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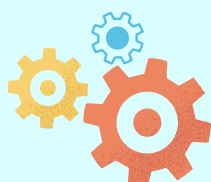


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## SCIENCE & TECHNOLOGY

### IISc scientists develop novel technique to encapsulate liquid droplets used for various applications

Droplets play a crucial role in microreactors, drug delivery systems, in single crystal growth and cell culture platforms.

Scientists at the Indian Institute of Science (IISc) have developed a novel technique to encapsulate liquid droplets used for various applications, including single crystal growth and cell culture.

“The technique exploits the capillary effect-the rise of a liquid through a narrow space - to coat droplets in a composite shell containing oil-loving and hydrophobic particles.



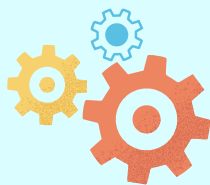
*In cell culture platforms, droplets can be used to grow cells in a controlled environment, which can help to improve cell viability and proliferation*

It offers the ability to tune the shell thickness over a wide range, allowing the encapsulation of droplets of different sizes,” said IISc. The study was published in ‘Nature Communications’.

### Significance of droplets

Droplets are important in a variety of fields. “In microreactors, droplets can be used to create different reaction environments or mix different chemicals. In drug delivery systems, droplets can be used to deliver drugs or other agents to specific tissues or organs. In crystallisation studies, droplets can be used to control the growth of crystals. And in cell culture platforms, droplets can be used to grow cells in a controlled environment, which can help to improve cell viability and proliferation,” said lead researcher Rutvik Lathia, a PhD student at the Centre for Nano Science and Engineering (CeNSE), IISc.

Source: <https://www.thehindu.com/news/cities/bangalore/iisc-scientists-develop-novel-technique-to-encapsulate-liquid-droplets-used-for-various-applications/article67637338.ece>



## IISc researcher comes up with water pumping system that requires zero electricity

Punit Singh, associate professor at the Centre for Sustainable Technologies (CST), has been working on a solution to address the irrigation scarcity in Chhattisgarh for the past 10 years



*Professor Punit Singh's efforts started with a field survey to understand the soil and terrain of Taipadar village in Bastar district of Chhattisgarh.*

The efforts of a researcher at the Indian Institute of Science (IISc.) have resulted in villages in Chhattisgarh being equipped with a sustainable water pumping system that requires zero electricity. Punit Singh, associate professor at the Centre for Sustainable Technologies (CST), has been working on a solution to address the irrigation scarcity in Chhattisgarh for the past 10 years. His efforts started with a field survey to understand the soil and terrain of Taipadar village in Bastar district.

According to IISc, due to Mr Singh's efforts, Taipadar is now equipped with a sustainable water pumping system that requires zero electricity. His project uses low-head check dams and cascades of such dams along rivers, with turbine pumps installed to pump water without any electricity.

The turbine uses about 90% of the river water flow at low head (which is then recycled back to the river) to generate power, specifically torque and speed, which is then used to drive standard submersible multi-stage pumps. The novelty lies in the precise design of the system.

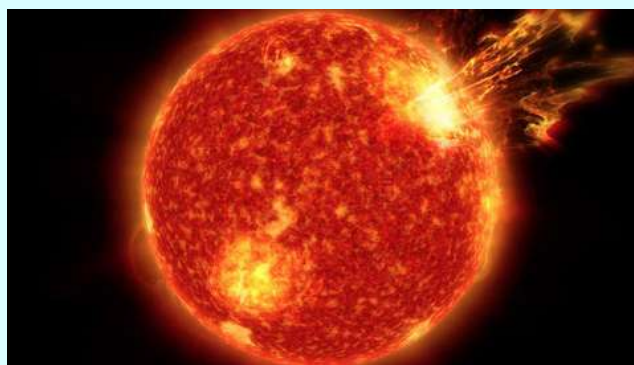
Depending on specific site conditions, where the water head ranges from 2-4 metres, the objective is to lift and transport water to different elevations, usually between 15 and 25 metres, or even up to 30 metres, if required.

Mr Singh started working on developing turbine pumps for electricity generation during his PhD at the Karlsruhe Institute of Technology in Germany. When he returned to India in 2009, he started exploring the deployment of ram pumps in Chhattisgarh, starting with Taipadar.

*Source: <https://www.thehindu.com/sci-tech/technology/iisc-researcher-punit-singh-professor-comes-up-with-water-pumping-system-that-requires-zero-electricity/article67613812.ece>*

## IIA SCIENTISTS TRACE THE SOURCE OF SOLAR BURST WHICH OCCURRED IN 2013

The study published in MNRAS asserts that simultaneous multiwavelength observations from different vantage points are very important to reveal the origin of CMEs from the sun



*Image used for representative purpose only. | Photo Credit: NASA Goddard Space Flight Center*

Scientists from the Indian Institute of Astrophysics (IIA) probing the evolution of a prominence eruption (PE) that occurred from the west-limb of the Sun in 2013 have traced the source of the solar burst. Using ground-based optical and radio telescope data, as well as data from space-based satellites of NASA, scientists from IIA studied a unique PE that occurred on December 4, 2013. This could help in a better understanding of what makes space weather tick.

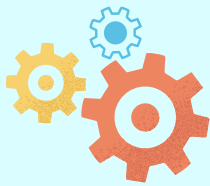
“The sun often ejects plasma and magnetic fields in the form of coronal mass ejections (CMEs). These CMEs are typically associated with features on the solar disk known as filaments or prominences. The triggering mechanisms of these erupting features are of great scientific interest in determining the speed of the CME and its impact on space weather, and hence the potential harm they can cause to our satellites and communication networks when they hit the Earth,” states the Department of Science and Technology.

### Predicting path not easy

Prediction of the exact path of the CME through interplanetary space, and hence its effect on Earth (or geoeffectiveness), is not easy, and is a subject of intense research. Therefore, studying CMEs that were geoeffective as well as those that did not make it, are both essential to make progress.

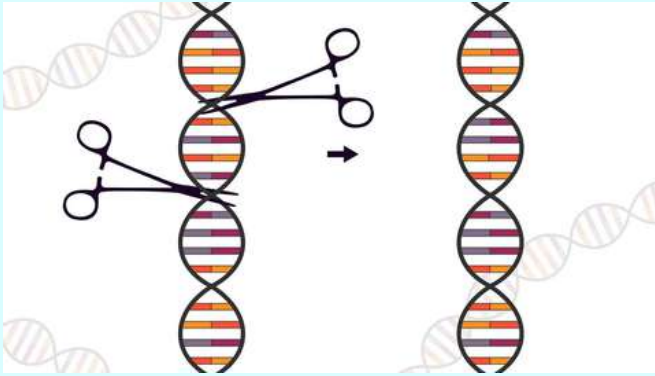
This PE was associated with a slow CME that propagated a distance of only 40 times the radius of the Sun in the Sun's atmosphere, as well as a weak solar flare. It was found that the average acceleration of the prominence is quite small compared to strong flares, which is why the associated CME was slower.

*Source: <https://www.thehindu.com/sci-tech/science/iaa-scientists-trace-the-source-of-solar-burst-which-occurred-in-2013/article67650343.ece>*



## THE ERA OF CRISPR THERAPEUTICS IS HERE – WHAT CAN WE EXPECT?

While the approvals for CRISPR-based therapeutics are exciting, they are all based on first-generation technologies.



Imagine a future where genetic anomalies can be precisely targeted and corrected using genome editing – a giant leap from our ability to sequence or read human genomes two decades ago. The world of medicine is currently abuzz with news of regulatory agencies' approval for two highly anticipated CRISPR-based therapies for sickle-cell disease and  $\beta$ -thalassaemia in the U.K. and the U.S.

The approval is groundbreaking because it augurs an era that could transform the lives of millions of patients and families grappling with these inherited blood disorders. To put this in perspective, more than a million people worldwide suffer from thalassemia, of whom 100,000 depend on regular blood transfusions. Another 20 million people around the world are estimated to be suffering from sickle-cell anaemia.

### Long and short of CRISPR

The discovery of the CRISPR system was the result of almost three decades of pure academic pursuit. Clustered regularly interspaced short palindromic repeats (CRISPR) are DNA elements that Spanish researchers discovered in archaea in 1993, and named and described later in a number of bacterial genomes.

These elements contain pieces of genetic material derived from viruses that infect bacteria (i.e. bacteriophages) and a set of proteins called Cas, or CRISPR-associated. Researchers tried to explain the elements' effect on antiviral immunity in 2005, but later found that CRISPR + Cas proteins could detect and prevent viral infections. That is, the two formed an antiviral defence system and helped bacteria 'acquire' resistance.

Then, in 2010, scientists demonstrated that CRISPR + specific proteins called Cas9 had the ability to cut double-stranded DNA at specific points. They also found the RNAs molecules that guided the Cas9 proteins to specific positions on a genome. And in 2012, researchers figured out a way to create synthetic RNA that could bind to Cas9 and guide it to a specific point on a DNA, where it could edit the DNA.

Source: <https://www.thehindu.com/sci-tech/science/crispr-casgevy-sickle-cell-disease-genetic-therapeutics-explained/article67641478.ece>

## SCIENTISTS REVEAL PHYSICS BEHIND STARS' UNUSUAL 'SUPERFLARES'

Scientists have used computer models to understand how "super flares" on brighter stars than the Sun work.



A video of a coronal loop taken by the Solar Dynamics Observatory. (University of Hawai'i)

Although it may look like a static ball of fire in the sky from our perspective, the Sun is very active and produces solar flares that can impact our planet. The strongest of these flares have the capacity to cause blackouts and disrupt communications on a global scale.

While solar flares are powerful by themselves, they are nothing compared to thousands of "superflares" that are observed by NASA's Kepler and TESS missions. These superflares are produced by stars that are 100 to 10,000 times brighter than the Sun.

The physics is believed to be the same between the solar flares on our sun and the superflares on other planets — they are sudden releases of magnetic energy, But since the super-flaring stars have stronger magnetic fields, they have brighter flares. But the superflares have some unusual behavior— they have in initial short-lived enhancement followed by a secondary longer-duration but less intense flare. Scientists developed a model to explain the phenomenon, which was published in a paper in The Astrophysical Journal on 27th December 2023.

It was thought that the visible light in these flares only came from the lower layers of a star's atmosphere. Particles that are energised by "magnetic reconnection" fall down from the hot corona (outer layer of the star) and heat these layers. But recent work put forward the hypothesis that the emission from coronal loops may also be detected for super-flaring stars but that their density in these loops would need to be extremely high for that.

Source: <https://indianexpress.com/article/technology/science/solar-sun-star-super-flares-physics-9059879/>



## DON'T FLUSH THAT PET FISH OR TURTLE DOWN THE TOILET: CCMB SCIENTIST

Invasive species are also responsible for incurring huge economic losses every year for the country, said invasion biologist Gopi Krishnan from Dr. G. Umapathy's lab in an official online post



*The much loved pet could become an invasive species and destroy an entire eco-system, said scientists at CSIR-Centre for Cellular and Molecular Biology (CCMB)*

Flushing pet fish or turtle down the toilet or releasing them in a pond, letting a pet bird fly away, abandoning a pet dog or cat does not only endanger their life but it can also set off a possible biological invasion in the future. The much loved pet could become an invasive species and destroy an entire eco-system, said scientists at CSIR-Centre for Cellular and Molecular Biology (CCMB).

Stray cats and dogs are considered among the worst invasive species in the world and are responsible for killing scores of native birds and terrestrial animals annually. Invasive species are also responsible for incurring huge economic losses every year for the country, said invasion biologist Gopi Krishnan from Dr. G. Umapathy's lab in an official online post.

Biological invasion is a multi-step process wherein a species is intentionally or accidentally transported for agriculture, ornamental or recreation purposes and then introduced to a new location outside its natural range. This species may soon establish a self-sustaining population and disperse to other regions. Since it negatively impacts the new ecosystem it is called an invasive species, although they are not inherently invasive. Mr. Gopi Krishnan took the example of the aquarium cleaning, catfish like 'armoured sailfin', which is just about two inches in size but can grow up to two feet in length when let out into a pond. Catfish species from South America are very popular among aquaculture hobbyists in the country as they do not need high maintenance and also help keep the tank clean by feeding on algal growth.

Source: <https://www.thehindu.com/sci-tech/energy-and-environment/do-not-flush-that-pet-fish-or-turtle-down-the-toilet/article67662806.ece>

## TO ACHIEVE NET-ZERO TARGET, DO NOT RELY ON BURYING EMISSIONS UNDERGROUND, SAYS SCIENTIST

It might be technically possible, and in some cases, desirable, but heavy reliance on CCS to achieve net-zero levels might not be viable, the study said.



*Significantly, the study found there had been no cost reductions in any part of the CCS process as the technology progressed in the last 40 years.*

The idea that all the problematic carbon dioxide emissions in the future can be safely and permanently buried in the ground with carbon capture and sequestration (CCS) technologies might be extremely misplaced and impractical, a new study by researchers of Oxford University and Imperial College in London suggests.

It might be technically possible, and in some cases, desirable, but heavy reliance on CCS to achieve net-zero levels might not be viable, the study said.

CCS involves the capture of carbon from the source of emissions, like a power plant or a cement factory, and storing it below the ground in suitable geological structures such as depleted oil or gas reservoirs or some specific rock formations to prevent the release of these carbon emissions into the atmosphere.

All net-zero emissions pathways to 2050 put forward by the Intergovernmental Panel on Climate Change involve some deployment of CCS technologies. There are currently no projections which make the world net-zero without some sort of carbon capture and sequestration.

Emission pathways that require the world to put up to 20 billion tonnes of carbon dioxide underground in 2050 to achieve net-zero could cost at least US\$ 30 trillion more than the pathways in which only about 5 billion tonnes have to be stored.

Source: <https://indianexpress.com/article/india/to-achieve-net-zero-target-do-not-rely-on-burying-emissions-underground-says-scientist-9057616/>



# ENVIRONMENT

## AIR POLLUTION CAUSES OVER 2 MILLION DEATHS ANNUALLY IN INDIA: BMJ STUDY

The research found that air pollution from using fossil fuels in industry, power generation, and transportation accounts for 5.1 million extra deaths a year worldwide.



*Burning of fossil fuels cause millions of deaths every year. Image for representational purpose only.*

Outdoor air pollution from all sources accounts for 2.18 million deaths per year in India, second only to China, according to a modelling study published in The BMJ.

The research found that air pollution from using fossil fuels in industry, power generation, and transportation accounts for 5.1 million extra deaths a year worldwide.

This equates to 61% of a total estimated 8.3 million deaths worldwide due to ambient (outdoor) air pollution from all sources in 2019, which could potentially be avoided by replacing fossil fuels with clean, renewable energy, the researchers said. These new estimates of fossil fuel-related deaths are larger than most previously reported values suggesting that phasing out fossil fuels might have a greater impact on attributable mortality than previously thought, they said.

The team, including researchers from Max Planck Institute for Chemistry, Germany, used a new model to estimate all cause and cause-specific deaths due to fossil fuel-related air pollution and to assess potential health benefits from policies that replace fossil fuels with clean, renewable energy sources.

They assessed excess deaths — the number of deaths above that expected during a given time period — using data from the Global Burden of Disease 2019 study, NASA satellite-based fine particulate matter and population data, and atmospheric chemistry, aerosol, and relative risk modelling for 2019, in four scenarios.

*Source: <https://www.thehindu.com/sci-tech/health/air-pollution-causes-over-2-million-deaths-annually-in-india-bmj-study/article67590177.ece>*

## HIMALAYAS NEED HELP, COP28 TALKS MUST RESPOND: UN CHIEF GUTERRES

Addressing a meeting with mountain countries at this year's Conference of Parties (COP28), UN Secretary-General Guterres emphasised that nearly a third of Nepal's ice had vanished in just over 30 years.



*The Secretary-General highlighted the alarming pace at which the glaciers were disappearing, causing devastating impacts on local communities*

Warning of a potential catastrophe in the Himalayas where the glaciers are melting at an alarming rate, UN chief Antonio Guterres on Saturday said the ongoing annual climate talks here must respond to the needs of the developing nations, especially the vulnerable mountain countries that need urgent help.

Almost 240 million people depend on the glaciers and 10 major rivers, such as Indus, Ganga, and Brahmaputra, originating in the Himalayas. Another billion people living downstream of these rivers across eight countries, including India, are also dependent on the glacier-fed rivers.

Addressing a meeting with mountain countries at this year's Conference of Parties (COP28), UN Secretary-General Guterres emphasised that nearly a third of Nepal's ice had vanished in just over 30 years, and it was directly linked to greenhouse gas pollution that heats up the planet.

Guterres, who visited Nepal, including the Everest region, in October last week, called for developed countries to clarify the delivery of USD 100 billion and produce a plan to double adaptation finance to USD 40 billion a year by 2025.

“But those sums are dwarfed by the scale of what's needed,” he said and advocated for reform in International Financial Institutions (IFIs) and Multilateral Development Banks (MDBs) to better cater to the needs of developing countries like Nepal.

*Source: <https://indianexpress.com/article/world/climate-change/himalayas-need-help-cop28-talks-must-respond-un-chief-guterres-9051369/>*



# ENVIRONMENT

## THREE YEARS SINCE FORMATION OF NGT PANEL, ONLY 21% OF FOREST LAND IN SOUTHERN RIDGE MADE ENCROACHMENT-FREE

The committee, which includes the Principal Chief Conservator of Forests, Delhi, has also decided that the district magistrates will appoint an officer from their district as a nodal officer to coordinate with the DCFs on encroachment removal.



*The Southern Ridge covers an area of around 6,200 hectares*

Only around 21% of forest land identified as “encroached” in the Southern Ridge in Delhi has been cleared of encroachments so far, nearly three years after the National Green Tribunal (NGT) constituted an oversight committee to oversee the progress of encroachment removal in the Ridge, which is an extension of the Aravallis.

Of the 398.61 hectares of forest land identified as encroached in 2019 in south, southeast and southwest Delhi, encroachment on 83.828 hectares has been removed, and 314.782 hectares of land remains encroached, according to the minutes of a meeting held last month of the oversight committee that was constituted on the orders of the NGT. The Southern Ridge covers an area of around 6,200 hectares.

The committee is chaired by the Director General of Forests and Special Secretary, Ministry of Environment, Forest, and Climate Change. According to the minutes, the Chairman of the committee “expressed strong displeasure on the slow pace of progress of encroachment removal in the ridge area,” and directed the District Magistrates (DMs) of south, southeast, southwest and New Delhi, and the Deputy Conservator of Forests (DCF) of the south and west forest divisions to intensify encroachment removal and prepare a schedule for removal.

Source: <https://indianexpress.com/article/cities/delhi/three-years-since-formation-of-ngt-panel-only-21-of-forest-land-in-southern-ridge-made-encroachment-free-9050837/>

## GROUNDWATER MOST ‘EXPLOITED’ AT DELHI’S VIP ENCLAVES, SHOWS REPORT

In Delhi, prior permission is required to extract groundwater for any purpose. Most of the city’s groundwater, close to 80%, is used for domestic purposes, going by the report.



*The New Delhi district, including parts of Chanakyapuri, are the most exploited.*

The New Delhi revenue district, including parts of Chanakyapuri, Vasant Vihar and the Delhi Cantonment area, remains the most exploited in terms of groundwater extraction in the city, extracting far more than it recharges. Delhi, however, has recorded a fall in groundwater extraction in this assessment year compared to last year, according to the Dynamic Groundwater Resources of India 2023 report of the Central Groundwater Board (CGWB) released Friday.

The total groundwater extraction in the city has fallen from 0.36 bcm (billion cubic metres) last year to 0.34 bcm this year, with 9 out of 11 revenue districts recording a fall compared to 2022. Only North and Northeast Delhi saw an increase.

But the city’s annual groundwater recharge has also fallen -from 0.41 bcm last year to 0.38 bcm this year-which means the extractable groundwater resource that is a portion of this recharge, has also decreased. With groundwater recharge falling, the stage of extraction (a percentage of groundwater extracted against the recharge) was 99.13% this year, up from 98.16% last year.

The New Delhi district has the highest stage of extraction -137.79% -which means it extracts 3,612.52 hectare metre of water, when the extractable groundwater from what is recharged annually is only 2,621.74 hectare metre, the report shows.

Source: <https://indianexpress.com/article/cities/delhi/groundwater-most-exploited-at-delhis-vip-enclaves-shows-report-9050811/>



# AGRICULTURE

## ODIA SCIENTIST DISCOVERS DISEASE RESISTANT WILD OKRA

The new species is the 14th variety of the plant species and has been named 'Abelmoschus Odishae' after the state from where the type specimens were originally collected.



*The new plant species of 'wild okra' that was discovered by a scientist from the Indian Council of Agricultural Research in Odisha*

In some good news for vegetable farmers and researchers, a scientist from the Indian Council of Agricultural Research (ICAR) in the state has discovered a new plant species of 'wild okra' that can be used for hybridisation to create a better variety having high disease resistance.

It can also play a vital role in widening the genetic base of okra. Principal scientist of ICAR-National Bureau of Plant Genetic Resources (NPGR) Regional Station in Cuttack Dr. Ramesh Chandra Mishra has discovered a new plant species of the wild okra from a moist deciduous forest of Bansapal block in Keonjhar district. For the first time a new plant species of 'wild okra' has been discovered anywhere in the country, Dr. Mishra told The New Indian Express.

He said till now 13 different species of wild okra have been discovered of which two are being harvested for consumption. The new species is the 14th variety of the plant species and has been named 'Abelmoschus Odishae' after the state from where the type specimens were originally collected.

"The plant species is a perennial shrub up to 5 metre high with densely hispid prickly stem with retrorse hairs, large deep yellow flowers with around 8 (7-9) lanceolate epicalyx, ovoid to oblong bristly capsules, sub-reniform seeds with short, stout and non-spiral trichomes. The species also has a seeds viability of 95 per cent," Mishra said. The scientist said after its discovery in 2019, the original herbarium specimens of the plant were deposited at the National Herbarium of Crop Plants, ICAR-NBPGR, New Delhi and Central National Herbarium, Botanical Survey of India, Howrah for reference.

Source: <https://www.newindianexpress.com/states/odisha/2023/dec/10/odia-scientist-discovers-disease-resistant-wild-okra-2638073.html>

## NEW RESEARCH URGES DATA-DRIVEN ACTION FOR AGRICULTURE AND FOOD SYSTEMS CHANGE

The state of food systems worldwide in the countdown to 2030", provides the first science-based monitoring to guide decision-makers as they seek wholesale transformation of the global agriculture and food systems



"The state of food systems worldwide in the countdown to 2030", published today by The Food Systems Countdown to 2030 Initiative (FSCI), provides the first science-based monitoring to guide decision-makers as they seek the wholesale transformation of the global agriculture and food systems. This transformation is needed urgently both to reduce the environmental impact of these systems and to mitigate the impact of climate change on them. The overarching objective is that all people – especially the most vulnerable – have equitable access to healthy diets through sustainable and resilient agriculture and food systems.

The UN Food Systems Summit catalysed agriculture and food system action, though policymakers often lack the data required to drive critical decisions. The FSCI is filling that gap, having identified an indicator framework composed of 50 indicators that monitor agriculture and food systems at a global level, using existing data to enable immediate action. Repurposing existing data, rather than carrying out time-consuming new research, means policymakers have quick access to relevant information. Following this first global baseline, the FSCI will track agriculture and food systems annually until 2030, updating the framework as needed where new indicators or better data emerge.

Lawrence Haddad, Executive Director of the Global Alliance for Improved Nutrition (GAIN), said, "The first annual Countdown report shows that no single region has all the answers. Europe and North America do well on undernutrition but poorly on indicators of unhealthy diets. In contrast, Africa and South Asia do relatively well on some environmental indicators but poorly on indicators of livelihoods. The data show very clearly that every region has significant room for improvement."

Agriculture and food systems play a vital role in meeting all 17 Sustainable Development Goals (SDGs), yet the SDGs are insufficient to monitor these systems. The FSCI fills this gap.

Source: <https://agriculturepost.com/international/new-research-urges-data-driven-action-for-agriculture-and-food-systems-change/>



# AGRICULTURE

## WORLD SOIL DAY 2023: ICRISAT LAUNCHES 'TECHNOLOGY ON WHEELS' TO BRING SCIENCE TO FARMERS' DOORSTEPS

This year's World Soil Day theme, "Soil and Water: A Source of Life," holds particular relevance for drylands, where there is a deficit of both water and soil nutrients



The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) marked World Soil Day 2023 with the inauguration of 'Technology on Wheels', a new initiative designed to promote sustainable soil and water management practices among farmers.

This year's World Soil Day theme, "Soil and Water: A Source of Life," holds particular relevance for drylands, where water and soil nutrients are deficient.

Cognizant of this inherent challenge, and the fact that soil and water account for 95 per cent of global food production, ICRISAT remains steadfast in addressing the urgent challenges posed by land degradation and the decline in soil health-particularly in climate change.

The newly launched 'Technology on Wheels', a mobile soil and water testing laboratory, reflects ICRISAT's commitment to bridging the gap between scientific advancements and in-the-field implementation.

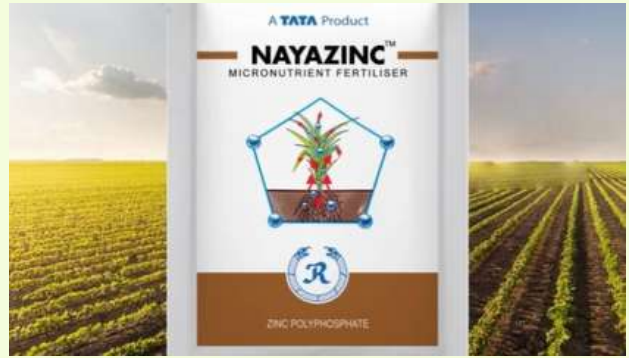
Developed in partnership with the Laurus Charitable Trust, the mobile facility will operate in the Medchal-Malkajgiri districts of Telangana, India, and offer on-site soil testing services to farmers, promoting the adoption of regenerative agricultural practices at the grassroots level.

Speaking at an event to mark the occasion, Director General of ICRISAT, Dr Jacqueline Hughes, highlighted ICRISAT's longstanding efforts to bolster soil health across Asia and Africa by advancing scientific knowledge and fostering awareness of the interconnectedness between soil and water for resilient and sustainable agrifood systems.

Source: <https://agriculturepost.com/farm-inputs/organic-farming/world-soil-day-2023-icrisat-launches-technology-on-wheels-to-bring-science-to-farmers-doorsteps/>

## RALLIS INDIA LAUNCHES NAYAZINC CROP NUTRITION TO TRANSFORM SOIL ZINC APPLICATION

NAYAZINC provides optimum zinc to plants at almost one-tenth of zinc application when compared to Zinc Sulphate. With 9% magnesium, it boosts photosynthesis during the early growth phase, according to Rallis



Rallis India Limited, a Tata enterprise and a leading player in the Indian agri inputs industry, has launched NAYAZINC, a unique, patented zinc fertiliser designed for soil application. This fertiliser will be applied in various crops, soils, and agro-climatic conditions, providing farmers with a highly efficient alternative to Zinc Sulphate, the company announced on 12 December 2023.

"NAYAZINC is a fully FCO-compliant product with high standards of quality and aspires to replace Zinc Sulphate as a preferred choice for Indian agriculture. With 16 per cent zinc, it provides optimum zinc nutrition to the plants at almost one-tenth of zinc application when compared to Zinc Sulphate. With 9 per cent magnesium also in its content, NAYAZINC boosts photosynthesis during the early growth phase. NAYAZINC offers an innovative solution suitable for a wide range of crops; paddy, wheat, maize, sugarcane, pulses, oilseed, vegetables, cotton, sorghum, mustard; groundnut, and soybean," Rallis India claimed.

Expressing his enthusiasm about NAYAZINC, Sanjiv Lal, Managing Director of Rallis India, said, "NAYAZINC is a testament to our dedication towards achieving our Mission – 'Serving Farmers Through Science'. More than 45 per cent of Indian soils are low in plant-available zinc, NAYAZINC is an innovative solution to enhance productivity and improve sustainability. Zinc nutrition in plants has a strong bearing, much like zinc nutrition in human beings, especially infants and babies. Our investments in this product are intended to provide a strong foundation for healthy soil, producing healthy foods for a healthy nation."

Source: <https://agriculturepost.com/farm-inputs/fertilisers/rallis-india-launches-nayazinc-crop-nutrition-to-transform-soil-zinc-application/>





# AGRICULTURE

## 310 DISTRICTS IN 28 STATES, UTS HIGHLY VULNERABLE UNDER NICRA: ICAR REPORT

Uttar Pradesh has the highest number of districts where agricultural land may be vulnerable to climate change



*A Farmer in Guna Fertilizes his Crop, guided by Technology*

310 districts belonging to 28 states and Union territories (UTs) in India have been categorised as the most vulnerable under the National Innovations on Climate Resilient Agriculture (NICRA). Of the 28 states and Union territories (UTs) listed, Uttar Pradesh has the highest number of vulnerable districts with 22 districts having a "very high" vulnerability and 26 districts being "highly" vulnerable. The Union Minister of Agriculture and Farmers' Welfare Narendra Singh Tomar provided this information in a written reply in Lok Sabha on Tuesday.

The Indian Council of Agricultural Research (ICAR) launched NICRA as a network project in 2011 with the aim of enhancing the resilience of agriculture to climate change and vulnerability in India. ICAR has played an important role in developing 1971 climate-resilient crop varieties since 2014, including 429 tolerant to abiotic stress and 1542 to biotic stress.

### "Very high" and "highly" vulnerable districts

The vulnerability of 109 districts belonging to 23 states/union territories have been classified as "very high", while 201 districts belonging to 28 states/Union territories are considered "highly" vulnerable.

In the "very high" category, Uttar Pradesh has the highest number of districts at 22, followed by Rajasthan (17), Bihar (10), and Kerala (8). Other regions, including Uttarakhand, Orissa, Meghalaya, and Punjab had between five to seven "very high" vulnerable districts. West Bengal, Karnataka, Haryana, and Jammu & Kashmir had three districts each. Mizoram, Maharashtra, Madhya Pradesh, Himachal Pradesh, Gujarat, and Assam, all had two districts each. Sikkim, Nagaland, Arunachal Pradesh, and Andhra Pradesh all had one district that fell into the "very high" vulnerability category.

Source: [https://www.business-standard.com/india-news/310-districts-in-28-states-uts-highly-vulnerable-under-nicra-icar-report-123120500815\\_1.html](https://www.business-standard.com/india-news/310-districts-in-28-states-uts-highly-vulnerable-under-nicra-icar-report-123120500815_1.html)

## GOVERNMENT PROGRAMMES FOR ADOPTION OF DIGITAL AND INNOVATIVE FARMING TECHNOLOGIES

Under NeGPA, funding is given to the states for Digital Agriculture projects using emerging technologies like Artificial Intelligence, Machine Learning, Internet of Things and Blockchai



The adoption of modern, smart and innovative farming technologies by farmers depends on various factors such as socioeconomic conditions, geographical conditions, crop grown, and irrigation facilities among many other factors. However, the Government of India supports and facilitates the State governments to promote agriculture throughout the country and infuse modern and smart farming technologies into the agriculture sector. The use of modern machines including Kisan Drones (agricultural drones) is promoted under the Sub-Mission on Agricultural Mechanization, Union Minister of Agriculture and Farmers' Welfare, Arjun Munda said in a written reply in Lok Sabha on 19 December 2023.

Under NeGPA (National e-Governance Plan in Agriculture) programme, funding is given to State governments for Digital Agriculture projects using emerging technologies like Artificial Intelligence, Machine Learning, the Internet of Things (IoT) and Blockchain. A component called "Innovation and Agri-Entrepreneurship Development" has been launched under Rashtriya Krishi Vikas Yojana (RKVY-RAFTAAR) in 2018-19 to promote innovation and agri-entrepreneurship by providing financial support and nurturing the incubation ecosystem. Under this programme, startups are encouraged to use innovative technologies to resolve challenges faced in agriculture and allied sectors. The funds are released to the states based on their proposals, Munda further informed the lower house of the Indian parliament.

Source: <https://agriculturepost.com/policy/government-programmes-for-adoption-of-digital-and-innovative-farming-technologies/>



# HEALTH

## RESEARCHERS PATENTING NEW TREATMENT FOR NICOTINE ADDICTION

Currently Nicotine Replacement Therapy (NRT) - nicotine patches or lozenges - relies on providing additional nicotine to the body. Researchers have now turned to nicotine's oxidative metabolite, cotinine.



*Ascorbic acid is at the heart of a new therapy to treat nicotine dependency*

Researchers have demonstrated a practical approach for treating nicotine dependence. Currently Nicotine Replacement Therapy (NRT) - nicotine patches or lozenges - relies on providing additional nicotine to the body. Researchers have now turned to nicotine's oxidative metabolite, cotinine. Using ascorbic acid as a potential reducing agent, they converted cotinine in smokers' plasma back to nicotine, targeting both nicotine addiction and detoxification simultaneously.

Publishing the results of their study, Recirculating bioavailable nicotine metabolite using ascorbic acid : A pragmatic approach to treating nicotine dependence, a team of researchers from the Faculty of Pharmacy, Sri Ramachandra Institute of Higher Education and Research, have developed a dissolvable film containing Vitamin C that a smoker places on the tongue whenever tempted to smoke. Ascorbic acid in a specified dose (Vitamin C) converts cotinine back to nicotine within the smokers' plasma, they claim.

Individuals find it difficult to quit smoking because of nicotine withdrawal. Current NRT products provide additional nicotine to the body. This turned researchers to cotinine. The results of the study were published in the indexed journal *Advances in Redox Research*. The team has filed for an Indian patent and has established an incubator for clinical application.

According to Murugesan Arumugam, first author: "Nicotine is metabolised into cotinine, an oxidative metabolite. Cotinine will stay in the body for six weeks (the quantity of cotinine depends on an individual's tobacco consumption). Generally, 80% of nicotine accumulates as cotinine in the body, while the remaining 20% is eliminated in urine. Cotinine can cause cancer. So, for the first time, instead of adding on to the nicotine content in the body, we have showcased that vitamin C can be utilised to recirculate cotinine. Side effects are negligible, the person does not receive additional nicotine and detoxification occurs at the end of the cycle." Raman Lakshmi Sundaram, Vishal Jayajothi, Manish Arul, Jerad A Suresh and Sathesh Kumar Kesavan are the other authors.

Source: [https://www.thehindu.com/sci-tech/health/researchers-patenting-new-treatment-for-nicotine-addiction/article67657975.ece?cx\\_testId=10&cx\\_testVariant=cx\\_1&cx\\_artPos=0&cx\\_experienceId=EXDJ12CXX29QX#cxrecs\\_s](https://www.thehindu.com/sci-tech/health/researchers-patenting-new-treatment-for-nicotine-addiction/article67657975.ece?cx_testId=10&cx_testVariant=cx_1&cx_artPos=0&cx_experienceId=EXDJ12CXX29QX#cxrecs_s)

## IISER BHOPAL RESEARCHERS CONDUCT FIRST GENOME SEQUENCING OF JAMUN

Jamun has various genes that make the plant rugged and improve its stress tolerance to factors like weeds and insects that induce damage, heat stress, salinity, and drought.



*From L to R - Manohar Bisht, Vineet K Sharma, Abhisek Chakraborty and Shruti Mahajan.*

Not just Ayurveda but multiple clinical studies have shown the health benefits of jamun as an excellent source of antioxidants, iron, and vitamin C. Now, researchers at the Indian Institute of Science Education and Research (IISER Bhopal) have completed the first-ever genome sequencing of the jamun tree (*Syzygium cumini*), popular in India for its medicinal properties, fruit and ornamental value.

This is the first time the plant has been examined and decoded so closely. Dr Vineet K Sharma, professor, department of biological sciences told *The Indian Express* that this research aimed to gain new functional and evolutionary insights from the jamun genome, which could be responsible for the wide range of pharmacological properties of this species "conferred by the bioactive compounds that act as nutraceutical agents in modern medicine".

A team, led by Dr Sharma, has published its findings in the journal *Frontiers in Plant Science*. *Syzygium cumini*, more commonly known as jamun, is a Myrtaceae plant family tropical tree. Fruit seed extracts of jamun have well-known anti-diabetic properties and is highly recommended in Ayurveda to treat a variety of health ailments.

To understand the genomic and evolutionary basis of the tree's medicinal values, the research team sequenced the *S.cumini* genome using Oxford Nanopore and 10x Genomics sequencing technologies.

Source: <https://indianexpress.com/article/cities/pune/iiser-bhopal-researchers-conduct-first-genome-sequencing-of-jamun-9056168/>



# HEALTH

## ANY ACTIVITY IS BETTER FOR YOUR HEART THAN SITTING



A study in the European Heart Journal by J M Blodgett et al. from the University College London points out that diseases of heart and circulation is the major cause of death in adults. And after analysing over 15,000 people across the world, they suggest that moderate to vigorous activity offers benefits. These involve simple activities such as running, brisk staircase climbing, and brisk exercising for about an hour. Many of us do a lot of sitting at our desks at work-all day, and then at home, watching TV or using our laptops.

Thus, improving our heart and health will involve simple activities such as the ones cited above, plus sports or swimming. In addition, eating ‘functional food’, as we mentioned in our article ‘Health benefits of functional foods’ on November 12, 2023 is good for our heart and health.

### Sleeping is good

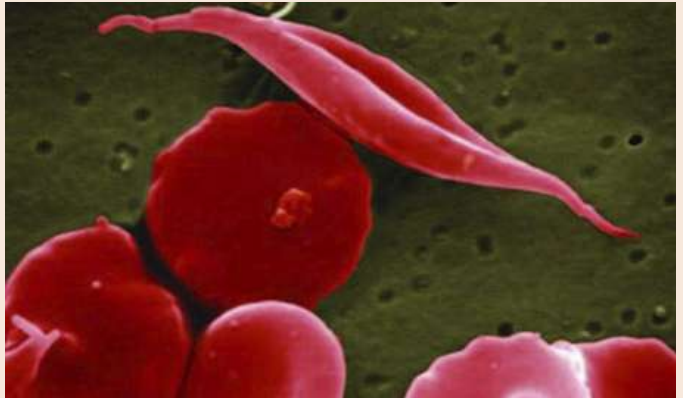
Researchers at Columbia University, New York point out that even sleeping well is good for our hearts. Sleep helps maintain cognitive skills, such as attention, learning, and memory, such that poor sleep can make it much more difficult to cope with even relatively minor stressors and impact our ability to perceive the world accurately. And others at the University of Rochester point out that sleep drives metabolic clearance from the adult brain; in other words, it removes neurotoxic wastes (such as plaques called beta-amyloids which disturb communication between various brain cells) which accumulate during the active daytime work.

We adults need about seven hours of sleep each night, and switch off lights, stop reading the book, switch off TV and put our cell phones in silent mode, and have the toxins cleared. And when we retired people sleep in the afternoon after lunch, we should do so for just about an hour and then do the brisk staircase walking and get on to exercising for one or two hours. Those who play games may also do so in the evening.

Source: <https://www.thehindu.com/sci-tech/science/any-activity-is-better-for-your-heart-than-sitting/article67618496.ece>

## US APPROVES TWO GENE THERAPIES FOR SICKLE CELL DISEASE

The Vertex/CRISPR gene therapy uses the breakthrough gene editing technology that won its inventors the Nobel Prize in 2020.



The U.S. Food and Drug Administration (FDA) on 9th December 2023 approved a pair of gene therapies for sickle cell disease, including the first treatment based on the breakthrough CRISPR gene editing technology.

The agency approved Lyfgenia from bluebird bio, and a separate treatment called Casgevy by partners Vertex Pharmaceuticals and CRISPR Therapeutics. Both the therapies were approved for people aged 12 years and older.

The Vertex/CRISPR gene therapy uses the breakthrough gene editing technology that won its inventors the Nobel Prize in 2020.

Sickle cell disease is a painful, inherited blood disorder that can be debilitating and lead to premature death. It affects an estimated 100,000 people in the United States, most of whom are Black. In sickle cell disease, the body makes flawed, sickle-shaped hemoglobin, impairing the ability of red blood cells to properly carry oxygen to the body's tissues. The sickle cells tend to stick together and can block small blood vessels, causing intense pain. It also can lead to strokes and organ failure.

U.S.-listed shares of CRISPR therapeutics were up 1.6%, while Vertex Pharmaceuticals stock was down 1.4%. Shares of bluebird bio were halted for trading ahead of the news. Makers of both the therapies have pitched them as one-time treatments, but data on how long their effect lasts is limited. The only longer-term treatment for sickle cell disease is a bone marrow transplant.

“I actually am very reticent to call them a cure. I prefer to call them a transformative therapy because patients will still have sickle cell disease on the other side of gene therapy,” said Dr Sharl Azar, medical director of the Comprehensive Sickle Cell Disease Treatment Center at Massachusetts General Hospital.

Source: <https://www.thehindu.com/sci-tech/health/us-approves-two-gene-therapies-for-sickle-cell-disease/article67621352.ece>



# HEALTH

## E-CIGARETTES ARE NOT SHOWN TO BE EFFECTIVE FOR QUITTING TOBACCO USE: WHO

It says there is an urgent need to control e-cigarettes to protect children, as well as non-smokers and minimise health harms to the population



E-cigarettes as consumer products are not shown to be effective for quitting tobacco use at the population level. Instead, alarming evidence has emerged on adverse population health effects, said the World Health Organisation on Thursday. It added there is an urgent need to control e-cigarettes to protect children, as well as non-smokers and minimise health harms to the population.

“Kids are being recruited and trapped at an early age to use e-cigarettes and may get hooked to nicotine,” said WHO Director-General Dr. Tedros Adhanom Ghebreyesus in a statement issued by the organisation, while urging countries to implement strict measures to prevent uptake to protect their citizens, especially their children and young people.

The WHO has added that e-cigarettes have been allowed on the open market and aggressively marketed to young people. Thirty-four countries have banned the sale of e-cigarettes, 88 countries have no minimum age at which e-cigarettes can be bought and 74 countries have no regulations in place for these harmful products. In India, the possession of e-cigarettes and similar devices is a violation of the Prohibition of Electronic Cigarette Act (PECA) 2019, according to the Union Health Ministry.

Even brief exposure to e-cigarette content on social media can be associated with increased intention to use these products, as well as more positive attitudes towards e-cigarettes. Studies consistently show that young people that use e-cigarettes are almost three times more likely to use cigarettes later in life, said the WHO.

Source: <https://www.thehindu.com/sci-tech/health/e-cigarettes-are-not-shown-to-be-effective-for-quit-ting-tobacco-use-whol/article67637629.ece>

## INDIA'S FIRST POMPE DISEASE PATIENT PASSES AWAY: WHAT IS THIS RARE GENETIC DISORDER?

Its prevalence estimates range from 1 in 40,000 to 1 in 300,000 births. How is it diagnosed and in what ways does it affect an individual?



*Nidhi Shirol, who passed away last month, was India's first patient of Pompe disease. She spent most of her childhood in a wheelchair and breathed with the help of BiPap (a breathing support device). (Photo: Special Arrangement)*

Nidhi Shirol, India's first Pompe disease patient, passed away last month at the age of 24 years after battling the disease. She spent the last six years in a semi-comatose state. In 2010, her father Prasanna Shirol started the Organisation for Rare Diseases India (ORDI), the first NGO in the country for rare diseases. Here, he explains what the disease is, how common it is, and how it is diagnosed.

### What is Pompe Disease?

Also known as Glycogen Storage Disease Type II, Pompe disease is a rare genetic disorder caused by a deficiency of the enzyme acid alpha-glucosidase (GAA). This enzyme is crucial for breaking down glycogen into glucose within the lysosomes of cells.

Its prevalence estimates range from 1 in 40,000 to 1 in 300,000 births. It occurs across diverse ethnicities and populations. The age of onset and severity can vary, leading to a spectrum of clinical presentations.

### How does Pompe disease affect an individual?

The severity of the condition and the progression of symptoms may differ among individuals. Some key symptoms are: \*Degenerative impact on bones \*Respiratory complications \*Cardiac involvement \*Hypertrophic cardiomyopathy \*Implications for daily living.

Source: <https://indianexpress.com/article/explained/explained-health/pompe-disease-symptoms-cure-diagnosis-explained-9058436/>



## S&T COOPERATION FOR GLOBAL SOUTH

### ON CLIMATE CHANGE, INDIA'S CHALLENGES LEADING THE GLOBAL SOUTH

India has immense potential to develop renewable energy and how it expands and scales up this capacity will be a critical barometer of its contribution to global climate change mitigation in the coming decade

The 28th United Nations Climate Change Conference (COP28) in Dubai brought global attention to the need for urgent action against global warming, with India positioning itself as a leader of the Global South. Climate justice has been India's position at COP meetings over the years. In his address, Prime Minister Narendra Modi highlighted the inequity of climate impact. While the conference's final text stopped short of explicitly calling for a phase-out of fossil fuels, the historic agreement on transitioning away from fossil fuels hinted at the potential "beginning of the end" for the fossil fuel era. India's role at the conference was, however, noted for its absence in signing crucial decarbonisation pledges, including the Global Renewables and Energy Efficiency Pledge aimed at tripling renewable energy capacity by 2030.

This stance seemed contradictory given India's commitment to expanding renewable energy. India has made strides in the RE sector, securing the fourth position globally for renewable energy capacity installations in 2022. The International Solar Alliance, a joint initiative of India and France launched during COP21, testifies India's will to promote REs. Solar energy in India attracted investment worth \$310 billion last year. It is expected to be \$380 billion this year. The latest National Electricity Plan projects a leap in solar and wind energy production to 35 per cent of the country's total electricity output by 2032, up from 10.6 per cent in 2022. India's updated Nationally Determined Contributions sets a goal of approximately 50 per cent of the country's cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030.

These investments and plans are in stark contrast with India's position in Dubai on fossil fuel. India continues to rely on fossil fuels. According to the Central Electricity Agency's monthly report, RE generation during October 2023 decreased by 12.38 per cent as compared to October 2022 and thermal power plants, mainly coal-based, generated around 78.74 per cent of the total electricity in the same month. Renewable energy comprised 17.9 per cent of the total, while nuclear and hydro contributed 3.02 per cent and 0.34 per cent. Ember, an independent energy think tank, estimates that fossil fuels accounted for 77 per cent of India's electricity production in 2022. Coal had the largest share at 74 per cent, followed by gas (2.7 per cent) and other fossil fuels (0.1 per cent). The Net Zero Emissions scenario by the International Energy Agency projects that to keep global temperature increases under 1.5 degrees, India would need to eliminate sub-critical coal facilities by 2030. It will need to achieve a completely decarbonised electricity sector by 2040 in order to attain net-zero emissions by 2050. However, India's current commitments are to achieve net zero by 2070 and ensure that 50 per cent of its energy capacity comes from renewable sources by 2030.

Source: <https://indianexpress.com/article/opinion/columns/a-climate-paradox-9075115/>

### INDIA-MADE LCA, LCH CAN BOOST CLOUT IN GLOBAL SOUTH: IAF CHIEF

Highlighting that these platforms have export potential, he said setting up joint ventures with these countries can be mutually beneficial. He added this could include jointly developing components, sharing production facilities, creation of regional maintenance and support hubs.



Chief of Air Staff Air Chief Marshal V R Chaudhari at an event in New Delhi

Indigenous aerospace platforms such as the Light Combat Aircraft, Light Combat Helicopter, Akash Missile systems and radars offer competitive and reliable options for air forces of the Global South, boosting India's economic and technological clout, Air Chief Marshal V R Chaudhari said Friday.

Highlighting that these platforms have export potential, he said setting up joint ventures with these countries can be mutually beneficial. He added this could include jointly developing components, sharing production facilities, creation of regional maintenance and support hubs.

He said there is a need to focus on capability development in global supply chains, manufacturing hubs and establishing maintenance, repair, and overhaul (MRO) facilities, along with joint research and development projects, defence innovation and technological exchange.

Speaking on the relevance of air power and the need for the IAF to act as a catalyst for progress, fostering strategic partnerships and contributing to the collective advancement of the Global South, he said the IAF's increased footprint during regular training engagements with partner nations has resulted in sharing of best practices in operations and maintenance.

Speaking about the role played by Indian Military Advisory Teams and courses offered through Indian Technical and Economic Cooperation programme, which had paved the way for increased cooperation by conducting training for more than 200,000 officials in both the civil and defence sector, he said in the past 9 years, IAF had trained more than 5,000 foreign trainees from countries of the Global South.

Source: <https://indianexpress.com/article/india/india-made-lca-lch-can-boost-clout-in-global-south-iaf-chief-9079728/>



# OTHERS

## HOW YOUR BRAIN DECIDES WHAT TO THINK

Why do we remember certain things and not others? Why does our mind go off on tangents and why do we have daydreams?



*The "default mode network" is engaged when we are daydreaming, thinking about ourselves or others, recalling memories, or imagining future events. Image for Representation.*

You're sitting on the plane, staring out of the window at the clouds and all of a sudden, you think back to how a few months ago, you had a heart-to-heart with a good colleague about the pressure you experience at work. How do thoughts seemingly completely unrelated to the present pop into our heads? Why do we remember certain things and not others? Why does our mind go off on tangents and why do we have daydreams?

Underlying these processes is a shared pattern of common brain activity, in regions which together make up the "default mode network", discovered and named by neurologist Marcus Raichle in the early 2000s. It's engaged when we are daydreaming, thinking about ourselves or others, recalling memories, or imagining future events. The default mode network becomes engaged when people appear to be doing "nothing" (hence the term "default"). This is usually when we are in a relaxed state and not focusing on a task or goal – think, sitting on a plane, staring out the window.

When the default mode network is engaged, other networks in the brain are down-regulated or become less active, such as the executive control network and other brain regions involved in attention, working memory, and decision-making. This is what allows the brain to wander.

### Why some memories over others?

Some memories are more likely to be spontaneously recalled, such as those that are more recent, highly emotional, highly detailed, frequently repeated, or central to our identity. They capture our attention – and for good reason. These types of memories were likely pivotal for engaging with our physical and social environments at the time, and so helped to contribute to our survival.

Source: <https://www.thehindu.com/sci-tech/science/how-your-brain-decides-what-to-think/article66535792.ece#:~:text=Indeed%2C%20much%20of%20our%20cognitive,may%20be%20an%20illusion%20anyway.>

## MUMBAI PROFESSOR BAGS ROYAL SOCIETY OF CHEMISTRY'S NYHOLM PRIZE

In addition to the prize, Professor Savita Ladage will be awarded £5,000 as well as a medal and a certificate



*Professor Savita Ladage bagged the award for her advocacy of the significance of chemical education.*

Professor Savita Ladage from Mumbai's Homi Bhabha Centre for Science Education, Tata Institute of Fundamental Research, received the Royal Society of Chemistry's Nyholm Prize for Education in recognition of her contributions to chemistry education.

Prof. Ladage bagged the award for her advocacy of the significance of chemical education. Her efforts include mentoring chemistry educators and spearheading impactful teacher and student programs that advance chemistry education in the country. Her accolade places her among a group of past winners in the RSC's prize portfolio, with 60 individuals from this list later receiving Nobel Prizes for their contributions, including 2022 Nobel Laureate Carolyn Bertozzi and 2019 Nobel laureate John B. Goodenough.

In addition to the prize, Prof. Ladage will be awarded £5,000, along with a medal and a certificate. Expressing her gratitude upon receiving the prize, she said, "I feel deeply honoured to receive this prize and recognition in the community of individuals working in the area of chemistry education. I am thankful to the RSC for the same. The award and recognition have motivated me further to continue my work with greater zeal and enthusiasm."

Acknowledging the critical role of those working in education within the chemical sciences, the Chief Executive of the Royal Society of Chemistry, Dr. Helen Pain, said, "The inspiration, innovation and dedication of those who work in education are fundamental to the progress of the chemical sciences – shaping the future and setting our young people up to tackle the challenges and the opportunities facing our society and our planet. Professor Ladage's work demonstrates an outstanding commitment to chemistry education, and it is our honour to celebrate their considerable contribution."

Source: <https://www.thehindu.com/sci-tech/science/mumbai-professor-bags-royal-society-of-chemistrys-nyholm-prize/article67634487.ece>



# OTHERS

## HOW THE WINTER SEASON AFFECTS HUMAN MINDS AND BEHAVIOUR

Like many other animals, humans are also seasonal creatures.



Srinagar woke up to frost on December 10 morning after the coldest night this winter, when the minimum temperature settled 4.6 degrees C below zero.

What comes to mind when you think about winter? Snowflakes? Mittens? Reindeer? In much of the Northern Hemisphere, winter means colder temperatures, shorter days and year-end holidays. Along with these changes, a growing body of research in psychology and related fields suggests that winter also brings some profound changes in how people think, feel and behave.

While it's one thing to identify seasonal tendencies in the population, it's much trickier to try to untangle why they exist. Some of winter's effects have been tied to cultural norms and practices, while others likely reflect our bodies' innate biological responses to changing meteorological and ecological conditions. The natural and cultural changes that come with winter often occur simultaneously, making it challenging to tease apart the causes underlying these seasonal swings.

### Wintertime blues and a long winter's nap

Do you find yourself feeling down in the winter months? You're not alone. As the days grow shorter, the American Psychiatric Association estimates that about 5% of Americans will experience a form of depression known as seasonal affective disorder, or SAD.

People experiencing SAD tend to have feelings of hopelessness, decreased motivation to take part in activities they generally enjoy, and lethargy. Even those who don't meet the clinical threshold for this disorder may see increases in anxiety and depressive symptoms; in fact, some estimates suggest more than 40% of Americans experience these symptoms to some degree in the winter months.

Scientists link SAD and more general increases in depression in the winter to decreased exposure to sunlight, which leads to lower levels of the neurotransmitter serotonin. Consistent with the idea that sunlight plays a key role, SAD tends to be more common in more northern regions of the world, like Scandinavia and Alaska, where the days are shortest and the winters longest.

Source: [https://www.thehindu.com/sci-tech/science/winter-season-effects-human-mind-behaviour-explained/article67640728.ece?](https://www.thehindu.com/sci-tech/science/winter-season-effects-human-mind-behaviour-explained/article67640728.ece?cx_testId=10&cx_testVariant=cx_1&cx_artPos=0&cx_experienceId=EXDJ12CX29QX#cxrecs_s)

[cx\\_testId=10&cx\\_testVariant=cx\\_1&cx\\_artPos=0&cx\\_experienceId=EXDJ12CX29QX#cxrecs\\_s](https://www.thehindu.com/sci-tech/science/winter-season-effects-human-mind-behaviour-explained/article67640728.ece?cx_testId=10&cx_testVariant=cx_1&cx_artPos=0&cx_experienceId=EXDJ12CX29QX#cxrecs_s)

## HUMAN INTELLIGENCE: HOW COGNITIVE CIRCUITRY, RATHER THAN BRAIN SIZE, DROVE ITS EVOLUTION

Brains take up at about 2% of typical human body weight, running them uses around 20% of our metabolism



Humans have demonstrated that having large brains are key to our evolutionary success, and yet such brains are extremely rare in other animals. Most get by on tiny brains, and don't seem to miss the extra brain cells (neurons).

It's one of the great paradoxes of evolution. Humans have demonstrated that having large brains are key to our evolutionary success, and yet such brains are extremely rare in other animals. Most get by on tiny brains, and don't seem to miss the extra brain cells (neurons).

Why? The answer that most biologists have settled on is that large brains are costly in terms of the energy they require to run. And, given the way natural selection works, the benefits simply don't exceed the costs.

But is it just a matter of size? Does the way our brains are laid out also affect their costs? A new study, published in Science Advances, has produced some intriguing answers.

All our organs have running costs, but some are cheap and others expensive. Bones, for example, are relatively cheap. Although they make up around 15% of your weight, they only use 5% of your metabolism. Brains are at the other end of the spectrum, and at about 2% of typical human body weight, running them uses around 20% of our metabolism. And this without doing any conscious thinking – it even happens when we're asleep.

For most animals, the benefits of serious thinking are simply not worth it. But for some reason – the greatest puzzle in human evolution, perhaps – humans found ways to overcome the costs of having a larger brain and reap the benefits.

All this is fairly well known, but there is a more tantalising question. Certainly humans have to bear the greater costs of our brains because they are so large, but are there different costs because of the special nature of our cognition? Does thinking, speaking, being self-conscious or doing sums cost more than typical day-to-day animal activities?

Source: <https://www.thehindu.com/sci-tech/science/human-intelligence-how-cognitive-circuitry-rather-than-brain-size-drove-its-evolution/article67683159.ece>