

EDITORIAL HIGHLIGHTS

06-10-2026

GS 3: SCIENCE AND TECHNOLOGY THE HINDU PAGE: 01

Trio wins medicine Nobel for 'controlling' neurons with light

The Hindu Bureau
CHENNAI

A trio of scientists was on Monday declared the winners of the 2026 Nobel Prize in Physiology or Medicine for discoveries leading to a technique called **optogenetics**, which allows scientists to control select nerve cells using light.

The Nobel Assembly said the work of the laureates – **Karl Deisseroth**, **Peter Hegemann**, and **Georg Nagel** – allowed neuroscience to move beyond observing correlations and testing how particular neurons and neural circuits are related to different behaviours and emotions. Today, optogenetics helps scientists study schizophrenia, depression, Alzheimer's and Parkinson's diseases, and test treatments to restore vision and hearing loss.

In the 1990s, Mr. Hegemann, now at Humboldt University in Berlin, and his team found that **shining light on a microscopic alga called Chlamydomonas** rapidly triggered an electric signal within its body. He reasoned that the molecule involved in detecting light might be, or linked to, a protein that lets certain charged ions enter cells.

Optogenetics technique

The team of Mr. Deisseroth, who is at the Stanford University in U.S., published its first major result in 2005 using rat neurons, and a year later, the technique had its name: optogenetics.

In 2007, Mr. Deisseroth's group stimulated specific neurons in the brain of live mice with light sent through a slender fibre-optic cable, moving

Bright minds

The trio won the Nobel for contributions towards **optogenetics**, which helps in the study of schizophrenia, depression, and Alzheimer's disease



Peter Hegemann
Humboldt
University of
Berlin, Germany



Karl Deisseroth
Stanford
University,
U.S.



Georg Nagel
University of
Würzburg,
Germany

the mice's whiskers.

Since then, scientists have used optogenetics to identify networks in the brain involved in pain, attention, sleep, memories, and social behaviours.

Around 2000, Mr. Hegemann approached Mr. Nagel, currently at the University of Würzburg in Germany, who confirmed the idea in an experiment. The team identified two proteins that were channels, and they opened when exposed to light. Mr. Hegemann and Mr. Nagel showed that putting the gene for this protein in mammal cells also made them sensitive to light.

At Stanford University, Mr. Deisseroth realised this discovery could transform the way scientists study the brain. Genetic methods could make sure the protein was associated with a specific set of neurons, while light could turn those neurons on or off.

The laureates will share the prize, worth 12 million Swedish kronor (₹11.5 crore), equally.

GS 3: ENVIRONMENT

THE HINDU PAGE: 01

SC refuses to stay proceedings against Nicobar project

Krishnadas Rajagopal
NEW DELHI

Saying that "preservation of culture is a constitutionally protected fundamental right", the Supreme Court on Monday refused to agree with a Union government plea to stay Calcutta High Court proceedings in a petition filed by former Union Environment Secretary Meena Gupta challenging the Great Nicobar Island Project as a threat to the area's fragile ecosystem and Forest Rights Act, 2006.

A three-judge Bench headed by Chief Justice of India Surya Kant instead urged the Calcutta High Court to hear the case and decide the issues without delay.

Appearing for the Centre, Attorney-General R. Venkataramani and Ad-

ditional Solicitor-General Aishwarya Bhati said the project worth over ₹72,000 crore involving a container terminal was of "immense" national importance and strategic value.

'No loss of habitat'

Mr. Venkataramani said there was "no loss of habitation" for the indigenous tribal population like the endangered Shompen tribe of the Great Nicobar Island.

Ms. Bhati submitted that the National Green Tribunal (NGT) had already twice disposed of the apprehensions raised regarding the project.

It had cleared the environmental clearance given to the project, subject to conditions and the formation of a High Powered Committee to re-examine



PRESERVATION OF CULTURE
is a constitutionally protected fundamental right... tribe culture requires constitutional protection
JUSTICE JOYMALYA BAGCHI
Supreme Court judge

specific ecological impacts. She said even a review against the environmental clearance was rejected by the NGT subsequently in April 2023.

Environmental threats

However, the Calcutta High Court had entertained writ petitions claiming that the project violated the Forest Rights Act, 2006, and highlighting severe environ-

mental threats it may allegedly cause.

Justice Joyimalya Bagchi, on the Bench along with Justice V. Mohana, said there should be some degree of filtration between what constitutes the security of the state and what involved commercial interests.

"Preservation of culture is a constitutionally protected fundamental right. When you are talking about tribe cultures in Nicobar ecology... tribe culture requires constitutional protection," he observed orally.

In May, the High Court dismissed the Union government's preliminary objections regarding the locus standi of Ms. Gupta, banking on the submission that she was not a local. The High Court had scheduled the case for Novem-

ber 25 and November 26 for hearing constitutional issues centring on fundamental rights and preservation of the tribals' way of life.

Senior advocate S. Muralidhar, for Ms. Gupta, said the Centre's argument in maintainability of the writ petitions before the High Court has become academic as the tribal councils have already been implemented.

Maintainability worry

Mr. Venkataramani said the tribes were integrated, and were not in the protected category.

"There is a lot of international..." he said.

"The Shompen are classified as a Particularly Vulnerable Tribal Group," Mr. Muralidhar intervened.

The Shompen and the Nicobarese tribes are said

to be affected by the project.

The Bench said the Union government could place the NGT decisions, with whatever persuasive value they may command, before the High Court.

Mr. Venkataramani urged the top court to at least allow the Centre to continue pressing the question of maintainability before the High Court.

But the Bench said it would limit itself to asking the High Court Chief Justice to decide the case, including all the petitions, without delay.

The petitions in the High Court had claimed that the diversion of over 130 sq. km of pristine tropical forest violated the Forest Rights Act, 2006, and threatened the Shompen and Nicobarese way of life and culture.

GS 2: SOCIAL JUSTICE THE HINDU PAGE: 3

Keralam to install sanitary napkin vending machines at bus depots

The Hindu Bureau

THIRUVANANTHAPURAM

WOMN - Women on the Move and Menstrual Needs, a scheme of the Keralam's Women and Child Development department to make women's travel easier from the menstrual hygiene perspective, will be launched on Tuesday.

Often, lack of sanitary products to meet unexpected needs of women during travel poses a big hardship. Sanitary napkin vending machines, besides incinerators, will be installed at public places to reduce women's anxiety about being caught unpre-



The upcoming scheme intends to make napkins available at low prices and provide incinerators for eco-friendly disposal. FACEBOOK

pared for such emergencies as part of the 100-day programme of the State government.

Minister for Women and Child Development Bindhu Krishna, who will inaugu-

rate the scheme, said it was intended to make sanitary napkins available at low prices to women and girls who were travelling and provide incinerators for eco-friendly disposal of the

napkins after use, according to a statement.

Incinerators available

As a pilot, napkin vending machines and incinerators would be installed at 14 terminals/depots of the Kerala State Road Transport Corporation (KSRTC). Each packet would contain three sanitary napkins. It would be priced at ₹10.

The KSRTC will oversee the machines kept at depots. HLL will hand over the napkins to the KSRTC for stocking the machines. The KSRTC is charge of the incinerator maintenance too. The training for cleaning will be given to the staff by the HLL.

GS 2: INTERNATIONAL RELATIONS

THE HINDU PAGE: 04

India, Switzerland agree to expand defence, nuclear cooperation: Modi

The Hindu Bureau
NEW DELHI

India and Switzerland have identified new opportunities for cooperation in areas of defence and nuclear energy, Prime Minister Narendra Modi said, following a bilateral meeting with Swiss President Guy Parmelin on Monday.

Agreements signed by the two sides included one to extend visa durations and student permits.

Mr. Parmelin is in India for a three-day visit to commemorate the first anniversary of the Trade and Economic Partnership Agreement (TEPA) between India and the four-country European Free Trade Association (EFTA), which came into force on October 1, 2025.

"Today, we identified new opportunities for cooperation in military exchanges and defence production," Mr. Modi said in a statement following the meeting. "We also agreed



Swiss President Guy Parmelin and Narendra Modi at a joint press meet at Hyderabad House in New Delhi on Monday. ANI

to further deepen cooperation in nuclear energy."

The two countries also signed an agreement on transport, mobility, and infrastructure. "We invite Swiss infrastructure companies to invest in India at a large scale and participate in capacity building, design, and manufacturing," Mr. Modi said.

Mr. Parmelin is accompanied by a large business delegation, underscoring the Swiss business community's desire to make

the most of the TEPA. However, the Swiss President noted that there are unfinished aspects, which will spur further investments once complete.

"To continue stimulating investment, Switzerland hopes to conclude an investment protection agreement quickly," Mr. Parmelin said. "In this context, it is equally important to achieve results in the discussions on intellectual property protection."

The two countries

signed five agreements, including Memorandums of Understanding (MoU) and Letters of Intent (LoI), across a wide variety of sectors, the External Affairs Ministry said.

Multiple-entry visas

The MoU on Migration and Mobility Partnership "aims to develop migration and mobility cooperation under equal treatment principles, and to prevent and combat irregular migration/human exploitation/trafficking in accordance with national laws," the MEA said.

"It provides for multiple-entry visas for up to 5 years, including stays of up to 6 months on each visit, and renewable 1-year student permits," it added.

The Agreement on the Exchange of Young Professionals covers young people taking up temporary employment in the other country to enhance their professional and language skills within their field.

GS 2: INTERNATIONAL RELATIONS

THE HINDU PAGE: 06

‘We need to foster a middle power approach’

India, a respected actor on the international stage, can help in finding a peaceful solution to the Ukraine war, says the French Minister-Delegate for European Affairs; stressing that India and France share a common attachment to multilateralism, he says the EU seeks de-escalation in West Asia crisis

INTERVIEW

Benjamin Haddad

Suhasini Haidar
NEW DELHI

India and France have a common attachment to "strategic autonomy", says French Minister-Delegate for European Affairs Benjamin Haddad, indicating that European countries are increasingly seeking more "middle power coalitions" to hedge against the uncertainty in ties with superpowers U.S. and China. In Delhi for the 'Munich Leaders Meeting', where External Affairs Minister S. Jaishankar indicated for the first time that India is mediating between Russia and Ukraine for a specific agreement, Mr. Haddad said that he hoped India would use its "voice" to bring Russia to the table for peace talks.

You're in Delhi two months before the culmination of the India-EU FTA, which is

supposed to happen on December 16 in Brussels. Can you confirm that the date is now set, and are there any hurdles still to cross before that?

It's indeed our objective to close by the end of the year. France is very supportive of the FTA with India, which really shows the deepening of both a bilateral relationship and the broader relationship between the European Union (EU) and India. We are in a world of geopolitical turmoil, where we see that we have a common attachment to multilateralism, to cooperation, to a form of independence in international relations, which I think is what also brings France and India very close... this attachment to having strategic autonomy, to developing a sort of approach of middle powers in this world.

Do you see India and France coming together in some kind of a non-superpower coalition - with the middle powers versus the superpowers?



I don't think it's 'versus'. I think we are attached to a world that's driven by reliable partnerships, by cooperation and multilateralism in international law. We have our traditional allies, and we are very committed to the European project, but we can see that with partners like India, we share the objective of not just being passive bystanders of a rivalry between the United States and China, but also to be able to defend our own interest. In areas like access to space and leadership of AI, I think there is really an incredible potential for a partnership. The India-EU FTA will only operationalise and deepen this. And

one of the reasons for my visits, my second visit this year, is beyond just the signature of [the FTA] document; [it] is to look at how we can take it to a stronger partnership and a common voice on the international stage.

An area of disagreement is the Russia-Ukraine conflict. What is your expectation from India, given it still imports more than half its oil needs from Russia?

I've seen Indian leaders state very clearly that they want to find a peaceful solution, including Prime Minister Modi, who told President Putin that it's time to

stop the wars. In this respect, a country like India, that is a respected actor on the international stage, can play a role in working with us to find a peaceful solution, but clearly Russia continues to refuse. The best way to put an end to this war is to increase the pressure on Russia to get it back to the negotiating table, and so it means also increasing economic pressures. We generally don't lecture other countries on what they should do, but at the European level, we have adopted different packages of sanctions.

The recent BRICS Summit 'Delhi Declaration' made no mention of the Ukraine war. Does this indicate that it is now just a European problem, not for the rest of the world?

It would be [a] mistake to think that. Of course it is a European issue, as it pertains to European security. [But] this is also about international principles, not just law, [but] of the security architecture that we want. If we allow a state to

invade its neighbour, to use nuclear blackmail to conduct a conventional war on its neighbours, it creates an extremely dangerous precedent for the rest of the world, including for the nations that were at this BRICS Summit.

The U.S. invasion of Iran earlier this year, the assassination of its Supreme Leader, of civilians there, targeting of nuclear installations, also ticks all these boxes, and yet no one is asking for the U.S. to be treated the same way...

Europeans are not involved in [the Iran] war. We have always called for de-escalation. We have always called to find peaceful and diplomatic solutions, whether that's on the freedom of navigation, the Strait of Hormuz, including on tackling issues where we agree with the U.S. for example, the Iranian nuclear programme, its ballistic missile programme, its support for terrorist proxies in the region. We said the best way is to do it through a diplomatic channel.

GS 2: SOCIAL JUSTICE THE HINDU PAGE: 08

The looming crisis of world unemployment

A recent World Bank forecast reveals that the global economy stands at the precipice of a silent catastrophe. A recent warning issued by Bank President Ajay Banga is stark: over the coming decade, an astonishing 1.2 billion young men and women in the Global South will reach working age, but the global economy is projected to generate no more than 400 million viable jobs. This creates a staggering deficit of 800 million opportunities in the job market, a demographic chasm of such unprecedented magnitude that it threatens to convert what should be the greatest economic dividend of the 21st century into a catalyst for widespread instability.

A failing blueprint

For decades, economic theorists have championed the demographic dividend as the primary engine for lifting developing nations out of poverty. The formula appeared straightforward: as fertility rates decline, the proportion of working-age adults relative to dependents increases, creating a temporary window of high productivity, elevated domestic savings, and rapid capital accumulation that fuelled the East Asian economic miracle in the late 20th century. Today, however, that classic blueprint is failing. Developing nations such as India are experiencing their youth bulges at a historical moment when the traditional escalators of economic mobility are stalling. The sheer velocity of demographic growth in many countries is outstripping the rate at which domestic markets, infrastructure, and institutional frameworks can absorb new labour, turning the potential dividend into a looming crisis.

Central to the dilemma is the rapid evolution of global trade, technology, and manufacturing. Historically, light manufacturing served as the indispensable bridge for low-income nations transitioning away from subsistence agriculture, absorbing millions of unskilled and semi-skilled workers into productive urban employment. Today, automation, robotics, and advanced industrial software have drastically reduced the labour intensity of manufacturing. As a result, developing nations are experiencing premature deindustrialisation: their manufacturing sectors are losing jobs before reaching the income thresholds of industrial economies of the past. Furthermore, the modern global economy increasingly rewards high-skilled, technology-driven labour, widening the chasm for millions of youth in developing countries who lack access to modern digital infrastructure, quality vocational training, or tertiary education.

There is no easy solution. The World Bank recommends unlocking private sector capital and



Shashi Tharoor
Four-term Member of Parliament (Congress) for Thiruvananthapuram, who served nearly three decades at the United Nations, where he rose to the position of Under-Secretary-General. He has also been Minister of State for External Affairs and for Human Resource Development in the Government of India and is the bestselling author, among others, of 'Pax Indica: India and the World of the 21st century'.

A widening jobs gap threatens the promise of demographic dividends; the Global South faces an unprecedented employment challenge

dismantling the regulatory sclerosis that throttles domestic enterprise in many developing economies. Potential entrepreneurs face prohibitive costs of capital, erratic regulatory environments and predatory taxation. Complex legal frameworks and weak property rights scare away long-term foreign direct investment, confining capital to speculative assets rather than employment-generating ventures. Simplifying regulatory regimes, establishing transparent governance structures, and bolstering institutional integrity are essential preconditions for creating environments where small and medium-sized enterprises, the main engines of global job creation, can launch, grow, and hire.

India lags here, but does better in improving infrastructure, another key recommendation. A small business cannot compete in global supply chains, nor can it grow locally, if it suffers from routine power failures or exorbitant logistics costs caused by dilapidated roads and port congestion. Modernising physical and digital infrastructure serves a dual economic purpose: the construction and deployment phase itself absorbs massive quantities of immediate labour, while the resulting assets lower the cost of doing business across the economy.

Sector-specific strategies are ideal

Within this broader macroeconomic overhaul, targeted sector-specific strategies offer the most realistic pathway toward mass labour absorption. Agriculture still remains the largest employer in the developing world. Transitioning from low-yield subsistence farming to high-value, technology-enabled agri-tech and commercial agribusiness can transform rural economies. By investing in cold-chain logistics, localised food processing, and climate-resilient farming techniques, nations can create sophisticated rural value chains that offer meaningful, remunerative employment to young people, reducing the desperate tide of distress migration to the cities.

Health care and the broader care economy offer other possibilities for employment expansion. The demand for trained health-care workers, nurses, community health personnel, and elder-care specialists is exploding. Investing in health human resources delivers a powerful double dividend: it creates millions of resilient, non-outsourcable domestic jobs (predominantly for young women who are often excluded from formal labour markets) while simultaneously building the human capital necessary to sustain long-term national productivity.

Similarly, tourism and culture offer an extraordinary vehicle for decentralised job creation. Tourism is inherently labour-intensive, engages semi-skilled and unskilled workers and is resistant to total automation. It possesses a

uniquely broad multiplier effect, driving revenues down to local transport providers, hospitality workers, artisans, and historical preservation efforts. Strategic investments in sustainable tourism infrastructure and international destination marketing translates directly into widespread employment.

Manufacturing, too, must be reimagined. Modern light assembly, green-transition manufacturing (such as the production of solar components, electric two-wheelers, and energy-efficient materials) and decentralised production networks can still absorb substantial labour if paired with agile skill-building programmes.

History demonstrates that when vast cohorts of educated, energetic, and ambitious young people are denied access to productive economic life, the resulting frustration erodes trust in governments, fuels social polarisation, and creates fertile ground for extremist or criminal ideologies and civil unrest. In an interconnected world, failure to generate livelihoods in the Global South will inevitably accelerate forced migration flows toward the Global North, exacerbating political tensions worldwide.

Preventing prolonged youth unemployment from leading to global catastrophe requires an unprecedented alignment of international finance, domestic political courage, and private sector dynamism. Developed economies and multilateral financial institutions must facilitate affordable, long-term development financing and technology transfers, while developing nations must undertake the hard, often politically painful work of institutional reform. The global economy possesses the financial resources and technological tools required to meet this challenge. But can the international community muster the collective resolve to build an inclusive global order where every young person is afforded a fair opportunity to work, contribute, and thrive? In today's climate this writer would not count on it.

As the world's most populous nation, India sits at the epicentre of this dynamic, adding millions of young entrants to its workforce each year while grappling with an economy that has struggled to match GDP growth with employment creation. The nation's immediate challenge, in a dwindling demographic window, includes matching skills to markets, persistent underemployment, low female labour force participation, and an agrarian sector that still absorbs nearly half the population despite producing just 16% of GDP (FY24). India, with a median age under 30, must move toward labour-absorbing value creation. Otherwise its celebrated demographic dividend could collapse into a demographic disaster.

GS 2: POLITY

THE HINDU PAGE: 10

Why are States divided over the mining amendment?

Amendment curbs States' fiscal powers, but their responses vary with dependence and political alignment

Safira Hussain
Sanjay Kumar

In a federal country like India, differences between the Centre and the States over certain issues are not unusual. One such instance recently arose over the **Mines and Minerals (Development and Regulation) Amendment Act, 2026**, passed by Parliament.

Under the amended Act, the Centre's regulatory powers over mining have been expanded to cover not only mines and mineral-bearing lands, but also mineral-bearing lands. It bars States from imposing fresh taxes on mineral rights and mineral-bearing lands, except under conditions prescribed by the Union government. It also cancels mineral taxes imposed by States but not fully collected before the Act came into force.

Mines and minerals are a subject over which legislative powers are divided between the Centre and the States. State governments are empowered to regulate

mines and minerals under **entry 23 of the State List**, but this power is subject to central legislation as per **entry 54 of the Union List**. The latter entry gives Parliament the discretion to determine the extent of authority over mining regulation and development in the public interest. The Constitution also gives States powers to tax mineral rights and land through **entries 50 and 49 of the State List**. The recent amendment draws on the Centre's regulatory authority over mineral development to place new limits on these State-level taxing powers. So, the issue widens from mining regulation to the fiscal autonomy of mineral-rich States.

The amended provisions contradict the constitutional position articulated by the Supreme Court in 2024. The court held that States can tax mineral rights, subject to Parliament's power to limit this in the public interest, while their power to tax mineral-bearing land cannot be curtailed through Parliament's powers under **Entry 54**. The Centre has argued that uneven and multiple State-level taxes raise the

cost of domestic minerals, prompting industries to turn to imports and placing an additional burden on the exchequer. By invalidating unrecovered past dues, the law hits at the potential source of revenue for States, narrowing the prospective mineral-related revenue for some of the major mineral-bearing States.

The fiscal stakes

Mineral-related receipts account for **85% of non-tax revenue in Jharkhand and 80% in Odisha**, compared with **48% in Karnataka**, **41% in Madhya Pradesh** and **39% in Rajasthan**. Telangana and Chhattisgarh are less dependent, with mineral receipts making up **11% and 6%, respectively**. For Jharkhand and Odisha, restrictions on the ability to impose or retain mineral-related levies therefore have significant fiscal implications, while the immediate impact may be smaller in Telangana and Chhattisgarh. Odisha is particularly revealing in this regard. Despite deriving a substantial share of its non-tax revenue from minerals, the State

has not responded with a unified position. The Opposition has demanded a special Assembly session. The BJP-led State government, however, has rejected the demand and argued that the amendment would not harm Odisha's mineral revenues. Telangana, where mineral receipts account for only about **11% of non-tax revenue**, has also joined other non-NDA-ruled States intending to move the Supreme Court against the amendment. While Karnataka, Telangana, Himachal Pradesh and Kerala are planning to challenge the law in the Supreme Court, arguing that the restrictions on State taxation of mineral rights and mineral-bearing land undermine States' fiscal powers and federalism, Kerala has additionally argued that treating mineral-bearing land in this manner gives the Centre wider powers over areas such as the State's coastal and forest regions. Jharkhand has also raised objections, with the Chief Minister warning that the loss of revenue from mineral taxes could affect social-security schemes benefiting millions because the amended Act renders certain uncollected past dues invalid. By contrast, there has been no comparable challenge from States such as Madhya Pradesh, Rajasthan or Chhattisgarh so far.

The political geography of this discontent points to an interesting feature of Indian federalism. Even when the underlying concern is perceived erosion of States' fiscal space, the extent to which it becomes a federal issue varies across States. Mineral dependence creates a

material stake, while political alignment may influence whether that stake translates into an organised federal challenge.

India's fiscal federal structure comes across as asymmetric rather than purely decentralised. It gives greater taxation powers to the Centre while placing greater expenditure responsibilities on the States in several areas. The Centre has significant influence over borrowing and transfers to the States, which restricts State autonomy when they depend on the Centre's transfers or require its approval for borrowing. How much fiscal autonomy do States possess, and how far can the Union influence it often becomes a bone of contention between them.

The evolving Indian federal dynamic is marked by push and pull between the central authority and States' autonomy. Conflicts between the Centre and the States over legislative jurisdiction, fiscal resources, administrative control, and even foreign policy engagements have surfaced time and again, be it over the GST compensation, the terms of reference for Finance Commissions, the National Education Policy, the Citizenship Amendment Act, and proposed amendments to All-India Services rules, to list a few. This amendment therefore adds another fault line to India's continuing Centre-State contest over legislative authority and fiscal autonomy.

(Safira Hussain is currently associated with Lokniti-CSDS; Sanjay Kumar is a Professor and an election analyst)