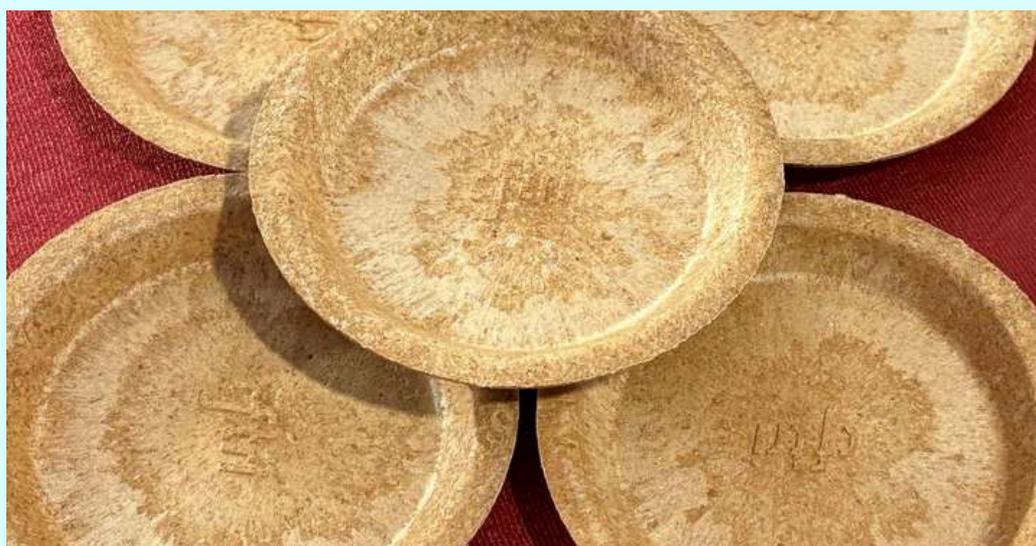




### SCIENCE & TECHNOLOGY

#### CSIR-CFTRI develops Biodegradable Plates



*The biodegradable plates developed by CSIR-Central Food Technological Research Institute in Mysuru.*

The Biodegradable Cutlery Research and Innovation Centre, which has been set up at the CSIR-Central Food Technological Research Institute (CFTRI) in Mysuru under the project ‘SHREE ANNA – the Millet Mission’ of CSIR, has developed biodegradable plates.

The initiative of the CSIR-CFTRI aims to address the environmental challenges posed by plastic waste while capitalising the vast potential of millet processing by products and wastes. The centre hosts the pre-processing, manufacturing, and analytical equipment for the development of the biodegradable cutlery and tableware.

At the 75th foundation day celebrations of the CSIR-CFTRI here on 19 October 2024, the high tea that was served to the guests was in the biodegradable plates made at the centre on a trial basis. “The journey in innovation will continue with research efforts focussing on developing edible alternatives of the cutlery and tableware, offering opportunity to enjoy the meal and even eat the utensils in which it is served,” the CFTRI said.

The project is led by Ashitosh A. Inamdar, senior principal scientist, along with Suresh D. Sakhare and Saravanan M. from the flour milling, baking and confectionery technology department at the CFTRI. The technologies that were released include probiotic carrot nectar, development of gluten-free bread premix, process for multigrain waffle, instant masala tea premix, ethylene scavenger technology.

*cont. page 2...*

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*Member*

#### EDITOR/COORDINATOR

**Dr. Manish Mohan Gore**  
**Dr. Enna Dogra Gupta**

**Executive Assistant**  
**Suman Gulalia**

#### ADDRESS FOR CORRESPONDENCE



Zaheer Science Foundation,  
4 Udyan Marg,  
New Delhi 110001

Tel: 011-23745697

**EMAIL**  
zsfindia@gmail.com

**WEBSITE**  
www.zaheersciencefoundation.org



cont. from page 1...

## Multigrain waffle

Generally, waffles are made from refined wheat flour with a high content of sugar and fat. They often have high calories with low dietary fibre and essential minerals. In order to improve the nutritional quality, the multigrain waffle has been formulated using whole wheat, pearl millet and finger millet flours with optimal amounts of sugar and fat. It is produced by baking the batter in the waffle machine. The multigrain waffle has desirable textures and tastes with higher dietary fibre, minerals, and low-calorie value as compared to the commonly available waffles in the market, according to a note from the CFTRI.

Waffles can be marketed as quick snacks or desserts through bakeries, departmental stores and restaurants. The popularity of bread variants such as waffles is increasing. Attempts are being made to formulate multigrain waffles from locally available ingredients. It will serve the growing consumer demand for healthy yet convenient foods. The technology can cater to the domestic sector for home baking as well as commercial sectors, the scientists said.

## Instant Masala Tea Premix

According to CFTRI, instant masala tea premix is a blend that brings the authentic taste of traditional Indian masala tea into the convenience of modern life. This ready-to-use premix offers a rich and flavorful tea experience.

The tea is packaged in single-serving sachets, allowing for quick and easy preparation, it said.

To cater to diverse tastes and dietary preferences, the tea is available with a variety of sweeteners, including regular sugar, jaggery, low-calorie sweeteners, and sugar-free options, the scientists said.

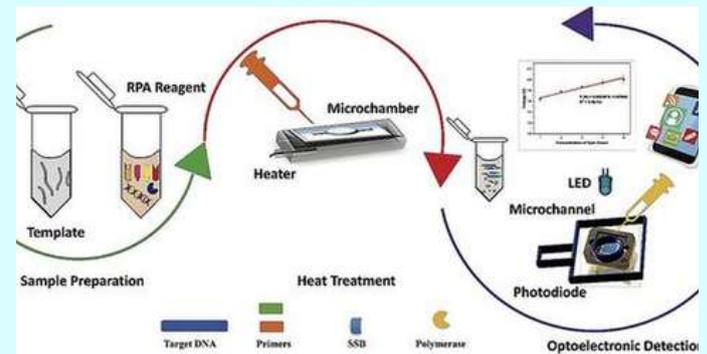
## Gluten-free bread premixes

The process for gluten-free bread premixes includes the production of 100% minor millets namely proso, foxtail and barnyard. The premix includes all the essential ingredients for producing bread and offers convenience for both small and large-scale bread production. The technology caters to the growing demand for gluten-free products as well as promotes millet utilisation. The work on the product was funded by MoFPI and executed by the team lead, P. Prabhasankar, and Soumya C., Tamilselvan T., Crassina Kasar, Sudha M.L. and MatcheRS as team members from the institute, a note from the institute said.

Source: [https://www.thehindu.com/news/national/karnataka/csir-cftri-develops-biodegradable-plates/article68783344.ece?cx\\_testId=81&cx\\_testVariant=cx\\_1&cx\\_artPos=3&cx\\_experienceId=EXPO56ZDYSGX&cx\\_experienceActionId=showRecommendations7EV8PP8TM51R64#cxrecs\\_s](https://www.thehindu.com/news/national/karnataka/csir-cftri-develops-biodegradable-plates/article68783344.ece?cx_testId=81&cx_testVariant=cx_1&cx_artPos=3&cx_experienceId=EXPO56ZDYSGX&cx_experienceActionId=showRecommendations7EV8PP8TM51R64#cxrecs_s)  
Dated: October 23, 2024, The Hindu

## BITS-Pilani Hyderabad researchers' new device can detect dangerous bacteria in just 15 minutes

Developed by researchers at BITS Pilani, Hyderabad Campus, the device that can rapidly detect harmful bacteria is set to transform how hospitals and clinics diagnose bacterial infections



Single Temperature Amplification DNA: User-Friendly, Cost-Effective and Turnkey PCR-free DNA Amplification

Researchers at BITS Pilani, Hyderabad Campus, have developed a miniaturized device that can rapidly detect harmful bacteria, including 'Pseudomonas Aeruginosa' which causes severe infections such as pneumonia and cystic fibrosis. The innovative technology can deliver results in just 15 minutes and it is set to transform how hospitals and clinics diagnose bacterial infections, informed Dean of Research & Innovation and co-lead researcher Sanket Goel.

"Our device is small, affordable and designed for quick, on-site testing, particularly in resource-constrained settings unlike current bacterial detection methods are slow and often require sophisticated lab equipment," he said in a press release.

The device employs 'Recombinase Polymerase Amplification (RPA)', a technique that operates at lower temperatures and does not require expensive thermal cycling equipment. A built-in photometric detection system can identify trace amounts of DNA from various bacteria," said Associate Professor and Co-lead Researcher Satish Kumar Dubey.

"The platform can easily be adapted to detect other dangerous bacteria, making it highly versatile for a range of diagnostic applications. We are also exploring integrating it with cloud-based systems for remote data monitoring," said research scholar P. Ramya Priya.

The device has immense potential to revolutionize healthcare diagnostics by enabling faster and more efficient pathogen detection and improving patient outcomes across the board, added Prof. Goel. The research has been published in the IEEE Open Journal of Engineering in Medicine and Biology, added the release.

Source: <https://www.thehindu.com/news/national/telangana/bits-pilani-hyderabad-researchers-new-device-can-detects-dangerous-bacteria-in-just-15-minutes/article68748784.ece>  
Dated: October 14, 2024, The Hindu



## SCIENCE & TECHNOLOGY

### Scientists are working on a way to detect cancer with sound waves

An ultrasound-based alternative to biopsies, which are painful and cumbersome, has been hailed as promising and more advanced than previous work.



*A technician prepares to use an ultrasonogram device that creates an image of the body's insides using ultrasound waves.*

Scientists have developed a new technique to detect cancers. The method uses ultrasound to turn a small part of our body's tissue into droplets that are released into the blood. These bubbles contain molecules like RNA, DNA, and proteins that allow the scientists to identify particular types of cancer.

Roger Zemp, Associate Professor of Electrical and Computer Engineering at the University of Alberta, Canada, led a recent study describing such a technique. He presented his team's findings at the joint meeting of the Acoustical Society of America and the Canadian Acoustical Association at Shaw Centre in Canada on May 13.

#### Break-off, blood, biomarker

Doctors have been using ultrasound to take pictures of internal organs. The technology converts the sound waves reflected by surfaces inside the body to an image, just the way bats use ultrasound to sense their surroundings.

This said, the gold standard to detect many cancers is a biopsy. Doctors extract a small piece of tissue or cells using a large needle from the part of the body where cancer is suspected to be present. In vitro tests can confirm if the tissue/cells are cancerous and, if so, what kind of cancer it is.

Now, Zemp and his colleagues at the university are figuring out a way to use ultrasound to perhaps someday replace biopsies, which are cumbersome, painful, and potentially injurious. They have found that high-energy ultrasound (at frequencies greater than those used in ultrasound scans) can break off a small piece of cancerous tissue into droplets and release their contents into the bloodstream. The team could then test the blood for biomarkers — certain biomolecules like DNA, RNA or proteins — specific to cancer.

Source: <https://www.thehindu.com/sci-tech/science/cancer-biopsies-painful-ultrasound-waves-alternative/article68724135.ece>  
Dated: October 07, 2024, The Hindu

### Colombian Scientists develop supplement to protect bees from pesticides

The supplement is created with flavonoids, plant-derived secondary metabolites known for their health benefits.



*Scientists in Colombia say they have developed a novel food supplement that protects bees' brains from pesticides, keeping the insects safe from neurological damage caused by agricultural chemicals.*

Scientists in Colombia say they have developed a novel food supplement that protects bees' brains from pesticides, keeping the insects safe from neurological damage caused by agricultural chemicals.

Bees, as pollinators, are considered essential for the preservation of natural ecosystems and food production.

The plant-based supplement developed at Colombia's private Rosario University in Bogota, in partnership with the Department of Neuroscience at the University of Arizona and Colombian Universidad Javeriana, allows bees to cope with neurotoxins commonly used in agriculture and avoid having their motor system and memory harmed by the chemicals.

"This is a nutritional solution to the problem bees face when exposed to pesticides," said Andre Riveros, associate professor at Rosario University. "The food induces them to develop a protection (against pesticides)".

The formula is created with flavonoids, plant-derived secondary metabolites known for their health benefits. Sedated and then confined to small laboratory tubes, bees were fed one-by-one by scientists during initial development of the supplement.

Testing has now moved to real-world scenarios in a university apiary, explained Juan Jose Ovalle, a natural science student at the university. "We already know that there are molecules that improve the bees' health, we already know that there are molecules that prevent neuronal damage caused by pesticides", Ovalle explained, adding it was important to continue the work to boost the effectiveness of these methods in supporting bees.

Source: <https://www.thehindu.com/sci-tech/science/colombian-scientists-develop-supplement-to-protect-bees-from-pesticides/article68782084.ece>  
Dated: October 29, 2024, The Hindu



# ENVIRONMENT

## New genus of jumping spiders 'Tenkana' discovered in south India

Unlike related species that live in forests, Tenkana spiders prefer drier areas and ground habitats and have been found in Tamil Nadu, Puducherry, Karnataka, Telangana and Andhra Pradesh



*The newly identified Tenkana jayamangali has been named after the Jayamangali river in Karnataka, where it was first seen*

A team of arachnologists has discovered a new genus of jumping spiders, 'Tenkana', found across southern India, encompassing two previously known species. It also introduced a new species, Tenkana jayamangali, from Karnataka.

The name Tenkana comes from the Kannada word for south, reflecting that all the known species are from southern India and northern Sri Lanka. This new group belongs to the Plexippina subtribe of jumping spiders and is different from related groups such as Hyllus and Telamonia.

The research team included scientists from various institutions in India and Canada, and their findings were published in the journal Zookeys. They used both genetic studies and physical examinations to support their work. The species was observed and collected by nature enthusiasts from Karnataka — B.G. Nisha, Y. T. Lohit, and Chinmay Maliye.

Unlike related species that live in forests, Tenkana spiders prefer drier areas and ground habitats. They have been found in Tamil Nadu, Puducherry, Karnataka, Telangana and Andhra Pradesh. Kiran Marathe and Wayne Maddison from the University of British Columbia, Canada, and John Caleb T.D. from Saveetha Institute in Chennai established this new genus. The genetic analysis was done with Krushnamegh Kunte from the National Centre for Biological Sciences in Bengaluru.

Source: <https://www.thehindu.com/sci-tech/energy-and-environment/new-genus-of-jumping-spiders-tenkana-discovered-in-south-india/article68783276.ece>  
Dated: October 23, 2024, The Hindu

## Microplastics Absorbed by Fetus Persist After Birth, Study in Mice Finds



It's increasingly clear that microplastics are everywhere, but scientists are still learning about how bad the health implications could be. Now a new study in mice shows these tiny bits of plastic can be passed from a mother into their unborn offspring, where they persist beyond birth.

Previous studies have shown that micro and nanoplastics (MNPs), smaller than grains of sand, can pass into the placenta. This latest research finds the tiny plastic fragments can remain in the growing mouse pup for at least two weeks after birth, according to this data.

The research team behind the study, from Rutgers University, found plastic traces in the lungs, hearts, livers, kidneys, and brains of the newborn mice, after the pregnant mothers inhaled fragments of polyamide-12 (PA-12), a type of nylon.

While it can't be ruled out that some fragments may have been passed through the mother's milk after birth, their very presence from such early pivotal moments in development should be a cause for alarm. "Nobody wants plastic in their liver," says Phoebe Stapleton, an associate professor of pharmacology and toxicology at Rutgers University. "Now that we know it's there — as well as in other organs — the next step is to understand why and what that means." As plastic products break apart and spread through the environment, they can enter the human body through the food we eat, water we drink, and even the air we breathe.

If these findings in mice apply to humans — and there are good biological reasons to believe that they do — then children are coming into the world with a microplastic load already embedded in their organs and tissues. Quite what that means for our health remains to be seen, but it's definitely not a positive. We've already seen microplastic pollutants linked to an increased risk of cardiovascular disease, but there remain a lot of questions about what the long-term implications of all this MNP exposure might be.

"These results raise concerns for the toxicological impacts associated with MNPs exposure, maternal-fetal health, and systemic MNPs particle deposition," the researchers write in their published paper. The research has been published in Science of the Total Environment.

Source: <https://www.sciencealert.com/microplastics-absorbed-by-fetus-persist-after-birth-study-in-mice-finds>  
Dated: 15 October 2024, <https://www.sciencealert.com>



# ENVIRONMENT

## Study documents extinction of 610 bird species

The 610 species combined represented 3 billion years of unique evolutionary history, with each lost species like chopping off a branch from the tree of life



*A flock of common teal fly across a wetland on a winter day on the outskirts of Srinagar, January 22, 2018.*

The dodo, the famous flightless bird that inhabited the Indian Ocean island of Mauritius, is a case study in extinction caused by humans. It was finely adapted to its isolated ecosystem but was unprepared for the arrival of people, was first encountered by Dutch sailors in 1598. Hunting, habitat destruction and the introduction of non-native species doomed it in under 80 years.

It is hardly alone. New research has documented the extinction of 610 bird species over the past 130,000 years, coinciding with the global spread of our species *Homo sapiens*, an avian crisis that has only accelerated in recent years and decades. For instance, the Kaua'i 'ō'ō, a Hawaiian songbird, was declared extinct just last year.

The researchers also revealed the ecological consequences, as the disappearance of avian species erases functions they serve in innumerable ecosystems. "Birds undertake a number of really important ecosystem functions, many of which we depend on, such as the dispersal of seeds, the consumption of insects, the recycling of dead material - for example, vultures - and pollination. If we lose species, then we lose these functions," said ecologist Tom Matthews of the University of Birmingham in England, lead author of the study published this week in the journal *Science*.

"A good example of this is on the islands of Mauritius and Hawaii, where all or almost all the native frugivores - birds that eat fruit - have gone extinct," Matthews said. The dodo and Kaua'i 'ō'ō, believed to have had fruit as part of their diets, were among those. "Frugivory is an important function, as in eating the fruits and then moving around, birds will disperse the seeds of the plants the fruits belong to," Matthews said.

This can precipitate "secondary knock-on extinctions," Matthews said, with Mauritius now having many threatened tree species.

Source: <https://www.thehindu.com/sci-tech/energy-and-environment/study-documents-extinction-of-610-bird-species/article68720664.ece>

Dated: October 05, 2024, *The Hindu*

## New sedimentary rock made from slag is a carbon-trapping champ

When lithified slag breaks down, it stores greenhouse gases like carbon dioxide through a process called mineral carbonation



*A piece of slag from a glazing process formed sometime between 1802 and 1450 BC in lower Egypt.*

Human activity has significantly altered the earth's landscape — so much so that many scientists have said the planet began a new geological chapter called the Anthropocene era.

Many of these changes have been wrought by deposits of materials like industrial waste and construction debris. These materials weather over time and mix with natural sediment, and affect the environment by changing the acidity of soil and water, the composition of soil, and the distribution of minerals.

### Slag become rock

In 2015, artificial ground contributed more than 316 million tonnes of sedimentary material to the oceans, far exceeding the natural supply.

But going beyond simply being abundant in the natural environment, scientists have been documenting some unusual formations that wouldn't have taken shape if not for the trash humans are throwing out. In a recent study in the journal *Sedimentologica*, for example, researchers documented a new kind of sedimentary rock made from coastal slag deposits in the U.K.

This rock follows other formations like molten glass and steel in the refuse of nuclear weapon tests and pieces of plastic pieces floating in oceans that disease-causing bacteria have grabbed hold of.

Slag is a major component of artificial ground. It is a composite material containing metal oxides and silicon dioxide, and is a by-product of the steelmaking process in the iron and steel industries.

Source: <https://www.thehindu.com/sci-tech/science/new-sedimentary-rock-made-from-slag-is-a-carbon-trapping-champ/article68735923.ece>

Dated: October 10, 2024, *The Hindu*



# ENVIRONMENT

## Zeroing in on methane diplomacy, at COP29

The Baku meet is an opportunity for India to fast-track its efforts in reducing methane emissions



'Methane may be a side issue in the overall COP29 agenda, but it presents a significant opportunity for India to fast-track its efforts in reducing methane emissions'

From November 11 to 22, 2024, world leaders will gather in Baku, Azerbaijan, for the 29th Conference of Parties (COP29) to the United Nations Framework Convention on Climate Change (UNFCCC). Dubbed the "Finance COP", representatives from every country will, for the first time in 15 years, set a new global climate finance goal, known as the "new collective quantified goal" or NCQG. The host country, Azerbaijan, has put forward an action agenda, which includes pledges to increase battery storage capacity six-fold, dramatically expand electricity networks, and cut methane emissions from organic waste.

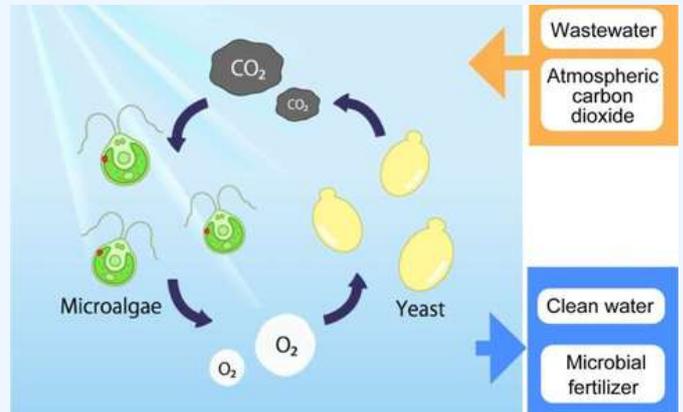
Methane's climate impacts are severe, accounting for around 30% of global warming since the pre-industrial era, and its atmospheric concentration is rising rapidly. Crucially, on a 100-year timescale, methane has 28 times greater global warming potential than carbon dioxide and is 84 times more potent on a 20-year timescale.

This means that cutting methane is one of the most effective levers we have to slow near-term temperature rise and buy time for the longer-term CO<sub>2</sub> reductions needed to stabilise climate change.

Source: <https://www.thehindu.com/opinion/op-ed/zeroing-in-on-methane-diplomacy-at-cop29/article68820057.ece>

Dated: November 02, 2024, The Hindu

## Scientists discover yeast-green algae mix improves water treatment



Bakeries and wineries can't do without yeast, but they have no need for green algae. Wastewater treatment facilities, however, might just want to have these microorganisms team up. Osaka Metropolitan University researchers have discovered that these simple organisms form the best combination in terms of boosting wastewater treatment efficiency.

The active sludge method of wastewater treatment requires electricity to ensure the flow of oxygen that feeds bacteria and other organisms that process the water. Adding microalgae to conduct photosynthesis, which produces oxygen, improves energy-efficiency, but low carbon dioxide levels hinder their growth. Enter the yeast *Saccharomyces cerevisiae*, which produces carbon dioxide.

Associate Professor Ryosuke Yamada of the Graduate School of Engineering led the group in investigating which combination of these types of microorganisms would provide the highest efficiency in wastewater treatment. The findings were published in [Applied Microbiology and Biotechnology](#).

Reported for the first time to the researchers' knowledge, the group found that the combination of the green algae *Chlamydomonas reinhardtii* and yeast had the best efficiency. Notably, the combination enhanced the green algae's ability to absorb ammonium and phosphate ions.

"The green algae and yeast are highly safe for humans, especially considering that treated wastewater is discharged into the environment," Professor Yamada explained.

"These microorganisms can also accumulate useful compounds such as polysaccharides, fats, and oils in their cells, and be used as microbial fertilizers, so it is possible to expect useful compounds to be produced at the same time as the wastewater is being treated."

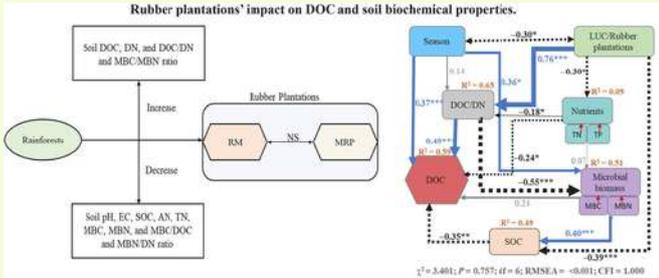
Source: <https://phys.org/news/2024-11-scientists-yeast-green-algae-treatment.html>

Dated: November 8, 2024, <https://phys.org/>



# AGRICULTURE

## Rubber plantations increase leaching of dissolved organic carbon in soil, study finds



Rubber planting brings huge economic benefits, but large-scale rubber plantations have a great impact on the ecological environment, especially in terms of the soil's physical and chemical properties.

In a study published in the *Journal of Environmental Management*, researchers from Xishuangbanna Tropical Botanical Garden (XTBG) examined the impacts of rainforest conversion to rubber plantations on soil dissolved organic carbon (DOC), one of the most mobile organic matter (OM) in the terrestrial ecosystem that causes the transformation and migration of carbon, and the ratio of carbon and nitrogen (C:N).

They also explored how such conversion mediated these impacts by altering soil biogeochemical properties. The researchers evaluated the effects of different land use types on soil DOC and other soil chemical properties by comparing soil samples from rubber monocultures, mixed rubber plantations (*Hevea brasiliensis*, *Ficus langkokensis*, and *Actinodaphne henryi*), and reference rainforests.

To explore the role of micro-organisms in the transformation process of DOC, they further analyzed the relationships between microbial biomass carbon (MBC) and nitrogen (MBN) with the DOC/DN ratio. Their results showed that rainforest conversion to rubber plantations led to an increase in soil DOC concentration and a decrease in soil organic carbon (SOC) and nutrients, which in turn increased the loss of DOC as its utilization by micro-organisms was limited.

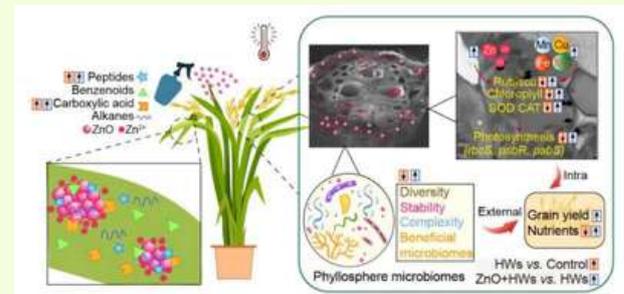
The rubber plantations had 150%–200% higher DOC concentration despite having 38.5% lower SOC concentration than in rainforests, which indicated the lower adsorption potential of soils in rubber plantations than in rainforests, according to the study.

In addition, the establishment of rubber agroforestry caused degradation of major soil properties including decreased pH, electrical conductivity, soil organic carbon, available nitrogen, available phosphorus, total nitrogen and total phosphorus, which were significantly negatively correlated with DOC. The researchers thus proposed to optimize plant density and introduce nitrogen-fixing legumes intercropping in rubber plantations, so as to improve soil health and reduce the loss of DOC and its potential environmental impacts.

Source: <https://phys.org/news/2024-11-rubber-plantations-leaching-dissolved-carbon.html>

Dated: November 4, 2024, <https://phys.org/>

## Spraying rice with zinc oxide nanoparticles protects yields during heat waves, study finds



A small team of horticulturists in China and the U.S. has found that spraying rice plants with a zinc oxide nanoparticle solution helps them better handle the stress of a heat wave. In their study, published in *Proceedings of the National Academy of Sciences*, the group conducted experiments involving spraying rice plants in a heated greenhouse.

Prior research has shown that heat waves can reduce rice yields or kill plants altogether, depending on the severity of the heat wave. Because of that, plant scientists have been looking for ways to help plants survive the likely increase in number and severity of heat waves expected due to global warming. The research team found that zinc oxide nanoparticles may be one such tool.

Prior research has also shown that zinc oxide is a natural part of plant metabolism—rice farmers have used it as a form of fertilizer for many years. More recently, researchers have found that applying zinc nanoparticles is a much more efficient approach—it allows the particles to pass through the pores in leaves. The team wondered if zinc oxide might also help rice plants maintain their yields during heat waves.

To find out, the researchers planted rice in a climate-controlled greenhouse. Once the plants were grown, the team raised the temperature to 37°C for six consecutive days. During the induced heat wave, they sprayed some of the plants with a zinc oxide nanoparticle solution, while the other plants were only watered.

Upon harvesting the rice, the research team found that those plants that had been sprayed with zinc oxide nanoparticles had yields that were 22.1% greater than the plants that had been sprayed with water alone. In taking a closer look at the rice grains, the research team also found that they contained more nutrients, as well. In conducting another similar experiment, the researchers found that spraying rice plants with zinc oxide nanoparticles also led to increased yields compared to those not sprayed even when there was no heat wave.

Source: <https://phys.org/news/2024-11-spraying-rice-zinc-oxide-nanoparticles.html>

Dated: November 5, 2024, [https://phys.org](https://phys.org/)



# AGRICULTURE

## How did the Haber-Bosch process change the world?

The Haber-Bosch method allowed industries to develop cheap synthetic fertilizers, which was a critical component in the sevenfold rise in the world's food supply during the 20th century. But environmentalists have said the utility of fertilizers can't be taken for granted. For one, Haber's nitrogen fertilizer is not harmless



*A village farmer applying fertilizers after replanting paddy saplings, in the outskirts of Bhubaneswar*

A hundred million tonnes of nitrogen are now removed from the atmosphere and converted into fertilizer via the Haber-Bosch process, adding 165 million tonnes of reactive nitrogen to the soil. To compare, biological processes replenish an estimated 100-140 million tonnes of reactive nitrogen every year. Without the industrial synthesis of ammonia from nitrogen and hydrogen, we would have had no way to meet the world's expanding demand for food.

### What is the nitrogen molecule?

Nitrates are molecules of oxygen and nitrogen, abundant in the earth's atmosphere. Nearly eight metric tonnes of nitrogen lie on every square metre of the earth's surface, yet it can't feed a single blade of grass. Nitrogen in the air is mostly in the form of  $N_2$ . When two nitrogen atoms join together, they share three pairs of electrons to form a triple bond, rendering the molecule nearly unbreakable.

The energy required to break the nitrogen triple bond is so high (946 kJ/mol) that molecular nitrogen is nearly inert. But if the bond is broken, atomic nitrogen can form ionic nitrides such as ammonia ( $NH_3$ ), ammonium ( $NH_4^+$ ), or nitrates ( $NO_3^-$ ). Plants need these types of nitrogen, called reactive nitrogen, to synthesise enzymes, proteins, and amino acids. Healthy plants often contain 3-4% nitrogen in their above-ground tissues, significantly more than other nutrients.

### How is nitrogen availed in nature?

Among natural things, only lightning has enough energy to destroy the  $N_2$  triple bond. In a lightning bolt, nitrogen in the air combines with oxygen to generate nitrogen oxides such as  $NO$  and  $NO_2$ . They can then combine with water vapour to create nitric and nitrous acids ( $HNO_3$  and  $HNO_2$ , respectively). Reactive nitrogen-rich droplets fertilize farmlands, woods, and grasslands when it rains. This pathway is estimated to replenish soil by around 10 kg of nitrogen per acre per year.

Source: <https://www.thehindu.com/sci-tech/energy-and-environment/how-did-the-haber-bosch-process-change-the-world/article68752579.ece>

Dated: October 15, 2024, The Hindu

## Heat hardiness: Scientists identify key phase for tomato heat tolerance



By studying tomato varieties that produce fruit in exceptionally hot growing seasons, biologists at Brown University identified the growth cycle phase when tomatoes are most vulnerable to extreme heat, as well as the molecular mechanisms that make the plants more heat tolerant.

The discovery, detailed in a study in *Current Biology*, could inform a key strategy to protect the food supply in the face of climate instability, the researchers said. Agricultural productivity is particularly vulnerable to climate change, the study noted, and rising temperatures are predicted to reduce crop yields by 2.5% to 16% for every additional 1 degree Celsius of seasonal warming.

The scientists took some lessons from evolution to experiment with how best to speed up the adaptation process for varieties of tomato plants, explained study author Sorel V. Yimga Ouonkap, a research associate in molecular biology, cell biology and biochemistry at Brown. It would take a long time to wait for evolution to weed out the vulnerable tomato varieties like Heinz in favor of those that can handle extreme heat, a process that might also jeopardize the qualities that make vulnerable crops commercially desirable.

"We're trying to figure out thermoregulation at a molecular and cellular level, and identify what and where we need to improve so that we can target those in commercial plant cultivars and conserve everything about them except for this one aspect that makes them vulnerable to extreme heat," Ouonkap said. "Over time, you can start accumulating different resistance mechanisms as the growing conditions continue to change."

Understanding thermotolerance, or the ability of a plant to withstand extreme temperatures, is a promising strategy to address climate adaptation, said study author Mark Johnson, a professor of biology at Brown.

Imagine if you could just make a Heinz tomato more resilient to temperature stress without affecting the flavor profile or the way people experience the tomato," Johnson said. "That would be a great advantage."

Source: <https://phys.org/news/2024-11-hardiness-scientists-key-phase-tomato.html>

Dated: November 9, 2024, <https://phys.org/>



# HEALTH

## To curb antimicrobial resistance, government may include antibiotics in definition of new drug

If brought into the new drug bracket, manufacturing, marketing and sale of antibiotics will be documented; patients will be able to buy antibiotics on prescription only



*The recommendation to the Drugs Consultative Committee (DCC) is aimed at curbing the growing antimicrobial resistance which is now recognised as a public health threat globally.*

The Drugs Technical Advisory Board (DTAB), the highest statutory decision-making body on technical matters related to drugs in the country, has recommended the inclusion of all antibiotics in the definition of new drugs in the New Drugs and Clinical Trial (NDCT) Rules, 2019.

The recommendation to the Drugs Consultative Committee (DCC) is aimed at curbing the growing antimicrobial resistance which is now recognised as a public health threat globally.

According to Rule 122 E of the Drug and Cosmetic Rules 1945, a new drug can be one which has not been used in the country and has not been recognised as effective and safe by the licensing authority for the proposed claims. It could also be an approved drug with modified or new claims including indications, dosage, and new route of administration.

If brought into the new drug bracket, the manufacturing, marketing, and sale of antibiotics will be documented. Also, the manufacturing and marketing clearance will have to be obtained from the Central government instead of State drug administration, and patients will be able to buy antibiotics only on prescription.

The board is also looking at amending the labelling requirements under the Drugs Rules, 1945 and adding a blue strip or box for antimicrobial products. It has recommended that no antimicrobials should be sold by the traders to the non-pharmaceutical industries who do not hold requisite licences.

A recently released report by the Indian Council of Medical Research's Antimicrobial Resistance Surveillance Network said that drug-resistant and difficult to treat urinary tract infections, blood stream infections, pneumonia, and typhoid are among the diseases that are showing resistance to commonly used antibiotics in India.

Source: <https://www.thehindu.com/sci-tech/health/to-curb-antimicrobial-resistance-government-may-include-antibiotics-in-definition-of-new-drug/article68760723.ece>

Dated: October 17, 2024, The Hindu

## Studies zero in on biology TB bacteria use to evade immune response

Scientists are intrigued by whatever allows the bacteria to survive in a macrophage's hostile environment and are on the lookout for proteins that shield it.



*A 3D illustration of Mycobacterium tuberculosis bacteria. Researchers believe these bacteria's many survival abilities are a result of its large genome, consisting of 4.4 million base pairs.*

Tuberculosis (TB) is a major focus in India's healthcare goals. The country is steadily improving its ability to diagnose and track TB patients and help them adhere to the long course of antibiotics required to treat it. But with increasing antimicrobial resistance in Mycobacterium tuberculosis (Mtb), the pathogen that causes TB, many existing antibiotics aren't working as effectively to kill it. So researchers are studying Mtb to identify its important proteins and then design new drugs that can act against them.

### A companion over millennia

This is not an easy problem to solve. The pathogen has co-evolved with humans for millennia. Researchers have found the Mtb complex was present as long as 70,000 years ago. Such a long relationship between the two species has allowed the microbe ample time to evolve and trick the human immune system in many ways.

One of them is its ability to grow in macrophages. The first line of human immune cells that destroy many other invading microorganisms are actually Mtb's home. Macrophages are designed to engulf foreign particles, including microbes. They can initiate a plethora of chemical reactions involving peroxides, free radicals, and other compounds that break down the engulfed particle or microbe. These reactions often collectively induce a state called oxidative stress and alter the chemical nature of molecules, including the DNA, the RNA, and/or the proteins of life-forms, rendering them dysfunctional or even literally broken up. Macrophages also use diverse strategies to starve the engulfed microbes of essential nutrients, eventually killing them.

But these techniques don't work against Mtb. Mtb keeps itself protected in clusters called tubercles (hence the name of the disease) surrounded by lipids (fatty substances) in the lungs. Though it's a respiratory pathogen, it has been known to spread to various other tissues. It can also stay dormant in the cells for a long time, up to a few decades, without causing disease or spreading to other people.

Source: <https://www.thehindu.com/sci-tech/science/studies-zero-in-on-biology-tb-bacteria-uses-to-evade-immune-response/article68752164.ece>

Dated: October 15, 2024, The Hindu



# HEALTH

## Joint research by Indian, U.S. universities leads to discovery of new genetic brain disorder

This discovery sheds light on a disorder that causes seizures, developmental delay, decreased muscle tone, and defects in myelination — a process vital for the protection and insulation of nerves in the brain



In a scientific breakthrough, a collaborative research team led by Anju Shukla, from Kasturba Medical College, Manipal Academy of Higher Education (MAHE), Stephanie Bielas from the University of Michigan in the United States, and Quasar Padiath from the University of Pittsburgh also in the U.S., has identified a new genetic disorder linked to a defect in the EPB41L3 gene.

This discovery, published in the scientific journal *Brain*, sheds light on a disorder that causes seizures, developmental delays, decreased muscle tone, and defects in myelination — a process vital for the protection and insulation of nerves in the brain.

The study was co-authored by Purvi Majethia, Elizabeth Werren, and Guillermo Rodriguez Bey, alongside several other distinguished contributors from around the globe. According to MAHE, the research emphasises the critical role that global collaboration plays in advancing genetic science, particularly in rare disorders.

“This is the first time that alterations in the EPB41L3 gene have been linked to a brain disorder. Discovering a new gene associated with a condition is an exhilarating achievement for any research team. It’s a major milestone for the myelin disorder research and will provide much-needed answers to families who have long sought diagnoses,” according to Anju Shukla, Principal Investigator of the research from MAHE.

The journey of discovery began when Dr. Shukla and her team clinically evaluated the genomic data of a four-year-old boy who exhibited seizures, developmental delays, and hypotonia at the Department of Medical Genetics, Kasturba Medical College. The team’s thorough genetic analysis revealed the EPB41L3 defect as a likely cause.

Source: <https://www.thehindu.com/sci-tech/health/joint-research-by-mahe-and-us-universities-leads-to-discovery-of-new-genetic-brain-disorder/article68690124.ece>

Dated: September 28, 2024, *The Hindu*

## Consumption of ultra-processed and fast foods leading cause of diabetes in India, reveals new study

The study found that low-AGE diets exhibited improvement in the insulin-sensitivity and reduction in the inflammatory levels compared to high-AGE diets



A diet rich in advanced glycation end products (AGEs) – which includes ultra processed and fast foods – is among the leading cause of India being the world’s diabetic capital notes a first-of-its-kind clinical trial finding published in the *International Journal of Food Sciences and Nutrition*, recently. The study was funded by the Department of Biotechnology, Ministry of Science and Technology.

The study found that low-AGE diets exhibited improvement in the insulin-sensitivity and reduction in the inflammatory levels compared to high-AGE diets.

“The study for the first time in India revealed that low AGE diets could be a potential strategy to reduce diabetes risk,” it said. AGEs, are harmful compounds that are formed when sugars react with fats or proteins during high-temperature cooking, like frying or roasting - are directly linked to inflammation, a key factor behind diabetes.

Prevalence of diabetes, pre-diabetes, and obesity is on the rise globally and among Indians, there are currently 101 million individuals with diabetes. Though India has faced a shortage of clinics, studies on the subject earlier studies from the west demonstrated an increased risk for chronic diseases due to the consumption of highly processed foods that are high in fat, sugar, salt, and potentially toxic compounds known as AGEs.

This current study has shown that consumption of AGE-rich foods leads to inflammation in the body, an underlying cause of diabetes. “This is because glycation - a non-enzymatic chemical process in which a sugar molecule binds to a protein or lipid molecule - can result in harmful reactions in the body,” notes the study. It recommends that by following a low-AGE diet (fruits, vegetables, whole grains, and low-fat milk) overweight and obese individuals can reduce oxidative stress in their bodies, which refers to the imbalance of free radicals and antioxidants that results in inflammation and cell damage.

Source: <https://www.thehindu.com/sci-tech/health/consumption-of-ultra-processed-and-fast-foods-leading-cause-of-diabetes-in-india-reveals-new-study/article68729384.ece>

Dated: October 15, 2024, *The Hindu*



# HEALTH

## T.N. Health Department takes cancer screening to women at their workplace

To give better access to women for screening of cancer, the Health Department is taking their programmes to work sites and also encouraging women to come in for annual check-ups



*The Health Department had rolled out the community-based cancer screening programmes in four districts of Erode, Ranipet, Kanniyakumari and Tirupattur in November 2023*

At a time when Tamil Nadu is taking ahead its community-based organised cancer screening programme, the Directorate of Public Health (DPH) and Preventive Medicine is taking steps to combat challenges in reaching out to women aged 30 and above. It has started to reach out to women at their workplaces, including MGNREGA sites, even while health staff are finding it increasingly difficult to access women residing in apartment complexes.

The Health Department, which had rolled out the community-based cancer screening programmes in four districts of Erode, Ranipet, Kanniyakumari and Tirupattur in November 2023, will be expanding the initiative to the rest of the State soon. Under the initiative, women aged 30 and above are screened for breast and cervical cancer, while oral cancer screening is done for all above the age of 18. In door-to-door visits, health staff “invite” women to come to the screening units.

“In the working sector, the number of women turning up for screening remains low. One of their biggest worries is losing their wages for the day. So, we are reaching out to them at their workplaces that include MGNREGA sites. We also reach out during Self-Help Group meetings, markets, local festivals and some religious gatherings. We have given options to local healthcare staff units to plan their screening programmes according to the situation,” T. S. Selvavinayagam, Director of Public Health and Preventive Medicine said.

While this is a key challenge, most women in middle and upper income groups remain inaccessible, he said, adding, “Physical access to places such as apartments remain difficult for our health staff.”

Source: <https://www.thehindu.com/news/national/tamil-nadu/tn-health-department-takes-cancer-screening-to-women-at-their-workplace/article68849022.ece>

Dated: November 11, 2024, The Hindu

## Under-diagnosed but very treatable: Expert explains how migraines can be managed

Neuro-ophthalmologist Deborah Friedman, former president of the North American Neuro-Ophthalmology Society, detailed lifestyle changes and new treatment options to tackle migraines



*Awareness plays a key role in the early diagnosis and treatment of migraine, says neuro-ophthalmologist from USA, Dr. Deborah Friedman*

Migraine is a common but under-diagnosed disease, affecting one in every five women and one in 10 men, says Deborah Friedman, neuro-ophthalmologist and headache medicine specialist from the United States. Though there is no known cure, migraine is the most treatable among all neurological diseases, she says.

A former member of the Board of Directors of the American Headache Society and former president of the North American Neuro-Ophthalmology Society, Dr. Friedman was in Hyderabad to deliver a lecture at the ongoing four-day annual conference of the Indian Academy of Neurology (IANCON 2024).

### Symptoms differ among patients

“Migraine symptoms differ from person to person. About 25% of patients experience an ‘aura’, which is like a warning before a migraine attack. These include visual disturbances, slurred speech, difficulty in coming up with the right words, sensitivity to light, neck pain and uncontrollable yawning for no reason,” Dr. Friedman told The Hindu on the sidelines of IANCON meeting.

Awareness plays a key role in the early diagnosis and treatment of migraine. Triggers should be identified and have to be avoided, she said.

“Lifestyle changes such as sticking to a strict sleep schedules, maintaining meal timings, staying hydrated and stress management play a vital role in controlling migraines,” she said.

“While there is no known cure for migraine, new treatments are available like CGRP inhibitors, drugs such as lasmiditan and triptans, which can reduce the severity and frequency of attacks. Devices like Nerivio, a band that can be worn on the upper arm for a specific time period, also provide relief from pain. There are peptides, which can provide pain relief too,” she said.

Source: <https://www.thehindu.com/sci-tech/health/complete-cure-for-migraine-not-available-but-it-can-be-treated-says-expert/article68765802.ece>

Dated: October 18, 2024, The Hindu



# S&T COOPERATION FOR GLOBAL SOUTH

## Regional South-South and Triangular Cooperation Building Sustainable Industry in Africa



In July 2016, the United Nations General Assembly (UNGA) adopted resolution A/RES/70/293, proclaiming the period 2016-2025 as the Third Industrial Development Decade for Africa (IDDA III). IDDA III aims to foster Africa's industrial growth in alignment with global frameworks such as the United Nations Sustainable Development Goals (SDGs), the African Union's Agenda 2063, and the Action Plan for the Accelerated Industrial Development of Africa (AIDA). It also provides a platform for Africa to synchronize its industrial development efforts with international cooperation platforms like the Group of 20, the Tokyo International Conference on African Development (TICAD), the Forum on China-Africa Cooperation (FOCAC), among others.

The IDDA III is in its final year and hence, a seventh and final annual High-Level gathering under IDDA III was jointly organized by the African Union Commission (AUC), United Nations Economic Commission for Africa (UNECA), and the United Nations Industrial Development Organization (UNIDO), in close collaboration with African Development Bank (AfDB), African Export-Import Bank (Afreximbank), African Business Council (AfBC), and Deloitte on 25 September on the sidelines of the 79th UN General Assembly. The meeting brought together high-level stakeholders including African Heads of State and Government; Ministers, the African Union Commission, Heads of UN agencies, African regional organizations, plus the private sector, financial institutions, donors, civil society, and non-governmental organizations, academia, and media.

Dima Al-Khatib, Director of the United Nations Office for South-South Cooperation, addressed the meeting during the Public/Private Interactive Session on Industrialization, Innovation and Investment in the Future of Africa.

Source: <https://unsouthsouth.org/2024/10/02/regional-south-south-and-triangular-cooperation-building-sustainable-industry-in-africa/>

Dated: October 2, 2024, <https://unsouthsouth.org/>

## Connecting Global Processes for Local Impact: 8th International Conference on Triangular Cooperation



“Connecting Global Processes for Local Impact” was the motto for the 8th International Conference on Triangular Cooperation, co-hosted by Camões, I.P., the Portuguese Development Agency, and the Organization for Economic Cooperation and Development, on the 7 and 8 October 2024 in the headquarters of Calouste Gulbenkian Foundation in Lisbon.

Nuno Sampaio, the Portuguese Secretary of State for Foreign Affairs and Cooperation, welcomed 180 delegates from more than 50 countries and international and regional organizations, with a view to promote the international debate on how, in times of polycrisis, triangular cooperation contributes to boosting investment in inclusive partnerships and local impact.

Mayumi Endoh, Deputy Director of the Development Cooperation Directorate, OECD said: “It is fair to say that triangular cooperation has gone mainstream, and the level of participation and enthusiasm in the room was a testimony to this. Looking ahead, all eyes are on Seville and FFD4, and this is a unique opportunity to scale-up triangular cooperation”.

“We come together with a shared purpose, united in the key objective to forge stronger relationships within and through triangular cooperation partnerships,” said UNOSSC Director Dima Al-Khatib. “The Pact for the Future highlights South-South and triangular cooperation as a critical mechanism for advancing the digital economy, artificial intelligence governance, and science, technology, and innovation capacities in developing countries.”

“We are proud to partner with Portugal and Camões, I.P.,” said the UNOSSC Director, “and pleased to launch the new Triangular Cooperation Window of the United Nations Fund for South-South Cooperation, to facilitate robust South-South and triangular cooperation strategies to guide and support coordinated action among partners, ensuring that these efforts are well-targeted, impactful, and deliver accelerated results”.

Source: <https://unsouthsouth.org/2024/10/10/connecting-global-processes-for-local-impact-8th-international-conference-on-triangular-cooperation/>

Dated: October 10, 2024, [https://unsouthsouth.org](https://unsouthsouth.org/)



# S&T COOPERATION FOR GLOBAL SOUTH

## ITU Global Innovation Forum Highlights South-South and Triangular Cooperation in Bridging the Digital Divide



The Global Innovation Forum held by the International Telecommunication Union (ITU) between 28 and 30 October has identified key ways to help close the digital innovation gap.

The suggested approaches, focusing on critical factors from expanding collaboration to attracting investment, are meant to spur sustainable economic growth and find solutions to pressing societal challenges through accelerated, and localized, technology innovation. “No one can be left lagging behind due to a lack of access to digital tools and resources,” said H.E. Myriam Spiteri Debono, President of Malta, who opened the Forum. “It is pertinent that access to information technology and digital tools should be made available to everyone, everywhere.”

The three-day Global Innovation Forum, held in Valletta, Malta, emphasized the importance of collaboration, knowledge sharing, and capacity building to bridge the innovation gap and advance socio-economic development.

“Digital innovation is a driving force behind economic progress, sustainable development and solving societal challenges,” said ITU Secretary-General Doreen Bogdan-Martin. “The Global Innovation Forum has helped identify how we can close the digital innovation gap to ensure that people and planet benefit from the transformative power of technology.”

“The Summit for the Future highlights the imperative of digital cooperation, especially to unlock the potential of the South,” said Director Dima Al-Khatib, moderator of the Global Innovation Forum dialogue on focusing on South-South and triangular cooperation as a catalyst for emerging technology. “By working together across borders and sectors, we can accelerate progress and create interconnected ecosystems of innovation that serve as engines of growth and resilience,” she said noting that, “Our task today is to leverage digital and technological advancements in a way that narrows – rather than widens – the digital and ultimately development divides. This is where South-South and triangular cooperation plays a pivotal role.”

Source: <https://unsouthsouth.org/2024/10/30/itu-global-innovation-forum-highlights-south-south-and-triangular-cooperation-in-bridging-the-digital-divide/>

Dated: October 30, 2024, <https://unsouthsouth.org/>

## 2024 Report of the Secretary-General on the State of South-South Cooperation Presented to the 2nd Committee



Samba Thiam, Senior Policy Development Adviser of the United Nations Office for South-South Cooperation, introduced the Secretary-General’s report on the “State of South-South cooperation” (document A/79/230).

Mr. Thiam noted that the report outlines the current global development context and analyses new developments and opportunities in South-South and triangular cooperation. It notes that 81 per cent of UN entities included this mode of collaboration in their strategic plans in 2023, and 86 per cent integrated South-South results in corporate reporting – up from 73 per cent and 79 per cent, respectively, in 2022. Since 2021, requests for United Nations support on South-South or triangular cooperation have risen steadily from 53 per cent to 61 per cent of host country Governments, focusing mainly on health, climate change, and social protection. The development system’s response was evident, with an increased number of Governments (71 per cent in 2023, compared to 67 per cent in 2022) receiving such support.

According to the report, 35 per cent of Governments indicated they have received support from the UN system in establishing or strengthening national institutions engaged in South-South and triangular cooperation. Specific initiatives included assigning South-South focal points (58 per cent), establishing dedicated units for South-South cooperation (29 per cent) and allocating budgets for South-South cooperation (20 per cent).

Source: <https://unsouthsouth.org/2024/10/10/2024-report-of-the-secretary-general-on-the-state-of-south-south-cooperation-presented-to-the-2nd-committee/>

Dated: October 10, 2024, <https://unsouthsouth.org/>



# OTHERS

## Leading Indian woman scientist is International Brain Research Organisation's president-elect

The first scientist from a developing country to be appointed to the top position of IBRO, Shubha Tole is currently the dean of graduate studies at Tata Institute of Fundamental Research, Mumbai



*Shubha Tole, the first scientist from a developing country to be appointed to the top position of IBRO*

A leading Indian woman scientist, Shubha Tole has been appointed as the president-elect of the International Brain Research Organisation (IBRO). She is the first scientist from a developing country to be appointed to the top position. The IBRO governing council represents 69 scientific societies and federations from 57 countries worldwide. It recently elected new officers during its annual assembly in Chicago, USA. Ms. Tole, currently serves as the dean of graduate studies at Mumbai's premier scientific research institute – Tata Institute of Fundamental Research.

The International Brain Research Organization is the global federation of neuroscience organizations which promote and support neuroscience around the world through training, teaching, collaborative research, advocacy and outreach. While speaking exclusively to The Hindu, Ms. Tole said, "Leadership position offers the opportunity to have impact on a wider range of issues and expands the range of people one can help. The importance of women role models cannot be under-emphasized in these matters."

Source: <https://www.thehindu.com/sci-tech/science/leading-indian-woman-scientist-is-international-brain-research-organisations-president-elect/article68757842.ece>  
Dated: October 15, 2024, The Hindu

## Nobel Prize in Chemistry awarded to David Baker, Demis Hassabis and John Jumper for decoding protein design and structures

The Nobel Prizes for 2024 in Chemistry was awarded to David Baker "for computational protein design" along with Demis Hassabis and John M. Jumper "for protein structure prediction"



*The Royal Swedish Academy of Sciences has decided to award the 2024 Nobel Prize in Chemistry with one half to David Baker "for computational protein design" and the other half jointly to Demis Hassabis and John M. Jumper "for protein structure prediction."*

The 2024 Nobel Prize for chemistry was shared by David Baker "for computational protein design" along with Demis Hassabis and John Jumper "for protein structure prediction," the Royal Swedish Academy of Sciences announced on Wednesday (October 9, 2024).

Last year the Nobel Prize for Chemistry was jointly awarded to Mounji G. Bawendi, Louis E. Brus and Alexei I. Ekimov for the discovery and synthesis of quantum dots.

### The Nobel Prize 2024: An interactive guide

Heiner Linke, chair of the Nobel Committee for Chemistry, said the award honoured research that connected the sequence of amino acids that make up a protein and the protein's structure. Baker led a team that in 2003 designed a new protein using bespoke software methods. They and others have since refined these methods to be able to point the way to 'designer' proteins intended for specific applications.

Johan Åqvist, a former chair of the chemistry Nobel Committee, called the variety of proteins developed by Baker et al. to be "absolutely mind-blowing" and that "it seems that you can almost construct any type of protein with this technology".

Hassabis and Jumper received the other half of the prize for their hand in developing an artificial intelligence model called AlphaFold 2 that could predict the structures of millions of proteins. Human scientists had done that for only around 1.7 lakh proteins until then, although the structures and patterns therein were used to train AlphaFold.

Source: <https://www.thehindu.com/sci-tech/science/chemistry-nobel-prize-2024-awarded-to-david-baker-along-with-demis-hassabis-and-john-m-jumper/article68735686.ece>  
Dated: October 09, 2024, The Hindu



# OTHERS

## 2024 physics Nobel for work on artificial neural networks

ANNs are within the reach of millions of people but also less resemble their ancestors, which this year's laureates helped build



On October 8, John Hopfield and Geoffrey Hinton won the 2024 Nobel Prize for physics “for foundational discoveries and inventions that enable machine learning with artificial neural networks”. Their work lies at the roots of a large tree of work, the newest branches of which we see today as artificially intelligent (AI) apps like ChatGPT.

### What is AI?

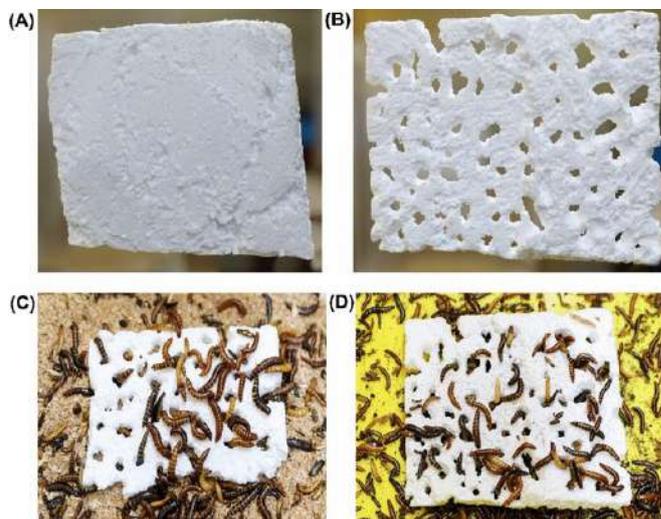
An accessible AI today is likely to be an implementation of an artificial neural network (ANN) — a collection of nodes designed to operate like networks of neurons in animal brains. Each node is a site where some input data is processed according to fixed rules to produce an output. A connection between nodes allows them to transfer input and output signals to each other. Stacking multiple layers of nodes, with each layer performing a specific task with great attention to detail, creates a machine capable of deep learning.

The popular imagination of AI today is in terms of computing: AI represents what computers like those in smartphones can do today that they weren't able to yesterday. These abilities are also beginning to surpass what humans are capable of. So it is a pleasant irony that the foundations of contemporary AI, for which Hopfield and Hinton received this year's physics Nobel Prize, are in machines that started off doing things humans were better at — pattern recognition — and based on ideas in statistical physics, neurobiology, and cognitive psychology.

Source: <https://www.thehindu.com/sci-tech/science/2024-physics-nobel-for-work-on-artificial-neural-networks-explained/article68735153.ece>

Dated: October 09, 2024, The Hindu

## Plastic-eating insect discovered in Kenya



There's been an exciting new discovery in the fight against plastic pollution: mealworm larvae that are capable of consuming polystyrene. They join the ranks of a small group of insects that have been found to be capable of breaking the polluting plastic down, though this is the first time that an insect species native to Africa has been found to do this.

Polystyrene, commonly known as styrofoam, is a plastic material that's widely used in food, electronic and industrial packaging. It's difficult to break down and therefore durable. Traditional recycling methods—like chemical and thermal processing—are expensive and can create pollutants. This was one of the reasons we wanted to explore biological methods of managing this persistent waste.

A team of scientists from the International Centre of Insect Physiology and Ecology who have found that the larvae of the Kenyan lesser mealworm can chew through polystyrene and host bacteria in their guts that help break down the material. Our paper is published in the journal *Scientific Reports*.

The lesser mealworm is the larval form of the *Alphitobius darkling* beetle. The larval period lasts between 8 and 10 weeks. The lesser mealworm are mostly found in poultry rearing houses which are warm and can offer a constant food supply—ideal conditions for them to grow and reproduce.

Though lesser mealworms are thought to have originated in Africa, they can be found in many countries around the world. The species we identified in our study, however, could be a sub-species of the *Alphitobius* genus. We are conducting further investigation to confirm this possibility.

Study also examined the insect's gut bacteria. We wanted to identify the bacterial communities that may support the plastic degradation process.

Source: <https://phys.org/news/2024-11-plastic-insect-kenya.html>, Dated: November 11, 2024, <https://phys.org/>