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SCIENCE & TECHNOLOGY

Scientists obtain first 3D images from inside Mexican volcano

Most of the world's volcanoes that pose a risk to humans already have detailed maps of their interiors, but not Popocatépetl, despite the fact that some 25 million people live within a 100-km radius

Two scientists take a break on the slopes of the Popocatépetl volcano in Mexico, December 5, 2025.

In the predawn darkness, a team of scientists climbs the slope of Mexico's Popocatépetl volcano, one of the world's most active and whose eruption could affect millions of people. Its mission: figure out what is happening under the crater.
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For five years, the group from Mexico's National Autonomous University has climbed the volcano with kilos of equipment, risked data loss due to bad weather or a volcanic explosion and used artificial intelligence to analyse the seismic data. Now, the team has created the first three-dimensional image of the 5,452-m volcano's interior, which tells them where the magma accumulates and will help them better understand its activity, and, eventually, help authorities better react to eruptions.

Marco Calò, professor in the UNAM's Geophysics Institute's vulcanology department and the project leader, invited The Associated Press to accompany the team on its most recent expedition, the last before its research on the volcano will be published.

Movement underground

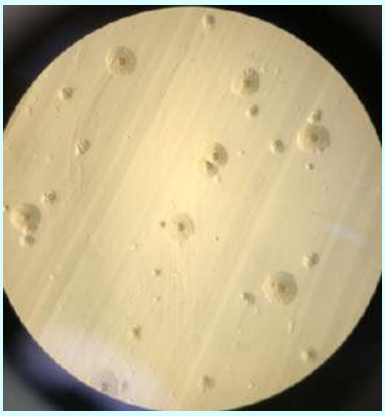
Inside an active volcano, everything is moving: the rocks, magma, gas and aquifers. It all generates seismic signals. Most of the world's volcanoes that pose a risk to humans already have detailed maps of their interiors, but not Popocatépetl, despite the fact that some 25 million people live within a 100-km radius and houses, schools, hospitals and five airports could be affected by an eruption.

Other scientists took some early images 15 years ago, but they showed contradictory results and did not have sufficient resolution to see "how the volcanic edifice was being built," and above all, where the magma gathered, Calò said.

Source: https://www.thehindu.com/sci-tech/science/scientists-obtain-first-3d-images-from-inside-mexican-volcano/article70473428.ece
Dated: January 05, 2026, https://www.thehindu.com

Unusual genetic code in Antarctic microbes yields rare amino acid

A new and 'first of its kind' study could help scientists engineer proteins with 'functional advantages that have been hitherto unknown', and could pave the way for new bioengineering where researchers can 'manipulate bacteria to produce useful materials', independent experts said



Mycoplasma growing on Hayflick agar. The stop codon TGA encodes the amino acid tryptophan in these bacteria and the rarer amino acid selenocysteine in humans

The dictionary of life has a new update. A DNA sequence that signals cells in almost all other organisms to stop synthesising proteins instead encodes a rare amino acid in some archaea, according to a study published in Science in November. Archaea are microbes that resemble bacteria in shape and size but are biologically distinct. Calling the study "the first of its kind," Bose Institute, Kolkata, biological sciences associate professor Abhrajyoti Ghosh said the discovery could help scientists engineer proteins with "functional advantages that have been hitherto unknown." Dr. Ghosh studies how archaea respond to stress.

The study's findings provide "yet another fantastic example of how biology hides secrets that drive biotechnology innovation," University of California Berkeley chemistry professor and study coauthor Alanna Schepartz said in a statement.

Reading the dictionary

By the late 1960s, scientists had identified the set of rules that dictate how a sequence of DNA corresponds to the order in which amino acids are placed in proteins. These rules came to be called the genetic code.

At the heart of this code are the four nitrogen-containing bases that are a part of DNA: adenine (A), guanine (G), cytosine (C) and thymine (T). Each amino acid in a protein corresponds to a three-base-long sequence of DNA — a.k.a. a triplet codon. For example, a codon consisting of three thymines (TTT) corresponds to the amino acid phenylalanine, while TTA encodes leucine.
The genetic code is a dictionary of 64 such codons. Of these, 61 'sense' codons together encode 20 common amino acids. The remaining three, called 'stop' codons, don't correspond to any amino acid. Instead, when the protein-making mechanism encounters them, it terminates the protein chain.

Source:https://www.thehindu.com/sci-tech/science/pyrrolysine-unusual-genetic-code-in-antarctic-microbes-yields-rare-amino-acid/article70470028.ece
Dated: January 05, 2026, https://www.thehindu.com

SCIENCE & TECHNOLOGY

A twist in the tale: are scientists wrong about dark energy?

For proving that the expansion of the universe had indeed speeded up, three scientists were awarded the 2011 physics Nobel Prize. A new study from Yonsei University has introduced a twist in this cosmic tale by suggesting that dark energy may actually be weakening, putting the brakes on the universe's acceleration

All major discoveries in cosmology underline the maxim that the universe is not only stranger than we suppose but that it is stranger than we can suppose. The latest example of this is a study by researchers at the Yonsei University in South Korea that said the expansion of the universe is slowing down.

The study, published in Notices of the Royal Astronomical Society of November 6, is in sharp contrast to the standard model of the universe, called Lambda-Cold Dark Matter (LCDM), which speaks of an accelerating universe.

Mysterious force

Accepted theory says the universe began about 13.8 billion years ago from a single, infinitely dense point that exploded cataclysmically in a 'Big Bang', leading to the formation of matter, energy, and space. As the explosion spread rapidly, it engendered subatomic particles such as protons, neutrons, and electrons before matter collapsed under gravity to form galaxies, stars and planets.

While the American astronomer Edwin Hubble confirmed that the universe was expanding in the 1920s, cosmologists conjectured that gravity must have also slowed down the expansion at some point. This is why they were surprised when, in 1998, astronomers who were measuring the distances to faraway galaxies using the light from exploding stars called Type Ia supernovae concluded that 9 billion years after the universe began, its expansion actually gained momentum.

They figured the impetus came from a mysterious force known as 'dark energy', which makes up about 70% of the cosmos. In 1917, Albert Einstein had proposed that its effects can be represented in equations by the cosmological constant lambda (Λ).

Source:https://www.thehindu.com/sci-tech/science/dark-energy-yonsei-university-universe-expansion-supernova-cosmology/article70448858.ece
Dated: December 30, 2025, https://www.thehindu.com

National Mathematics Day and the double life of Jantar Mantar

The instruments at Jantar Mantar embody the tenet of 'show, don't tell' by making measurements inspectable. Protests, in their best form, have a similar demand

Commemorating December 22 as National Mathematics Day invites memories of biographies, theorems, institutes, and prizes. But India also has mathematical places: built environments that render the mathematical act of measurement public. Jantar Mantar in New Delhi is one of them.

It was commissioned by Sawai Jai Singh II and completed in 1724 as an architectural observatory. Its masonry embodies its instruments, using which observers can measure time and celestial positions with only the naked eye. Over the years the Jantar Mantar has also helped scholars produce and correct astronomical tables and calendars.

Designated space

It is also, by a subsequent and largely administrative turn, the address that the Delhi police and governments have used to route public demonstrations. Since the early 1990s, Jantar Mantar Road has functioned as the designated street of protest, after the Delhi government pushed protests away from other central spaces such as Boat Club. This second life sits next to the first: the protest site is typically the road outside the protected monument complex, not the monument itself, but the civic shorthand often merges them into one entity in name.

Shorthand or not, however, these two histories sit in the same account and share a political problem that's become more crucial of late: how a state makes public life legible and how citizens contest that legibility.

Sawai Jai Singh's observatories weren't private retreats but instruments that produced knowledge in the public, whether they served courtly governance or scholarship. Their calibrated surfaces and shadow lines embed geometry and astronomy in built form, translating the sky itself into numbers that reveal a clearer view of the future.

This is important. The Delhi Jantar Mantar is not a library of proofs: it's a demonstration that measurement is a social act, something we do together. In the same vein but at a smaller scale, a sundial or a hemisphere instrument is a device as well as a claim about what counts as 'correct' time and 'correct' position, and about who can certify that. Even in the 18th century, accuracy wasn't just technical; it carried administrative consequences. For example calendars structured religious practices as well as taxation cycles, travel schedules as well as the timing of public authority.

Source:https://www.thehindu.com/sci-tech/science/national-mathematics-day-and-the-double-life-of-jantar-mantar/article70425574.ece
Dated: December 22, 2025, https://www.thehindu.com

ENVIRONMENT

How mangroves' cells help plants survive in saltwater

Scientists found that mangroves show a range of physiological strategies to tolerate the low osmotic potentials associated with saltwater

Given so much of the world's population lives along coasts, mangroves' functions directly benefit many people.

Saltwater would kill most plants, but it cannot fell the ancient mangroves species distinct for their giant stilt roots. So how do they survive on brine? International researchers and authors of a new paper in Current Biologyhave delved into their cells and discovered what makes mangrove shrubs and trees so different from all other terrestrial plants.

The scientists identified cell traits that are critical to tolerating a surge in saltwater as climate change raises sea levels. And this could also help create plants, especially agricultural crops, to survive in salty water.

"This work reveals that just a few simple cell traits are critical to tolerating the extreme conditions experienced by some of the most distinctive and resilient plants in the world," said Adam Roddy, a co-author and assistant professor in New York University's department of environmental studies.

Mangroves have evolved 30 times over the last 200 million years as they adapted to saltwater.

The scientists analysed 34 mangroves species and across 17 plant families and found that, compared to their inland relatives, mangroves do not exhibit smaller or more stomata to enable higher photosynthetic rates. Mangroves however have unusually small leaf epidermal pavement cells and thicker cell walls, which together give them more mechanical strength to tolerate low osmotic potentials.

Source:https://www.thehindu.com/sci-tech/science/how-mangroves-cells-helps-plants-survive-in-saltwater/article70375660.ece
Dated: December 14, 2025, https://www.thehindu.com/

Sex systems drive faster mitochondrial evolution in many insects

The results of a new study show how the way a species produces its males and females can shape the path of mitochondrial evolution, revealing an unexpected connection between reproductive biology and diversity. The implications extend to how experts keep track of insect biodiversity

Ants, bees, and wasps make females from eggs fertilized by sperm while the unfertilized eggs develop into males

Researchers at the University of Guelph, Canada, have discovered an unexpected link between the number of chromosome sets in insect cells and the rate at which their mitochondrial DNA evolves. This finding is surprising because mitochondrial DNA is separate from nuclear chromosomes and is usually thought to evolve independently of them.

The study shows that insects with a haplo-diploid (HD) sex-determination system—where females are diploid and males are haploid, as in ants, bees, and wasps—have faster-evolving mitochondrial genomes than species with a diplo-diploid (DD) system, in which both sexes are diploid. Since mitochondria are inherited only from females, scientists had not expected male chromosome number to influence mitochondrial evolution.

Mitochondria, the cell's energy producers, have their own tiny genome, far smaller than nuclear DNA and encoding only a few essential proteins. Despite this limited role, the mitochondrial genome plays a key part in evolutionary studies and biodiversity tracking.

To reach their conclusions, the researchers analyzed data from about 86,000 insect species across 26 orders. They found that certain orders, such as Hymenoptera and Thysanoptera, were entirely HD, while others showed a mix of HD and DD systems.

Published in Proceedings of the Royal Society B on November 26, the findings could reshape how scientists understand insect evolution and measure biodiversity.

Source:https://www.thehindu.com/sci-tech/science/sex-systems-drive-faster-mitochondrial-evolution-in-many-insects/article70456348.ece
Dated: January 01, 2026, https://www.thehindu.com/

Environment

Stress tests and drones: the new playbook to protect the endangered western hoolock gibbon

Over the last 50 years, the gibbon population has plummeted from over an estimated 100,000 individuals to less than 5,000

A male western hoolock gibbon at the Hollongapar Gibbon Sanctuary in Assam

In the Hollongapar Gibbon Sanctuary in Jorhat, Assam, the endangered western hoolock gibbon, the only non-human ape species in India, compete to be heard over the thundering roar of a passenger train that passes through the reserve forest.

Walking through the 2,100 hectare sanctuary, visitors listen intently for the cacophonous vocalisations of the gibbon from the upper canopy while our guide points to a tall hollong tree that this forest is famous for and named after.

Soon afterwards, we hear a rustle as a family of gibbons, including two offspring, swing majestically overhead. Even as we watch in awe, a faint, more threatening rumble grows louder. The gibbons scamper through the trees, and the entire forest resonates with the deafening noise of a train on the British-era Northeast Frontier Railway line that splits the forest into two unequal parts.

The train typifies the multiple anthropogenic pressures, including habitat loss, fragmentation and hunting, that affect the western hoolock gibbon across its habitat in the northeast Indian states of Assam, Meghalaya, Arunachal Pradesh, Manipur, Nagaland and Mizoram. Such has been its decline over the last half a century that, according to estimates, the gibbon population has plummeted from over an estimated 100,000 individuals to less than 5,000.

Addressing these overlapping threats to the western hoolock gibbon requires more than isolated research or localised interventions. Increasingly, this work is being coordinated through The Habitats Trust (THT), a Delhi-based conservation organisation that acts as a platform bringing together field scientists, local NGOs, technologists and community actors to address gaps in data, monitoring and long-term protection of species across fragmented landscapes in Northeast India.

Source:https://www.thehindu.com/sci-tech/energy-and-environment/western-hoolock-gibbon-endangered-assam-northeast-conservation/article70406652.ece
Dated: January 02, 2026, https://www.thehindu.com/

Study affirms Kerala's rich butterfly diversity

Monograph finds Kerala to be home to most number of butterflies species along Western Ghats

Kerala hosts the highest butterfly diversity in India along the Western Ghats, with 328 species recorded, including 41 species endemic to the region, according to a new monograph published in ENTOMON, an open-access journal of the Association for Advancement of Entomology.

The study, "The Butterflies (Lepidoptera, Rhopalocera) of Kerala: Status and Distribution," reports that the Western Ghats support 337 butterfly species, nearly all of which occur in Kerala. These species belong to six families, dominated by Nymphalidae (97 species), Lycaenidae (96), and Hesperiidae (82).

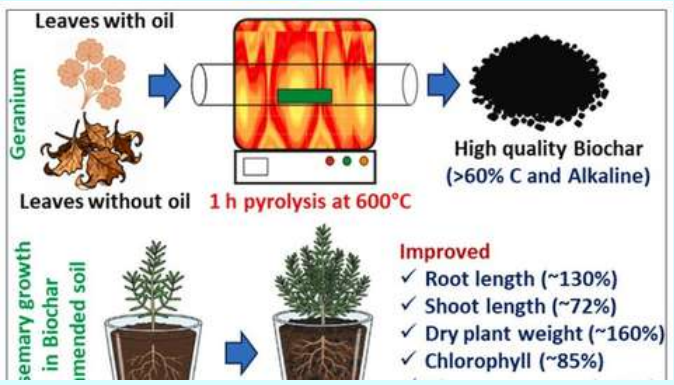
Led by Kalesh Sadasivan, the research documents 36 migratory species, underscoring Kerala's importance as a seasonal movement corridor. It also notes that 22 species found in the State are listed in the IUCN Red List, including two classified as 'Near Threatened'. Additionally, 70 species are protected under the Wildlife (Protection) Act, 1972.

A major contribution of the monograph is its extensive larval host plant checklist, featuring over 1,800 feeding records across nearly 800 plant species. The publication also provides key taxonomic revisions and describes a new subspecies, Tajuria maculata sureshi, discovered in Kerala.

Source:https://www.thehindu.com/sci-tech/energy-and-environment/study-affirms-keralas-rich-butterfly-diversity/article70403285.ece
Dated: December 16, 2025, https://www.thehindu.com/

AGRICULTURE

UoH turns Geranium waste from oil extraction into low-cost Biochar to boost plant growth



The process of converting Geranium waste into biochar is low-cost and energy-efficient, as per researchers

Geranium leaf waste — both from pre and post oil extraction — which is a mostly discarded byproduct, can be upcycled into a value-added material to rejuvenate soils and enhance plant growth, a multi-disciplinary team from University of Hyderabad has found.

The research was carried out by the Schools of Life Sciences and Engineering Sciences and Technology and led by senior professors in respective departments Appa Rao Podile and V.V.S.S. Srikanth. The research was recently published in Biomass and Bioenergy journal.

Biochar

According to the team, a process was designed to transform Geranium plant material into biochar — a carbon-rich product that improves soil and stores carbon. And tests showed that biochar contained about 65% carbon and useful minerals, giving it strong soil-boosting qualities.

When added to soil, it helped Rosemary plants grow better. The process is low-cost and energy-efficient, making it attractive for farmers. The researchers opined that abundant Geranium waste could reduce environmental impact, cut production costs, and promote a circular bioeconomy while improving crop yields across many regions in India.

Source:https://www.thehindu.com/news/cities/Hyderabad/uoh-turns-geranium-waste-from-oil-extraction-into-low-cost-biochar-to-boost-plant-growth/article70321266.ece
Dated: November 25, 2025, https://www.thehindu.com

Centre releases draft Seeds Bill; industry welcomes; farm outfits cautious

Bill defines farmers, seed traders and importers; provides for setting up seed committees at States and Centre

After two failed attempts by the United Progressive Alliance and National Democratic Alliance governments in 2004 and 2019, respectively, the Centre has introduced yet another draft Seeds Bill.

The Union Agriculture Ministry said the draft aligns with current agricultural and regulatory needs and seeks to replace the Seeds Act, 1966, and the Seeds (Control) Order, 1983. While the seed industry has welcomed the move, farmer organisations have reminded the Centre that similar Bills had to be withdrawn twice earlier following strong opposition.

According to an official release, the draft Seeds Bill, 2025 aims to regulate the quality of seeds and planting material in the market, ensure farmers' access to high-quality seeds at affordable prices, curb the sale of spurious and substandard seeds, and protect farmers from losses. It also seeks to liberalise seed imports to encourage innovation and access to global varieties, while safeguarding farmers' rights through greater transparency and accountability in the seed supply chain. On enforcement, the Bill proposes decriminalising minor offences to promote ease of doing business and reduce compliance burdens, while retaining strict penalties for serious violations.

The draft has been placed in the public domain, and stakeholders and citizens can submit comments and suggestions until December 11, 2025.

Under the proposed law, every seed dealer and distributor must obtain a registration certificate from the State government before selling, offering for sale, importing, exporting, or otherwise supplying seeds. It also mandates regulation of seed sales to ensure varieties meet minimum standards for germination, genetic and physical purity, traits, seed health, and other criteria laid down in the Indian Minimum Seed Certification Standards.

The draft further allows the Central government, through notification, to permit the import of unregistered seed varieties in specified quantities for research and trial purposes. It also defines the constitution and functions of Central and State seed committees.

Source:https://www.thehindu.com/news/national/centre-releases-draft-seeds-bill-industry-welcomes-farm-outfits-cautious/article70276737.ece
Dated:November 14, 2025, https://www.thehindu.com

AGRICULTURE

Climate change, imbalance in fertilizer use impacts soil's organic carbon: ICAR study

Team of scientists study more than two lakh soil samples to find out impact of loss of natural soil carbon, suggests measures to Governments to address situation

The team of scientists developed an 'agri-ecological base' map to assess the impact of cropping systems and the use of fertilisers on organic carbon. They covered 20 agro-ecological regions

A detailed study conducted by eight scientists of the Indian Council of Agricultural Research (ICAR), including its Director General Mangi Lal Jat, has found that the unscientific use of fertilisers and climate change are contributing to degradation of organic carbon in arable areas of the country.

The study, primarily coordinated by the ICAR's Indian Institute of Soil Science in Bhopal, has used 254,236 soil samples of 620 districts covering 29 States to reach the conclusions. A research paper based on the six-year-long study started in 2017 has been published now in the England-based international research journal 'Land Degradation & Development.'

Talking to The Hindu about the research, coordinator of the project Arvind K. Shukla said organic carbon is not only part of the chemistry of the soil, but it covers all the aspects of physics, chemistry and biology of soil. He said a study published by the United Nations' Food and Agriculture Organisation about 25 years ago flagged this issue, but the samples were very low. "In this study, we have taken samples extensively, and the sample collection was well designed. We have covered both arable and barren land, mostly arable land," he said.

Mr. Shukla said organic soil carbon is negatively correlated with temperature. "For example, in Rajasthan and Telangana, the temperature is very high and their organic carbon content is low," he added. The study noted that irrespective of the crops and cropping patterns, temperature, rainfall and elevation are the three important factors which decide the organic carbon concentration in the soil.

Source:https://www.thehindu.com/sci-tech/energy-and-environment/climate-change-imbalance-in-fertiliser-use-kill-soils-organic-carbon-icar-study/article70257059.ece
Dated: November 10, 2025, https://www.thehindu.com

India's horticulture sector to get hi-tech boost with Dutch initiative for pesticide-free food production in high-end green houses

This initiative focuses on technologies and practices that help produce food crops in a climate resilient manner

India's horticultural sector is set to get a hi-tech boost powered by AI for precision, as the Dutch government has embarked on a collaborative project in India to help produce pesticide-free food in state-of-the-art green houses that focus on water conservation and energy efficiency.

The initiative focuses on technologies and practices that help produce food crops in a climate resilient manner. The Dutch horticultural sector has formed a consortium, HortiRoad2India, a public-private partnership, to take forward its initiative in India. The consortium is now ready to forge alliance with stakeholders in India.

Indian requirement

Tiffany Meijer, Project Manager for International Trade in the Dutch horticulture sector & co-lead for HortiRoad2India, says the Dutch team has spent the last five years on understanding the Indian requirements based on which a comprehensive package has been prepared.

Emphasising that it comes with a pragmatic and holistic approach, Desh Ramnath, Director and co-ordinator of HortiRoad2India, says it would involve technology consultation, education, training and market linkages. "We have even built finance models with Indian banks together with the Dutch government," he says.

According to him, the Dutch package would offer mid-tech and high-tech green house technologies that include building glass houses instead of conventional polyhouses for high-efficiency and climate resilience. However, the choice of mid-tech or high-tech polyhouses would depend on the nature of crops proposed to be grown. While strawberry, coloured capsicum, cherry tomato, micro greens and lettuce are proposed to be grown in hi-tech glass houses, tomato cultivation can be ideally taken place in mid-tech green houses, he explained.

"The technology is environmentally and financially sustainable as we use 96% less water when compared with cultivation on open field, and get 30 times more yield (with respect to tomato). We desist from using pesticides, and manage pests only with biological control methods. Also, we do not use genetically modified crops. We prefer disease-resistance hybrid varieties," he says. "We want to generate clean food that does not need washing."

Source:https://www.thehindu.com/news/national/karnataka/indias-horticulture-sector-to-get-hi-tech-boost-with-dutch-initiative-for-pesticide-free-food-production-in-high-end-green-houses/article70224841.ece
Dated: November 01, 2025 , https://www.thehindu.com

HEALTH

Study finds normalising blood glucose with lifestyle could halve heart disease risk in prediabetics

Reaching prediabetes remission is linked to a decades-long benefit, halving the risk of cardiovascular death or hospitalisation for heart failure in diverse populations.

Normalising blood glucose levels through lifestyle changes can reduce the risk of heart attack, heart failure and premature death by nearly 50% among people with prediabetes, according to a study published in The Lancet Diabetes and Endocrinology.

Researchers found that achieving prediabetes remission—defined as a fasting blood glucose level below 97 mg/dL—was associated with a sustained reduction in cardiovascular risk, irrespective of age, weight or ethnicity. This simple threshold could be widely adopted in primary care settings worldwide.

Analysis of long-term data from over 2,400 prediabetic individuals in the US and China, followed for up to 30 years, showed significantly lower cardiovascular and overall mortality among those who achieved remission.

The findings suggest that alongside blood pressure control, LDL cholesterol reduction and smoking cessation, sustained normalisation of blood glucose should be considered a fourth pillar of cardiovascular prevention. Researchers recommend explicitly incorporating prediabetes remission as a treatment goal in clinical guidelines to reduce long-term cardiovascular disease and mortality.

Source:https://www.thehindu.com/sci-tech/health/study-finds-normalising-blood-glucose-with-lifestyle-could-halve-heart-disease-risk-in-prediabetics/article70421036.ece
Dated: December 28, 2025, https://www.thehindu.com/

JNCASR researchers uncover missing link in cellular cleanup that can help treat Alzheimer's, Parkinson's, and cancer

JNCASR researchers have found that a group of proteins called the exocyst complex, which normally helps move important molecules to the cell surface, also plays a key role in autophagy.

The JNCASR researchers have found that a group of proteins called the exocyst complex, which normally helps move important molecules to the cell surface, also plays a key role in autophagy.

Researchers from Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) have uncovered a surprising player in autophagy or the 'self-eating' process that removes damaged parts, fights infections, and keeps long-lived cells like neurons in good working order.

This newly uncovered missing link in cellular cleanup can help develop therapeutic strategies for Alzheimer's, Parkinson's and cancer.

According to the Department of Science and Technology, identification of key players in the early steps of autophagosome biogenesis, a key stage in the autophagy pathway, can lay the foundations for modulating the pathway for finding interventions that can restore the pathway in diseases such as Alzheimer's, Parkinson's and cancer.

"Just as our homes need regular cleaning, our cells also clear out damaged and unwanted materials through a process called autophagy," it said.

It added that when a cell fails to clear waste, its health suffers, especially in long-lived neurons.

The autophagy pathway, which removes damaged material and defends against infections, is disrupted in diseases like Alzheimer's and Huntington's. Autophagy also has dual roles in cancer, preventing it early on but supporting tumor growth later. Autophagy acts as tumor suppressor by maintaining genome integrity and cellular homeostasis by clearing cellular junk such as protein aggregates and damaged mitochondria. But it is also a double-edged sword as certain types of cancer cells hijack autophagy for their own survival and propagation. Understanding its regulation is crucial for the development of effective therapies," it added.

The JNCASR researchers have found that a group of proteins called the exocyst complex, which normally helps move important molecules to the cell surface, also plays a key role in autophagy.

Source:https://www.thehindu.com/news/national/karnataka/jncasr-researchers-uncover-missing-link-in-cellular-cleanup-that-can-help-treat-alzheimers-parkinsons-and-cancer/article70422321.ece
Dated: December 22, 2025 , https://www.thehindu.com/

HEALTH

Researchers identify key genetic factors causing oral cancer early among Indian tobacco chewers

In India, there are around 1,41,342 cases of oral cancer, with an average age-standardised rate of 10.0 per 1,00,000 people. In some states, this rate ranges from 25 to 33 per 100,000

The new research has identified specific genetic markers that significantly increase susceptibility to oral cavity cancer, one of the most common and preventable cancers in India, primarily linked to tobacco use

Researchers at the Advanced Centre for Treatment, Research and Education in Cancer (ACTREC) at Tata Memorial Centre (TMC), Mumbai, have identified key genetic factors that cause oral cancer among some tobacco chewers in India nearly a decade earlier than others.

The new research, published in eBioMedicine, part of The Lancet Discovery Science, has identified specific genetic markers that significantly increase susceptibility to oral cavity cancer, one of the most common and preventable cancers in India, primarily linked to tobacco use.

Study findings

The Genome-Wide Association study (GWAS) was done by researchers at Centre for Cancer Epidemiology (CCE), ACTREC.

Researchers compared 2,160 cases of Buccal Mucosa cancer with 2,325 controls from various geographical regions in India and conducted a genome-wide scan to understand the role of genetic susceptibility in the development of oral cancer.

They discovered genetic risk loci on chromosomes 5 and 6, near the genes CLPTM1L-TERT, HLA-DRB1, HLA-DQB1, and CEP43. Additionally, a meta-analysis that included data from Europe and Taiwan identified novel risk loci near the NOTCH1 gene.

The investigators calculated a polygenic risk score and found that tobacco chewers with a high polygenic risk score (indicating higher genetic susceptibility) developed Buccal Mucosa cancer 10 years earlier than those with a low polygenic risk score.

In India, there are around 1,41,342 cases of oral cancer, with an average age-standardised rate of 10.0 per 1,00,000 people. In some states, this rate ranges from 25 to 33 per 100,000. Despite similar lifestyle factors, the onset and progression of the disease can vary significantly among individuals.

Source:https://www.thehindu.com/sci-tech/health/researchers-identify-key-genetic-factors-causing-oral-cancer-early-among-indian-tobacco-chewers/article70341644.ece
Dated: December 01, 2025, https://www.thehindu.com/

All you need to know about: cellulitis

Cellulitis is a common skin infection caused mostly by streptococcus and staphylococcus bacteria. Anyone can contract cellulitis, but persons with skin wounds, or compromised immune systems, which allows the bacteria to enter easily, are at higher risk.

Cellulitis is a common bacterial infection that can be treated with a course of antibiotics. This skin infection is caused by a bacteria entering the system through broken skin, a wound or contracted by those with weak immune systems. The infection can affect the subcutaneous tissues, and is commonly found to affect the legs, feet and toes but could occur on the face, arms, hands and fingers as well. If left untreated the infection could spread to the lymph nodes and the blood stream, requiring hospitalisation.

What is cellulitis?

Cellulitis is a common skin infection caused mostly by streptococcus and staphylococcus bacteria. It can affect the tissues beneath the skin. Though it can affect any part of the body such as the face, arms, hands and fingers it usually affects the legs, feet and toes. Cellulitis can also affect just one side of the body. Anyone can contract cellulitis, but persons with skin wounds, or compromised immune systems, which allows the bacteria to enter easily, are at higher risk. Poor skin hygiene may also be a contributing factor. Cellulitis is not contagious but if untreated or if severe, it can spread to tissue under the skin, the lymph nodes and the bloodstream.

Symptoms and treatment

Infected skin may appear slightly discoloured, and warm to touch. As the infection spreads, the discolouration darkens and the skin swells and becomes tender. Apart from swelling and warmth, the infection could be painful. Affected persons could have fever, feel fatigued, experience chills, develop spots on the skin, blisters filled with fluid and dimpling of the skin. Treatment usually consists of a course of oral antibiotics. Severe cases may need hospitalisation and IV antibiotics.

Preventing relapses

Good skin hygiene can help prevent a relapse. It is necessary to wash hands regularly with soap and warm water. Cleaning and trimming finger and toenails and thoroughly drying the skin after a shower, wearing clean clothes and keeping small wounds clean can prevent the infection.

Cellulitis in India

An observational study by Tripta S. Bhagat, Luv Kumar, et al published in the The International Journal of Lower Extremity Wounds in March 2023 found that cellulitis was commonly seen in men, in the working age group. The mean age of those affected in the study was around 36 years. The affected were in field jobs, and among them 50% of the time, the risk factor for the condition was trauma. Other factors included diabetes mellitus and smoking. The commonest complication was abscess. While over half the persons required only conservative management the rest needed surgical intervention, requiring hospitalisation for five or more days.

Source: https://www.thehindu.com/sci-tech/health/all-you-need-to-know-about-cellulitis/article70459892.ece
Dated: January 01, 2026, https://www.thehindu.com/

Regional Cooperation: The Third Africa High-Level Forum on South-South and Triangular Cooperation for Sustainable Development

The 3rd Africa High-level Forum on South-South and Triangular Cooperation for Sustainable Development was convened under the patronage of His Excellency Dr. Julius Maada Bio, President of the Republic of Sierra Leone. This Forum followed the adoption of the Declaration of the Second High-level Forum on South-South and Triangular Cooperation for Sustainable Development, which was held in Kampala from 15 to 17 January 2024.

First convened in 2021, the Forum serves as an institutional platform for promoting South-South and triangular cooperation in Africa under the leadership of the African Peer Review Mechanism (APRM) Continental Secretariat, the leading peer-review body of the African Union, in close collaboration with key partners. Third edition partners included the Islamic Development Bank, the Saudi Fund for Development, the United Nations Development Programme, the African Development Bank, the Organisation of Southern Cooperation, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) office to the African Union, the African Union Economic and Social Council, the United Nations Office for South-South Cooperation, and other strategic partners. The Forum brought together more than 25 African countries as well as representatives from non-African countries including Saudi Arabia, Germany, India and China. UN entities including the World Food Programme (WFP) and the United Nations Development Programme (UNDP) and the UN Resident Coordinator in Sierra Leone were also key partners.

Featuring eight thematic discussion sessions spanning topics related to economic resilience, global financial architecture, digital transformation, and engagement of non-state actors to promote inclusive and participatory governance in Africa and, building national ecosystems for South-South and triangular cooperation, the Forum aimed at raising awareness and deepening understanding of the current state of South-South and triangular cooperation in Africa, the implementation of the BAPA+40 outcome document in Africa and, the significance of these cooperation modalities in the second-ten-year implementation plan of Agenda 2063.

Source: https://unsouthsouth.org/2025/05/09/regional-cooperation-the-third-africa-high-level-forum-on-south-south-and-triangular-cooperation-for-sustainable-development/
Dated: May 9, 2025, https://unsouthsouth.org/

CSW69: Elevating Voices of Grassroots Women's Organizations through South-South and Triangular Cooperation

The Beijing Platform for Action (BPfA) was adopted at a time of hope when democratic and human rights institutions were being strengthened; social movements were strong, supported and resourced; and trust in global institutions, multilateralism and the United Nations was high." This year marks its 30th anniversary amid economic uncertainty and a shifting geopolitical landscape, with growing demands for a new era of multilateralism.

Various reports feeding into the Beijing+30 Review noted uneven progress and persistent challenges. The synthesis report prepared by UNWomen raised that:

- 10% of women and girls remain in extreme poverty
- women still have only 64% of legal rights of men
- proportion of women with Internet access still low at 65%
- 2 billion women and girls still have no social protection
- half of the world's women and girls face conflict-related sexual violence
- women still carry 2.5X more unpaid care work than men
- only 4% of aid goes to programmes with gender equality as main objective

The call to action at CSW69 includes greater attention to the reality on the ground for women in the Global South, for context-specific prioritization and responses, and for greater solidarity among and for women across the North and South.

At a roundtable discussion during CSW69 with UNWomen, Huairou Commission, Oxfam and Spain, UNOSSC Director Dima Al-Khatib highlighted that the global community needs to more effectively leverage all available assets, knowledge, tools, and resources in responding to this call, with a particular focus on women at the "frontlines" – the women at the grassroots. Strengthening the linkages between Beijing+30 and BAPA+40 at the regional and grassroots level will help move goals and aspirations forward, she said.

The Second High-level United Nations Conference on South-South Cooperation, or BAPA+40 was a Summit in 2019 where Member States reviewed, reaffirmed and strengthened the Buenos Aires Plan of Action that was adopted in 1978, which elevated the immense potential of South-South and triangular cooperation for achieving development goals.

Source:https://unsouthsouth.org/2025/03/17/csw69-elevating-voices-of-grassroots-womens-organizations-through-south-south-and-triangular-cooperation/
Dated: March 17, 2025, https://unsouthsouth.org

Advancing Financing for Development through South-South and Triangular Cooperation in the Arab Region

The Regional Commissions of the United Nations conduct annual Sustainable Development Forums to review progress on five SDGs around a specific theme, with outcomes feeding into the High-Level Political Forum (HLPF) in New York each July. For 2025, the SDGs under review are SDG 3 (health and wellbeing), SDG 5 (gender equality), SDG 8 (decent work and economic growth), SDG 14 (life below water), and SDG 17 (partnerships, reviewed every year). The 2025 theme is "Advancing sustainable, inclusive, science- and evidence-based solutions for the 2030 Agenda and its SDGs for leaving no one behind".

The Arab Forum for Sustainable Development (AFSD) convened 14-16 April 2025 on the theme "Restoring hope, raising ambition", calling attention to inclusive, science- and evidence-based solutions for the 2030 Agenda and its Sustainable Development Goals (SDGs). A high-level segment during the Forum (at Ministerial level) focused on financing for development, given the upcoming *Fourth Conference on Financing for Development (FfD4)* in Seville, Spain 30 June – 3July 2025.

The Ministerial-level discussion at AFSD on 15 April ("On the Road to FfD4: Advancing a renewed global FfD framework and reforming the international financial architecture") addressed the regional position on financing for development in the lead up to the FfD4 and deliberated on the First Draft Outcome Document released on 10 March (leaning on the priorities of the region). In the session were:

- Moderator: Ibrahim Ahmed Elbadawi Founder and Managing Director of the Gulf Economic Policy and Research Center
- Panelists: Yassine Jaber, Minister of Finance of Lebanon; Abbas Kadhom Obaid, Chair of the Group of 77 and Permanent Representative of the Republic of Iraq to the United Nations; Jesús Ignacio Santos Aguado, Ambassador of Spain to Lebanon; and, Mahmoud Mohieldin, United Nations Special Envoy on Financing the 2030 Agenda for Sustainable Development
- Discussants (live from New York): Navid Hanif, Assistant Secretary-General for Economic Development, United Nations Department of Economic and Social Affairs (UNDESA) and Dima Al-Khatib Director of the United Nations Office for South-South Cooperation.

Source:https://unsouthsouth.org/2025/04/25/advancing-financing-for-development-through-south-south-and-triangular-cooperation-in-the-arab-region/
Dated: April 25, 2025, https://unsouthsouth.org/

Middle-Income Countries Unite Behind the New Makati Development Plan in Manila

A new global action plan aimed at supporting middle-income countries (MICs) was officially adopted in the Philippines this week. Known as the Makati Declaration, the plan was the outcome of the High-Level Conference of Middle-Income Countries (HLC-MICs) hosted by the Philippine government as incoming MICs Chair, in Makati City from April 28 to 29.

The High-Level Conference brought together more than 200 leaders and senior representatives from 24 MICs. Their shared goal: to craft strategies that help MICs grow sustainably, and play a stronger role in shaping the global development agenda. The Makati Declaration endorses recommendations to help MICs achieve sustainable growth and avoid falling into the so-called "middle-income trap," among others.

The Makati Declaration on Middle-Income Countries

The list of measures adopted at the High-Level Conference of Middle-Income Countries:

- Productive capacity development
- Human and social development
- Environment and climate change
- Science, technology and innovation and digital transformation
- Inclusive development cooperation
- Global multi-stakeholder partnerships
- South-South and Triangular cooperation (SSTC)
- Measures for sustainable development beyond GDP
- Building resilience to global shocks and multidimensional crisis.

"South-South cooperation is not just a modality – it is a movement of solidarity, shared leadership, and action," said H.E. Mr. Omar Hilale, Ambassador of Morocco to the UN and President of the High-level Committee on South-South Cooperation, noting that MICs are not only recipients but also active contributors to South-South cooperation. "It is the key to unlocking MICs' potential and addressing the structural gaps that still prevent many from fully realizing the SDGs."

Source:https://unsouthsouth.org/2025/04/30/middle-income-countries-unite-behind-the-new-makati-development-plan-in-manila/
Dated: April 30, 2025, https://unsouthsouth.org/

OTHERS

New species of gecko endemic to Western Ghats discovered in Coonoor

Published in 'Bionomina', Dravidogecko coonoor is the formal name of the "...distinct population of Dravidogecko in Coonoor Hills of the Upper Nilgiris, Western Ghats, India"

A new species of gecko, believed to be present only around Coonoor, has been discovered in the Nilgiris in Tamil Nadu.

Published in 'Bionomina', Dravidogecko coonoor is the formal name of the "...distinct population of Dravidogecko in Coonoor Hills of the Upper Nilgiris, Western Ghats, India," noted authors A. Abinesh, R.S. Naveen, A.N. Srikanthan, S. Babu, and S.R. Ganesh. The paper is titled 'Code-compliant description of a recently identified district Dravidogecko species from Coonoor, Western Ghats, India'.

Speaking to The Hindu, Mr. Abinesh, the lead author of the paper, said the gecko from Coonoor had originally been thought to belong to the same species of geckos known previously as Hemidactylus anamallensis, and now known as Dravidogecko anamallensis. "However, surveys done throughout the Western Ghats led to the subsequent discovery of eight different Dravidogecko species," he said.

Following the discovery of the new gecko species in Coonoor, the number of Dravidogecko species found across the Western Ghats now stands at nine, added Mr. Abinesh. The researchers said the species was noted in both urban as well as natural habitats, including the walls of a building, on the branches of plants, and in tree bark and wall crevices.

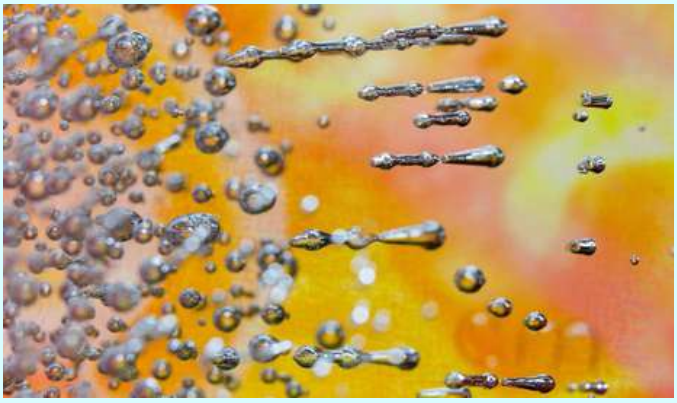
"In much as is known, Dravidogecko coonoor is currently known with certainty from the type locality Coonoor. The habitat here is generally characterised by a matrix of montane forests and monoculture plantations amidst human habitations. In all of the recorded places, human influence and settlement were rather dominant, with only partial vegetation cover," noted the authors.

The authors also said the species could be a "potentially threatened gecko species" whose population "as far as we know exists entirely outside the protected area network." This makes them highly susceptible to population decline due to habitat fragmentation, deforestation and potentially, climate change, said Mr. Abinesh, adding Dravidogecko was the only species of gecko endemic to the high elevation regions of the Western Ghats.

Source:https://www.thehindu.com/news/national/tamil-nadu/new-species-of-gecko-endemic-to-western-ghats-discovered-in-coonoor-in-tamil-nadu/article69727216.ece
Dated: June 24, 2025, The Hindu

Air bubbles trapped in ice can store messages in cold places

Scientists have developed a method that could be useful in cold places like the Arctic, the moon or Mars, where traditional storage like paper or electronics is hard to maintain



Close-up view of air bubbles in a variety of shapes frozen inside a mass of ice.

For as long as humans have lived, they've found ways to store information for others to find. Cave paintings were perhaps the first examples, followed later by messages in bottles, semaphore, books, persistent URLs, and so on.

Now, a research team from China and Czechia has reported in Cell Reports Physical Science a way to store messages by freezing air bubbles into ice. The researchers were inspired by bubbles in glaciers that preserve ancient air. They developed a method that could be useful in cold places like the Arctic, the moon or Mars, where traditional storage like paper or electronics is hard to maintain.

The idea is based on the fact that when water freezes, it traps air bubbles. The shape and arrangement of bubbles depend on how fast the water freezes. By carefully changing the freezing speed, the scientists could create layers of bubbles at specific spots in ice. These layers can be used to represent information just like the dots and dashes in Morse code or the 1s and 0s in binary code.

The scientists found that a bubble started smaller, grew, and shrank just a little before finally freezing. The bubble's final shape depended on how fast the freezing front, the part of water turning to ice, moved.

The team discerned two main bubble shapes: egg-shaped and needle-shaped. By measuring the height and width of the bubbles, team members classified regions as containing egg-shaped only, both eggs and needles, needle-shaped only, and no bubbles.

Next, the team created bubble layers by rapidly changing the freezing speed. This was done by suddenly lowering the temperature of the plate the water sat on. Each sudden change formed a new layer of bubbles. The scientists could form multiple layers in one ice slice by repeating this trick.

Source:https://www.thehindu.com/sci-tech/science/air-bubbles-trapped-in-ice-can-store-messages-in-cold-places/article69697105.ece
Dated: June 22, 2025, The Hindu

OTHERS

The snail as a model for restoring vision in humans

Regeneration isn't a rare miracle; instead it's an ancient biological program still written into the DNA of many species, and one that science is gradually learning to decode and revive

In Hindu mythology, Lord Shiva's third eye is said to open only in moments of great transformation. What if this isn't just a mythic symbol of cosmic vision but also a metaphor for renewal?

Ever wondered if there's a hidden switch that could unlock something just as extraordinary as the ability to regrow our own eyes? A camera-type eye, like that of humans and many other species, has a lens that focuses light onto a retina. Regeneration would be the ability of the eye to regrow itself after being completely removed or damaged. Recent work by Alice Accorsi and Alejandro Sánchez Alvarado's team (Nature Communications 16, 2025) has shown how such regeneration of the eye occurs in a golden apple snail. The snail is a mollusc: a backboneless, shell-covered animal that can live equally well in land and water.

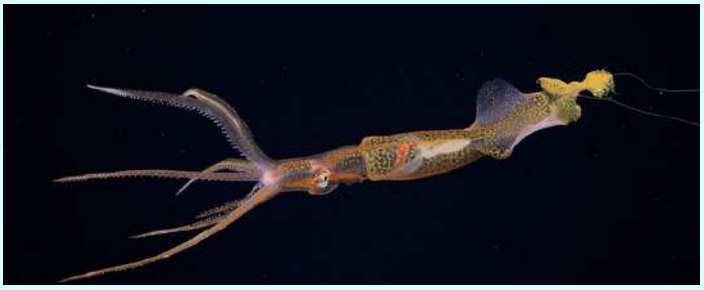
This miracle of regeneration isn't magic but beautiful molecular choreography. When the snail loses an eye, thousands of genes flip like switches: first those guiding wound healing, then those for cell growth and division, followed by diverse networks for new retinal cells, photoreceptors, and lenses. Among them, the PAX6 gene plays a critical role in the early development of the eye. In snails, this process is carefully coordinated by several other genes. These include genes responsible for forming new nerve cells, guiding nerve fibres to their correct targets, and detecting light, each becoming active at the right stage to ensure proper development. We as humans can't do the same yet but decoding these genetic triggers may one day help us awaken our own silent regenerative programs.

Just as snails can regrow their eyes, other animals such as frogs, planaria, and the African spiny mouse also possess strong regenerative powers. In axolotls, a type of salamander, damaged tissue can revert to a flexible stem cell-like state and rebuild bones, muscles, and other body parts. CRISPR is a gene-editing technology that enables us to redesign, remodel, and regenerate the genome structure we desire. At the L.V. Prasad Eye Institute at Hyderabad, scientists have used the CRISPR method to correct genetic eye diseases such as Leber congenital amaurosis (LCA) and Stargardt disease, using zebrafish as the animal model.

Source:https://www.thehindu.com/sci-tech/science/the-snail-as-a-model-for-restoring-vision-in-humans/article70380493.ece
Dated: December 14, 2025, https://www.thehindu.com/

Digital fossil-mining finally reveals origin of squids

The findings suggest squids became important players in marine ecosystems long before the mass extinction 66 million years ago that wiped out dinosaurs



Squids are some of the smartest and most agile animals in today's oceans, but their evolutionary history has been hard to figure out because their soft bodies don't fossilise well.

A new study has changed this using a method called digital fossil-mining to uncover fossils that were hidden inside rocks.

Instead of using traditional tools like chisels and acid baths, which often damage fragile rocks, scientists from Japan created a machine that slowly grinds a rock while taking detailed photographs of each layer. These images were stitched together to form a 3D model of everything inside the rock, including fossils. The method enabled the team to detect and digitally extract small squid beaks, the hard, chitin-based mouthparts all squids have.

By combining cutting-edge imaging with careful analysis of ancient rocks, the study has filled a big gap in the story of squid evolution. It was published in Science on June 26.

The team collected hard, round carbonate concretions from Cretaceous-era deposits in Japan dated 110-70 million years ago. These rocks were already known to preserve fossils well. From there, the team scanned and reconstructed 263 lower beaks from squids for further analysis.

The team found that the fossil beaks came from at least 40 squid species, divided among 23 genera and five families. This is a major discovery because previously only one fossil squid beak was known. The newfound squids belonged to two modern groups: deep-sea squids (Oegopsida) and coastal squids (Myopsida). It meant both groups existed as early as 100 million years ago, which is about 30 million years earlier than previously thought.

The earliest squids already had many different forms. Within only 6 million years, most known squid families had evolved, suggesting squids diversified very quickly once they appeared. By the Late Cretaceous, squids had become so abundant that their fossils outnumbered those of ammonites and bony fish.

Source:https://www.thehindu.com/sci-tech/science/digital-fossil-mining-finally-reveals-origin-of-squids/article69726508.ece
Dated: June 29, 2025, The Hindu