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SCIENCE & TECHNOLOGY

What is IIT-Delhi's quantum communications breakthrough?

After the event, defence minister Rajnath Singh said India had entered "a new quantum era of secure communication" that will be "a game changer in future warfare"

On June 16, the Ministry of Defence said in a statement that IIT-Delhi scientists together with the Defence Research and Development Organisation (DRDO) demonstrated quantum communication over a distance of more than 1 km in free space. The development was hailed as a breakthrough in quantum cybersecurity.

What is quantum communication?

When two or more photons, the subatomic particles of light, are created in just the right way, measurements made on one photon will instantly determine the result for the partner photon, too — even if the photons are far apart. This phenomenon is called quantum entanglement. Ordinary or classical physics can't explain this correlation, it's a purely quantum phenomenon.

Quantum communication is an umbrella term for any scheme that uses the concepts of quantum physics, but especially entanglement, to make a given communication channel leak-proof. In one scheme, like the one the IIT-Delhi team demonstrated, entangled photons carry information from a source to two stations. If any third party intercepts one of the photons, the other photon will immediately be disturbed as well and the channel will be revealed as insecure.

In short, quantum communication can be used to create communication channels that are protected against computational attacks since any attempt to tap the quantum channel will itself be revealed. Thus they have great value in defence settings. An important method in quantum communication is quantum key distribution (QKD).

Source: https://www.thehindu.com/sci-tech/science/quantum-communication-iit-delhi-drdo-entanglement-qkd-explained/article69705017.ece
Dated: June 10, 2025, https://www.thehindu.com

How does a plant's first shoot rise safely through soil, into daylight?

When a seed sprouts in darkness under the soil, its stem curves into a small hook shape that protects the delicate shoot tip as it pushes upward

Researchers from the Indian Institute of Science Education and Research (IISER), Bhopal, have found that a single protein helps plants time their first step from darkness into light.

When a seed sprouts in darkness under the soil, its stem curves into a small hook shape that protects the delicate shoot tip as it pushes upward. The hook needs to stay 'closed' until the seedling breaks through the soil and meets light. In the study, the team wanted to know how two common signals — ethylene, a plant hormone that builds up underground, and light — work together to decide exactly when the hook opens.

The team focused on what a gene called BBX32 really does in the model plant Arabidopsis thaliana. By comparing seedlings modified to lack BBX32, to churn out extra copies, to carry extra mutations, or to glow blue or green when the gene was activated or its protein moved around, the scientists could pinpoint how the protein made by the gene helps keep the hook closed.

The team also grew seedlings indarkness, red, blue, far-red light, and normal light, in plates with or without a compound that raises ethylene levels, and in thin layers of sand to imitate soil pressure.

They photographed three-day-old seedlings and used software to measure the hook angle as it opened over time. They also used genetic tools to track the performance of the BBX32 gene and counted how many seedlings breached a sand layer and turned green.

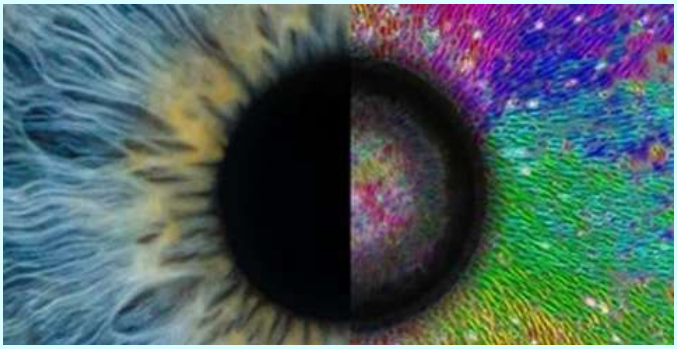
The findings were published in New Phytologiston May 28. The team comprised Nevedha Ravindran, Kavuri Venkateswara Rao, and Sourav Datta of the Department of Biological Sciences at IISER Bhopal.

Source:https://www.thehindu.com/sci-tech/science/how-does-a-plants-first-shoot-rise-safely-through-soil-into-daylight/article69644610.ece
Dated: June 10, 2025, https://www.thehindu.com

SCIENCE & TECHNOLOGY

IIT Bombay researchers uncover the role of invisible mechanical cues in tissue organisation

Researchers at IIT Bombay uncover how strain fields produced by embedded inhomogeneities within biomaterials influence cell alignment, reshaping our understanding of cell behaviour in development, disease, and tissue engineering.



In a new study, scientists at the Indian Institute of Technology (IIT) Bombay have demonstrated how cells can sense and respond to invisible mechanical patterns—like built-in tensions around them.

The research led by Professor Abhijit Majumder, was published in Cell Reports Physical Science. The findings not only add to the fundamental understanding of how cells organise themselves, but also have important implications for tissue engineering, cancer research, and wound healing.

Cells follow very specific patterns, for instance, muscle fibres are aligned parallel to each other to enable coordinated movements, blood vessels extend toward wounds to facilitate healing, and cells in the eye are arranged radially to help focus light precisely onto the retina, ensuring clear and accurate vision. Such precise spatial organisation is essential for proper tissue function.

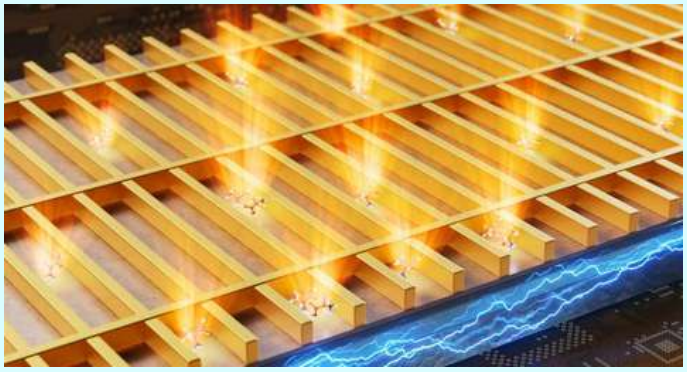
The arrangement of cells directly influences how effectively a tissue can carry out its role, be it contracting, transporting nutrients, or processing sensory input. But how do cells determine their correct location and orientation within these complex systems? Professor Majumder said that for decades, scientists believed that cells primarily relied on chemical signals, like growth factors or morphogens, to decide how and in which direction to grow.

“However, recent discoveries in this field suggest that mechanical signals are just as important. Cells can feel how stiff their surroundings are, detect tiny stretches, and even respond to surface textures smaller than themselves. In living tissue, mechanical inhomogeneities are common. You see it in tumours, healing wounds, and developing organs. But we haven’t fully explored how cells interpret and respond to these physical cues,” Professor Majumder said.

The researchers embedded a rigid object inside an otherwise soft material, mimicking mechanical inhomogeneity. The goal was to mimic how tissues naturally develop internal tension during processes like growth, injury, or tumour formation, and how cells might sense and respond to such forces.

Source:https://www.thehindu.com/sci-tech/science/iit-bombay-researchers-uncover-the-role-of-invisible-mechanical-cues-in-tissue-organisation/article69680462.ece
Dated: June 11, 2025, https://www.thehindu.com

Scientists build first self-illuminating biosensor



Optical biosensors use light waves as a probe to detect molecules, and are essential for precise medical diagnostics, personalized medicine, and environmental monitoring.

Their performance is dramatically enhanced if they can focus light waves down to the nanometer scale—small enough to detect proteins or amino acids, for example—using nanophotonic structures that "squeeze" light at the surface of a tiny chip. But the generation and detection of light for these nanophotonic biosensors requires bulky, expensive equipment that greatly limits their use in rapid diagnostics or point-of-care settings.

So, how do you make a light-based biosensor without an external light source? The answer is: with quantum physics.

By harnessing a quantum phenomenon called inelastic electron tunneling, researchers in the Bionanophotonic Systems Laboratory in EPFL's School of Engineering have created a biosensor that requires only a steady flow of electrons—in the form of an applied electrical voltage—to illuminate and detect molecules at the same time.

The work has been published in Nature Photonics in collaboration with researchers at ETH Zurich, ICFO (Spain), and Yonsei University (Korea).

"If you think of an electron as a wave, rather than a particle, that wave has a certain low probability of 'tunneling' to the other side of an extremely thin insulating barrier while emitting a photon of light. What we have done is create a nanostructure that both forms part of this insulating barrier and increases the probability that light emission will take place," explains Bionanophotonic Systems Lab researcher Mikhail Masharin.

Trillionth-of-a-gram detection

In short, the design of the team's nanostructure creates just the right conditions for an electron passing upward through it to cross a barrier of aluminum oxide and arrive at an ultrathin layer of gold. In the process, the electron transfers some of its energy to a collective excitation called a plasmon, which then emits a photon.

Their design ensures that the intensity and spectrum of this light changes in response to contact with biomolecules, resulting in a powerful method for extremely sensitive, real-time, label-free detection.

Source:https://phys.org/news/2025-06-scientists-illuminating-biosensor.html
Dated: June 26, 2025,https://phys.org/

ENVIRONMENT

New flowering plant species discovered in Aravali hills landscape near Jaipur

The plant was first spotted by researcher Nishant Chauhan, a committee member of the Satpura Biodiversity Conservation Society, who noticed a unique Portulaca-like succulent growing from the rock crevice on the dry and rocky hill slopes near the historic Galtaji temple on the outskirts of Jaipur.

New plant species Portulaca bharat discovered in Aravali hills near Jaipur.

A new flowering plant species with unusual morphological characteristics has been discovered in the rocky and semi-arid landscape of Aravali hills near Jaipur, shedding light on the region's hidden biodiversity. Classified as Portulaca bharat, the plant adds to the list of Indian endemics.

With no other populations currently known, Portulaca bharat has been provisionally assessed as "data deficient" under the International Union for Conservation of Nature Red List guidelines. The plant's narrow endemism and specific habitat requirements make it highly vulnerable to habitat degradation and climate change.

The plant was first spotted by researcher Nishant Chauhan, a committee member of the Satpura Biodiversity Conservation Society (SBCS), who noticed a unique Portulaca-like succulent growing from the rock crevice on the dry and rocky hill slopes near the historic Galtaji temple on the outskirts of Jaipur.

Mr. Chauhan collected a few live specimens, which were subsequently cultivated under the controlled conditions in Himachal Pradesh's Hamirpur and later in Lucknow to monitor growth patterns, flowering, and morphological stability across environments.

"After a detailed study and comparison with known species, the plant has been confirmed as a new species to science," Mr. Chauhan told The Hindu on Monday. The species has been described and published in the latest issue of international scientific journal, Phytotaxa, after a thorough examination of the herbarium collections at the Botanical Survey of India (BSI) and other institutions.

Source:https://www.thehindu.com/news/national/other-states/new-flowering-plant-species-discovered-in-aravali-hills-landscape-near-jaipur/article69701655.ece?cx_testId=81&cx_testVariant=cx_1&cx_artPos=2&cx_experienceId=EXPO56ZDYSGX&cx_experienceActionId=showRecommendationsX1R7QXU17VG227#cxrecs_s
Dated: May 31, 2025, The Hindu

Rediscovery of the Losgna genus in India: a new species of parasitic wasp discovered in Chandigarh, named - 'Losgna Occidentalis'

The rediscovery of the Losgna genus in India, after close to six decades, and describes "a new species collected from an urban dry scrub forest in Chandigarh"

Type specimen of the new wasp species, Losgna occidentalis collected from Chandigarh.

At a time when habitat loss and climate change threaten countless species, the discovery of a new species of parasitic wasp - named 'Losgna Occidentalis' from Chandigarh has drawn attention to the unexplored richness of India's biodiversity.

A recent study published in Zootaxa, a peer-reviewed scientific journal for animal taxonomists, titled - 'Rediscovery and description of a new species of Losgna (Cameron 1903): reviving a forgotten ichneumonid genus (Darwin wasps) in India' - points out the rediscovery of the Losgna genus in India, after close to six decades, and describes "a new species collected from an urban dry scrub forest in Chandigarh."

"The solitary Losgna (wasp) specimen was collected from a windowsill in Chandigarh, during winter 2023–24. This locality marks the first time any new insect species has been formally described from Chandigarh. The specimen belongs to a parasitic wasp (family Ichneumonidae), a group known for laying eggs inside or on other arthropod hosts. Prior to this discovery, Losgna had not been recorded in India since Heinrich's 1965 monograph. No records, specimens or published literature on Losgna existed in any Indian institution after 1965. It appeared that the genus had vanished entirely from its once-documented range in northeast India until we found this new specimen in Chandigarh," Karmannye Chaudhary, who led the study, a researcher in bird ecology and insect taxonomy at the Queen Mary University of London.

"We named the new species 'Losgna occidentalis' because it represents the westernmost known occurrence of the genus: prior records came exclusively from tropical forests of eastern India and adjacent regions of Southeast Asia. 'Occidentalis' signifies this western extension," he said.

Source:https://www.thehindu.com/sci-tech/science/rediscovery-of-the-losgna-genus-in-india-a-new-species-of-parasitic-wasp-discovered-in-chandigarh-named-losgna-occidentalis/article69665130.ece
Dated: May 30, 2025, https://www.thehindu.com/

Environment

Cancer is on the rise in India: could air pollution be a factor?

India reports about 75,000 new cases of lung cancer each year, this is projected to go up to 1 lakh cases, calling for urgent action

Over the past decade or so, air pollution has been increasingly spoken about in India, particularly in the context of the deterioration of air quality across large parts of the country, especially in the winter months. The air we breathe is known to be linked to respiratory illnesses and even cardiac disease, but now, experts say, there is also a strong association with a disease that is a rising burden in India: cancer.

The scale of the cancer burden in India

Cancer numbers are rising, and rising fast in India. The Indian Council of Medical Research-National Cancer Registry Programme has projected that the number of cancer cases in the country will spike from 14.6 lakh in 2022 to 15.7 lakh in 2025. Approximately one in nine people in India is expected to face a cancer diagnosis during their lifetime, the ICMR estimates.

Cancer ranks second when it comes to non-communicable diseases that cause deaths in India. Lung cancer is the second-most common cancer among men in India, and also figures amongst the top five when it comes to women. Globally, it is the leading cause of cancer-related deaths, accounting for the highest mortality rates among both men and women.

Could air pollution be behind the rise?

There is no doubt, says Krithiga Shridhar, head, Cancer Epidemiology Unit, Centre for Chronic Disease Control, New Delhi, that both outdoor (ambient) air pollution in general, and particulate matter (PM) in particular, are Group 1 carcinogens, meaning that there is sufficient evidence based on human studies that they have the potential to cause cancer. Indoor (household) air pollution, meanwhile, is classified as a group 2 carcinogen, meaning the evidence is probable.

According to Swiss tech company IQAir's 2024 World Air Quality Report, India ranked as the fifth-most polluted country in the world with an annual average PM 2.5 concentration of 50.6 micrograms per cubic metre, against the World Health Organization's recommendation of 5, and higher than India's National Ambient Air Quality Standards of 40.

Source:https://www.thehindu.com/sci-tech/health/cancer-is-on-the-rise-in-india-could-air-pollution-be-a-factor/article69648732.ece
Dated: June 03, 2025, The Hindu

The challenges of data centres trying to meet their climate goals

Electronics heat up very quickly. If the chips get too hot, they may malfunction or altogether fail. Cooling keeps them running smoothly and ensures a longer lifespan. However, in data centres, cooling consumes nearly as much power as computing

A team of researchers from Microsoft and WSP Global has published a groundbreaking study in Nature demonstrating that advanced cooling methods like cold plates and immersion cooling can cut data centre emissions by 15-21%, energy use by 15-20%, and water consumption by 31-52% compared to traditional air cooling.

The life cycle assessment, led by Husam Alissa of Microsoft, Mukunth Natarajan, and Praneet Arshi of WSP, among others, also provided actionable insights to help the Information and Communications Technology (ICT) industry meet its climate goals. "Our [life cycle assessment] has shown that reducing data centre energy use through advanced liquid-cooling technologies will lead to marked reductions in data centre environmental impacts," the authors wrote in their paper.

Electronics versus rising temperatures

Electronics heat up like crowded kitchens: billions of microscopic switches (transistors) are like cooks working nonstop, bumping into each other while flipping electrical dosas (data). The tighter they are packed — that is smaller the chips are — or the more tasks they handle, the more they collide and create heat, just like a packed kitchen gets hotter, needing fans and ACs to cool down. A laptop is like a kitchen with one burner: a simple fan suffices. A data centre is like a thousand laptops working at full speed in a single room, generating heat like a massive bonfire compared to a single candle. Without cooling, the intense heat will melt the hardware in minutes.

Heat slows down electrons, like runners in thick mud. If the chips get too hot, they may malfunction or altogether fail. Cooling keeps them running smoothly, ensures a longer lifespan and fast and reliable performance, and prevents heat damage. Just like an athlete needs water to stay sharp in a race, electronics need efficient heat removal.

Race to cut emissions

In data centres, cooling consumes nearly as much power as computing, like an AC fighting oven heat in a busy kitchen. To curb climate change, the ICT industry needs to cut emissions by 42% by 2030 (from its 2015 levels). Data centres need greener designs that use less energy and water, and have lower greenhouse gas emissions to help meet global climate goals and keep warming below 1.5°C. Urgent upgrades to energy, efficiency, and cooling are critical.

Source:https://www.thehindu.com/sci-tech/energy-and-environment/how-the-technology-industry-is-trying-to-meet-its-climate-goals/article69645291.ece
Dated: June 02, 2025, The Hindu

AGRICULTURE

The story of how heeng came to be successfully cultivated in India

The first flowering and seed set of heengat Palampur was reported on May 28, 2025, by CSIR, showing heeng can indeed be successfully cultivated in India; until early last decade India depended on imports; the government subsequently launched a national effort to promote indigenous cultivation which was led by the IHBT in Palampur, Himachal Pradesh

File photo of saplings of Ferula assa-foetida grown by CSIR-IHBT scientists.

Heeng or asafoetida (Ferula assa-foetida) is an essential ingredient in many Indian cuisines. A pinch of heeng is typically added to hot oil before other constituents when cooking. Despite the great diversity of India's cuisines, most of them have recipes with heeng.

There are mentions of heeng in ancient Indian texts including the Mahabharata and texts of Ayurveda. The latter recommends using heeng to refresh one's senses, including consciousness. The Charaka Sanhita Sutrasthana 27/299 says heeng can help relieve abdominal pain, digest undigested food, and enhance taste. The Pippalada Samhita and the works of Panini also include heeng.

Today, heeng plants thrive in cold, arid environments suited to the native regions in Iran, Afghanistan, and Central Asia. The plant prefers sandy, well-drained soil with low moisture, ideally receiving annual rainfall of 200 mm or less, though it can tolerate up to 300 mm in cultivated regions like the Indian Himalaya. It flourishes in temperatures of 10-20° C, tolerates highs of up to 40° C, and withstands winter lows down to –4° C. In extremely dry and cold weather, heeng plants typically become dormant to survive.

These requirements make high-altitude, semi-arid regions like Lahaul-Spiti and Uttarkashi in India suitable for its cultivation. Excessive rainfall or high soil moisture can hinder growth.

The final product obtained from the plant, asafoetida, is derived from an oleo-gum resin extracted from the plant's thick, fleshy taproot and rhizome, which makes up 40-64% of the dried gum. Heeng is a perennial plant that typically takes five years to mature and start flowering. Incisions are then made in the taproot, allowing the milky latex to exude and harden into a gum-like substance. This resin is dried and processed into powder or crystal form for culinary and medicinal use.

Source:https://www.thehindu.com/sci-tech/energy-and-environment/the-story-of-how-heeng-came-to-be-successfully-cultivated-in-india/article69671137.ece
Dated: June 19, 2025, https://www.thehindu.com/

IISc researchers unravel the mystery behind how lac insect produces pigment

Researchers have found that the colourful pigment extracted from the lac insect may be produced by a symbiotic yeast-like organism living inside the insect

Insects surrounded by their resin seen attached on their host plant.

In a new study, researchers at the Indian Institute of Science (IISc) have unravelled the mystery behind how the lac insect produces laccaic acid that is used to make lac pigment. The lac pigment is a prized commodity used in food colouring, textiles, dyes, handicrafts, and folk art.

According to IISc, the lac insect grows on certain trees (like the flame of the forest), drinks its sugary sap, and secretes a sticky resin called shellac.

It also makes a bright red compound called laccaic acid, which is used to make the pigment. "How the insect produces laccaic acid has remained a source of mystery. For decades, scientists have unsuccessfully hunted for genes coding for its synthesis in the insect's genome," IISc said. However, now the researchers have found that the colourful pigment extracted from the lac insect may actually be produced by a symbiotic yeast-like organism living inside the insect. The team also showed that the yeast-like organism exclusively harbours genes coding for key ingredients in the pigment synthesis pathway.

India, a key producer

"For thousands of years, India has been a key producer of lac pigment. The pathway for the pigment production was not very clear," said Shantanu Shukla, assistant professor in the Department of Developmental Biology and Genetics, IISc.

IISc said that one of the key ingredients required for laccaic acid synthesis is an amino acid called tyrosine, which the insect cannot make on its own or source from the tree sap. Such missing ingredients are usually supplied by symbiotic bacteria or fungi that live inside insect bodies and secrete these molecules in exchange for housing.

The team sequenced the entire bacterial and fungal microbiome of the insect and zeroed in on two possible candidates: a bacterium belonging to the Wolbachia genus and a yeast-like fungus. Previous studies by other researchers had hinted at the presence of the fungus but had not identified it or sequenced its genome.

In the current study, the team found that neither the insect nor the bacterium carried the genes needed to make tyrosine and other components of the pigment pathway. But the yeast-like organism did — it carried the entire set of genes needed for laccaic acid production. This includes genes coding for various enzymes which catalyse the production of aromatic molecules that are the building blocks of laccaic acid.

Source:https://www.thehindu.com/news/national/karnataka/iisc-researchers-unravel-the-mystery-behind-how-lac-insect-produces-pigment/article69704152.ece
Dated: June 18, 2025, The Hindu

AGRICULTURE

NIPGR's gene-edited japonica rice shows increased phosphate uptake, 20% more yield

Phosphorus is an essential mineral for plant growth and development of plants. In case of limited phosphorus availability, crop productivity drops drastically. Even when phosphate fertilizers are used, only about 15-20% are taken up by plants while the balance gets leached out or lost through runoff

Scientists at the Delhi-based National Institute of Plant Genome Research (NIPGR) have used CRISPR-Cas9 gene editing technology to increase phosphate uptake and transport in japonica rice varieties. The resulting rice lines had higher seed and panicle numbers, thereby increasing the yield without compromising seed quality. The studies were carried out in a greenhouse.

Phosphorus is an essential mineral for plant growth and development of plants. In case of limited phosphorus availability, crop productivity drops drastically. Even when phosphate fertilizers are used, only about 15-20% are taken up by plants while the balance gets leached out or lost through runoff.

When the recommended amount of phosphate fertilizer was used, yield increased by 20% in gene edited rice lines. However, when only 10% of the recommended dose of phosphate fertilizer was used, yield in gene-edited rice lines increased by 40% compared with the control, says Dr. Jitender Giri from NIPGR, and the corresponding author of a paper published in Plant Biotechnology Journal.

"The purpose was to just demonstrate that even under extreme conditions of using only 10% of the recommended dose, the gene-edited lines showed increased phosphate uptake resulting in 40% higher yield compared with the control group, where the yield reduced sharply," says Dr. Giri. "But if phosphate fertilizer supply is reduced by 10% or even 30%, it is very likely that the gene-edited lines will still outperform the control plants."

Source: https://www.thehindu.com/sci-tech/science/nipgrs-gene-edited-japonica-rice-shows-increased-phosphate-uptake-20-more-yield/article69786092.ece
Dated: July 08, 2025, The Hindu

Warmer spots within fields have more blooms and more bees, researchers discover

Climate can vary across large areas of land, but it can also vary within much smaller areas such as farms. A new study by researchers at Penn State has examined whether these microclimates—the climate of a very small or restricted area—affect pollination by both wild and managed bees and resulting wild blueberry yields.

The study, appearing in Agriculture, Ecosystems & Environment, took place on a 170-acre wild blueberry field in Maine.

Researchers discovered that both wild bees and honey bees found the most densely blooming areas of the fields and concentrated their foraging in these areas. Wild bees also tended to forage on plots that were warmer than average.

The researchers also found that even though managed honey bees were abundant at the site, there was no evidence of fewer wild bees near the honey bee hive locations or in the fields that had the highest honey bee foraging.

Heather Grab, assistant professor in the College of Agricultural Sciences and lead author on the paper, said the findings could be used to help inform precision agriculture approaches to help conservation efforts.

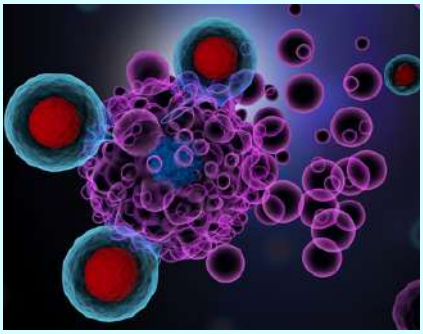
"For example, precision agricultural management approaches often suggest removing low-performing sites from production, perhaps to the benefit of increasing areas for biodiversity conservation," she said. "Remote sensing techniques could measure flower density patterns across the field and identify low-blooming regions, which may be a promising method for selecting candidate areas to convert to conservation habitats."

As pollinators decline worldwide, much research has been dedicated to finding out why, with factors such as climate change and availability of floral resources and nesting habitats identified as contributors, according to Grab. The researchers said that while these factors are important at a broad scale, finer-scale variations in these factors can also drive pollinator distributions in smaller microclimates, such as within farms.

Source:https://phys.org/news/2025-06-warmer-fields-blooms-bees.html
Dated: June 24, 2025, www.phys.org

HEALTH

CAR T-cell therapy and its promise of new hope for cancer treatment



In recent years, cancer treatment has taken a big leap forward with a new, advancement known as CAR T-cell therapy. This may may sound complex, but the idea behind it is fairly simple: using the power of a patient's own immune system to fight and destroy cancer cells.

What is CAR T-cell therapy?
Our body's immune system has special cells called T-cells that help fight viral infections and cancer. In CAR T-cell therapy, doctors take these T-cells from a person's blood (a process known as leukapheresis) and modify them in a lab so they can recognise and destroy cancer cells more effectively. These modified cells are called CAR T-cells, where "CAR" stands for Chimeric Antigen Receptor, a special protein added to help the T-cells find cancer cells. Once these smart T-cells are ready, they are put back into the patient's body through an intravenous (IV) drip. From there, they search for cancer cells and attack them.

How does this therapy help?
CAR T-cell therapy has shown promising results so far, especially in blood cancers like leukaemia and lymphoma. For many patients who do not respond to other treatments like chemotherapy or radiation, CAR T-cell therapy has helped achieve remission, which means their cancer signs stopped growing or even disappeared.
This therapy is not just another medicine—it is personalised for each patient, using their own cells. That is what makes it powerful and unique.

Where does CAR-T help?
CAR T-cell therapy is approved for use in haematological malignancies like leukemia, non-Hodgkin lymphoma and multiple myeloma. It is indicated in patients who have either relapsed (cancer has returned after treatment) or who have a refractory (cancer has not responded to prior treatment) disease.

Are there any side effects?
Like any powerful treatment, CAR T-cell therapy can have side effects. The most common side effect is cytokine release syndrome (CRS), which is like a strong immune reaction. It can cause fever, low blood pressure, or trouble with breathing. However, doctors are trained to handle these symptoms, and many patients recover from them within a few days. Another possible side effect is a condition known as immune effector cell-associated neurotoxicity syndrome (ICANS) where patients have symptoms like headache, changes in consciousness, confusion, and loss of balance. These side effects are mostly temporary and can be managed medically.

Source: https://www.thehindu.com/sci-tech/health/car-t-cell-therapy-and-its-promise-of-new-hope-for-cancer-treatment/article69720976.ece?cx_testId=81&cx_testVariant=cx_1&cx_artPos=1&cx_experienceId=EXPO56ZDYSGX&cx_experienceActionId=showRecommendationsX1R7QXU17VG227#cxrecs_s
Dated: June 24, 2025, The Hindu

Towards empowerment: busting myths around vitilig

India is home to one of the highest populations affected by vitiligo globally, with studies showing a prevalence ranging from 0.46% to 2.16%. Millions live with this condition — often silently, and sometimes, undiagnosed — in the shadow of misconceptions

Vitiligo is an autoimmune condition where the body's immune system mistakenly attacks its own pigment-producing cells.

In a world that idolises perfection, vitiligo tells a strikingly different story — one of resilience, uniqueness, and rediscovered beauty. Vitiligo is a skin condition where the body loses its pigment in patches, turning areas of the skin white due to the loss of melanin. India is home to one of the highest populations affected by vitiligo globally, with studies showing a prevalence ranging from 0.46% to 2.16%. That means that millions live with this condition — often silently, and sometimes, undiagnosed, in the shadows of misconceptions.

What causes it?
Vitiligo is an autoimmune condition where the body's immune system mistakenly attacks its own pigment-producing cells. It can also be triggered by genetics, thyroid dysfunctions, or skin trauma. It can occur at any stage in life — across genders, ages, and skin tones. Importantly, vitiligo is not contagious, and is not caused by poor hygiene.

Treatment and support
There is no permanent cure for vitiligo as yet; however, several treatments can help to manage and reduce progression of the condition. These include: topical creams to encourage re-pigmentation; phototherapy (UVB light therapy). Surgical options such as mini punch grafting, blister grafting and split-thickness skin grafting give excellent re-pigmentation in stable cases.

There are also options for cosmetic coverage for those who choose it and certain oral medications including immunosuppressants, as well as multivitamins, to arrest progression and for repigmentation. Consulting a dermatologist is essential to decide what is best for each individual. Emotional support and counselling often prove just as important as medical care.

Busting myths

Myth 1: Vitiligo is contagious.
Fact: It cannot be spread through contact.
Myth 2: It only affects people with dark skin.
Fact: It occurs in all skin tones.
Myth 3: Vitiligo is caused by poor hygiene.
Fact: Vitiligo is an autoimmune disorder.
Myth 4: Vitiligo is just cosmetic.
Fact: It is a skin condition that requires treatment as it impacts emotional and mental well-being.

Source:https://www.thehindu.com/sci-tech/health/towards-empowerment-busting-myths-around-vitiligo/article69707616.ece
Dated: June 18, 2025, The Hindu

HEALTH

All you need to know about: sickle cell disease

Sickle cell disease is inherited. When both parents have a copy of the sickle cell gene and the child inherits both copies, then the child gets sickle cell disease

It's a disease that not many know about, despite estimates indicating that India carries the second-highest burden globally. Sickle cell disease, a group of inherited blood disorders, affects around 1 million people in India, a significant proportion of whom are concentrated in tribal belts across Odisha, Jharkhand, Chhattisgarh, Madhya Pradesh, and Maharashtra.

June 19 is observed as World Sickle Cell Awareness Day and this year's theme is: 'Global Action, Local Impact: Empowering Communities for Effective Self-Advocacy.' Here is all you need to know about sickle cell disease.

What is sickle cell disease?

Sickle cell disease refers to a group of inherited blood disorders. A genetic mutation causes the body to produce abnormal haemoglobin. Haemoglobin is a protein containing iron, found in the body's red blood cells. It plays a crucial role in transporting oxygen from the lungs to the rest of the body. In patients with sickle cell disease, the abnormal haemoglobin causes the shape of the red blood cells to change. Healthy red blood cells are round, and can easily move throughout the body, delivering oxygen. In sickle cell disease, the red blood cells are shaped like a sickle (hence the name) or a crescent, and become rigid and sticky. The sickle cells can slow or block blood flow, hampering the delivery of oxygen to organs and tissues, causing pain and other complications. In addition, sickle red blood cells are more fragile than normal red blood cells: they last only 10 to 20 days as opposed to 90 to 120 days that the normal red blood cells last, which means the body may have a lower number of red blood cells -- anaemia.

How does it occur?

Sickle cell disease is inherited. When both parents have a copy of the sickle cell gene and the child inherits both copies, then the child gets sickle cell disease. If the child inherits only one copy of the sickle cell gene, the child has sickle cell trait -- this means that there is one normal haemoglobin gene and one sickle cell gene. These children generally do not have symptoms, but are carriers, and can pass on the gene to their children.

Source:https://www.thehindu.com/sci-tech/health/all-you-need-to-know-about-sickle-cell-disease/article69708505.ece?cx_testId=81&cx_testVariant=cx_1&cx_artPos=1&cx_experienceId=EXPO56ZDYSGX&cx_experienceActionId=showRecommendationsX1R7QXU17VG227#cxrecs_s
Dated: June 19, 2025, The Hindu

Major study says malaria reinfection creates special immune cells

A study published in Science Immunology may open new pathways to conquer malaria and other difficult infections for which we currently lack effective vaccines

In a groundbreaking discovery that could reshape our understanding of the immune system and pave the way for revolutionary new vaccines and drugs, scientists have characterised a previously less-understood immune cell with powerful regulatory functions.

They have found that immune cells called T_R1 cells play a dominant role in mounting an immune response to malaria. The implications of the study, published in the journal Science Immunologyon April 25, are far-reaching, potentially opening new pathways to conquer not only malaria but many other 'difficult' infections for which we currently lack effective vaccines.

Lines of defence

The human immune system has a complex multi-layered defence against infections. Its arsenal of weapons includes numerous components and subcomponents with precisely defined tasks to execute. They must also coordinate with each other to ensure the response is effective and minimises self-harm.

When an infectious agent breaches the first layers of defence (skin and mucosae), specialised arms of the immune system respond. The first among them is innate immunity: it acts against any threat non-specifically, while activating other arms of the system, which are collectively called adaptive immunity.

In addition to acting against a threat, adaptive immunity stores a record of the molecular signature of the threat, or antigen, with help from the memory cells. Every antigen has specific memory cells. When they recognise an antigen they've encountered before, they accelerate and enhance the immune response. This adaptive immunity has two important subcomponents. Antibody-mediated humoral immunity is mediated chiefly by B-cells while cell-mediated immunity involves the T-cells.

The real heroes

The new study, led by Jason Nideffer of Stanford University, focused on a subtype of T-cells called $CD4_+$ cells. They are also called helper cells because they help activate B-cells, T-cells, and immune cells like macrophages during an immune response. The team examined helper cells in children and adults who have suffered malaria multiple times. One subset of helper cells are the type-1 regulatory T-cells, or T_R1 cells. Another subset of helper cells are the T_H1 cells.

Source: https://www.thehindu.com/sci-tech/science/major-study-says-malaria-reinfection-creates-special-immune-cells/article69628586.ece
Dated: May 29, 2025, The Hindu

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:vhttps://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.

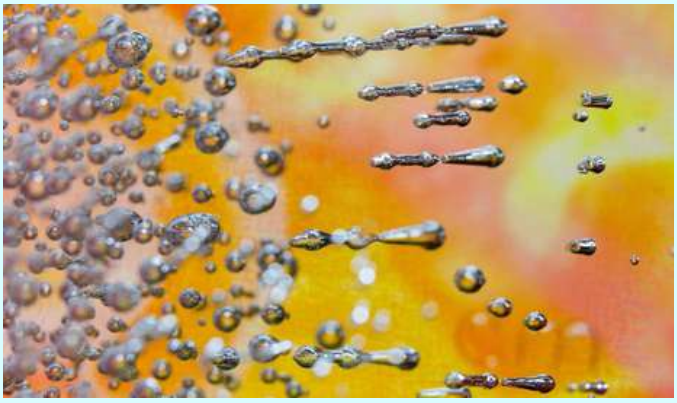
"In much as is known, Dravidogecko coonoor is currently known with certainty from the type locality Coonoor. The habitat here is generally characterised by a matrix of montane forests and monoculture plantations amidst human habitations. In all of the recorded places, human influence and settlement were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

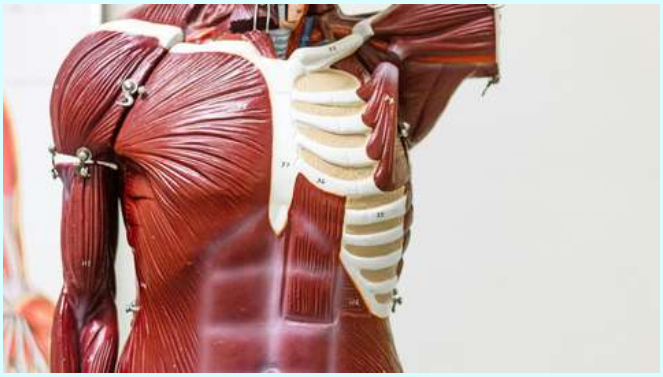
Next, the team created bubble layers by rapidly changing the freezing speed. This was done by suddenly lowering the temperature of the plate the water sat on. Each sudden change formed a new layer of bubbles. The scientists could form multiple layers in one ice slice by repeating this trick.

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

Common molecule offers clue to making old muscles young again

Researchers found that five daily injections of prostaglandin E2 restored muscle stem cell function in aged mice



As we age, it gets harder to recover from a fall, injury or even a tough workout because the body's muscle-repair system starts to falter. Muscle stem cells (MuSCs), the in-house repair crew, stop dividing and rebuilding tissue, losing their ability to respond to damage.

A study in Cell Stem Cell on June 12 suggested this decline may be reversible. The key isn't some futuristic therapy but a molecule already used in hospitals today.

Researchers found that five daily injections of prostaglandin E2 (PGE2), a compound involved in inflammation and used clinically to induce labour, restored muscle stem cell function in aged mice. After treatment, older mice regained the ability to regenerate damaged muscle: their muscle fibres grew larger, muscle mass increased, and strength improved by about 20% compared to their untreated peers.

The findings are important because PGE2 is naturally produced in the body, particularly after injury. It signals MuSCs to start repairs in young muscle, but in older tissue this signal fades, leaving stem cells inactive even when needed.

After PGE2 treatment, aged stem cells "woke up", resumed dividing, participated in tissue repair, and helped restore the animals' muscle strength. Remarkably, these effects lasted at least two weeks beyond the treatment window, suggesting more than just a temporary boost.

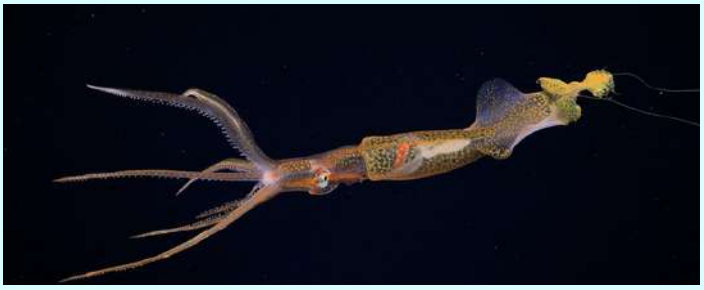
Even more strikingly, the outcome held true outside the body. When aged stem cells were treated with PGE2 for just 48 hours in the lab and transplanted into injured muscle, they formed new tissue at levels comparable to young stem cells. Imaging showed that these treated cells engrafted robustly, persisted for weeks, and even expanded in response to subsequent injury — evidence that PGE2 acted directly on the cells themselves, not just their environment.

To understand how, the team examined molecular changes inside the cells. PGE2 reopened regions of the genome that had become inaccessible with age. It also dialed down a stress-related pathway called AP-1, which becomes overactive in aging MuSCs. The molecule reset the cells' internal programmes, allowing them to act more like their younger selves.

Source:https://www.thehindu.com/sci-tech/science/can-old-muscles-be-made-young-again-common-molecule-offers-clue/article69697042.ece
Dated: June 16, 2025, The Hindu

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