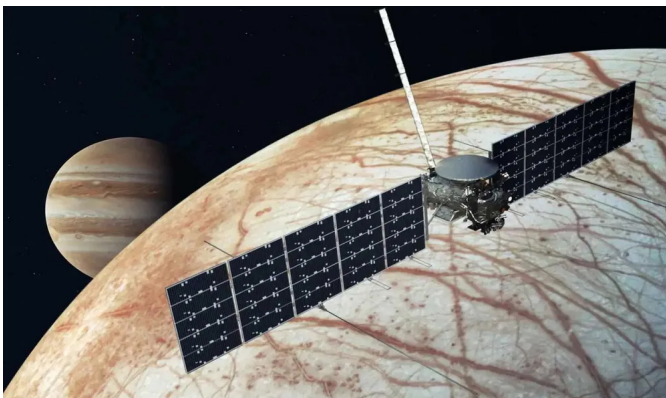


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NASA's Europa Clipper Mission Launched to Explore Jupiter's Icy Moon

Context: NASA has launched the Europa Clipper spacecraft using a SpaceX Falcon Heavy rocket from Kennedy Space Center in Florida. This mission aims to explore whether Jupiter's moon Europa could support life. It is NASA's largest planetary exploration project, with a budget of \$5.2 billion.

- The Europa Clipper aims to place a spacecraft in Jupiter's orbit to conduct an in-depth investigation of Europa, a moon with evidence suggesting a subsurface ocean of liquid water beneath its thick ice crust.
- Europa Clipper's primary goal is to assess whether this icy moon possesses the right conditions to support life. This will be NASA's first dedicated mission to study the potential habitability of an ocean world beyond Earth.



Key Instruments:

Equipped with cutting-edge scientific tools, the spacecraft will study Europa's surface, subsurface, and atmosphere. Key instruments include:

- **Plasma Instrument for Magnetic Sounding (PIMS):** Measures Europa's magnetic fields to analyze the depth and salinity of its subsurface ocean.
- **Mapping Imaging Spectrometer for Europa (MISE):** Identifies the chemical composition of Europa's surface.
- **Europa Imaging System (EIS):** Captures high-resolution images of the moon's surface.
- **Radar for Europa Assessment and Sounding Ocean to Near-surface (REASON):** Probes beneath

the ice to examine subsurface structures, such as possible lakes and cryovolcanoes.

- **Europa Clipper Magnetometer:** Analyzes Europa's magnetic environment, essential for understanding the moon's potential habitability.

Power and Flight Path:

- The spacecraft features large solar arrays, providing it with sufficient power as it operates in the distant Jupiter system, where sunlight is sparse.
- The mission will utilize gravitational assists from Mars and Earth before reaching Jupiter's orbit in 2030. Over the course of 49 flybys, Europa Clipper will gather data while navigating through one of the solar system's most intense radiation zones.

Significance of Europa:

- Europa, Jupiter's fourth-largest moon, is believed to have more water than Earth's oceans, making it a prime candidate for studies on potential extraterrestrial life.
- The mission will explore whether Europa has the necessary water, energy, and chemical building blocks to support life. By investigating the subsurface ocean, the mission could answer fundamental questions about the moon's habitability.

Conclusion:

NASA's Europa Clipper mission is a groundbreaking effort that combines advanced scientific research with space exploration, seeking to uncover whether Europa could harbor life. This mission not only promises to provide profound insights into Europa's environment but also has the potential to reshape humanity's understanding of life beyond Earth.

SC validates Section 6A of Citizenship Act

Context: In a landmark verdict, the Supreme Court, upheld the constitutional validity of Section 6A of the Citizenship Act, 1955, which granted citizenship to immigrants who entered Assam before March 24, 1971. Section 6A was added to the statute in 1985 following the signing of the Assam Accord between the Rajiv Gandhi government at the Centre and the All Assam Students' Union (AASU).

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Background of Section 6A:

- Enacted in 1986, Section 6A was added to address the specific circumstances of migration from Bangladesh, particularly during the tumultuous period surrounding the Bangladesh Liberation War in 1971.
- It grants citizenship to persons who entered India before March 24, 1971, recognising their right to stay in India without fear of deportation.



SC VERDICT ON CONSTITUTIONALITY OF SECTION 6A OF CITIZENSHIP ACT

The Judgement:

- The majority opinion held that Parliament has the power to grant citizenship under different conditions so long as the differentiation is reasonable.
- As the migrant situation in Assam was unique in comparison to the rest of India at the time, it was justified to create a law to specifically address it and doing so would not violate the right to equality under Article 14 of the Constitution.
- The petitioners did not provide any proof to show that the influx of migrants affected the cultural rights of citizens already residing in Assam. Article 29(1) gives citizens the right to 'conserve' their language and culture. CJI Chandrachud stated that "Mere presence of different ethnic groups in a state is not sufficient to infringe the right guaranteed by Article 29(1)".
- The cut-off dates of January 1, 1966 and March 24, 1971 were constitutional as Section 6A and the Citizenship Rules, 2009 provide 'legible' conditions for the grant of citizenship and a reasonable process.

The Dissent:

- Justice Pardiwala, in his dissenting opinion, held that

the provision was unconstitutional and suffered from "temporal unreasonableness" as it does not prescribe a time limit for detecting foreigners and determining whether they were citizens.

- This, he held, relieves the government of the burden of identifying immigrants and deleting them from the electoral rolls which goes against the objective of providing citizenship while protecting the cultural and political rights of the people of Assam.

Implications of the Ruling:

- Stability for Migrants:** The ruling provides legal reassurance to thousands of individuals and families who have lived in India for generations. It protects their rights and addresses fears of statelessness.
- Political Repercussions:** The decision is likely to influence ongoing debates surrounding citizenship and migration in India, especially in the context of the National Register of Citizens (NRC) and the Citizenship Amendment Act (CAA).
- Regional Dynamics:** In northeastern states, where migration has been a contentious issue, this ruling could either exacerbate tensions or promote a more nuanced understanding of historical migrations.
- Future Legal Frameworks:** The ruling sets a precedent for how future migration policies may be framed, potentially influencing legislative changes that address the complexities of citizenship in a diverse nation.

Conclusion:

The Supreme Court's upholding of Section 6A reflects the ongoing struggle to balance humanitarian concerns with national integrity. The decision not only impacts those directly affected but also shapes the future of India's legal and political landscape regarding migrants. As discussions continue, it is imperative for policymakers and civil society to engage in meaningful dialogue to address the multifaceted nature of citizenship in India.

Brain Tuberculosis

Context: Scientists at the Institute of Nano Science and Technology (INST) in Mohali, which operates under the Department of Science and Technology (DST), have developed an innovative method to deliver Tuberculosis (TB) medicines directly to the brain.

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- This approach effectively bypasses the blood-brain barrier (BBB), addressing a major challenge in treating brain TB, a serious condition with a high risk of death.

What is Brain Tuberculosis?

- Central Nervous System Tuberculosis (CNS-TB) is one of the most dangerous forms of TB, often resulting in severe complications or death.
- The primary obstacle in treating CNS-TB is the difficulty of TB drugs in penetrating the blood-brain barrier (BBB), which protects the brain but also restricts many medicines from reaching it.
- Traditional treatments typically involve high doses of oral anti-TB drugs, but these often fail to attain effective concentrations in the cerebrospinal fluid due to the BBB. This limitation emphasizes the need for more effective delivery methods that can directly target the brain.

About the Study:

- To enhance the delivery of TB medicines, scientists have developed chitosan nano-aggregates. These are tiny clusters of nanoparticles made from chitosan, a biocompatible and biodegradable material.
- These nano-aggregates are specifically designed for easy nasal delivery and can encapsulate TB drugs such as isoniazid (INH) and rifampicin (RIF).
- The researchers used nose-to-brain (N2B) drug delivery technology, which leverages the olfactory and trigeminal nerve pathways in the nasal cavity to bypass the blood-

brain barrier (BBB). This method enhances the availability of the drugs directly at the brain infection site.

- The mucoadhesive properties of chitosan help the nano-aggregates stick to the nasal lining, allowing them to remain in place longer and release the medication steadily. Additionally, the spray-drying process used to create these nano-aggregates ensures they are stable and can be easily administered through the nose, leading to efficient absorption into brain tissues.
- In laboratory tests, these nano-aggregates demonstrated improved adherence to the nasal cavity, delivering substantially more medication into brain cells compared to conventional TB treatments. In experiments with TB-infected mice, the nasal delivery of these nano-aggregates resulted in a nearly 1,000-fold reduction in bacterial counts in the brain compared to untreated mice, showcasing their potential as a targeted treatment for CNS-TB.

Conclusion:

This study marks a significant milestone, demonstrating that delivering TB drugs through the nose using these advanced particles can effectively treat brain TB. The new treatment ensures that the medication reaches the brain while also helping to reduce inflammation caused by the infection. Furthermore, this innovative delivery method could be applied to treat other brain infections, neurodegenerative diseases (such as Alzheimer's and Parkinson's), brain tumors, and epilepsy by enabling efficient drug delivery to the brain.

Power Packed News

Recommendation of Justice Sanjiv Khanna as 51st Chief Justice

- Chief Justice of India (CJI) D.Y. Chandrachud has recommended Justice Sanjiv Khanna, the second-most senior judge of the Supreme Court, as his successor in a letter to the Union Law Ministry.
- Upon approval by the government, Justice Khanna will become the 51st Chief Justice of India and serve a six-month tenure, concluding on May 13, 2025. Supreme Court judges retire at the age of 65. CJI Chandrachud, appointed on November 9, 2022, will retire on November 10, 2024.
- According to established convention, the outgoing Chief Justice nominates the second-most senior judge as the next CJI.
- Born on May 14, 1960, Justice Khanna enrolled as an advocate with the Bar Council of Delhi in 1983. He initially practiced in the district courts at the Tis Hazari complex, later moving to the Delhi High Court and various tribunals.
- Justice Khanna was appointed an additional judge of the Delhi High Court in 2005 and became a permanent judge in 2006. On January 18, 2019, he was elevated to the Supreme Court.

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Kaziranga National Park becomes India's second butterfly diversity centre

- Recently Kaziranga National Park, which is now home to over 446 butterfly species, has become India's second butterfly diversity centre after Namdapha National Park in Arunachal Pradesh.
- The "Butterfly Conservation Meet-2024" was organised for the first time in Kaziranga from 27 to 29 September 2024, which was attended by 40 butterfly experts from across the country.
- A new illustrated guidebook on butterflies written by Dr. Jyoti Gogoi was launched. The book documents 446 species of butterflies recorded in Kaziranga, of which 18 are new records for India. These include Burmese Threering, Glassy Cerulean, Dark-bordered Hedge Blue, Andaman Yellow Banded Flat, Ferrar's Cerulean, Great Red-veined Lancer, Peacock Oakblue, Singled, Lined Flash, Yellow-tailed Awlking, White Palm Bob, Dark-dusted Palm Dart, Clavate Banded Demon, Pale-marked Ace, Yellow Onyx, Long-winged Hedge Blue, Ace SP and Dwarf Banded Demon.
- The aim of the event was to prepare detailed records of butterflies and assess their conservation status. A total of 85 butterfly species were observed during the meeting. This record is particularly important given Kaziranga's location outside the Himalayas and Patkai mountain ranges. The main objective of this initiative was to raise awareness of the importance of butterfly conservation in Kaziranga National Park.



International Abhidhamma Divas

- On International Abhidhamma Divas, the Prime Minister highlighted India's cultural revival efforts linked to Lord Buddha. Celebrated at Vigyan Bhavan in New Delhi, the event also marked the recognition of Pali as a classical language.
- Emphasizing the importance of preserving the Pali language, PM stated that the language embodies civilization and culture, making it a collective responsibility to keep it alive.
- The government is actively developing a Buddhist circuit in India and Nepal, with projects such as the International Airport at Kushinagar and the India-International Centre for Buddhist Culture and Heritage in Lumbini.
- The Prime Minister announced plans for an upcoming visit to Varanasi to inaugurate new projects in Sarnath, reinforcing the commitment to preserving India's rich cultural heritage.
- Abhidhamma Divas commemorates Lord Buddha's teachings on Abhidhamma, integral to Buddhist philosophy.



31st Foundation Day of National Human Rights Commission (NHRC)

- The National Human Rights Commission (NHRC) of India celebrated its 31st Foundation Day on October 18, 2024.
- The NHRC has addressed over 2.3 million cases and recommended more than Rs. 254 crore in monetary relief to victims of human rights violations.

About NHRC:

- The NHRC operates under the Protection of Human Rights Act and aims to ensure the protection of individual rights related to life, liberty, equality, and dignity. It has undergone amendments through the Protection of Human Rights (Amendment) Act, 2006, and the Human Rights (Amendment) Act, 2019, enhancing its effectiveness.
- Operating in alignment with the Paris Principles, which guide national human rights institutions, the NHRC safeguards rights related to life, liberty, equality, and dignity, as guaranteed by the Indian Constitution and enforceable by Indian courts.

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