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CONTROLLING THE BRAIN WITH LIGHT: THE 2026 NOBEL PRIZE IN MEDICINE

The 2026 Nobel Prize in Physiology or Medicine has been jointly awarded to Karl Deisseroth, Peter Hegemann, and Georg Nagel for "discoveries concerning **light-gated ion channels** and **optogenetics**."

The Laureates

- Karl Deisseroth (1971) - Professor of Bioengineering and Psychiatry & Behavioral Sciences, Howard Hughes Medical Institute and Stanford University, USA
- Peter Hegemann (1954) - Professor of Neuroscience, Humboldt University of Berlin, Germany
- Georg Nagel (1953) - Professor of Molecular Plant Physiology, University of Würzburg, Germany

What Are Light-Gated Ion Channels and Optogenetics?

- Light-gated ion channels are **proteins** acting like tiny doors in a cell's membrane — but **controlled by light** instead of chemical signals. When a specific wavelength of light hits the protein, it changes shape and opens, allowing charged particles (ions) to flow through.
- **Optogenetics** is the technique built on this discovery — it lets scientists switch specific cells on or off using light, by placing **light-sensitive proteins called opsins** into targeted cells.
- As the Nobel committee put it, optogenetics has transformed neuroscience from observing and reading brain activity to actively writing into it.

The Idea's Origin: Francis Crick's Far-Fetched Theory

- The foundation for this field traces back to Francis Crick (Nobel laureate, 1962, for the double helix structure of DNA).
- Crick wanted to activate individual nerve cells to study the mechanisms underlying human consciousness.
- Since nerve signals are extremely rapid, he reasoned light would be the ideal control mechanism. He admitted the idea sounded "far-fetched" — but not impossible.

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What Optogenetics Has Revealed?

- The adult human brain has roughly **90 billion nerve cells**, often intermingled despite having entirely different functions.
- Optogenetics lets researchers separate and isolate these circuits, identifying those governing:
 - Pain, social behaviour, thirst, food consumption, reward, attention, circadian rhythm, and fever.
- The technique also works beyond the brain — Deisseroth showed forcing the heart to work harder can reinforce anxiety, while other researchers identified gut cells explaining sugar preference over sweeteners.

Moving Toward Treatments

- Optogenetics has deepened understanding of depression, anxiety, schizophrenia, Alzheimer's, and Parkinson's disease.
- In ongoing trials for retinitis pigmentosa (a disease destroying the eye's rods and cones), a channelrhodopsin-like protein placed in a blind person's retina restored partial vision — enabling them to discern and grasp objects on a table using special light-emitting glasses.
- Researchers hope optogenetics could make cochlear implants (which currently stimulate the auditory nerve electrically) more **precise**.

Addressing Safety Concerns

- Experts outlined three technical safeguards making misuse unlikely:
 - Optogenetics requires genetically modifying neurons to produce light-sensitive proteins human cells don't naturally make — this needs a deliberate genetic intervention.
 - The scalp and skull block most visible light, and what penetrates gets scattered, making precise targeting difficult from outside the body.
 - Changing specific neurons' activity does not by itself grant control over a person's thoughts or actions.

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FROM WATER INFRASTRUCTURE TO WATER SECURITY - LESSONS FOR CLIMATE-RESILIENT GOVERNANCE

- The 9th edition of the **India International Water Week** in New Delhi highlighted India's evolving approach to water management—from expanding access and building infrastructure to **ensuring climate resilience**, efficient water use, sustainable services and reuse of treated wastewater.
- The central message is that **water security** is not merely an engineering challenge; it is fundamentally a **governance and institutional**

Four Lessons for Future Water Governance:

- **Lead with governance, not just hardware:**
 - Water security requires more than taps, canals and dams. It needs political will, institutions, financing, partnerships and citizen participation.
 - The “**4 Ps**” framework, articulated through the **Delhi Declaration** (2018), highlights -
 - **Political leadership** — placing water security high on the policy agenda.
 - **Public and private financing** — meeting both capital and recurring expenditure.
 - **Partnerships** — cooperation among Union, State and local governments, communities, knowledge institutions and development partners.
 - **People's participation** — involving communities in local water planning and management.
- **Manage water resources and services together:**
 - Infrastructure is **ineffective** if the underlying water resource is unsustainable. Hence, water-resource management and service delivery must be planned together.
 - **Rapid urbanisation** and rising industrial and irrigation demand, particularly in Africa and other developing regions, make advance planning essential.

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- **Integrated** planning can prevent costly retrofitting and reduce future water insecurity. A major emerging opportunity is **water reuse**, particularly for non-potable purposes.
- **Treated** wastewater can support industries such as data centres and semiconductor manufacturing while reducing pressure on freshwater resources.
- **Put communities at the centre:**
 - Sustainable water management depends on community ownership and local institutions.
 - Bodies such as **Pani Samitis**, supported by reliable infrastructure and appropriate financial and technical assistance, can make water governance more responsive and durable.
- **Think big and build for scale:**
 - The world remains off track on **SDG 6**, which seeks universal access to safe water and sanitation and sustainable management of water resources and ecosystems by 2030.
 - Meeting this goal is estimated to require an additional \$500 billion annually.
 - India's experience with the **Jal Jeevan Mission** demonstrates the possibility of combining large-scale political commitment, financing, institutional capacity and implementation.

Way Forward:

- India's next phase of water governance must move **beyond access to sustainability** by integrating -
 - Climate resilience,
 - Groundwater management,
 - Wastewater reuse,
 - Demand management,
 - Data-driven planning and
 - Community ownership.

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PRIVILEGE VS PRESS FREEDOM: THE SUPREME COURT QUESTION THAT BEGAN WITH A 2003 NEWS REPORT

The Supreme Court began hearing a long-pending reference on the **scope of legislative privileges** — the special powers and immunities enjoyed by Parliament and state legislatures to protect their functioning.

The central question: can these privileges, under Articles 105 and 194 of the Constitution, be invoked against citizens and journalists, and can they override fundamental rights like freedom of speech under Article 19?

A seven-judge Constitution Bench, headed by Chief Justice of India Surya Kant, is hearing the matter.

The Legal Framework at Stake

- **Article 194(3):** Grants state legislatures certain privileges and immunities to protect their functioning (Article 105 does the same for Parliament).
- **Article 19(1)(a):** Guarantees freedom of speech and expression, including press freedom.
- The case turns on how these two rights interact. The petitioners argue privilege exists "to protect the functioning of the House, not to shield it from scrutiny."
- **Liberty angle:** Petitioners also invoke **Article 14 (equality)** and **Article 21 (right to life)**, arguing that when legislatures order arrest or imprisonment for alleged "breach of privilege," this affects personal liberty.
 - Any such action must satisfy constitutional guarantees of fairness, due process, and protection against arbitrariness.

How the Case Began: Tamil Nadu, 2003

- In 2003, **The Hindu** newspaper reported on sharp exchanges between the then Tamil Nadu CM J Jayalalithaa and the Opposition in the Assembly.
- The then Speaker K Kalimuthu objected, calling the reports "contrary to truth" and referring them to a Privileges Committee.

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- The controversy escalated after The Hindu published an editorial titled **Rising Intolerance**.
- It criticised crude use of state power against various sections including political opponents and the independent media as showing "**contempt for the democratic spirit**."
- The editorial stated that legislative privilege exists to protect its free and independent functioning and not to protect the reputation of the government or of individual members.
- **The outcome:** The Tamil Nadu Assembly held journalists **guilty of gross contempt and breach of privilege**, sentencing them to 15 days' imprisonment and issuing arrest warrants. Police teams were deployed across Tamil Nadu, Karnataka and Delhi to execute them.
- The journalists approached the Supreme Court, which immediately stayed the warrants and referred the matter to a Constitution Bench, noting "substantial questions of law as to the interpretation of Articles 194(3) and 19(1)(a)" were involved.

The Evolving Judicial Trend

Case	Year	Key Holding
Blitz editor case	1954	SC ordered release after editor wasn't produced before a magistrate within 24 hours
Raja Ram Pal (cash-for-query)	2007	Upheld expulsion of 11 MPs, but held parliamentary privilege is subject to judicial review
Amarinder Singh	2010	Quashed Punjab Assembly's expulsion of a former CM — privilege cannot punish conduct unrelated to House functioning
Sita Soren	2024	Seven-judge bench overruled P V Narasimha Rao (1998) , holding bribery is not protected by parliamentary immunity

• This trajectory shows the Court steadily **narrowing** the scope of unchecked legislative privilege over the decades.

What the Petitioners Argue?

- The Assembly's action violated free speech, personal liberty, and natural justice.
- Honest and courageous reporting by the press is the bedrock of parliamentary democracy," and journalists cannot function in an atmosphere of fear and terror.
- Legislative privileges are subject to Article 21; allowing a legislature to deprive someone of liberty by mere passing of a resolution would be "an anathema to the Constitution.
- Privilege protects the House's functioning, not the government — there is no concept of any parliamentary privilege being applicable to a Chief Minister... or to a government, and privilege is not intended to protect the fame and reputation of the ruling party.

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WHAT ARE JUMPING GENES?



- Jumping genes, scientifically called **transposable elements (TEs)** or **transposons**, are **DNA sequences** that **move from one location on the genome to another**.
- They are **widespread in both prokaryotes and eukaryotes**, often making up significant portions of an organism's genetic material.
- In humans, for instance, transposons account for approximately **50% of the genome**, whereas in corn, they account for up to 90%.

Types: Transposons can be grouped into distinct types based on **2 main criteria: their mechanism of movement and their independence**.

- They are classified as **retrotransposons or DNA transposons**, depending on how they move within the genome.
- They are classified as **autonomous or non-autonomous**, based on whether they require other transposons for their mobility.
- Transposons have a dual nature as **both a threat to genome stability** and a **driver of genetic diversity**.
 - On the harmful side, they **can inactivate genes or disrupt gene expression patterns by inserting into regulatory or coding regions**, leading to diseases such as hemophilia, hypercholesterolemia and various cancers.
 - However, transposons also play a **key part in evolution**.
 - For instance, in plants, **environmental stresses** like climate change can **trigger increased transposon activity**, potentially giving rise to **adaptive mutations that enhance survival**.
- Transposons can also be useful tools in the lab, with **applications in mutagenesis, transgenesis, and gene therapy**.

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EXERCISE MOUNTAIN GUARDIAN 2026



- It is a **joint military exercise** conducted between **India and UAE**.
- **Aim:** It aims to enhance **interoperability, mutual understanding and cooperation**, with a focus on **Mountain Warfare**.
- **Participating Contingent:** The Indian Army contingent comprises troops from a **Bhairav Battalion**, women officers and combatants from both Armies are also participating in the exercise across specialist roles.
- During the exercise, troops will **undertake joint planning, tactical drills, firing practices**, establishment of surveillance grids, drone operations, physical endurance training, rock climbing, obstacle training and integrated field exercises.
- The training will also incorporate **technology-enabled operations** and exchange of tactics, techniques and procedures relevant to operations in challenging mountainous terrain.
- **Significance:** The exercise will further strengthen **military-to-military cooperation** between India and the UAE and reinforce the bonds of friendship and trust between the two nations.

KEY FACTS ABOUT GREAT INDIAN BUSTARD (GIB)



- Known locally as **Godawan**, it is a **large terrestrial bird** endemic to the **Indian subcontinent**.
- It is **one of the heaviest flying birds** in the world.
- **Habitat and Distribution:**
 - It is endemic to the Indian subcontinent, with its **remaining population** concentrated **mainly in India**.

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- Its **core population** survives in the **Thar Desert**, mainly in Jaisalmer and Barmer districts of **Rajasthan**.
- **Other important habitats** occur in **Gujarat, Maharashtra, Karnataka** and **Andhra Pradesh**.
- The bird is primarily found in **dry grasslands and scrublands**, which are rapidly declining due to agricultural expansion and development.
- **Conservation Status:**
 - **IUCN Red List: Critically Endangered.**

URANIUM CORPORATION OF INDIA LIMITED (UCIL)



- It is a **Central Public Sector Enterprise (CPSE)** under the **Department of Atomic Energy**.
- UCIL is the **main organization** that **mines and processes uranium ore** to meet the **fuel needs of India's nuclear power program**.
- It plays an important role in the country's nuclear power cycle and **provides uranium for Pressurized Heavy Water Reactors**.
- Over the past six decades, the corporation has **developed expertise across underground and open-cast mining**, ore processing, technology development, occupational safety, radiation protection, and environmental management.
- The company **operates six underground mines** (Bagjata, Jaduguda, Bhatin, Narwapahar, Turamdih, and Mohuldih) and **one open pit** (Banduhurang) in the state of **Jharkhand**.
- The ore produced from these mines is processed at two processing plants located in **Jaduguda and Turamdih**.
- UCIL also **operates an underground mine and processing plant** in **Tummalapalli, Andhra Pradesh**.