

# **Daily Current Affairs** To The Point by Dhananjay Gautam

Table Of Content 14 April 2025

- **1 Ancient Jawbone Discovery Reveals Wider Reach of** Mysterious Denisovans
- 2. Concerns Arise Over Amendments to RTI Act Amid Data Privacy Reforms
- 3. India Needs an Ecosystem That Enables Deep-Tech Innovation
- 4. Extradition of Tahawwur Rana
- 5. Sunbird: Nuclear Fusion Rocket Aiming to Revolutionize Space Travel
- 6. Sea Lions: Unusual Aggression Linked to Algal Bloom and Neurotoxins

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GS Paper 1 – History and Culture

Ancient Jawbone Discovery Reveals Wider Reach of Mysterious Denisovans

**Context:** A **remarkable fossilized jawbone**, known as **Penghu 1**, has been recovered from the **Penghu Channel near Taiwan**, shedding new light on the **geographic spread** and **evolutionary history** of the **Denisovans** — a long-lost branch of the human family tree. This discovery, made accidentally during **commercial fishing operations**, is changing our understanding of where these ancient humans lived and how adaptable they were.



## Who Were the Denisovans?

The **Denisovans** are an **extinct group of archaic humans** known mostly through scarce fossil remains and groundbreaking **genetic analysis**.

#### **Origins and First Discovery:**

- First identified in **2010** from DNA extracted from a **finger bone** found in **Denisova Cave**, **Siberia**.
- Genetic studies revealed they were a distinct lineage, closely related to both Neanderthals and modern Homo sapiens.

#### Physical Characteristics:

- Based on **DNA methylation reconstruction**, Denisovans likely had:
  - A **broader skull** structure.
  - A longer dental arch than Neanderthals or modern humans.
- Their robust jawbones and large molars suggest powerful chewing capabilities, possibly adapted to a tough diet.

#### **Significance of the Penghu 1 Discovery:**

# Expanding Their Geographic Footprint:

The jawbone discovery off **Taiwan's coast** extends the known range of Denisovans to **East and Southeast Asia**, reinforcing their **adaptability to diverse environments**.

Previously Known Denisovan Fossil Sites:

- **Denisova Cave, Siberia (Russia)**: Finger bone and teeth.
- Baishiya Karst Cave, Tibetan Plateau (China): Jawbone and rib fragment.
- Cobra Cave, Laos: A molar (likely Denisovan based on morphology).
- Penghu Channel, Taiwan: Newly found Penghu 1 jawbone.

This wide distribution shows Denisovans thrived from **icy highlands** to **subtropical coastal zones** — a level of ecological flexibility once underestimated.

#### **Challenges in Dating the Fossil:**

• The exact age of Penghu 1 remains undetermined due to the lack of traditional stratigraphic context.

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• Estimated to be between 10,000 and 190,000 years old, based on nearby animal fossils.

#### Lasting Genetic Legacy:

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Denisovans **interbred** with both **Neanderthals** and **early Homo sapiens**, contributing **genetic material** still present in modern human populations, especially in **Asia and Oceania**.

## Modern-Day Impacts of Denisovan DNA:

- High-altitude **adaptation genes** in **Tibetans** trace back to Denisovans.
- Traits related to the **immune system** and **skin pigmentation** also show Denisovan influence.

## Looking Ahead: Unlocking More Secrets:

#### New Frontiers in Research:

The Penghu 1 discovery underscores the importance of investigating **submerged landscapes**—once accessible during Ice Ages when sea levels were lower.

#### Future breakthroughs may come from:

- **Paleoproteomics**: Studying **ancient proteins** in fossils to identify species and relationships when DNA isn't preserved.
- **Underwater archaeology**: Exploring **submerged land bridges** and **coastal shelves** that may have supported early human populations.

#### **Recognition in the Field:**

In **2022**, Swedish geneticist **Svante Pääbo** was awarded the **Nobel Prize in Physiology or Medicine** for pioneering work on the **genomes of extinct hominins**, including **Denisovans**. His research has been foundational in understanding how ancient DNA informs **human evolution**.

#### Did You Know?

- Modern humans carry up to 5% Denisovan DNA in some Melanesian and Aboriginal Australian populations.
- Denisovan remains are so rare, most knowledge about them comes from genomics, not traditional fossil records.
- The **Denisovan genome** was the first of an extinct human group to be sequenced with such high quality.

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**Conlusion**: The discovery of the **Penghu 1 jawbone** doesn't just expand the **map of Denisovan existence** it deepens the mystery and wonder surrounding these **ancient relatives** of ours. As science advances, we may find even more clues buried in the **earth—or under the sea**.

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GS Paper 2 – Polity, Governance, and Rights Issues

**Concerns Arise Over Amendments to RTI Act Amid Data Privacy Reforms** 

**Context:** The **Union Minister for Information and Technology** has stated that **personal information required to be disclosed under existing laws** will still be accessible through the **Right to Information (RTI) Act**, even after the **Digital Personal Data Protection (DPDP) Act** is implemented. However, many civil society groups and activists remain concerned that recent **amendments may hinder transparency and public accountability**.



Key Change: Amendment to Section 8(1)(j) of the RTI Act

## Under the proposed Digital Personal Data Protection (DPDP) Rules,

the **RTI Act (2005)** will be amended to incorporate a **blanket prohibition on the disclosure of personal information**, regardless of whether it serves the **public interest**.

#### **Concerns Raised**:

- Limits access to information vital for social audits, investigations into misuse of public funds, and exposing corruption.
- Hampers the RTI's role in verifying government welfare programs like the Public Distribution System (PDS) and NREGS.
- Critics argue the amendment **disrupts the balance** between **privacy and transparency** maintained in the original Act.
- They reject the claim that this aligns with the Supreme Court's 2017 ruling on the right to privacy under Article 21.

#### **Government's Justification**:

The government claims the amendment:

- Will **not curtail transparency**, and
- Will allow disclosure of personal data when legally mandated.

The **2017 Supreme Court judgement** that recognized **privacy as a fundamental right** is cited as the **basis for the reform**.

#### RTI (Amendment) Act, 2019: A Recap

- **Tenure Reduced**: The term of the **Chief Information Commissioner (CIC)** and **Information Commissioners (ICs)** was reduced from **5 years to 3 years**.
- **Centralized Control**: Their **salaries and service conditions** are now determined by the **Central Government**, rather than being on par with **Election Commissioners**.

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# **RTI Rules, 2022: Digitization Push**

- **Online Filing**: Citizens are encouraged to file RTI applications through the **RTI Online Portal**.
- **Streamlined Processes**: Revisions made to improve **appeals** and **complaints procedures**.

# The Right to Information Act (RTI), 2005 - An Overview

Purpose:

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To promote transparency and empower citizens by granting access to information from public authorities.

#### Scope:

- Applies to **all government departments** and **organizations** substantially funded by the government.
- Ensures access to **records, files, contracts, correspondence**, and more.

# Exclusions:

• National security, **confidential investigations**, and **sensitive data** are exempted.

# Timelines:

• Responses must be provided **within 30 days**, extendable to **45 days** in special cases.

# **Penalties**:

• Officials face penalties for **wrongful denial** or **misleading information**.

# The Road Ahead

- Digital Personal Data Protection Act (DPDP) is not yet operational, as the rules are still in draft form.
- Civil society organizations are urging the government to reconsider the amendments, fearing erosion of public accountability.
- The **core strength of the RTI Act** lies in its ab<mark>ility to</mark> empower the public and **expose corruption** a function that must not be compromised under the guise of privacy.

# **Conclusion:**

While **data protection** is a legitimate concern in the digital age, it must not come at the **cost of transparency and democratic accountability**. The **RTI Act** has been a cornerstone of **citizen empowerment** and **good governance** in India. Any amendment should aim to **strengthen**, not **weaken**, the public's right to know.

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GS Paper 3 – Economic Development, Science and Technology

# India Needs an Ecosystem That Enables Deep-Tech Innovation

**Context:** At the **Startup Mahakumbh**, Commerce Minister **Piyush Goyal** criticized Indian startups for being too focused on **consumer-centric models** like **food delivery** and **influencer-driven apps**. He emphasized that **India must shift toward deep-tech innovation** to stay competitive globally.



**Did You Know?** 

- Startup Mahakumbh is a flagship event promoting entrepreneurship and innovation in India.
- Theme: 'Startup India @ 2047: Unfolding the Bharat Story'
- The event aims to **propel India** as a **global startup hub** by the time it reaches 100 years of independence.

# Comparison with China: The Innovation Gap:

India	China
Focuses on <b>food delivery</b> , betting platforms, and	Invests in electric vehicles (EVs), AI, robotics, and
short-form content	battery tech
Lacks significant intellectual property (IP) in deep-	Over 6,000 deep-tech startups; nearly \$100B in
tech	funding
Still evaluating AI model proposals	Leads with <b>DeepSeek</b> , an efficient AI model
Dependent on Chinese components for manufacturing	Strong domestic hardware ecosystem
Ranks <b>39th</b> in Global Innovation Index (2024)	Ranks 11th

China's strategic focus on foundational technologies is what gives it a dominant edge in the global tech race. Challenges Facing Indian Startups:

# **Innovation Deficit:**

- Global Indian talent, like Satya Nadella (Microsoft) and Sundar Pichai (Google), thrive abroad while local innovation lags.
- India hasn't produced a globally competitive **AI model** yet.

# Funding Gap:

- India invested **\$160B in tech (2014–2024)** vs China's **\$845B**.
- Only **10% of Indians** can afford discretionary spending—limiting consumer tech scalability.

# Weak Education and Research:

- Many graduates are **unemployable**.
- Indian universities lack global research credibility.
- Brain Drain: Top talent emigrates for better research and entrepreneurial environments.
- **Risk-Averse VC Culture:** VCs favor **quick-return apps** over **long-gestation deep-tech ventures**.

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• Limited Global Presence: Startups like Zomato, Swiggy, and Flipkart are India-centric, with little global reach.

# **Opportunities and Strengths**

# Startup Ecosystem Growth:

- India is the **3rd-largest startup ecosystem**, with **1.57 lakh+ recognized startups** (as of Dec 2024).
- Over **100 unicorns** span across SaaS, fintech, healthtech, and more.

# Geographic Spread:

- Major hubs: Bengaluru, Hyderabad, Delhi-NCR, Mumbai.
- Tier II & III cities now account for over **51%** of recognized startups—showing grassroots innovation.

# Tech Contributions:

- India has become a global leader in **SaaS** with companies like **Zoho**, **Freshworks**, **TCS**, and **Infosys**.
- Pioneered digital public infrastructure with UPI, revolutionizing digital payments via Paytm and PhonePe.

# Space and Deep-Tech Potential:

- Startups like **Skyroot**, **Agnikul**, and **Digantara** are emerging in **space tech**.
- Cybersecurity startups are rising but often face early exits via acquisition.
- **Deep-tech investments grew 78% in 2024**, reaching **\$1.6B**.

# Key Areas to Focus On:

To truly trans<mark>ition into</mark> a **deep-tech powerhouse**, India must focus on:

- Artificial Intelligence (AI)
- Smart manufacturing and Industry 4.0
- Medical technology (MedTech)
- Climate tech & green energy
- Defence tech and aerospace
- Quantum and advanced computing

# **Conclusion: A Call for Bold Reforms**

India has made **tremendous strides** in **SaaS**, **fintech**, and **digital payments**, but it still lags behind global powers like China in **deep-tech innovation and global competitiveness**.

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To bridge the gap, India needs:

- Bold, long-term investment in R&D
- A culture of risk-taking among VCs
- Stronger academic-industry collaboration
- Policies that incentivize deep-tech development
- A national mission to **retain and empower Indian tech talent**













GS Paper 3 – Internal Security

4

## Extradition of Tahawwur Rana: A Diplomatic & Legal Victory in the 26/11 Case

**Context:** After **16 years** since the devastating **26/11 Mumbai terror attacks**, **Tahawwur Rana**, a **key conspirator**, has finally been **extradited to India** from the **United States**. This marks a **watershed moment** in India's anti-terrorism efforts and a **remarkable success** in **India-US diplomatic and legal cooperation**.

Flashback: The 26/11 Mumbai Terror Attacks

- Dates: November 26–29, 2008
- Casualties: 166 dead, 238+ injured



- Terror Outfit: Lashkar-e-Taiba (LeT), a Pakistan-based terrorist organization
- Key Locations Attacked:
  - Chhatrapati Shivaji Terminus (CST)
  - Taj Mahal Palace Hotel
  - o Oberoi Trident Hotel
  - Nariman House (Jewish Centre)
- Tactic Used: Infiltration via sea route from Karachi, Pakistan

#### Did you know?

This attack was broadcast live, creating a new era of **media-covered urban terrorism**. It changed how India approaches **counter-terrorism and urban security**.

#### Who is Taha<mark>wwur Ra</mark>na?

- Nationality: Pakistani-born, naturalized Canadian citizen
- Profession: Former officer in Pakistan Army's Medical Corps
- Associations:
  - Close associate of **David Coleman Headley** (aka Daood Gilani), a LeT scout
  - Linked to banned groups like LeT and Harkat-ul-Jihadi Islami (HUJI)
- Arrested: In Chicago, October 2009

#### His Role in the Attack:

- Provided logistical and strategic support to Headley
- Helped in reconnaissance operations and coordinated planning of attacks

# Legal Proceedings & Extradition Journey:

**Key Milestones:** 

- US Magistrate Court approves extradition after rejecting the "double jeopardy" defense
- US Supreme Court declines review plea, finalizing Rana's extradition
- Special aircraft deployed to fly him to India under tight security

# Legal & Security Coordination:

- Lead Counsel (India): Senior Advocate Dayan Krishnan
- Supported by: Narender Mann, Sanjeevi Sheshadri, Sridhar Kale, and NIA legal team.

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• Security Escorts: National Security Guard (NSG) & NIA officials

# **Current Status:**

- Arrested at IGI Airport, New Delhi
- Produced before NIA Special Court at Patiala House
- Remanded to 18 days of NIA custody for interrogation

# Political & Diplomatic Significance:

# India-US Cooperation:

- Based on India-US Extradition Treaty (1997)
- Key players:
  - US Department of Justice
  - Indian Ministry of External Affairs (MEA)
  - Ministry of Home Affairs (MHA)
  - Indian Embassy in Washington D.C.

# Political Acknowledgement:

- Prime Minister Narendra Modi thanked the US for its support to India's justice system
- Demonstrates strong India-US strategic partnership in counterterrorism cooperation

# What is Extradition?

**Extradition** is a formal legal process through which one country **transfers a fugitive or accused** to another country where they face **criminal charges** or **sentencing**.

# Core Principles:

- Treaty-based process
- **Dual criminality:** Offence must be punishable in both countries
- Exemptions: Political offences, persecution risks, or weak evidence

# India's Extradition Framework:

- Extradition treaties: With 48 countries
- Extradition arrangements (non-binding): With 12 nations
- Nodal Agency: MEA's Consular, Passport & Visa (CPV) Division

# **Challenges in the Extradition Process:**

- Legal complexities: Rana's case spanned over a decade
- Double jeopardy claims: Rejected but caused delays
- Diplomatic roadblocks: Depends on bilateral goodwill
- Contrast with Headley:
  - o David Headley received a plea bargain in the US
  - Avoided extradition, serving a **35-year sentence** in the US

**Interesting Fact:** In 2013, Headley was declared a **prosecution witness**, further complicating extradition efforts but helping build a stronger case against Rana.

**Conclusion: A Strategic Win for India** -The extradition of Tahawwur Rana represents more than just justice it's a **symbol of resilience**, **strategic diplomacy**, and a **testament to India's growing international influence**. It also sets a precedent for future cross-border **counterterrorism collaboration**.

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Sunbird: Nuclear Fusion Rocket Aiming to Revolutionize Space Travel

Context: Sunbird, an ambitious nuclear fusion-powered rocket under development by the UK-based startup **Pulsar Fusion**, is making headlines for potential to redefine interplanetary travel. With an orbital its **demonstration planned for 2027**, this could be a **historic breakthrough** in propulsion technology.



GS Paper 3 – Science Technology

## What is Sunbird?

- Speed Potential: Expected to reach up to 805,000 km/h, surpassing NASA's Parker Solar Probe (currently the fastest human-made object at **692,000 km/h**).
- Travel Efficiency:
  - Could reduce Mars travel time by nearly half
  - Could reach **Pluto in just 4 years** a mission that currently takes around 9.5 years
- **Core Objective:** Dramatically **cut travel time** to planets beyond Earth, making long-distance **space** missions more feasible and frequent

#### **Did You Know?**

If Sunbird's concept is successful, it could support **crewed missions** beyond Mars — a milestone in **deep** space exploration.

#### **Understanding Nuclear Fusion Propulsion:**

#### What is Nuclear Fusion?

- **Fusion** is the process where two atomic nuclei combine to form a heavier nucleus, releasing a **huge amount of energy** — the same principle that powers the **Sun and stars**.
- Unlike **nuclear fission**, fusion:
  - Generates minimal radioactive waste
  - Offers a higher energy yield 0
  - Is considered **cleaner and safer**  $\cap$

#### **Two Major Concepts in Nuclear Propulsion:**

#### **1. Nuclear Thermal Propulsion (NTP):**

- Uses a **nuclear reactor** to heat **liquid hydrogen (LH<sub>2</sub>)**
- Hydrogen expands into **plasma** and is ejected through a **nozzle** to create **thrust** ٠
- Advantages:
  - Higher exhaust velocity 0
  - Can **double or triple payload capacity** compared to chemical rockets
- Historical Context: Ground tests started as early as 1955, making it a well-established concept with decades of R&D

#### 2. Nuclear Electric Propulsion (NEP):

- Converts **nuclear heat into electricity**, which then powers **ion thrusters**
- Thrusters build speed gradually but efficiently, suitable for long-duration missions

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- Key Components:
  - Compact nuclear reactor
  - Electric generator
  - Heat rejection system (e.g., heat pipes)
  - **Electric propulsion system** (like **ion thrusters**)
- **Bonus:** While **solar panels** can also power electric propulsion, a **nuclear source** ensures **consistent energy output**—especially useful **beyond Mars** where solar power weakens

# Why Sunbird Matters:

- Fusion-based propulsion could become the next leap in aerospace engineering
- Faster interplanetary travel could open doors to:
  - Commercial space tourism
  - Rapid resupply missions
  - Deep space exploration including Jupiter's moons or even interstellar probes
- Pulsar Fusion's work is backed by growing interest in private space innovation and clean energy tech

# What's Next?

- 2027: Planned orbital demonstration of the Sunbird fusion rocket
- Success could trigger investments, international collaborations, and possibly future missions to Mars and beyond

# **Conclusion:**

**Sunbird** isn't just a rocket — it's a **glimpse into the future of spaceflight**. By combining the **limitless power of fusion** with cutting-edge propulsion engineering, Sunbird could drastically **shorten cosmic distances** and bring **deep space exploration** within humanity's reach.

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6







GS Paper 3 – Environment, Ecology, and Biodiversity

#### Sea Lions: Unusual Aggression Linked to Algal Bloom and Neurotoxins

**Context:** A recent **algal bloom** along the **California coast** has led to the release of a **neurotoxin**, causing **sea lions** to exhibit **uncharacteristically aggressive behavior**. This has resulted in multiple **attacks on beachgoers** and **surfers**.

#### About Sea Lions: The Social Marine Mammals

Scientific Classification:

- Family: Otariidae, which encompasses five sea lion species:
  - California Sea Lion
  - Northern Sea Lion
  - o Southern Sea Lion
  - Australian Sea Lion
  - New Zealand Sea Lion

#### Habitat & Distribution:

- Found along the Western coasts of North America, stretching from southeast Alaska to central Mexico.
- Prefer **rocky shores** and **sandy beaches**, where they haul out to rest, breed, and give birth.

#### **Physical Traits:**

- External ear flaps distinguish sea lions from seals.
- **Long foreflippers** enable them to move efficiently on land and in water.
- Males can weigh up to 1200 pounds (545 kg), with a mane-like fur around their necks, particularly
  noticeable in mature males.

#### **Social Behavior:**

- Typically **non-aggressive** and **social**, sea lions live in **large colonies**.
- Known for their playful nature, **intelligent** problem-solving abilities, and strong family bonds.

#### What is Causing the Sea Lions' Aggression?

Although generally calm, sea lions have recently displayed **violent and erratic behavior**, which has raised concerns among beachgoers and marine researchers alike. The culprit behind this sudden change is **domoic acid**, a neurotoxin produced by **toxic diatom algae**.

#### **Domoic Acid: The Neurotoxin**

- **Produced by:** The algae **Pseudo-nitzschia**, which forms blooms under **nutrient-rich conditions** in the ocean.
- Effects on Marine Life:
  - The **toxin** enters the **marine food chain**, affecting smaller fish and, in turn, larger predators like sea lions who consume these contaminated fish.

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- Domoic acid causes **neurological damage**, leading to symptoms like **disorientation**, **aggression**, and **seizures** in sea lions.
- In severe cases, it can lead to **death** or long-term damage to brain function.

# **Impact of Algal Blooms:**

- **Algal blooms** occur when **nutrient levels** in the ocean rise, often due to **human activities** such as agricultural runoff or changes in ocean currents.
- These blooms can be **harmful to both marine life** and humans, as the toxins can accumulate in shellfish, posing health risks.

# Understanding the Risks: Neurotoxin Effects on Sea Lions

Sea lions, typically **gentle** creatures, are now exhibiting **lethal aggression** due to the effects of **domoic acid** on their nervous systems. In addition to aggression, these mammals may experience:

- Confusion and disorientation
- Difficulty swimming
- Seizures or uncontrolled movements
- Erratic behavior, including attacks on humans or other animals

This sudden shift in behavior has raised alarms, as these once-friendly animals become dangerous due to their altered brain chemistry.

# The Bigger Pi<mark>cture: En</mark>vironmental Implications

The increasin<mark>g frequen</mark>cy of **algal blooms** and the spread of **neurotoxins** like **domoic acid** signal broader environmental changes. Factors contributing to this phenomenon include:

- **Climate change**, which may be altering ocean temperatures and currents, contributing to more frequent and intense algal blooms.
- **Pollution**, particularly nutrient runoff from agriculture and urban areas, exacerbating the conditions for these toxic blooms.

# What Can Be Done?

- **Monitoring and research** are key to understanding how **toxic algal blooms** affect marine ecosystems and how they can be mitigated.
- **Regulations on nutrient runoff** and **environmental protection measures** could help reduce the occurrence of harmful blooms.

# **Conclusion: Protecting Both Sea Lions and Humans**

The unusual aggression displayed by sea lions along the California coast highlights the **direct impact** of environmental changes on marine wildlife. The **presence of domoic acid** in the food chain has turned these typically **peaceful creatures** into a public safety concern, underlining the need for **sustainable environmental practices** and **better monitoring** of ocean health.

By understanding the interplay between **toxic algae**, **marine life**, and **climate change**, we can work towards protecting both **sea lions** and **human beachgoers** alike.

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