Topics

- Meningoencephalitis
- Coconut husk for supercapacitor
- Prosopagnosia
- Perpetual motion: cheating nature's laws
- Seine River
- M.K. Ranjitsinh and Ors. vs Union of India
- Should education be brought back to the State list?

By saurabh Pandey

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Topics-2

- Safeguard duty
- Freedom Edge.’
- Cryo-electron microscopy (cryo-EM)
- (AZD3152)
- Pesticide protection
- NTA Proposal
- What is the Teesta proposal?
- product and process patents.

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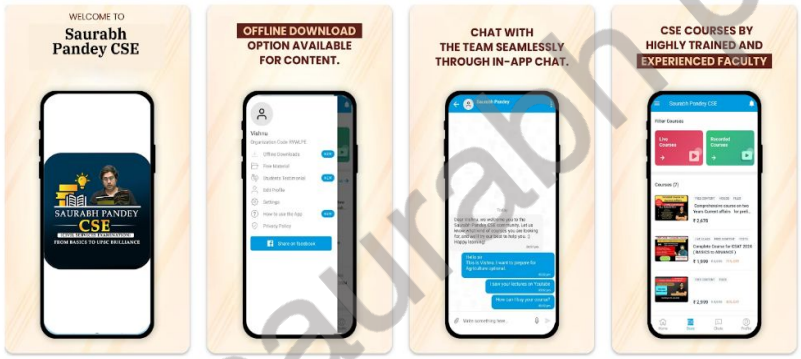

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Batch-1

BY SAURABH PANDEY SIR

Meningoencephalitis due to amoebic infection claims two lives in Kerala

A.S. Jayanth
KOZHIKODE

Unhygienic and stagnant water resources and high temperatures may be worsening situation

Unhygienic and stagnant water resources and high temperatures could be the factors contributing to the recent unusual rise in the rare, but fatal primary amoebic meningoencephalitis cases in the State.

Three cases of the infection, including two deaths, have been reported in the last two months alone. While a five-year-old girl from Malappuram district died in May, a 13-year-old girl from Kannur district lost her life in June. Another 12-year-old boy from Kozhikode district is right now undergoing medical treatment at a private hospital. First detected in Alappuzha municipality in 2016, the inection was reported in Malappuram in 2019 and 2020, Kozhikode in 2020, Thrissur in 2022, and in Alappuzha in 2023.

"There has been a rise in such cases the world over. Warming of the atmosphere and stagnant and unhygienic water resources could be some of the conditions leading to it. This type of amoeba is found to be more active in warm water," M.P. Jayakrishnan, Additional Professor, Paediatrics, Government Medical College Hospital, Kozhikode, told *The Hindu* on Sunday.

Dr. Jayakrishnan was among those who treated the five-year-old girl from Malappuram and also suspected the possibility of the infection.

"Earlier, we used to have cases of bacterial meningitis among children. But, its instances have come down of late due to vaccination. The five-year-old girl had symptoms similar to that of bacterial meningitis. That was when we thought if it could be amoebic meningoencephalitis," he pointed out.

meningoencephalitis

- **Unhygienic and stagnant water resources and high temperatures could be the factors contributing to the recent unusual rise in the rare, but fatal primary amoebic meningoencephalitis cases in the State.**
- The meninges are the layers of thin tissue that cover your brain. Meningitis is when these tissues become inflamed or infected.
- The problem is called encephalitis when your brain becomes inflamed or infected.
- If both the meninges and the brain are infected, the condition is called meningoencephalitis

Causes

- Infectious diseases, like viruses, bacteria, fungi and the amoeba Naegleria fowleri, are the main causes of meningoencephalitis.
- These infections can spread through air, water, food or close contact with somebody else who has them.
- Not everyone who gets these infections develops meningoencephalitis

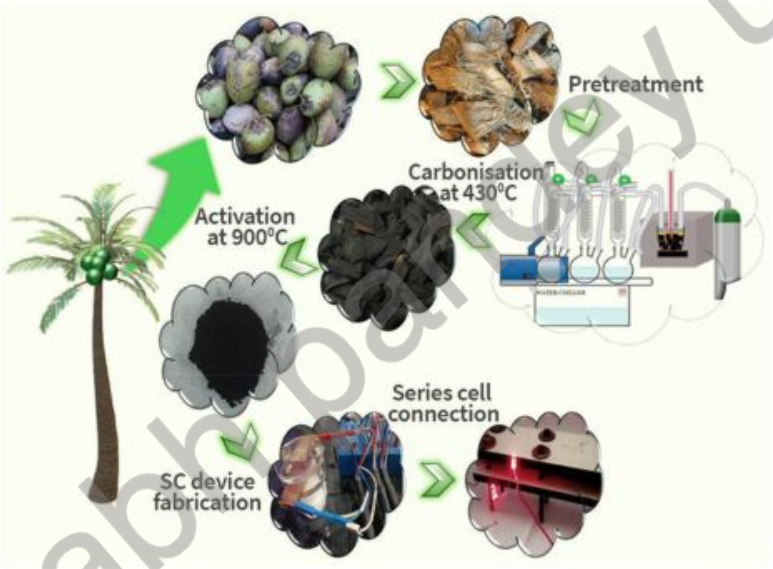
Carbon derived from coconut husks can power supercapacitors, find researchers

Sarath Babu George
THIRUVANANTHAPURAM

Researchers at the Government College for Women, Thiruvananthapuram, have devised a method to produce activated carbon, suitable for supercapacitor fabrication, from coconut husks, which are a major agricultural residue in Kerala.

The coconut husk biowaste-derived activated carbon holds immense promise for sustainable and efficient green solutions for high-performance supercapacitors owing to its availability, low cost, and eco-friendly nature.

Supercapacitors, with significantly higher capacitance and energy storage capacity than conventional capacitors, have emerged as a vital component in the quest for sustainable energy storage solutions. But, the search for an ideal supercapacitor electrode material has been a challenge.



Schematic illustration of the synthesis of activated carbon.

The research team, led by Xavier T.S., Assistant Professor, Department of Physics, and including Merin Tomy, Ganesh S.G., Anu M.A., and Sreelakshmi S.R., found the prototype supercapacitors made of coconut husk-derived activated carbon to be four-times more efficient than the existing supercapacitors. The findings have been published in the American *Sustainable Resource Management Journal*.

The team had leveraged the innovative microwave-assisted method designed at the Centralised Common Instrumentation Facility (CCIF) at the college.

Coconut husk for supercapacitor

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What is Capacitor ?

Capacitors are energy-storing devices available in many sizes and shapes. They consist of two plates of conducting material sandwiched between an insulator made of ceramic, film, glass or other materials, even air. The insulator is also known as a **dielectric**, and it boosts a capacitor's charging capacity. Capacitors are sometimes called **condensers** in the automotive, marine and aviation industries.

The internal plates are wired to two external terminals, which sometimes are long and thin and can resemble tiny metallic antennae or legs. These terminals can be plugged into a circuit.

Capacitors and batteries both **store energy**. While batteries release energy gradually, **capacitors discharge it quickly.**

Super capacitor

- Supercapacitors are electrochemical devices with following features:
  - High energy density.
  - High power density.
  - High capacitance.
  - Longer life.

- A supercapacitor or ultra capacitor is an electrochemical capacitor that has an unusually high energy density when compared to common capacitors. They are of particular interest in automotive applications for hybrid vehicles and as supplementary storage for battery electric vehicles.

Study finds gene mutation that turns familiar faces into strangers

Individuals with the misfortune of carrying the mutant gene took much longer than is socially acceptable to recognise people with whom they were expected to be familiar – such as spouses, siblings, and children – while they confused strangers with familiar people

D.P. Kasbekar

A simple joy, often taken for granted, is to unexpectedly run into a friend or a relative at a train station or market. Recognising a familiar face in an unfamiliar context or crowded place gives most of us unalloyed pleasure.

We should give thanks to our MCTP2 gene for this ability. According to research published in this month's issue of the journal *Genetics*, by researchers led by Ye Rao of Capital Medical University, Beijing, when this gene is mutated the ability to recognise faces is severely impaired.

Individuals with the misfortune of carrying the mutant gene took much longer than is socially acceptable to recognise people with whom they were expected to be familiar – such as spouses, siblings, and children – while they confused strangers with familiar people.

This disorder is called prosopagnosia, or face blindness. Its prevalence worldwide is estimated to be 1.8-2.9% in the general population. Prosopagnosia is one form of visual agnosia, or inability to identify everyday items just by looking at them.

The MCTP2 gene is thus the first found to be required for a higher form of visual social cognition in humans.

Face recognition and a gene

The researchers identified a family of 35 individuals spread across three generations. The members of its eldest generation were all older than 60 years. Nine members of the family had daily problems with recognising faces. They also performed very poorly on a standardised face recognition test. Another nine performed normally in the tests, yet they too had difficulty recognising faces.

The remaining 17 – including nine who married into the family – performed normally in the tests and had no difficulty recognising faces.

By charting the family tree, the researchers inferred that a great-grandparent of the eldest generation must have carried the mutation. The eldest members then passed on the mutation to their affected children and grandchildren.

Examining the genome of the affected family members revealed they had all inherited the same genome segment in one copy of their chromosome no. 15. Recall that we inherit two copies of each chromosome, one from each parent, and in this way each one of us possesses 23 pairs of chromosomes.

By sequencing the genomic DNA, the researchers found that the MCTP2 gene, located in this segment, had been altered by a mutation. As a result, one amino acid in the protein encoded by the MCTP2 gene had been replaced by another. The researchers didn't find this mutation in any of the hundreds of thousands of human genome sequences stored on different databases.

That is, the mutation was novel and private to this family.

Examining the genome of the affected family members revealed they had all inherited the same genome segment in one copy of their chromosome no. 15. STEWART MACLEAN/UNSPLASH

Validation from population studies

But how did the researchers conclude that face blindness was caused by precisely this mutation, and not by some other mutation in the candidate genome segment?

They came to their conclusion on the basis of a population screen. The researchers recruited a cohort of 2,904 individuals (743 male and 2161 female, all around 19 years of age) to answer an online questionnaire. The questionnaire incorporated elements of the face recognition test. Seventy-eight individuals scored very poorly: that is, their scores deviated by two standard deviations or more from the average score.

The researchers sequenced the genome of 75 of the poor scorers and found seven of them carried one of five other sequence alterations in the MCTP2 gene. This demonstrated that unrelated individuals who performed very poorly in face recognition tests were more likely to carry independent mutations in the MCTP2 gene compared to the general population.

> The MCTP2 gene is the first found to be required for a higher form of visual social cognition in humans

Additionally, the team found that the individuals' first-degree relatives, such as a parent, a child or a sibling, who shared their mutation also shared the facial recognition impairment.

These findings implicated the MCTP2 gene in face recognition.

As for the 68 others who did poorly on the test but had non-mutated MCTP2 genes: some of them might have had mutations in yet other genes for face recognition. Others might have suffered face recognition problems because of infection or injury. And still others might indeed have been false positives.

A questionnaire-based screen is unlikely to have been 100% specific for identifying individuals with face recognition deficits; for extraneous reasons, even 'normal' face recognisers might perform poorly on a questionnaire.

In the brain, the right middle fusiform gyrus, a.k.a. the fusiform face area (rFFA), is activated during facial recognition. When the researchers used functional magnetic resonance imaging to study individuals carrying the different MCTP2 mutations, they found abnormal responses in the rFFA.

When a glove becomes a puzzle

It is perplexing for most of us to imagine what it is to live with a visual agnosia. In his bestselling 1985 book *The Man Who Mistook His Wife for a Hat*, the gifted neurologist and writer Oliver Sacks (1933-2015) recounted case histories of some of his patients. Dr P. was a distinguished musician and teacher, and had a visual agnosia caused by a tumour in the brain.

When Dr P. was offered a glove and asked what it was, he described it as "a continuous surface infolded on itself, (with) five outpouchings..." He imagined it to be a change purse for coins. When asked to put on his shoe, he was unable to tell his foot from his shoe. He mistook water hydrants and parking metres on the street for children and patted them on the head. And he mistook his wife for a hat.

Baffled, Dr. Sacks wondered how a man such as this could function as a teacher at the Music School. Yet Dr. P. taught music until the last days of his life.

With the discovery of MCTP2's role, our helpless bewilderment regarding visual agnosia should give way to our first molecular glimpse of what actually might be happening in the troubled brain. Both Dr. Sacks and Dr. P. would have been pleased with this progress.

(D.P. Kasbekar is a retired scientist.)

THE GIST

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Prosopagnosia

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- **When researchers used functional magnetic resonance imaging to study individuals carrying different MCTP2 mutations, they found abnormal responses in the gyrus**

WHAT IS IT?

Perpetual motion: cheating nature's laws

Karthik Vinod

Nothing lasts forever. This is good life advice, and it also happens to be an important feature of our physical universe.

Natural philosophers considered and discarded the idea of "perpetual motion" a long time ago. The basic premise of perpetual motion is that it should be possible to operate a system without supplying power to it. We know from daily experience that this can't be true: for example, your phone's battery will drop to zero if you use it without charging.

In physicists' parlance, perpetual motion violates the law of conservation of energy. The first and second laws of thermodynamics also stipulate that anything that offers power must also liberate heat. If there was an infinite power supply, there would also have to be an infinite heat liberator. There isn't.

But this simple explanation hasn't stopped some people from wondering whether perpetual motion machines might exist. A simple example is the dunking bird toy. It uses a temperature differential between the bird's top and bottom to move back and forth. Very simply speaking, when it moves forth, its beak dips into a glass of water that flows to the bird's bottom, and the weight causes the bird to move back.

A dunking bird toy uses a temperature differential between the top and bottom to move back and forth. ROBINLEICESTER (CC BY-SA 3.0)

The dunking bird toy can work like this for a long time, but it can't move perpetually: it will stop when the temperature differential between the bird's top and bottom vanishes.

(*Karthik Vinod is an intern with* The Hindu.)

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Perpetual motion: cheating nature's laws

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BIG SHOT

Water pollution levels in Paris's Seine river remain much higher than the level allowed for swimming, data showed on Friday. The numbers arrived just one month before the start of the Olympics, in which the capital's landmark waterway is meant to be one of the swimming venues. REUTERS

Seine River

- Seine River, ancient Sequana, Second longest river in France.
- It rises on the Langres plateau, 18 mi (30 km) northwest of Dijon, and flows through Paris before emptying into the English Channel at Le Havre after a course of 485 mi (780 km). Its tributaries include the Marne and Oise rivers.

Court on climate right and how India can enforce it

Navroz K. Dubash
Senior Fellow at the Sustainable Futures Collaborative

Shibani Ghosh
Visiting Fellow at the Sustainable Futures Collaborative

Aditya Valiathan Pillai
Fellow at the Sustainable Futures Collaborative

Through its recent judgment in *M.K. Ranjitsinh and Ors. vs Union of India & Ors.*, the Supreme Court of India has dropped a large rock into the relatively placid waters of India's nascent climate change jurisprudence. It has read into the Constitution of India the right to 'be free from the adverse effects of climate change', identifying both the right to life and the right to equality as its sources. As a new government considers its imperatives and agenda, *Ranjitsinh* provides an intriguing opportunity to think through and possibly enact much more systematic governance around climate change.

A new right around climate

Scholars and legal practitioners are still unpacking the judgment. The issue before the Court was whether and how electricity transmission lines can be built through the habitat of the critically endangered Great Indian Bustard. The government claimed that a previous court order protecting the bird's habitat had affected the country's renewable energy potential. Modifying this order, the Court prioritised transmission infrastructure to enable accelerated development of renewable energy to address climate change. But the more seismic aspect of the judgment was the newly minted 'climate right' rooted in the constitutionally guaranteed right to life (Article 21) and right to equality (Article 14). Reading this right into the Constitution potentially opens the door to climate litigation, empowering citizens to demand from the government that this right be protected.

But the judgment also leaves unresolved questions. Does the Court overstate the large-scale clean energy agenda as the main pathway to avoiding climate harms and, correspondingly, understate climate adaptation and local environmental resilience? Just how will this right against the adverse effects of climate change be protected? And what might it mean for the agenda of the newly formed government? One way forward is the slow accretion of judicial decisions around this right. But another is new legislation to actively realise a right against the adverse effects of climate change.

The former approach, the proliferation of court-based action through enhanced litigation around climate claims, will likely lead, slowly and over time, to an incomplete patchwork of (judiciary-led) protections. As with many other well-meaning judicial orders directing the protection of fundamental rights, realising climate rights could become contingent on the passage of several subsequent policy actions. Moreover, a patchwork approach is less likely to chart an overarching framework to guide future policy.

> Because India is still developing, what the country needs is a law that enables progress toward low-carbon and climate-resilient development

Is the latter approach, climate legislation, then a preferred approach to protect climate rights? The judgment itself states that there is no 'umbrella legislation' in India that relates to climate change. And in so doing, seems to implicitly recognise the merits of an overarching, framework legislation. Drawing from the experience of other countries, framework legislation can bring several advantages. It can set the vision for engaging with climate change across sectors and regions, create necessary institutions and endow them with powers, and put in place processes for structured and deliberative governance in anticipation of and reaction to climate change.

Indian context is important

These are important advantages, and good reasons for India to consider climate legislation. But at the same time, it is essential that Indian climate legislation not blindly copy other countries, and is tailored to the Indian context.

Undoubtedly, India needs to transition to a low-carbon energy future, an imperative that is highlighted in the Ranjitsinh judgment. But this, by itself, is not nearly enough to enforce a right against the adverse effects of climate change. Climate legislation should also create a supportive regulatory environment for more sustainable cities, buildings, and transport networks. It should enable adaptation measures such as heat action plans sensitive to local context. It should provide mechanisms for shifting to more climate-resilient crops. It should protect key ecosystems such as mangroves that act as a buffer against extreme weather events. And, it should actively consider questions of social equity in how it achieves these tasks. In brief, it should provide a way of mainstreaming and internalising climate change considerations into how India develops. Nothing less is required to make progress toward avoiding the adverse effects of climate change.

But having a single, omnibus law that covers all these areas is not feasible, particularly in the face of an existing legal framework that legislates on most of these issues. It is impossible to anticipate upfront all the ways in which society can and should prepare for climate change. So, what is the way forward?

Here, there is scope to learn from international experience both what not to do and what directions to follow. Climate laws in many countries, often following the example of the United Kingdom, focus narrowly on regulating carbon emissions, for example, by setting regular five yearly national carbon budgets and then putting in place mechanisms to meet them. This sort of approach, which has unfortunately become somewhat of a template for countries to follow, is ill-suited to India.

Instead, because India is still developing, is highly vulnerable, and yet to build much of its infrastructure, what the country needs is a law that enables progress toward both low-carbon and climate resilient development. The distinction between a regulatory law, such as the U.K.'s, and an enabling one, like, for example in Kenya, is important to understand. A regulatory law focuses, in a narrow way, on emissions and how they can be limited. An enabling law can be written to stimulate development-focused decisions in a range of sectors across the economy – urban, agriculture, water, energy and so on – by systematically asking whether each decision moves the country closer to or further from low-carbon growth and climate resilience. Importantly, this approach emphasises adaptation as much as mitigation.

An enabling law is likely to be a more procedurally-oriented law, one that systematically creates the institutions, processes and standards for mainstreaming climate change across diverse ministries and different parts of society. For example, such a law would build in procedures to support knowledge-sharing, ensuring transparency and avenues for public participation and expert consultation, prompting meaningful setting (and revision) of targets and timelines and reporting against these.

The factor of federalism

There is another dimension essential for a climate law tailored to India: ensuring that the law works effectively within Indian federalism. Many areas relevant to climate action, from urban policy to agriculture and water fall under the authority of sub-national governments – States or local levels, and electricity also is a concurrent subject. An Indian climate law must simultaneously set a framework for coherent national action while decentralising sufficiently to empower States and local governments, and enable them with information and finance to take effective action.

Finally, the enabling role should ideally also extend beyond government. Business, civil society and communities, particularly those on the frontlines of climate impacts, have essential knowledge to bring to energy transition and resilience. Finding ways of enabling participation in decision making would enable all these sections of society to bring their knowledge to the table in addressing climate change. An effective Indian climate law based on enabling procedures would also provide opportunities for voice to diverse segments of society.

These broad ideas provide a set of principles for a climate law tailored to India, one that provides a basis for taking forward and fulfilling the promise of the Ranjitsinh judgment.

M.K. Ranjitsinh and Ors. vs Union of India

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- As a new government considers its imperatives and agenda, Ranjitsinh provides an intriguing opportunity to think through and possibly enact much more systematic governance around climate change

Should education be brought back to the State list?

When was the subject added to the concurrent list? How do other countries govern education?

Rangarajan. R

The story so far:

The NEET-UG exam has been embroiled in controversies over the award of grace marks, allegation of paper leaks and other irregularities. The government also cancelled the UGC-NET exam after it was held, while the CSIR-NET and NEET-PG exams have been postponed.

What is the historical background?

The Government of India Act, 1935 during the British rule created a federal structure for the first time in our polity. The legislative subjects were distributed between the federal legislature (present day Union) and provinces (present day States). Education which is an important public good was kept under the provincial list. After independence, this continued and education was part of the 'State list' under the distribution of powers.

However, during the Emergency, the Congress party constituted the Swaran Singh Committee to provide recommendations for amendments to the Constitution. One of the recommendations of this committee was to place 'education' in the concurrent list in order to evolve all-India policies on the subject. This was implemented through the 42nd constitutional amendment (1976) by shifting 'education' from the State list to the concurrent list. There was no detailed rationale that was provided for this switch and the amendment was ratified by various States without adequate debate.

The Janata Party government led by Morarji Desai that came to power after Emergency passed the 44th constitutional amendment (1978) to reverse many of the controversial changes made through the 42nd amendment. One of these amendments that was passed in the Lok Sabha but not in the Rajya Sabha was to bring back 'education' to the State list.

What are international practices?

In the U.S., State and local governments set the overall educational standards, mandate standardised tests and supervise colleges and universities. The federal education department's functions primarily include policies for financial aid, focussing on key educational issues and ensuring equal access. In Canada, education is completely managed by the provinces. In Germany, the constitution vests legislative powers for education with landers (equivalent of States). In South Africa, on the other hand, education is governed by two national departments for school and higher education. The provinces of the country have their own education departments for implementing policies of the national departments and dealing with local issues.

What can be the way forward?

The arguments in favour of 'education' in the concurrent list include a uniform education policy, improvement in standards and synergy between Centre and States. However, considering the vast diversity of the country, a 'one size fits all' approach is neither feasible nor desirable. Further, as per the report on 'Analysis of Budgeted expenditure on Education' prepared by the Ministry of Education in 2022, out of the total revenue expenditure by education departments in our country estimated at ₹6.25 lakh crore (2020-21), 15% is spent by the Centre while 85% is spent by the States. Even if expenditure by all other departments on education and training are considered, the share works out to 24% and 76% respectively.

The arguments against restoring 'education' to State list include corruption coupled with lack of professionalism. The recent issues surrounding the NEET and NTA have however displayed that centralisation does not necessarily mean that these issues would vanish.

Considering the need for autonomy in view of the lion's share of the expenditure being borne by the States, there needs to be a productive discussion towards moving 'education' back to the State list. This would enable them to frame tailor-made policies for syllabus, testing and admissions for higher education including professional courses like medicine and engineering. Regulatory mechanisms for higher education can continue to be governed by central institutions like the National Medical Commission, University Grants Commission and All India Council for Technical Education.

Rangarajan. R is a former IAS officer and author of 'Polity Simplified'. Views expressed are personal.

THE GIST

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Indonesia to levy safeguard duties of 100% to 200%: Hasan

Protectionist move: The duties are aimed at protecting local industry, says Trade Minister Zulkifli Hasan. REUTERS

Reuters
JAKARTA

Indonesia will impose safeguard duties of 100% to 200% on imports ranging from footwear to ceramics, reviving a plan to protect domestic industries, the Trade Minister said.

The planned import duties average more than 100%, Trade Minister Zulkifli Hasan told reporters on Friday. "If we are flooded with (imported goods), our micro, small and medium enterprises could collapse."

Southeast Asia's biggest economy issued a regulation late last year to tighten monitoring for more than 3,000 imported goods, from food ingredients to electronics to chemicals.

Reverses regulation

However, the regulation was reversed after domestic industry said it hindered the flow of imported materials needed by domestic industry.

Duties will be imposed soon and could affect imports of footwear, clothing, textiles, cosmetics and ceramics, Mr. Zulkifli said.

The Indonesian Trade Safeguards Committee is investigating to determine duty rates, senior Trade Ministry official Budi Santoso said on Saturday.

Indonesia mainly imports apparel and clothing accessories from China, Vietnam and Bangladesh, data from the statistics bureau show.

Safeguard duty

- A safeguard duty is a type of customs duty imposed by emergency action under the WTO Agreement on Safeguards.
- It is designed to prevent harm and injury to a domestic industry that would face intense competitive pressure from the continued importation of a particular good

SEOUL

N. Korea condemns drills by U.S., Japan, South Korea as 'Asian NATO'

AP

North Korea denounced joint military drills by South Korea, Japan and the U.S., calling them an "Asian version of NATO" and warning of "fatal consequences". It comes a day after the allies wrapped up the exercises, dubbed "Freedom Edge", in missile and air defences, anti-submarine warfare and defensive cyber training. AFP

Freedom Edge.’

- joint military exercise by South Korea, Japan, and the United States held this month.
- In a statement, its state media said such drills show that the relationship among the three countries has developed into the Asian version of NATO. Earlier on Thursday, the three countries began large-scale joint military drills called ‘Freedom Edge.’
- The exercise involving navy destroyers, fighter jets, and the nuclear-powered U.S. aircraft carrier Theodore Roosevelt aimed at boosting defences against missiles, submarines, and air attacks.

Anti-measles antibody prevents viral fusion: study

Cryo-electron microscopy (cryo-EM) structures of an anti-measles antibody reveal its therapeutic potential by blocking the virus's fusion process, a new study reports. The work paves the way for the next generation of measles virus therapeutics and illuminates a mechanism that may be shared by antibodies against other viral pathogens. The structures generated by the researchers also revealed an important epitope that may provide a new druggable target for MeV as well as other paramyxoviruses like mumps.

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- Cryo-EM is a version of electron microscopy that freezes many copies of a delicate sample into a glassy state and hits them with an electron beam. Electrons pass through the copies to create images into a high-res 3D model of the sample.
- Microscopy is the technical field of using microscopes to view samples & objects that cannot be seen with the unaided eye (objects that are not within the resolution range of the normal eye)

Antibody shields hamsters from SARS-CoV-2 variants

Scientists show that a new antibody therapy for COVID-19 can neutralise the Omicron strain of SARS-CoV-2 in hamsters and is safe in humans, according to their research. The antibody (AZD3152) could provide an additional layer of protection to vulnerable groups at risk of severe COVID-19. The antibody binds to the back "left shoulder" of the receptor binding domain on the SARS-CoV-2 spike protein, and is designed to be more potent against emerging variants.

(AZD3152)

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inStem's fabric offers protection from pesticides

R. Prasad

Researchers at the Institute for Stem Cell Science and Regenerative Medicine (inStem), in Bengaluru have developed an anti-insecticide fabric that effectively neutralises organophosphate-based pesticides. In an earlier work published about six years ago, the team had developed a gel for topical dermal application to deactivate the pesticides. But considering that compliance might be poor, the researchers looked at another alternative that is as effective in deactivating the insecticide but at the same time does not reduce compliance.

When esters present in organophosphate-based pesticides enter the body they bind and inhibit an enzyme (acetylcholinesterase or AChE) critical for neuromuscular function from working. Therefore, inhibition of this important enzyme is implicated in learning deficits, suffocation, paralysis, muscle weakness among others.

In a paper published recently in *Nature Communications*, the team led by Dr. Praveen Kumar Vemula from inStem coated the cotton fabric with small molecules, rendering the final product the ability to deactivate the insecticide. "The small molecules are covalently bonded with the cellulose of the fabric making the cloth not only breathable but also durable," says Dr. Vemula. The small molecules that are covalently bonded with the fabric are nucleophile in nature, and can detoxify the pesticides upon contact through nucleophile-mediated hydrolysis, says Dr. Vemula. "The fabric attacks the pesticide molecule and breaks it into non-toxic products. The pesticide is deactivated even before it reaches the skin surface," he says. The fabric with covalently-bonded small molecules was developed in collaboration with Sepio Health Pvt Ltd, a spin-off company from inStem.

Right way: The fabric deactivates the pesticide and breaks it down into non-toxic products. AP

"The fabric retains the anti-insecticide property even after washing 150 times." Though the reusability after 50 cycles was reported in the paper, the researchers continued the reusability testing and found the effectiveness to last up to 150 cycles of washing. "Unlike the gel, the reusability will make the fabric an affordable solution to prevent insecticide-induced toxicity to farmers. It will also increase compliance," he says.

According to Dr, Vemula, the small molecule-coated fabric does not act as a physical barrier to organophosphate-based insecticide. Instead, the fabric hydrolytically deactivates the insecticides, causing the prevention of insecticide-induced AChE inhibition.

To investigate the efficiency of the fabric containing the small molecules, the active AChE in the blood before and three days after exposure to the insecticide was measured in rats. While direct exposure or when normal cloth did little to halt the drop in active AChE in blood, no reduction in blood active AchE level was observed in the presence of the fabric coated with small molecules. Several organs from the exposed and unexposed rats were studied and compared, and the researchers found that the active AChE levels in the organs did not drop in the case of rats that were exposed to the insecticide in the presence of the fabric coated with small molecules. Also, while rats that were repeatedly and directly exposed to ethyl paraoxon (an activated organophosphate insecticide) or through the normal fabric died within four days, none of the rats exposed to the insecticide in the presence of the special fabric died.

Farmers get repeatedly exposed to the insecticide due to frequent usage, and this can cause chronic toxicity and severe adverse health effects. The animal study results show promise that the fabric containing the small molecules can prevent chronic toxicity in farmers, he says.

"The design of one nucleophile that can deactivate a wide range of organophosphates and carbamates was challenging. Subsequently, optimising the industry-friendly chemistry to covalently attach on the fabric was the key in developing anti-pesticide fabric," says Dr. Ketan Thorat, a former research student at inStem and coauthor of the paper.

Pesticide protection

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Why has the NTA failed to deliver?

How many examinations are under the charge of the National Testing Agency? Is it equipped to handle the large number of students and centres? What are the challenges? What are the loopholes in the system that can be manipulated by unscrupulous players?

Priscilla Jebaraj

The story so far:

The National Testing Agency (NTA) has come under intense fire over the past few weeks, with widespread allegations of cheating, paper leaks and other irregularities impacting flagship examinations such as the NEET (National Eligibility cum Entrance Test) for undergraduate medical college admissions and the UGC-NET for Ph.D and assistant professor appointments. The agency's director general, Subodh Kumar Singh, has been removed, the CBI is probing irregularities, and a high-level panel has been set up to create a roadmap for a systemic overhaul.

What is the NTA?

The NTA was set up in 2017 as a specialist, self-sustaining and autonomous organisation under the aegis of the Union Education Ministry. Its director general and governing body are appointed by the Union government. However, it is registered as a society and is a separate legal entity, which raises questions about the government's legal liability for the NTA's actions. Its main mandate is to conduct efficient, transparent and international standard tests to assess the competency of candidates for admission, and recruitment purposes. Soon after it was established, the NTA took over the conduct of major all-India examinations, such as the JEE for engineering college admissions, NEET-UG, and UGC-NET (both of which had previously been conducted by the Central Board for Secondary Education or CBSE), as well as the entrance tests for Jawaharlal Nehru University and Delhi University. The National Education Policy of 2020 envisaged a broader role,

Educationists propose broader pathways like equipping NTA better or dismantling the centralisation process

recommending that the NTA conduct an entrance or aptitude test for all universities across the country. In all, the NTA now has charge for more than 20 examinations.

Outrage and uproar: Members of the Students' Federation of India staging a protest in Vijayawada on June 22. G.N. RAO

Why have there been so many problems?

One of the main problems is that the NTA was originally intended to conduct computer-based tests only. "This will ensure that high volume can be processed in a short period of time," says the agency's website, claiming that such online testing will "eliminate the possibility of leakage of questions and question papers, post-test malpractice of filling in the OMR sheets, late entry of students to cheat in the test, subjectivity errors on descriptive testing, etc...In a short period of three years, all the tests administered by NTA will be computer adaptive. This will completely eliminate the problem of cheating," it declares. Thus, when the NTA took over conduct of the UGC-NET examination from the CBSE six years ago, it was converted from a pen-and-paper examination to a computer-adaptive test. This year, however, for reasons that are unclear, UGC-NET shifted back to the pen-and-paper mode. The day after it was conducted for over 11 lakh aspirants, the government cancelled the examination, citing inputs from the cyber crime unit.

"Pen-and-paper is a heaven for scamsters," said one former official, noting that the printing process is particularly vulnerable to leaks. It is interesting that when the government announced fresh dates for UGC-NET 2024 to be held again, it also stipulated that it would be a computer-adaptive test this time.

However, when the conduct of NEET-UG was taken over by the NTA, the Health Ministry flatly refused to allow it to shift to a computer-based exam, citing concerns about students in rural areas who would not be prepared for an online exam, as well as Supreme Court rulings on how the examination should be conducted. Hence, the NTA has been forced to run a major examination in a mode that it was never intended to implement by design.

Officials and educationists note that the agency is severely understaffed for the role it is currently being asked to undertake. According to a senior official, the agency was set up with only about 25 permanent staff positions. A number of its functions have also been outsourced to technical partners from the very beginning. Given that NEET-UG alone had more than 23 lakh candidates writing the examination in almost 5,000 centres across the country and abroad, this has left the agency stretched thin, according to some officials. "The NTA was set up to be a lean, professional organisation. The more people, the higher risks. The NIC [National Informatics Centre] simply does not have the capacity or IT infrastructure needed, so it was always meant to engage third-party technical partners which have the robust cyber security expertise needed to run large-scale computer based examinations," said R. Subrahmanyam, former Higher Education Secretary who was in charge at the time the NTA was set up. However, some educationists have complained that engaging third-party players takes accountability out of the government's hands and leaves loopholes in the system which can be exploited by unscrupulous players.

Officials say the NTA has also failed to develop robust mechanisms needed to handle a large-scale pen-and-paper examination, including the setting of the question paper and its encryption, selection of external printing presses and exam centres, transportation to printing presses, storage and distribution to examinees at examination centres and then the collection and transportation of answer sheets to evaluation centres. Each of these is a stage where malpractice can occur without robust security mechanisms.

What is the way ahead?

The high-level panel headed by former ISRO chief K. Radhakrishnan has been given two months to recommend reforms in the examination process, improve data security protocols, and overhaul the NTA's functioning.

Educationists, however, propose starkly different pathways for the future. One option is to add manpower and infrastructure to the NTA to equip it to take on large-scale pen-and-paper examinations in an improvement to the CBSE system that preceded it. Those recommending this return to the past point out that pen-and-paper examinations are more equitable, especially for students in rural and remote areas with little access to technology.

Another option is to dismantle the centralisation process that seeks to move all testing in the country under the NTA. Some State governments, and professors from individual universities, notably JNU, have called for entrance tests for their institutions to be removed from the NTA and handed back to the institutions themselves, arguing that more decentralised structures are needed to meet the vastly differing needs of institutions.

However, others seek a more radical reform of the assessment system. They suggest systemic changes to remove the single, high-stakes entrance examination which results in extreme pressure on students, encourages an inequitable coaching industry, and incentivises malpractice. Instead, periodic assessments of knowledge, concept-based understanding, and aptitude can be conducted in the final years of school education as the precursor to the admission process, using online testing, and AI-based proctoring which can be overseen by the NTA.

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What is holding up the Teesta treaty?

What has the Indian government told Bangladesh? What is the technical team going to look into? Why is Bengal Chief Minister protesting this development? What about the Ganga water sharing agreement? When does it come up for renewal? What is the state of both the rivers?

Shiv Sahay Singh

The story so far:

During the recent state visit of Sheikh Hasina, Prime Minister of Bangladesh, to India, Prime Minister Narendra Modi on June 22 said: "A technical team will soon visit Bangladesh to discuss conservation and management of the Teesta river in Bangladesh." The remark triggered fresh speculation about the Teesta water sharing treaty with Bangladesh, a key bilateral agreement that has been pending between the two countries for over a decade.

What is India's stand?

After Mr. Modi's comment, Foreign Secretary Vinay Kwatra told the media that the discussion "between the two leaders was less about water sharing per se, and more about the management of the water flows within Teesta". West Bengal Chief Minister Mamata Banerjee took issue with the Centre's stand. On June 24, she wrote a letter to Mr. Modi conveying her strong reservation that no discussion on the sharing of Teesta waters should be taken up with Bangladesh without the involvement of the State.

Why is Bengal upset?

Ms. Banerjee pointed out that if Teesta's water is shared with Bangladesh, lakhs of people in north Bengal will get severely impacted. This is not the first time she has voiced her opposition to the proposed water sharing agreement of India with Bangladesh. In July 2019, the Trinamool Congress chairperson admitted that Bangladesh is hurt because the Teesta waters could not be shared and added, "If I had the ability, I would have definitely shared Teesta waters with them." In 2017, the Chief Minister had also referred to an alternative proposal of sharing waters of the Torsa, Manshai, Sankosh and Dhansai rivers but not Teesta.

Bengal claims if Teesta water is shared with Bangladesh, lakhs of people in north Bengal will get severely impacted

In all, 54 rivers flow between India and Bangladesh and sharing of river waters has been a key bilateral issue. India and Bangladesh agreed on the sharing of waters of the Ganga in 1996 after the construction of the Farakka Barrage and by the 2010s the issue of sharing of the Teesta came up for negotiation. In 2011, during the United Progressive Alliance-II government, India and Bangladesh were close to signing an agreement on the Teesta but Ms. Banerjee walked out of the deal, and since then, the agreement has been pending.

Extreme weather: The flooded bank of the Teesta river following heavy downpour, in Siliguri, West Bengal, on June 14. PTI

What is the proposal?

In 2011, when the proposal for sharing Teesta water was drawn up, it was said India would get 42.5% and Bangladesh 37.5% of the river water from December to March.

A tributary of the Brahmaputra, the Teesta river originates from the Tso Lhamo Lake at an elevation of about 5,280 metres in north Sikkim. The river travels for about 150 km in Sikkim and 123 km in West Bengal, before entering Bangladesh from Mekhligunj in Cooch Behar district; it flows another 140 km in Bangladesh and joins the Bay of Bengal. Teesta is Bangladesh's fourth largest trans-boundary river and its floodplain covers an area of 2,750 square kilometres in Bangladesh. But 83% of the river's catchment area lies in India and the remaining 17% is in Bangladesh, supporting 8.5% of its population and 14% of its crop production.

What are the political considerations?

While the Awami League government in Bangladesh is facing questions from the Opposition about the delay in inking an agreement on the Teesta, the dams for hydro-electric power generation in Sikkim and the Teesta Barrage Project at Gazoldoba in West Bengal is making the flow of the river erratic in Bangladesh, leading to either floods or scarcity of water. The visit of a technical team from India to discuss conservation of the Teesta in Bangladesh also comes amid the backdrop of China proposing major dredging work on the river and building reservoirs and embankments in 2020. The Bangladesh government has put the proposal on hold for the past four years.

Soon after returning to Bangladesh, Prime Minister Hasina announced that her country would accept India's proposal to develop the Teesta River basin. Ms. Banerjee raised questions about the health of the Teesta river after the construction of a series of hydropower projects in Sikkim, deforestation in upper catchment areas and impact of climate change. She expressed surprise that no concrete steps have been taken by the Ministry of Jal Shakti to restore the river to its original form and health on the Indian side when a bilateral cooperation between India and Bangladesh for restoration of Teesta in Bangladesh is being proposed.

Environmental activists have also been raising questions on the ecological impact of hydro-electric projects on the river. In October 2023, a glacial lake outburst triggered floods in the Teesta basin that claimed hundred lives and destroyed the Teesta III hydroelectric dam.

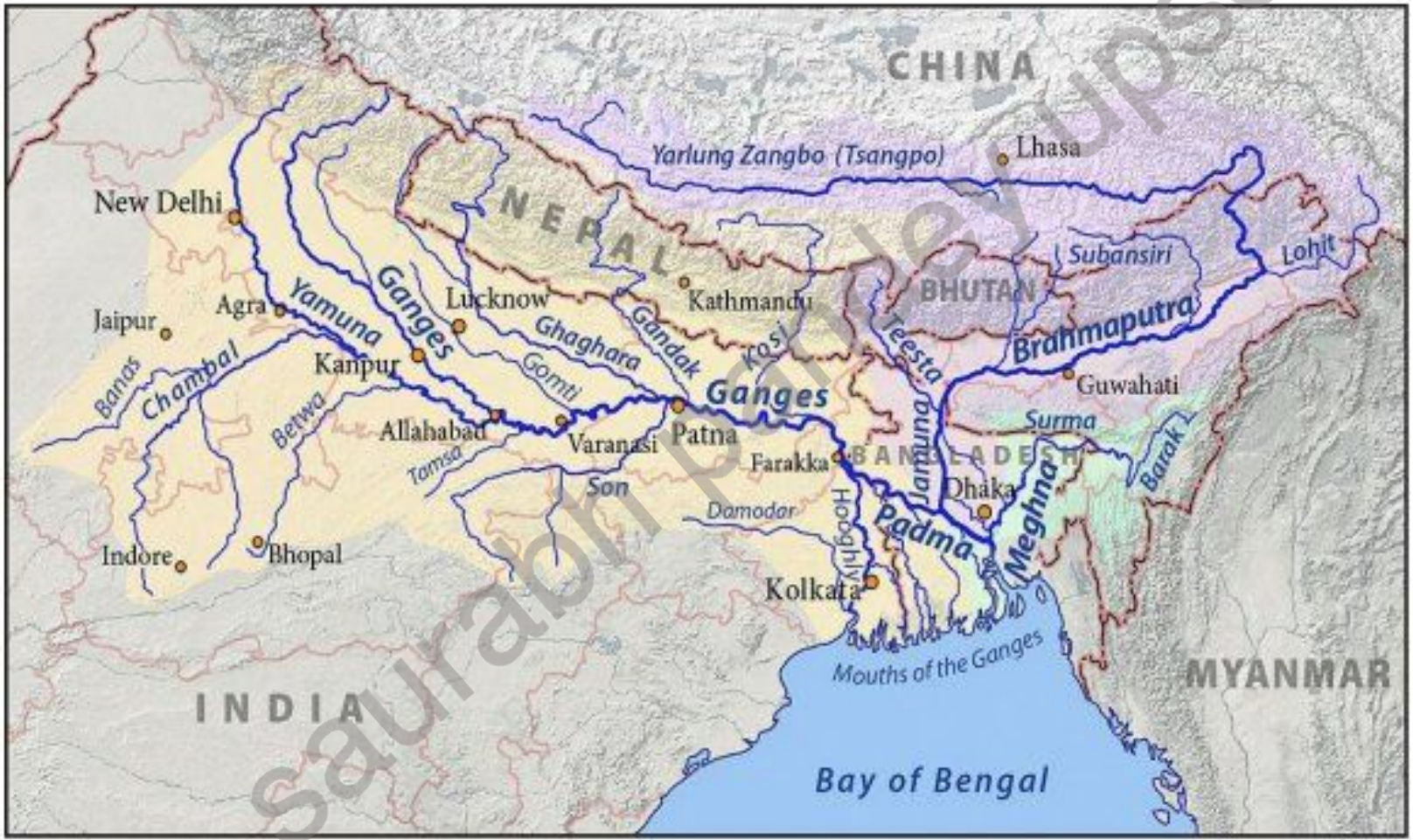
Sharing of waters of transboundary rivers have been mandated by international laws including The Helsinki Rules on the Uses of the Waters of International Rivers in 1966. Article 253 of the Indian Constitution gives powers to the government to enter any transboundary river water-related treaty with a riparian state.

Why is Bengal talking about Ganga treaty?

The Ganga water sharing treaty with Bangladesh completes 30 years in 2026 and a renewal of the agreement is on the cards. The Trinamool Congress chairperson has pointed out that water sharing with Bangladesh has changed the Ganga's morphology and affected lakhs of people in West Bengal owing to river erosion.

"Lakhs of people have been displaced from their habitation rendering them homeless and also leading to their loss of livelihood. The reduced silt load in Hooghly has impeded the nourishment of the Sundarban delta," she wrote in the letter to the Prime Minister.

The Ganges-Brahmaputra Basin



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What was the tussle over Covaxin IPR?

What are the rules for patenting the intellectual property rights of a vaccine? Why was the ICMR not included?

Jacob Koshy

The story so far:

The maker of the indigenous coronavirus vaccine, Covaxin, Bharat Biotech International Limited (BBIL), has admitted to an "inadvertent error" in patent filings to protect the vaccine's Intellectual Property Rights (IPR). One of India's leading biotechnology companies, it had failed to include scientists from the Indian Council of Medical Research (ICMR) as co-inventors in the Covaxin patent filings.

What kind of rights govern vaccine patents?

India's patent laws govern both product and process patents. Product patents grant an inventor a monopoly over, say, a drug. Process patents bar competitors from making a similar drug using the same sequence of steps. In response to queries from *The Hindu*, Bharat Biotech said it had patented the process, namely of making a batch of vaccines from the virus strains that were provided by the ICMR-NIV (National Institute of Virology). This is the lab that has expertise in extracting viruses from blood samples, identifying its characteristics, conducting various tests to gauge its infectiousness and quality it in comparison to related strains. However, preparing a vaccine out of this at an industrial scale is beyond the capabilities of a lab and requires a different order of facilities that only established vaccine manufacturers have. Covaxin is an inactivated version of COVID-causing coronavirus; once injected into the body it coaxes it into producing antibodies that can potentially protect against severe disease from a coronavirus infection. To do this effectively, an "adjuvant" is added which increases the vaccine's potency. Vaccine makers may have their own ways of bringing all of these steps together and, given the competitive nature of the field, strive to ward off competitors from imitating these processes to gain a temporary monopoly in the market and rake profits.

Bharat Biotech International Limited had collaborated with the Indian Council of Medical Research-National Institute of Virology for all the steps in developing a vaccine

To be sure, while companies are free to file for a product or process patent in as many countries as they can afford, a patent is only granted after regulatory authorities grant them one or are convinced that this process is indeed novel or inventive. BBIL, as far is publicly known, hasn't yet been granted these patents.

What were the roles of BBIL and ICMR?

BBIL had collaborated with the ICMR-NIV for all the steps in developing a vaccine. The two organisations had signed an agreement that spelt out each entity's responsibilities. As ICMR is a public entity and because of the scale of the COVID crisis, there were Right To Information requests to make this agreement public. However, it was only in July 2021, that parts of the agreement were made public in Rajya Sabha.

Beyond transferring the strains and making vaccines, the agreement said, ICMR would also test these vaccines on animals – rodents to monkeys – and then on people to establish that the vaccine worked as intended. The ICMR also funded these clinical trials – ₹35 crore – and incurred costs in developing Covaxin. In return it was to get 5% of royalties that BBIL earned from the sale of Covaxin. Since the announcement of the BBIL and ICMR collaboration, it was generally accepted that both entities would contribute to the vaccine and would therefore hold "joint intellectual property rights," as was stated in Parliament.

However, BBIL first told *The Hindu* that it made a distinction between the rights governing the making of the vaccine and the rights over the data generated from clinical trials. The ICMR hadn't invested in the actual making of the vaccine and so wasn't included in patent applications. However, a day after the matter became public, BBIL said it had made a mistake, and that it would be making amends by filing fresh applications that listed ICMR personnel as inventors. It is unclear what prompted this.

Why does being cited as an inventor matter?

IPR is a vast, complex domain and spans the minutest parts of the product invention process. As the development of pharmaceutical products involves a wide range of expertise, it is hard for single firms or entities to develop everything in-house. Just like the BBIL-ICMR collaboration, companies may enter into several licensing agreements – BBIL for instance had a technology licensing agreement with Viravax for the adjuvant – with other companies. If a single product thus involves multiple entities and collaborators, being listed as an inventor has a bearing on the sharing of intellectual property rights, royalties and even determining how a product can be used. There is no field of human activity that is untouched by disputes over IPR. In patent filings, not listing out all the inventors – in the U.S especially – could even lead to patent applications being rejected.

- **T he maker of the indigenous coronavirus vaccine, Covaxin, Bharat Biotech International Limited (BBIL), has admitted to an “inadvertent error” in patent □lings to protect the vaccine’s Intellectual Property Rights (IPR).**
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- Product patents grant an inventor a monopoly over, say, a drug. Process patents bar competitors from making a similar drug using the same sequence of steps. In response to queries from

Adjuvant

- An adjuvant is a substance that enhances the immune system's response to the presence of an antigen.
- They are commonly used to improve the effectiveness of a vaccine. Generally, they are injected alongside an antigen to help the immune system generate antibodies that fight the antigen.

- The purpose of adding adjuvants into vaccines is to boost the immune system response and to allow for fewer doses or lesser quantities of the vaccine to be administered.
- Aluminum, one of the most commonly used adjuvants, was first discovered to have adjuvant properties back in 1926.
- Research has revealed that adjuvants are likely generating immuno-competent environments at the location of the vaccine injection through the activation of an innate immune response.

New criminal laws in effect; amendments soon

Till the BNS gets a new section on sexual crimes against men and transgender persons, police can invoke allied charges such as wrongful confinement and physical hurt if they receive such complaints; Union government officials say the States are free to bring in their own amendments to some provisions of the BNSS that replace the Cr.PC.

Vijaita Singh
NEW DELHI

Crime and punishment

The new Bharatiya Nyaya Sanhita has 358 Sections against the 511 in the Indian Penal Code that it replaces. The Bharatiya Nagarik Suraksha Sanhita replaces the Code of Criminal Procedure, and the Bharatiya Sakshya Adhiniyam comes in place of the Indian Evidence Act

ISTOCKPHOTO

What is new?

- Provision for **Zero FIR** allowing filing of a first information report at any police station, regardless of jurisdiction
- **Online registration** of police complaints and mandatory videography of crime scenes for all heinous crimes
- A person can now report incidents by **electronic communication**, without the need to visit a police station
- Judgment in criminal cases has to come **within 45 days** of completion of the trial
- Provisions against false promise of marriage, gang rape of minors and **mob lynching**
- Statement of a woman rape victim will be recorded by a woman police officer **in the presence of her guardian or relative**
- Death sentence or life imprisonment for **gang rape of a minor**
- **Sedition** has been replaced with 'secession' or 'act against the country's sovereignty, unity and integrity'

As three new criminal laws come into effect across the country from Monday despite objections from States ruled by non-BJP parties, Union government officials said here on Sunday that the States were free to bring in their own amendments to some provisions of the Bharatiya Nagrik Suraksha Sanhita (BNSS) that replaces the Code of Criminal Procedure (Cr.PC.). The BNSS prescribes the procedure and conditions for arrest, bail, and custody, among other things.

The Bharatiya Nyaya Sanhita (BNS), which replaces the Indian Penal Code, 1860, may also be amended soon to incorporate a section on sexual crimes against men and transgender persons. A senior government official said that police officers were being asked to invoke other allied sections under the BNS, such as wrongful confinement and physical hurt, if they get such complaints, until an amendment is brought to correct this anomaly.

The Bharatiya Sakshya (BS), which replaces the Indian Evidence Act, 1872, is the third law which will come into force.

From 00:00 hours on July 1, more than 650 district courts and 16,000 police stations across the country will have no option but to migrate to the new system. Cognisable offences will be registered under Section 173 of the BNSS, instead of Section 154 of the Cr.PC.

The IPC and Cr.PC will run concurrently along with the new laws as several cases are still pending in courts and some crimes that took place before July 1 that are reported later will have to be registered under the IPC.

'Hand-holding done'

On June 21, West Bengal Chief Minister Mamata Banerjee wrote to Prime Minister Narendra Modi seeking deferment of the implementation of the laws passed by Parliament in December 2023.

However, a senior government official told *The Hindu* that training and hand-holding has been done for all States to help them adapt to the new system.

First information reports (FIRs) are filed through the Crime and Criminal Tracking Network Systems (CCTNS), a programme that functions under the National Crime Records Bureau. A significant upgrade to the CCTNS will help people file an e-FIR, without visiting a police station, and a zero FIR, which can be filed irrespective of the jurisdiction of the crime location.

The official said that changes have also been made to the CCTNS software to register FIRs in languages other than English and Hindi.

Electronic evidence

The BNSS mandates compulsory audio-video recording of search and seizure in each criminal case and mandatory forensic examination in all cases where an offence attracts punishment of seven years or more.

The recordings will have to be submitted before the court electronically "without delay."

Under Section 105 of the BNSS, the scope of audiovisual recording during search and seizure includes the process of preparing a list of seized items and the signature of witnesses.

While the Home Ministry is testing eSakshya (e-evidence), a mobile based application to help police record scene of crime, search and seizure in a criminal case and upload the file on the cloud-based platform, several States depending on their capacities have devised their own systems.

For instance, the Delhi Police have developed an e-pramaan application which will help investigating officials record a scene of crime and generate a hash value along with a certificate under Section 62 of Bharatiya Sakshya.

Officials pointed out that the security of the cloud-based system where the data will be stored will be of prime concern.

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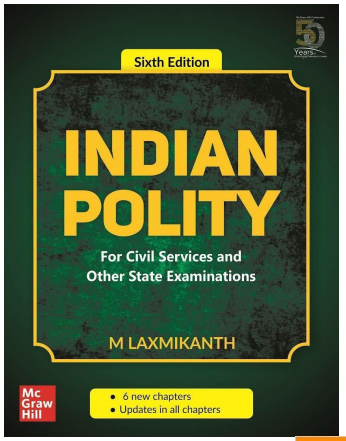

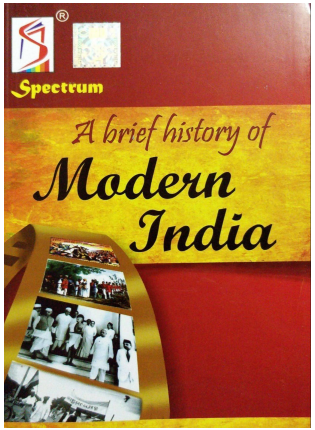

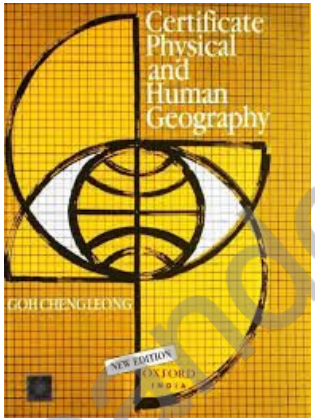

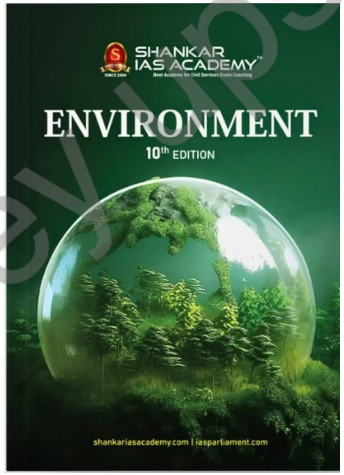

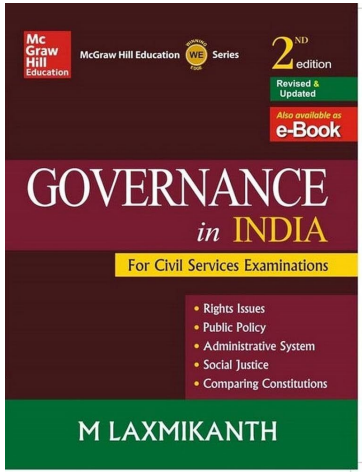

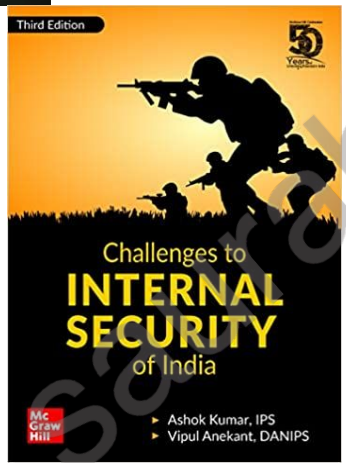

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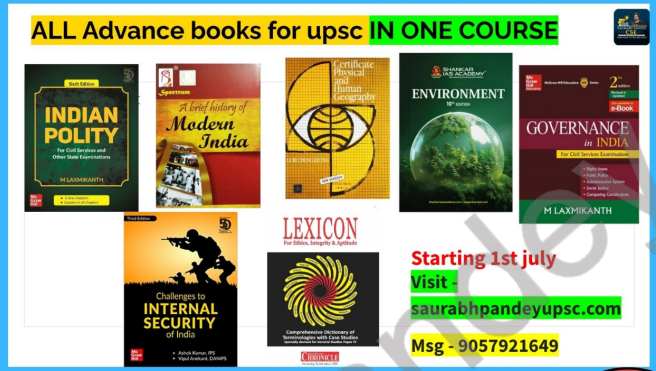

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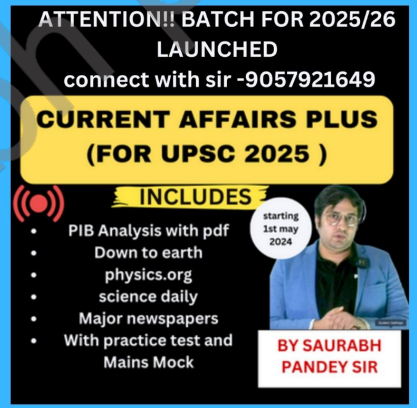

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