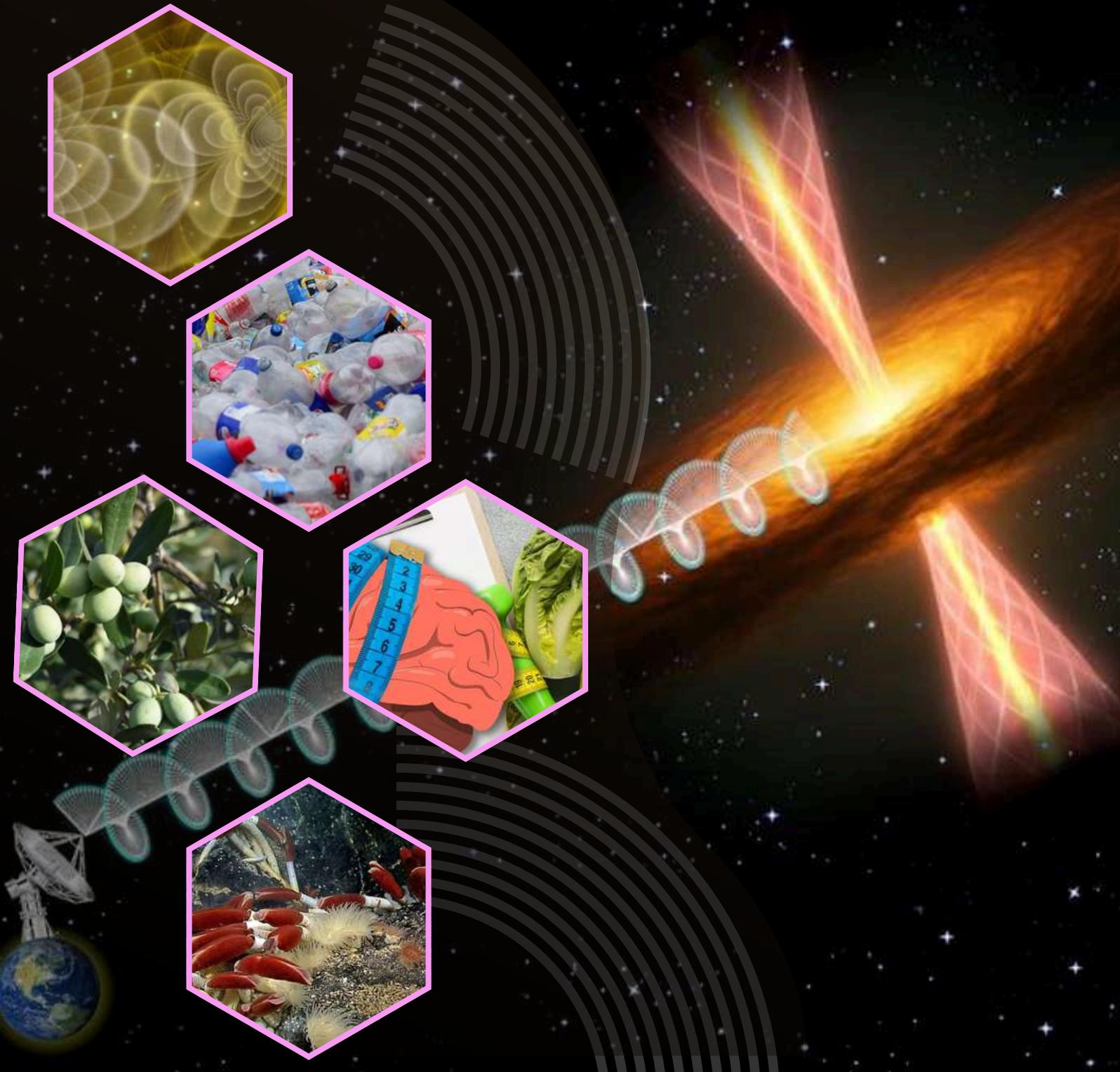


Science & Society in Media

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Zaheer Science Foundation

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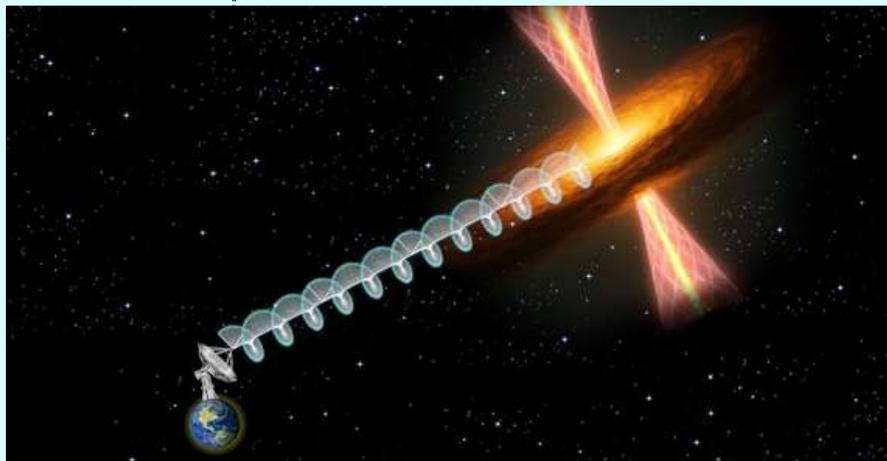
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IIST team discovers radio emission with circular polarisation near a massive young protostar

Discovery linked to IRAS 18162-2048, a massive protostar in the Milky Way, expands scientists' understanding of how massive stars form, say a research team from Indian Institute of Space Science and Technology, Thiruvananthapuram

An international team led by astronomers from the Indian Institute of Space Science and Technology (IIST) here has discovered radio emission with a special property known as circular polarisation near a massive young protostar that is still forming about 4,500 light years from earth. Protostar refers to the earliest known stage of a star when it is still accumulating gas and dust material from its surroundings.



An artist's impression of the emissions from the protostar. The circular polarisation is shown in the schematic image as a twisted light beam

The discovery linked to IRAS 18162-2048, a massive protostar in the Milky Way galaxy, opens an exciting window into scientists' understanding of how massive stars form, astronomers at the IIST.

Circular polarisation occurs when electric and magnetic field vectors of electromagnetic waves—in this case radio waves—rotate in a circle about the direction in which the waves travel through space. This emission offers the first direct clue to the strength of magnetic fields in the immediate neighbourhood of a protostar, they said.

The findings have been published in The Astrophysical Journal Letters under the title 'First Detection of Circular Polarization in Radio Continuum Toward a Massive Protostar.'

In the early stage, the protostar can also eject high-velocity material in opposite directions, known as a bipolar jet. 'Massive protostars' evolve to have mass more than 8 to 10 times that of the Sun.

Protostellar jets

According to the astronomers, IRAS 18162-2048 powers one of the largest and brightest known protostellar jets in the Milky Way, the HH80-81 jet. It is believed that the magnetic field and rotation in the protostellar system are responsible for the ejection of the jet. While a magnetic field has been imaged from the jet earlier, this is the first time that hints of it have been detected directly from this massive protostar, according to the IIST.

Source: <https://www.thehindu.com/sci-tech/science/iist-team-discovers-radio-emission-with-circular-polarisation-near-a-massive-young-protostar/article69823026.ece>

Dated: July 18, 2025, <https://www.thehindu.com>

Strong magnetic fields have been observed earlier in low-mass protostars that go on to form stars like the Sun. But measuring such fields around massive protostars has remained elusive, until now.

Much harder to study

"Massive protostars are much harder to study. The circular polarisation we are looking for is very faint and sporadic, making such measurements very challenging," Amal George Cheriyan from the IIST, lead author of the paper.

The radio observations were carried out using the National Radio Astronomy Observatory's (NRAO) Karl G. Jansky Very Large Array (VLA) in the U.S. "This is the first inference of the magnetic field strength using circular polarisation in radio waves from a massive protostar," said Sarita Vig of the IIST who conceptualised the work.

Remarkable result

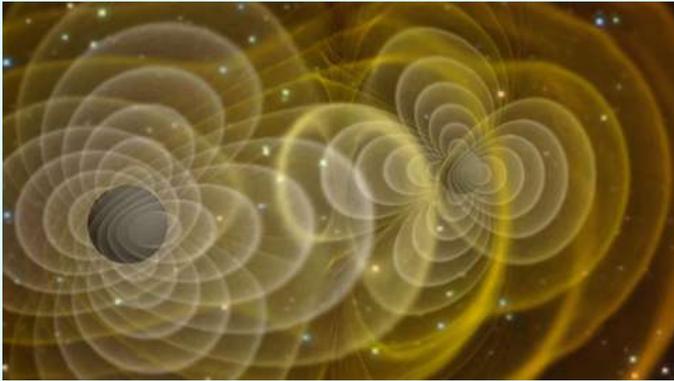
"The detection of circular polarisation is an exceptionally rare and challenging feat even in active galactic nuclei (AGNs), where conditions are extreme, but better investigated," Nirupam Roy from the Indian Institute of Science (IISc), Bengaluru, said. Samir Mandal of the IIST noted that observing the phenomenon in the environment of a massive protostar, which lies buried in dense gas and dust, is even more difficult, making this result remarkable. The new data has allowed researchers to infer that the magnetic field near the protostar is roughly 100 times stronger than the Earth's magnetic field. They also support a long-standing theory that powerful jets from stars and black holes are driven by the same magnetic engine.



SCIENCE & TECHNOLOGY

New gravitational waves reveal black hole with 'forbidden' mass

The mass of a heavier black hole that collided with a lighter one 2 billion lightyears away was found to be right inside, or just above, the pair instability mass gap



Scientists working with a network of observatories located around the world recently reported that they had detected a powerful and unusual burst of gravitational waves, which they called GW231123. The signal was traced back to two black holes colliding into each other on November 23, 2023.

This isn't the first time the observatories have detected gravitational waves, but the event is special because of the extraordinary size of the black holes involved: they are much heavier than most seen before. More interesting is the fact that the heavier black hole appeared to have a "forbidden" mass — a value inside a range called the pair instability mass gap — which challenges what physicists thought was possible for black holes created from dying stars.

Imagine a massive star at the end of its life. Usually, very heavy stars explode in supernovae, leaving behind black holes. But theory predicts that no black holes should form with masses between about 60 and 130 times the mass of our sun. This is the pair instability mass gap: it's thought to exist because stars this large explode so violently that nothing remains, not even a black hole, just scattered gas.

Above 130 solar masses, stars may skip the explosion and directly collapse to create supermassive black holes. So finding black holes in the mass gap raises important questions about how they got there. On November 23, 2023, the two Laser Interferometer Gravitational-wave Observatories (LIGO) in the U.S. detected a burst of gravitational waves, faint ripples in spacetime created by massive objects accelerating and colliding. The GW231123 event lasted only about one-tenth of a second and the signal was strong and clear. The collision happened about 2 billion lightyears away.

Scientists at the LIGO as well as Virgo and KAGRA observatories in Italy and Japan, respectively, conducted a detailed analysis and determined the pre-merger mass of the two colliding black holes. The heavier one had 120-159 solar masses but likely centred at 137 solar masses. The lighter one weighed 51-123 solar masses but likely centred at 103 solar masses. The total mass involved in the collision was thus likely 190-265 solar masses, rendering GW231123 the most massive black hole merger ever seen with high confidence.

Source: <https://www.thehindu.com/sci-tech/science/new-gravitational-waves-reveal-black-hole-with-forbidden-mass-explained/article69826127.ece>

Dated: June 11, 2025, <https://www.thehindu.com>

Smart Irrigation Plan can save 10-30% of irrigation water in drought-prone regions: IIT Bombay research

The researchers stated that the farmers in a drought-prone area require a plan for irrigation as rains are unpredictable, and they can't waste the diminishing groundwater



The researchers from the Indian Institute of Technology Bombay (IIT Bombay) and the Indian Institute of Tropical Meteorology, Pune (IITM Pune) have developed a Smart Irrigation Plan to save 10-30% of irrigation water in drought-prone regions, combining weather forecasts, satellite soil moisture data, and a computer simulation for efficient irrigation water management.

Researchers from the Department of Civil Engineering and Centre for Climate Studies at the IIT Bombay and the IITM Pune formulated a method to predict the amount of irrigation water needed up to three weeks, on a district and sub-district scale.

The researchers stated that the farmers in a drought-prone area require a plan for irrigation as rains are unpredictable, and they can't waste the diminishing groundwater. So, if farmers know beforehand how much water they will receive through rainfall in the coming weeks, they "can plan their irrigation wisely", helping "crop growth" and "conserving groundwater".

The pilot study was conducted in Maharashtra's Nashik district, where researchers found that a few grape farmers used local soil moisture sensors. Thereafter, the study extended its methodology in 12 sub-districts of West Bengal's Bankura, a drought-prone district.

"During our pilot study in Nashik, we included local weather forecasts in the soil moisture data and showed farmers that groundwater can be conserved up to 30%. We initially predicted up to one week (short-range) ahead," shares Professor Subimal Ghosh, from IIT Bombay.

Professor Ghosh explained that during the execution of methodology in Bankura, they considered crop varieties, varied growth patterns, root zone depth, and water requirements.

According to researchers, they fed weather forecast and soil moisture data into a computer model that checks the possible amount of rain, the water capacity of the soil, and the water requirements of each crop. On the basis of these details, the system provides information on the crop's water requirement. If the model predicts no rainfall in the coming days, it will suggest irrigating crops now. In case of rainfall arrival predictions, avoid irrigation of crops. This approach prevents overwatering the crops and saves water.

Source: <https://www.thehindu.com/sci-tech/science/smart-irrigation-plan-can-save-10-30-of-irrigation-water-in-drought-prone-regions-iit-bombay-research/article69846886.ece>

Dated: July 24, 2025, <https://www.thehindu.com>



ENVIRONMENT

A new path to upcycling plastic waste into paracetamol



Scientists at the University of Edinburgh have found a way to make a classic lab reaction, called the Lossen rearrangement, happen safely inside living *Escherichia coli* cells — thus opening a potential new path to recycling plastic waste into valuable products.

The team started with a bacterium that couldn't make para-aminobenzoic acid (PABA), a small molecule every cell needs to build DNA. When the mutant strain was given PABA, it grew. Without it, the strain was stalled. Researchers fed the cells a synthetic compound, simply called 1, that would release PABA only if a Lossen rearrangement reaction took place.

After 72 hours at 37 degrees C, the bacteria cultures turned cloudy, proving the reaction, and therefore PABA production, had taken place inside the flask. The cloudiness test allowed the authors to track chemistry and cell health at the same time. The reaction worked even when the researchers added no metal catalyst. They were able to figure out with more tests that ordinary phosphate ions, which are present in most cell media and inside cells themselves, quietly catalysed the rearrangement reaction.

High-performance liquid-chromatography measurements revealed that active, growing cells sped up the reaction up even more. The team also found that none of the tested substrates harmed cell growth at realistic concentrations, meaning they were not toxic to the bacteria.

Compound 1 was easy to make from terephthalic acid, which is the basic unit of polyethylene terephthalate (PET) soda bottles. This means the Lossen rearrangement reaction happening inside the bacteria could consume (a form of) plastic to produce a different, newly useful compound.

The researchers shredded a used bottle, hydrolysed it to terephthalic acid, and converted that into PET-1. The mutant *E. coli* strain grew just as well on PET-1 as on the lab-grade material, directly linking plastic-waste upcycling to biomass production and hinting at future bioremediation strategies.

Source: [https://www.thehindu.com/sci-tech/sciencel/science-for-all-new-research-opens-doors-to-upcycling-plastic-waste-into-paracetamol/article69735751.ece?](https://www.thehindu.com/sci-tech/sciencel/science-for-all-new-research-opens-doors-to-upcycling-plastic-waste-into-paracetamol/article69735751.ece?cx_testId=11&cx_testVariant=cx_1&cx_artPos=3&cx_experienceId=EKXWL3XAQS9E&cx_experience.ActionId=showRecommendationsWZ26ZFU3B6UO9#cxrecs_s)

[cx_testId=11&cx_testVariant=cx_1&cx_artPos=3&cx_experienceId=EKXWL3XAQS9E&cx_experience.ActionId=showRecommendationsWZ26ZFU3B6UO9#cxrecs_s](https://www.thehindu.com/sci-tech/sciencel/science-for-all-new-research-opens-doors-to-upcycling-plastic-waste-into-paracetamol/article69735751.ece?cx_testId=11&cx_testVariant=cx_1&cx_artPos=3&cx_experienceId=EKXWL3XAQS9E&cx_experience.ActionId=showRecommendationsWZ26ZFU3B6UO9#cxrecs_s)

Dated: May 31, 2025, <https://www.thehindu.com/>

New butterfly species, *Zographetus mathewi*, discovered in Western Ghats

Zographetus mathewi is part of the *Zographetus satwa* species-group, characterised by unique features such as wing venation patterns and secondary sexual traits, including swollen forewing veins in males



Zographetus mathewi, the newly discovered skipper butterfly from the Western Ghats.

A team of lepidopterists have identified a new butterfly species in the Western Ghats, one of the world's eight "hottest hotspots" of biological diversity.

Named *Zographetus mathewi*, this newly described skipper butterfly belongs to the family HesperIIDae and adds a new entry to the genus *Zographetus* Watson, 1893, making it the 15th species in this oriental group and the fifth to be recorded from India.

The species, endemic to the low-elevation forests of Kerala, was identified after the researchers observed larvae feeding on *Aganope thyriflora* (Fabaceae), a leguminous vine. Although initially resembling the widely distributed *Z. ogygia*, detailed studies revealed key differences in wing venation and genital structure, thereby prompting its classification as a new species.

The species, published in the peer-reviewed journal *Entomon*, was discovered by scientists from the Travancore Nature History Society (TNHS), the Institute of Tropical Research, Ecology and Conservation (INTREC) Thiruvananthapuram, and the Zoological Survey of India.

"Initially, we thought we had encountered *Zographetus ogygia*, a known species from Western Ghats," explained Kalesh Sadasivan, the lead author and butterfly researcher from TNHS. "But detailed morphological and genitalia studies revealed that this was, in fact, a completely new species."

The new species is named in honour of George Mathew, a renowned Indian entomologist and former Head of the Entomology Division, Kerala Forest Research Institute. Its proposed common name is Sahyadri Spotted Flitter in reference to the Western Ghats, locally known as Sahyadri.

Zographetus mathewi is part of the *Zographetus satwa* species-group, characterised by unique features such as wing venation patterns and secondary sexual traits, including swollen forewing veins in males. It can be further distinguished by a basal hair tuft on the underside of the forewing, yellow-ochre scaling on the hindwing underside, and distinct genitalia structures in both males and females.

Source: <https://www.thehindu.com/news/national/kerala/new-butterfly-species-zographetus-mathewi-discovered-in-western-ghats/article69807076.ece>

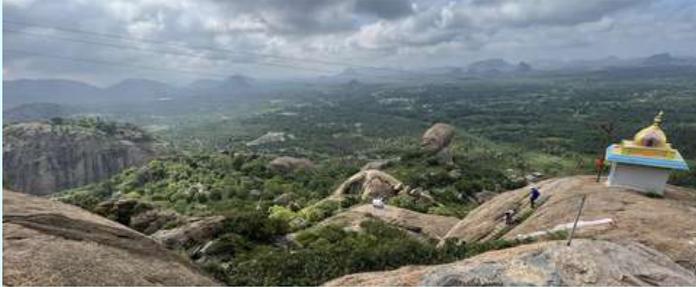
Dated: July 13, 2025, <https://www.thehindu.com/>



Environment

Groundwater crisis deepens in Karnataka's hard rock terrain

A new study suggests the primary cause of borewell abandonment is severe depletion of the water table rather than groundwater quality issues



Stretching across much of peninsular India, the Deccan Plateau hides a silent, subterranean struggle. Beneath its sunbaked soil lie ancient, fractured layers of basalt and granite — hard rock aquifers that dominate the region's groundwater story.

In Karnataka, this rocky reality is nearly absolute: about 99% of the State relies on these stubbornly unyielding formations for its water needs. With limited porosity and a dependence on narrow fractures and weathered pockets to store and move water, these geological formations offer far less than they promise, unlike the generous flow of sedimentary aquifers.

In a new study, researchers from the Water, Environment, Land and Livelihoods (WELL) Labs in Chennai examined Aralumallige and Doddathumakuru gram panchayats in the Upper Arkavathy watershed near Bengaluru, revealing a sharp decline in groundwater levels driven by intensive agricultural practices.

These areas supply vegetables, exotic crops, and flowers to Bengaluru, banking on water-intensive farming. While monsoon rains offer seasonal relief, farmers depend on deep borewells for the rest of the year. Borewells drilled into granite bedrock alter the subsurface geology, creating microfractures that fast-track rainwater deep underground. As a result, instead of recharging shallow aquifers, water bypasses them entirely, disrupting the local hydrology and weakening long-term water retention.

Every year, the water table continues to drop. According to the study, published recently in PLoS Water, the average depth of gram panchayat drinking water borewells dramatically increased from 183 m during 2001-2011 to 321 m in 2011-2021. Thus almost 55% of all wells drilled in the Aralumallige sub-watershed have failed, with a staggering 70% of drinking water wells failing within a decade of their construction, primarily due to falling water tables.

The study also highlighted water quality issues. While nitrate levels in drinking water were often higher than the prescribed norm of 50 mg/l, people didn't abandon their wells. Interviews with gram panchayat officials revealed that only two of the 79 abandoned borewells were shut due to elevated fluoride concentrations.

Source: <https://www.thehindu.com/sci-tech/energy-and-environment/groundwater-crisis-deepens-karnataka-hard-rock-terrain/article69758601.ece>
Dated: June 03, 2025, The Hindu

Extreme weather conditions can harm Indian cities: World Bank report

The number of Indians living in cities is projected to nearly double to 951 million by 2050 from 480 million in 2020



Indian cities hold tremendous potential as centres of economic growth with 70 % of new jobs coming from them by 2030. However, extreme weather events can lead to billions of dollars in future losses and timely action is needed to deal with it, according to a new World Bank report.

The report "Towards Resilient and Prosperous Cities in India", prepared in collaboration with the Union Ministry of Housing and Urban Affairs, says that with India's urban population is expected to almost double by 2050 to 951 million and more than 144 million new homes will be needed by 2070.

At the same time, intense heat waves and urban heat island effects are already causing temperatures in city centres to rise by over 3-4 degrees over surrounding areas. The rapid growth of built-up areas is also reducing cities' capacity to absorb storm water, making them more vulnerable to floods. The report, studied 24 Indian cities, with a special focus on Chennai, Indore, New Delhi, Lucknow, Surat and Thiruvananthapuram.

With over 50% of the urban infrastructure required for 2050 still to be built, India has a critical opportunity to drive resilient urban infrastructure development, it said.

"The imperative for India to build resilient cities at scale is clear. By investing in more green and resilient urban development—including housing, transport, and municipal services – cities can better mitigate extreme heat conditions and urban floods, and continue to grow and create jobs," said Auguste Tano Kouame, World Bank Country Director.

The report outlined some key recommendations to urgently help Indian cities and support vulnerable populations like implementing programs to address extreme urban heat and flooding, including better regulation of storm water, green spaces, installation of cool roofs, and effective early warning systems.

It also recommended investment in resilient infrastructure and municipal services, energy efficient and resilient housing, modernize solid waste management and make urban transport flood resilient and improve access to urban finance through better private sector engagement.

The report estimates that investments of over \$2.4 trillion will be needed by 2050 to meet the need for new, resilient, and low-carbon infrastructure and services in cities and the private sector's role will be critical in meeting these investments.

Source: <https://www.thehindu.com/sci-tech/energy-and-environment/indian-cities-need-24-trillion-for-climate-infrastructure-by-2050-world-bank-says/article69842331.ece>
Dated: June 02, 2025, The Hindu



AGRICULTURE

A beetle-fungi combo threatens plantations in rubber capital Kerala

The destructive power of the beetle-fungi association and the risk of other pathogenic fungi teaming up with the beetles together portend alarm. According to experts, the possibility calls for an action plan to mitigate and prevent further attacks.



Rubber farmers have called for the use of genetically modified rubber plants.

Rubber plantations in Kerala have been under threat since a beetle-fungus alliance has been attacking trees, causing severe leaf fall and rapid drying. Researchers at the Kerala Forest Research Institute in Thrissur recently identified the parasite to be the ambrosia beetle (*Euplatypus parallelus*).

In their new study, published in *Current Science*, the beetle has been reported to share a mutualistic relationship with two fungal species, *Fusarium ambrosia* and *Fusarium solani*. This is the first report of *F. solani* in association with the adult ambrosia beetles.

Fungi in the galleries

Earlier, farmers working in the rubber plantations in the Irrity-Kannur region of Kerala noticed latex oozing from the barks of rubber trees. Under the Tree Health Helpline project, they alerted researchers from the Institute, insect ecologist Jithu Unni Krishnan said.

Ambrosia beetles get their name from the ambrosia fungi that call the beetle their home. The name 'ambrosia' is not taxonomic but ecological. These beetles are native to Central and South America. They were first reported in India in the cashew trees of Ponda, Goa, in 2012.

These beetles attack dead or infected trees, although they're also known to attack stressed trees. At times, the stressed trees release ethanol, a volatile compound that the ambrosia beetles can sense and attack. The beetles don't feed on the woody bark of trees; the fungi do. The beetles bore tunnels called galleries in the bark, carry fungi into the galleries, and farm the fungi to concentrate nutrients. The beetles and their larvae feed on nutrient-rich fungal mycelia. The fungi also release enzymes that weaken the wood, allowing beetles to penetrate deeper.

In other insect hosts, the fungi are present in sacs called mycangia. In the present study, however, the team didn't find mycangia in the ambrosia beetle. Krishnan said that it's of interest to study how the fungal species interact with each other while coexisting in a beetle without the mycangia.

Source: https://www.thehindu.com/sci-tech/energy-and-environment/a-beetle-fungi-combo-threatens-plantations-in-rubber-capital-keralalarticle69841157.ece?cx_testId=81&cx_testVariant=cx_1&cx_artPos=1&cx_experienceId=EXPO56ZDYSGX&cx_experienceActionId=showRecommendationsX1R7QXU17VG227#cxrecs_s
Dated: July 23, 2025, <https://www.thehindu.com/>

Turning local know-how into European solutions for smarter bio-based farming



Farmers and foresters across Europe are sharing sustainable bio-based practices and technologies, showing how local knowledge and European collaboration can help drive the transition to a greener future.

Michalis Genitsariotis, a former salesman turned olive grower from the northern Greek region of Halkidiki, is constantly learning in his "second life" as a farmer.

Unlike many people with a traditional farming background, Michalis only turned to agriculture in the aftermath of the 2008 financial crisis, at a time when many were pushed to change their lives.

Seeking stability, he chose olives—a highly valued crop and a staple of the region. "I wanted something that we know how to grow in Greece, but I wanted to do it better," he said. His goal is to transition to completely organic farming—growing without chemical fertilizers and pesticides.

He is getting support from an EU-funded network of experts from Czechia, Greece, Ireland, Italy, Poland and Spain. The network was set up in 2023 to help farmers and foresters transition to more sustainable methods of production. Their goal is to accelerate the adoption of bio-based technologies in agriculture and forestry to help boost climate resilience, ease the transition to a circular economy and support zero-waste practices.

Empowering farmers

According to Carmen Girón Domínguez, a Spanish biologist specializing in sustainable biomass and circular bioeconomy strategies, the BBioNets team's aim is not so much to create new technologies, but to function as a large-scale network spreading awareness of existing circular bioeconomy technologies and practices already being used by farmers and foresters across Europe.

Working closely with the Circular Bioeconomy Research Group at Munster Technological University in Ireland, Girón Domínguez coordinates the BBioNets team, which brings together bioeconomy experts from the six participating countries.

Source: <https://phys.org/news/2025-07-local-european-solutions-smarter-bio.html>
Dated: July 11, 2025, <https://phys.org/>



AGRICULTURE

Barley allergy-triggering proteins measured precisely, paving way for gentler foods



Amylase/trypsin-inhibitors (ATIs) are proteins that can trigger immune reactions in the human body. They are best known from wheat, where they are considered a possible trigger of non-celiac wheat sensitivity.

An international research team led by Katharina Scherf from the Leibniz Institute for Food Systems Biology at the Technical University of Munich has now, for the first time, succeeded in precisely measuring these proteins in barley. The results, published in *Food Research International*, could open up new avenues for the development of more tolerable foods.

For their study, the researchers analyzed 181 different barley accessions from around the world. Among the accessions were 113 two-row and 68 six-row types with different genetic backgrounds. Although two-row accessions only form one grain per node in the ear, this grain is particularly strong and rich in starch, making it especially suitable for beer production. In contrast, multi-row barley accessions develop three grains per node. These are slightly weaker and are mainly used as animal feed.

Using a specially developed analysis method, Scherf and her team were able to clearly identify and quantify 10 barley-specific ATI types for the first time. "Until now, we knew very little about the occurrence of ATIs in barley. Our method now provides reliable data on the barley-specific ATI composition for the first time," reports Scherf.

As her research team shows, the total ATI content of the samples examined varied between 1.1 and 5.2 milligrams per gram of flour, which corresponds to 0.7%–3.6% of the total protein content. Interestingly, the number of rows of barley did not significantly influence the ATI content.

Source: <https://phys.org/news/2025-07-barley-allergy-triggering-proteins-precisely.html>

Dated: July 29, 2025, www.phys.org

With help from AI, researchers upgrade plants' internal alarm system to fend off pathogens



Ralstonia solanacearum in a potato plant. The bacterium destroys the vascular system in plants, causing them to succumb to wilt disease.

Scientists at the University of California, Davis, used artificial intelligence to help plants recognize a wider range of bacterial threats — which may lead to new ways to protect crops like tomatoes and potatoes from devastating diseases. The study was published in *Nature Plants*.

Plants, like animals, have immune systems. Part of their defense toolkit includes immune receptors, which give them the ability to detect bacteria and defend against it. One of those receptors, called FLS2, helps plants recognize flagellin — a protein in the tiny tails bacteria use to swim. But bacteria are sneaky and constantly evolving to avoid detection.

"Bacteria are in an arms race with their plant hosts, and they can change the underlying amino acids in flagellin to evade detection," said lead author Gitta Coaker, professor in the Department of Plant Pathology.

To help plants keep up, Coaker's team turned to using natural variation coupled with artificial intelligence — specifically AlphaFold, a tool developed to predict the 3D shape of proteins and reengineered FLS2, essentially upgrading its immune system to catch more intruders.

The team focused on receptors already known to recognize more bacteria, even if they weren't found in useful crop species. By comparing them with more narrowly focused receptors, the researchers were able to identify which amino acids to change.

"We were able to resurrect a defeated receptor, one where the pathogen has won, and enable the plant to have a chance to resist infection in a much more targeted and precise way," Coaker said.

Coaker said this opens the door to developing broad-spectrum disease resistance in crops using predictive design. One of the researchers' targets is a major crop threat: *Ralstonia solanacearum*, the cause of bacterial wilt. Some strains of the soil-borne pathogen can infect more than 200 plant species, including staple crops like tomato and potato.

Source: <https://phys.org/news/2025-07-ai-internal-alarm-fend-pathogens.html>

Dated: July 28, 2025, www.phys.org



HEALTH

High-quality diet may have led to bigger human brain: CSIR-CCMB-led international study reveals genetic link between diet and brain size

An international study involving scientists from the United States and China, has uncovered the genetic mechanisms linking diet quality and brain size in primates; it reveals that the quality of food primates eat influences not just their energy levels but also the way their brains evolve at the genetic level



Our ancestors' shift to higher-quality diets, especially with use of fire and consumption of meat and fruits, had likely triggered genetic changes and may have paved the way for the dramatic expansion of the human brain, deduce researchers at the CSIR-Centre for Cellular and Molecular Biology (CCMB) here in Hyderabad.

A ground-breaking international study published in the latest issue of Philosophical Transactions of the Royal Society B, involving scientists from the United States and China, has uncovered the genetic mechanisms linking diet quality and brain size in primates, shedding new light on how some species, especially humans, evolved to have such large and complex brains. It reveals that the quality of food primates eat influences not just their energy levels but also the way their brains evolve at the genetic level.

The research team, including CCMB's Laboratory for Conservation of Endangered Species (LaCONES) Chief Scientist Govindhaswamy Umapathy (senior author), Vinay Teja Potharlanka (first author) and others, including Shao Y, Wu D, Banda N and DeCasien A., had analysed over 8,000 genes from 50 whole genomes across primate species to understand how brain size co-evolved with diet and to identify the specific genes that may have helped make it happen.

Energy intensive organs

Brain is one of the most energy-hungry organs in the body. In humans, the brain consumes nearly 20% of the total energy, despite accounting for just 2% of body weight. For many years, scientists have wondered how such an organ could have evolved and why some species have bigger brains than others. A key idea is that better-quality diets those rich in fruits, seeds, and animal protein provide more energy, allowing for the development of larger brains. But until now, no one had clearly shown how this plays out at the genetic level.

Digging Into the Data

Researchers combined genetic, ecological, and anatomical data in a novel way by measuring the size of brains and bodies in different primates and used published information on diet composition to create a Diet Quality Index (DQI).

Source: <https://www.thehindu.com/sci-tech/science/high-quality-diet-may-have-led-to-bigger-human-brain-csir-ccmb-led-international-study-reveals-genetic-link-between-diet-and-brain-size/article69767880.ece>
Dated: July 05, 2025, <https://www.thehindu.com/>

Infusing mitochondria helps renew tissues deprived of blood: research

Results from an experiment that ran from 2015 to 2018 have inspired other clinicians whose patients suffer from ischaemia-reperfusion injuries



James McCully was in the lab extracting tiny structures called mitochondria from cells when researchers on his team rushed in. They'd been operating on a pig heart and couldn't get it pumping normally again.

McCully studies heart damage prevention at Boston Children's Hospital and Harvard Medical School and was keenly interested in mitochondria. These power-producing organelles are particularly important for organs like the heart that have high energy needs. McCully had been wondering whether transplanting healthy mitochondria into injured hearts might help restore their function.

The pig's heart was graying rapidly, so McCully decided to try it. He loaded a syringe with the extracted mitochondria and injected them directly into the heart. Before his eyes, it began beating normally, returning to its rosy hue.

Since that day almost 20 years ago, McCully and other researchers have replicated that success in pigs and other animals. Human transplantations followed, in babies who suffered complications from heart surgery — sparking a new field of research using mitochondria transplantation to treat damaged organs and disease. In the last five years, a widening array of scientists have begun exploring mitochondria transplantation for heart damage after cardiac arrest, brain damage following stroke and damage to organs destined for transplantation.

Mitochondria are best known for producing usable energy for cells. But they also send molecular signals that help to keep the body in equilibrium and manage its immune and stress responses. Some types of cells may naturally donate healthy mitochondria to other cells in need, such as brain cells after a stroke, in a process called mitochondria transfer. So the idea that clinicians could boost this process by transplanting mitochondria to reinvigorate injured tissue made sense to some scientists.

From studies in rabbits and rat heart cells, McCully's group has reported that the plasma membranes of cells engulf the mitochondria and shuttle them inside, where they fuse with the cell's internal mitochondria. There, they seem to cause molecular changes that help recover heart function: When comparing blood- and oxygen-deprived pig hearts treated with mitochondria to ones receiving placebos, McCully's group saw differences in gene activity and proteins that indicated less cell death and less inflammation.

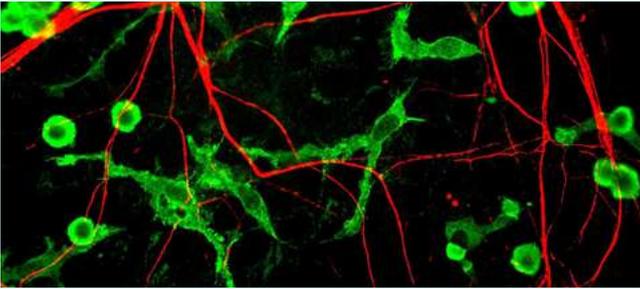
Source: <https://www.thehindu.com/sci-tech/science/infusing-mitochondria-helps-renew-tissues-deprived-of-blood-research/article69798928.ece>
Dated: July 11, 2025, https://www.thehindu.com



HEALTH

Immune cells' fat blocks brain's ability to clean Alzheimer's plaques

A new finding that microglia sacrifice their protective immune function in exchange for lipid safety may be a key step in Alzheimer's progression



Alzheimer's disease is a progressive brain disorder and a form of dementia that affects memory, thinking, and behaviour. As symptoms become more severe, the disease can seriously affect a person's ability to perform tasks that would otherwise be deemed routine, like brushing teeth, making a meal or even recognising family members.

For many years, the leading theory has been that Alzheimer's is caused when two harmful proteins called amyloid-beta and tau accumulate in the brain. This pile-up sets off a chain of events, eventually damaging nerve cells and leading to memory loss, confusion, and mood changes. This destruction doesn't happen overnight. It begins years, even decades before symptoms appear.

In 2021, an estimated 57 million people worldwide were affected by dementia, with Alzheimer's contributing to 60-70% of the cases. Currently, there is no cure for Alzheimer's but there are treatments that can slow symptoms and improve quality of life.

It isn't surprising that in the ongoing search for answers, scientists are increasingly turning their attention from neurons to their lesser-known but equally critical neighbours: microglia, the brain's resident immune cells. In a new study published in *Immunity*, researchers led by Gaurav Chopra at Purdue University have uncovered how fat metabolism in microglia may be a key driver of disease progression.

"This study is pretty interesting and part of a growing body of studies indicating the role of fat metabolism problems in cells around amyloid plaques," Indian Institute of Science professor Deepak Nair said.

The lipid link

In healthy brains, microglia serve as surveillance cells, clearing away waste products and toxic proteins like amyloid-beta (A β), the sticky molecule that forms the hallmark plaques in Alzheimer's. This clean-up process helps protect neurons from damage. But in Alzheimer's patients this mechanism fails.

Source: <https://www.thehindu.com/sci-tech/science/immune-cells-fat-blocks-brains-ability-to-clean-alzheimers-plaques/article69779865.ece>

Dated: July 13, 2025, <https://www.thehindu.com>

AIC-CCMB planning trials for Chikungunya vaccine with indigenously developed mRNA technology

CSIR-Centre for Cellular and Molecular Biology (CCMB) Atal Incubation Centre (AIC) is planning to go ahead with the next stage larger-scale trials of the indigenously developed mRNA vaccine technology for tackling Chikungunya.

"Chikungunya is a serious, major debilitating disease in India and it does not yet have a vaccine. We have already demonstrated the ability to make use of mRNA technology to develop vaccines with a 'Proof of Concept' (PoC) during the COVID-19 pandemic. Our lab data trials show our Chikungunya vaccine works," disclosed AIC-CCMB chief executive officer N. Madhusudhana Rao.

Results of lab experiments

The lab experiments conducted on animals showed that the vaccine candidate can produce antibodies against Chikungunya proteins. The next phase will be to infect the animals and check if the virus load has decreased upon injecting the developed vaccine, he explained.

The CEO said the institute had also completed initial trials into a potential mRNA vaccine to prevent tuberculosis (TB). But, to go into the next stage of animal trials and more elaborate testing, adequate funding is required, for which different options are being explored.

How vaccines work?

Vaccines work by preparing and training the immune system to identify disease-causing microorganisms and eliminate them quickly when the system encounters them. In mRNA technology, the host cell's immune system is trained to evade the real infection by introducing mRNA of an important protein of the microorganism of concern into the host, said Mr. Rao.

Interestingly, though AIC had developed the PoC for mRNA technology in less than a year and had announced the same two years ago, it did not elicit much response from either the Indian industry or foreign collaborators.

"There were a few firms which evinced interest in making use of our **mRNA technology** for vaccine research. But they never came back with concrete proposals. It is an accepted fact that firms spend millions to take licenses from abroad rather than spend a few lakhs on local technology," said Mr. Rao, a former senior scientist of the CSIR-CCMB.

Comirnaty (by Pfizer) or Spikevax (by Moderna) are based on mRNA technology for COVID and found to be extremely effective. The mRNA technology is considered chemically safe with no long-term challenges. The one developed in AIC-CCMB too is based on the existing mRNA vaccine model. It is as safe as the one approved by the US Food & Drug Administration Agency and had undergone a third party quality check, affirmed the CEO.

mRNA works much better on viruses and vaccines can be developed for other diseases faster. "It is unfortunate that there are few takers for our technology, though many are trying the same through different platforms. But we want to go ahead with our trials for the potential Chikungunya and TB vaccine candidates now with different partners," added Mr. Rao.

Source: <https://www.thehindu.com/sci-tech/science/aic-ccmb-planning-trials-for-chikungunya-vaccine-with-indigenously-developed-mrna-technology/article69810775.ece>

Dated: July 15, 2025, <https://www.thehindu.com>



S&T COOPERATION FOR GLOBAL SOUTH

Learning from Each Other: South-South Conversations on Mainstreaming Gender-Transformative Evaluation



On 5 June 2025, experts from India, South Africa, and multilateral agencies convened for the virtual roundtable “Learning from Each Other: South-South Conversations on Mainstreaming Gender-Transformative Evaluation”, hosted by the Institute of Social Studies Trust, in partnership with the South African Monitoring and Evaluation Association and the South African Department of Planning, Monitoring & Evaluation. The roundtable was part of the gLocal Evaluation Week 2025.

The event explored methods of mainstreaming gender-responsive and gender-transformative evaluation within national evaluation systems. Speakers highlighted the tangible progress made – and persistent challenges – in embedding inclusive measurement, evaluation, and learning practices across diverse regions and sectors, particularly within government and South-South cooperation frameworks.

Moderated by Jennifer Norins, Chairperson, South African Monitoring and Evaluation Association, the roundtable featured:

- Jahnvi Andharia, Director & Research Fellow, Institute of Social Studies Trust (ISST), India;
- Anuradha Rajan, Executive Director, South Asia Women Foundation, India
- Kgaugelo Moshia-Molebatsi, Senior Evaluation Specialist, South African Department of Planning, Monitoring & Evaluation
- Dineo Mmako, Chief Director – M&E, South African Department of Women, Youth & Persons with Disabilities
- Bhushan Shrestha, Results-Based Management Specialist, United Nations Office for South-South Cooperation.

Dr. Andharia introduced ISST’s self-paced course on gender-transformative evaluation, highlighting its impact on reshaping gender dialogues in India. Ms. Rajan spoke about SAWF’s commitment to feminist MEL principles in partnership work. From South Africa, Ms. Moshia-Molebatsi and Ms. Mmako detailed government strategies for integrating gender into evaluation processes, while also touching on barriers faced by evaluators and commissioners. Mr. Shrestha rounded out the discussion by sharing UNOSSC initiatives aimed at enhancing gender and inclusivity within South-South cooperation initiatives.

Source: <https://unsouthsouth.org/2025/06/26/learning-from-each-other-south-south-conversations-on-mainstreaming-gender-transformative-evaluation/>

Dated: June 26, 2025, <https://unsouthsouth.org/>

South-South Cooperation in Action: China-Africa Partnerships Spotlighted in Changsha and Guangzhou



South-South cooperation between China and Africa continues to gain momentum – delivering tangible benefits to communities across the continent. Recent events in Changsha and Guangzhou highlighted growing collaboration between African institutions, Chinese partners and international organizations, made possible through the Global South-South Development Center (GSSDC) project, supported by the United Nations Office for South-South Cooperation (UNOSSC) and the Government of China.

At the Fourth China-Africa Economic and Trade Expo (CAETE), held in Changsha from 12–15 June 2025, a dedicated exhibition on “China-Africa South-South Cooperation” showcased impactful initiatives supported by the GSSDC project. Just days later, over 150 stakeholders gathered in Guangzhou for the Fifth Seminar on China-Africa Rice Value Chain Cooperation, where partners reaffirmed their shared commitment to enhancing food systems through technology transfer, capacity building, and cross-regional learning.

Established under the 2018 Beijing Summit of the Forum on China-Africa Cooperation (FOCAC), CAETE has evolved into a premier national platform for promoting China-Africa economic and trade ties. The biennial event plays a central role in advancing FOCAC’s trade and development priorities and increasingly fosters collaboration between African partners and various Chinese provinces and cities.

China-Africa Rice Value Chain Cooperation Seminar Concludes in Guangzhou

The Fifth Seminar on China-Africa Rice Value Chain Cooperation, alongside the West Africa Rice Value Chain Project Review Conference, concluded successfully in Guangzhou from June 17 to 19, convening over 150 stakeholders from governments, international organizations, research institutions, the private sector, and civil society.

Source: <https://unsouthsouth.org/2025/06/26/south-south-cooperation-in-action-china-africa-partnerships-spotlighted-in-changsha-and-guangzhou/>

Dated: June 26, 2025, <https://unsouthsouth.org/>



S&T COOPERATION FOR GLOBAL SOUTH

Regional Conference Highlights South-South Cooperation as Essential for Building More Resilient Future in Latin America and the Caribbean



International cooperation is not only an expression of solidarity – it is a structural imperative for building a more productive, inclusive, sustainable, just, and resilient future in Latin America and the Caribbean. This was the shared message from leaders and experts participating in the Second Session of the Regional Conference on South-South Cooperation in Latin America and the Caribbean, held through June 18, at the headquarters of the Economic Commission for Latin America and the Caribbean (ECLAC) in Santiago, Chile.

The intergovernmental gathering brought together representatives from across the region, the United Nations system, and various regional and international organizations. The session was officially opened by José Manuel Salazar-Xirinachs, Executive Secretary of ECLAC; Dima Al-Khatib, Director of the United Nations Office for South-South Cooperation (UNOSSC), who joined virtually; and Mateo Estremé, Director General of International Cooperation at Argentina's Ministry of Foreign Affairs, International Trade and Worship, in Argentina's capacity as the outgoing Chair of the Conference. Luis Fidel Yáñez, Secretary of the Commission at ECLAC, also participated in the opening ceremony.

In his opening remarks, ECLAC's Executive Secretary emphasized that the creation of the Regional Conference on South-South Cooperation, during the thirty-sixth session of ECLAC's Committee of the Whole in December 2021, marked a decisive step towards more integrated and effective cooperation in Latin America and the Caribbean. "This space has strengthened ties between countries from the Global South and has opened new doors to triangular cooperation with extra-regional actors, donors and international organizations," he said.

Source: <https://unsouthsouth.org/2025/06/27/regional-conference-highlights-south-south-cooperation-as-essential-for-building-more-resilient-future-in-latin-america-and-the-caribbean/>

Dated: June 27, 2025, <https://unsouthsouth.org/>

UNOSSC and Norway organized a Joint event to showcase Personnel Exchange for Development Cooperation



28 May 2025- New York – The High-Level Conference (HLC) on SSC side event on Empowering Global South Personnel Exchange Cooperation, held on 28 May 2025 at the UN Office for South-South Cooperation, brought together experts, policymakers, and practitioners to explore the transformative power of reciprocal knowledge-sharing initiatives. Co-organized by the UN Office for South-South Cooperation (UNOSSC), the Permanent Mission of Norway to the UN, and the Norwegian Agency for Exchange Cooperation (Norec). The gathering explored how reciprocal knowledge-sharing initiatives can transform development cooperation by fostering mutual learning, institutional resilience, and cross-cultural collaboration.

Opening the event, Ms. Dima Al-Khatib, Director of UNOSSC, emphasized that personnel exchanges redefine traditional aid by prioritizing horizontal learning and mutual benefit, equipping Global South nations with critical skills amid declining development assistance. His Excellency Andreas Løvold of Norway framed exchanges as a solution to today's interconnected crises—geopolitical tensions, financial shortages, and debt—urging a shift toward partnerships built on trust and equality.

A joint study by Norec and UNOSSC, presented by Dr. Vaqar Ahmed, revealed how exchanges create lasting impact. Case studies, such as a Malawi-Norway hospital partnership and agricultural exchanges in Nepal and India, demonstrated that immersive collaboration strengthens institutional ties and retains skills long after projects conclude. The research called for Southern governments to allocate budgets for such programs, leverage corporate social responsibility, and adopt digital tools to preserve knowledge.

Global perspectives enriched the discussion. Switzerland's Unité highlighted capacity sharing over technical training, stressing soft skills and trust as enduring outcomes. Germany's DAAD shared decades of success in academic exchanges, while Japan's JICA showcased triangular cooperation models where trainees evolve into regional leaders. The event closed with a call to scale these initiatives, integrating them into national development strategies and global frameworks like the SDGs.

Source: <https://unsouthsouth.org/2025/06/27/unossc-and-norway-organized-a-joint-event-to-showcase-personnel-exchange-for-development-cooperation/>

Dated: June 27, 2025, <https://unsouthsouth.org/>



OTHERS

Why don't birds get electrocuted on wires?

We see birds perched on electric wires all the time. It looks so casual, almost like they're just relaxing up there! But have you ever wondered—why don't they get electrocuted?



If we tried the same thing, the result would be... well, shocking. So what makes birds different?

Let's understand how electricity works. Electricity flows through metal wires, just like water flows through pipes. It moves from a place with high voltage (electric pressure) to a place with low voltage. For electricity to flow, it needs a complete path — from a power source, through wires, and back again.

It usually travels smoothly toward the ground, which has zero voltage. But if something touches the wire and the ground at the same time, electricity can flow through that object — which can be dangerous.

The bird's trick

When a bird is sitting on a wire, it's perched with both feet on the same wire. This means its body is at the same voltage as the wire.

Since there's no voltage difference across its body, electricity has no reason to flow through it. No flow of electricity = no shock! In simple terms, the bird becomes part of the wire, not a path electricity wants to travel through.

When it becomes dangerous

Birds are safe when they sit on just one wire, because there's no voltage difference across their body. But things change when a bird (or person) touches two points at once — like:

- Two wires with different voltages, or
- A wire and something connected to the ground, like a pole or tree.

In both cases, the body creates a complete path for electricity to flow. Electricity moves from high voltage to low voltage or ground, and if the body is in the way, it becomes the path. This sudden flow of electricity through the body causes a shock or electrocution.

That's why power lines are spaced apart and kept high up — to prevent birds and people from touching more than one point at the same time.

What about humans?

Unlike birds, humans stay in contact with the ground. If a person touches a wire while grounded, it creates a path for electricity to flow. That's why people can get shocked easily near power lines. Linemen wear special gear and follow safety rules to stay safe. Birds avoid shocks by not touching the ground or multiple wires — and that's their trick!

Source: <https://www.thehindu.com/children/why-dont-birds-get-electrocuted-on-wires/article69730820.ece>

Dated: July 04, 2025, The Hindu

How deep in the ocean does life exist?



Deep-sea animals called giant tubeworms rely on hydrothermal vents to survive.

Life often finds a way to survive even in extreme conditions. For example, in 1960, when Don Walsh and Jacques Piccard explored the bottom of the Challenger Deep in the Mariana Trench, they spotted a small fish at a depth of 8.1 km.

On July 30, researchers exploring the Kuril-Kamchatka and Aleutian trenches discovered the deepest known communities of life powered by chemosynthesis, where organisms get energy from chemicals like methane and hydrogen sulphide instead of sunlight. These ecosystems were found between depths of 5.8 and 9.5 km and stretched over 2,500 km along the ocean floor.

The communities, dominated by worms called siboglinids and clams, thrived where chemical-rich fluids rose through geological faults. These fluids were created by microbes breaking down organic matter, producing methane that may form gas hydrates in the high-pressure conditions.

Per the researchers, the finding suggests these ecosystems may be more widespread than previously believed and highlights a potential new role for deep-sea microbes in the earth's carbon cycle: storing methane underground instead of letting it escape into the ocean or atmosphere.

Source: <https://www.thehindu.com/sci-tech/sciencellhow-deep-in-the-ocean-does-life-exist/article69868552.ece>

Dated: August 02, 2025, The Hindu