the user to enter the characters displayed in a blurred image or identify all of the images in a grid that contain a traffic light.
- Some newer CAPTCHAs ask the user to click in a box stating that they are not a robot and **use various metrics** to differentiate between human and automated visitors.
- CAPTCHAs are used by any website that wishes **to restrict usage by bots**.

MESOPOTAMIA



- Mesopotamia is located in the region now known as the **Middle East**, which includes parts of **southwest Asia** and lands **around the**



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eastern Mediterranean Sea.

- It is **part of the Fertile Crescent**, an area also known as the “**Cradle of Civilization**” for the number of innovations that arose from the early societies in this region, which are among some of the **earliest known human civilizations** on earth.
- The word “mesopotamia” is formed from the ancient words “meso,” meaning **between** or in the middle of, and “potamos,” meaning **river**.
- Situated in the fertile valleys **between the Tigris and Euphrates rivers**, the region is now **home to modern-day Iraq, Kuwait, Turkey, and Syria**.
- It was home to the **ancient civilizations of Sumer, Assyria, and Babylonia**.
- It was **one of the first places** where **humans started practicing settled agriculture**, and the **earliest known writing system, cuneiform, originated** there as well.
- For some three thousand years, Mesopotamia remained the preeminent force in the Near East.
- **Decline:**
 - **In 539 BC**, however, **Cyrus the Great captured Babylon and incorporated Mesopotamia into the Persian Empire**.
 - Periods of Greek and Parthian rule followed, and **by about AD 100** Mesopotamian culture had **effectively come to an end**.

INDIA WORKING ON MILITARY SPACE DOCTRINE

India's Key Developments in Space Security

- India adheres to major international space treaties including:
 - 1967 Outer Space Treaty (OST)
 - 1968 Rescue Agreement
 - 1972 Liability Convention
 - 1974 Registration Convention and Signatory to the 1979 Moon Agreement
- India is a member of the Inter-Agency Space Debris Coordination Committee (IADC) and follows the 2008 Debris Mitigation Guidelines.

India's Key Developments in Space Security

- **2019 ASAT Test (Mission Shakti):** India demonstrated its counter-space capabilities, joining the US, Russia, and China.
- **2010 – Integrated Space Cell:** Enhanced coordination between the Department of Space and Armed Forces.
- **2018 – Defence Space Agency (DSA):** Formed to address space-based military threats.
 - DSA is playing a central role in: Drafting the military space doctrine; Building an integrated satellite communication grid; Identifying and countering threats to national security from both state and non-state actors.
- **2023 – Indian Space Policy (ISP):** First formal space policy, although it lightly touches upon “national security”.
- **52-Satellite Constellation for Defence:** The government has approved the launch of a 52-satellite constellation for intelligence, surveillance, and reconnaissance (ISR).
 - 31 satellites to be built by the private sector
 - Execution in partnership with ISRO and private players
 - Aimed at bridging operational gaps and preparing for future threats
- **GSAT-9 (2017):** Used space diplomacy through the South Asia Satellite, strengthening regional influence (excluding Pakistan).
- **International Partnerships:** India is strengthening space cooperation with QUAD, France, and others.

Conclusion: Towards a Space-Ready Military

India's ongoing reforms in the space sector and the development of military space doctrines and policies reflect a **strategic shift** towards embracing **space as a crucial frontier for national security**. These initiatives aim to **build resilience, foster innovation, and integrate military, civil, and private capabilities** for a robust space defence architecture.