

### SCIENCE & TECHNOLOGY

#### ADITYA L-1 LAUNCH: ABOUT THE MISSION

How did the Aditya L-1 mission reach space? Where will it be placed in space? What are its objectives? What payloads it is carrying? And, why does ISRO need to examine the Sun anyway? Here is everything you need to know about ISRO's Aditya-L1 mission.

The Indian Space Research Organisation (ISRO) launched Aditya L-1, its first space-based mission to study the Sun, from the Satish Dhawan Space Centre in Sriharikota on 2nd September at 11:50 am. The lift-off took place barely 10 days after ISRO became the first space agency to soft-land a spacecraft near the Moon's south pole.



The PSLV carrying Aditya L1 preparing for launch. (Photo: ISRO)

How did the Aditya L-1 mission reach space? Where will it be placed in space? What are its objectives? What payloads it is carrying? And, why does ISRO need to examine the Sun anyway? Here is everything you need to know about ISRO's Aditya-L1 mission.

#### What is the Aditya L-1 mission?

The PSLV will initially place the Aditya L-1 in a lower Earth orbit. Subsequently, the spacecraft's orbit around the Earth will be raised multiple times before it is put on a path to a halo orbit around the L1 Lagrange point.

The spacecraft will finally be stationed in a halo orbit around the Lagrange point 1 (L1) of the Sun-Earth system (more on this later), which is about 1.5 million km from the Earth. Named after the rising Sun, the Aditya L-1 will cover its journey to the L1 point in about four months. The spacecraft will carry seven payloads to observe solar activities for the next five years.

Source: <https://indianexpress.com/article/explained/explained-sci-tech/aditya-l-1-solar-mission-explained-8920110/>

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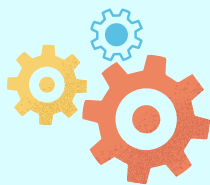


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## WITHOUT SPERM OR EGG, HOW SCIENTISTS GREW WHOLE MODEL OF HUMAN EMBRYO

There is no way for scientists to ethically research the early stages of development of an embryo, as it is difficult to study it after it implants in the uterus.



*The scientists have called it one of the most complete models of a 14-days-old human embryo.*

Scientists have successfully grown a “human embryo” in the lab without using an egg or sperm. They used a mix of stem cells — early cells that have the ability to differentiate into other types of cells — that was able to spontaneously assemble into an embryo-like structure, mimicking molecular characteristics of an early embryo. How was the embryo model created?

The scientists have called it one of the most complete models of a 14-days-old human embryo. Several teams have been working on developing these human embryo-like models — around six such models have been published this year itself. None of them fully replicate the processes that happen during the early stages of embryo development, but all of them add to their understanding.

The researchers from Israel used a mix of stem cells and chemicals, a small portion of which was able to spontaneously assemble to form different types of cells that form the foetus, those that provide nutrients to the foetus, cells that lay out the plan for development of the body, and cells that create structures like placenta and umbilical cord to support the foetus. One of the problems that the team faced, however, was that only 1% of this mixture actually assembled spontaneously, making the process not very efficient.

### Why are embryo models and related research important?

There is no way for scientists to ethically research the early stages of development of an embryo, as it is difficult to study it after it implants in the uterus. Scientists currently study these initial changes in various lab models or donated embryos.

*Source: <https://indianexpress.com/article/explained/without-sperm-or-egg-how-scientists-grew-whole-model-of-human-embryo-8929693/>*

## SCIENTISTS FIND ELUSIVE PINES' DEMON PARTICLE AFTER 67 YEARS

The demon could have a role in why some metal hydrides become superconductors under high pressure.



An elusive particle proposed in 1956 by theoretical physicist David Pines has just been discovered by a team of scientists led by Peter Abbamonte of the University of Illinois. Scientists long suspected that this particle, called a ‘demon’, plays a fundamental role in the characteristics of several metals, but had been unable to confirm its existence thus far.

“Demons have been theoretically conjectured for a long time, but experimentalists never studied them,” Dr. Abbamonte said of the discovery in a press release. “In fact, we weren’t even looking for it. But it turned out we were doing exactly the right thing, and we found it.”

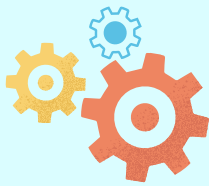
The demon is not a particle in the conventional sense of the term. Instead, it is a collection of particles, or a composite particle, made of electrons. (Protons are another example of a composite particle; they are made up of quarks.)

### From excitation to plasmon

In a solid, electrons can interact to form collective units, or excitations. This possibility was one of the fundamental discoveries in condensed-matter physics. One example of an excitation is a denser group of electrons in one part of the solid relative to another.

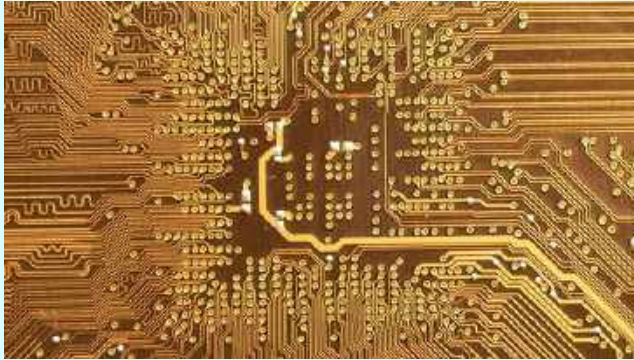
If supplied with enough energy, these excitations can form a composite particle called a plasmon. Imagine excitations to be ripples in a pond. Now imagine a continuous wind that keeps adding energy to these ripples.

*Source: [https://www.thehindu.com/sci-tech/science/pines-demon-acoustic-plasmon-strontium-ruthenate-applications/article67259569.ece?](https://www.thehindu.com/sci-tech/science/pines-demon-acoustic-plasmon-strontium-ruthenate-applications/article67259569.ece?cx_testId=15&cx_testVariant=cx_1&cx_artPos=0&cx_experienceId=EXKWL3XAQS9E#cxrecs_s)  
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## HOW CAN A QUANTUM COMPUTER PROVE THAT IT IS SUPERIOR?

A Google researcher has shown that one class of mathematical problems can be solved only by quantum computers, not classical computers.



*A close-up view of a printed circuit board.*

Quantum computing is becoming more popular – both as a field of study and in the public imagination. The technology promises more speed and more efficient problem-solving abilities, challenging the boundaries set by classical, conventional computing.

The hype has led to inflated expectations. But whether or not it can meet them, the *raison d'être* of a quantum computer is taken to be synonymous with the ability to solve some problems much faster than a classical computer can. This achievement, called quantum supremacy, will establish quantum computers as superior machines. Scientists have been exploring both experimental and theoretical ways to prove quantum supremacy.

Ramis Movassagh, a researcher at Google Quantum AI, recently had a study published in the journal *Nature Physics*. Here, he has reportedly demonstrated in theory that simulating random quantum circuits and determining their output will be extremely difficult for classical computers. In other words, if a quantum computer solves this problem, it can achieve quantum supremacy. But why do such problems exist?

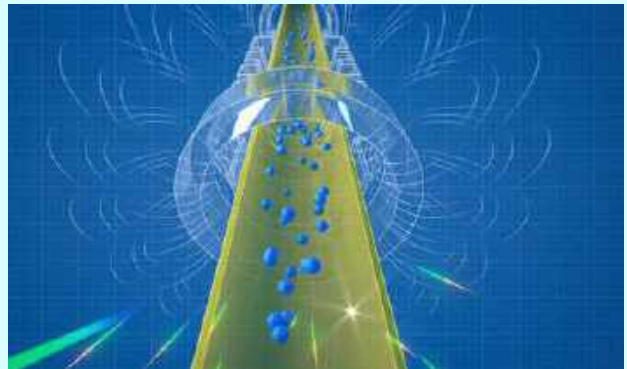
### Facing the quantum challenge

Quantum computers use quantum bits, or qubits, whereas classical computers use binary bits (0 and 1). Qubits are fundamentally different from classical bits as they can have the value 0 or 1, as a classical bit can, or a value that's a combination of 0 and 1, called a superposition.

Source: <https://www.thehindu.com/sci-tech/technology/how-quantum-computer-prove-supremacy-cayley-path/article67325838.ece>

## GRAVITY MAKES ANTIMATTER FALL JUST LIKE EVERYTHING ELSE: STUDY

Around 13.8 billion years ago, the Big Bang is believed to have produced an equal amount of matter -- what everything you can see is made out of -- and antimatter, its equal yet opposite counterpart



*This handout illustration released by U.S. National Science Foundation on September 27, 2023*

For the first time, scientists have observed antimatter particles -- the mysterious twins of the visible matter all around us -- falling downwards due to the effect of gravity, Europe's physics lab CERN announced on 28th September 2023.

The experiment was hailed as "huge milestone", though most physicists anticipated the result, and it had been predicted by Einstein's 1915 theory of relativity. It definitively rules out that gravity repels antimatter upwards -- a finding that would have upended our fundamental understanding of the universe.

Around 13.8 billion years ago, the Big Bang is believed to have produced an equal amount of matter -- what everything you can see is made out of -- and antimatter, its equal yet opposite counterpart. However there is virtually no antimatter in the universe, which prompted one of the greatest mysteries of physics: what happened to all the antimatter?

"Half the universe is missing," said Jeffrey Hangst, a member of CERN's ALPHA collaboration in Geneva which conducted the new experiment.

"In principle, we could build a universe -- everything that we know about -- with only antimatter, and it would work in exactly the same way," he told AFP.

Source: <https://www.thehindu.com/sci-tech/science/antimatter-observed-falling-down-under-influence-gravity-matter-einsteins-theory-of-relativity/article67356316.ece>

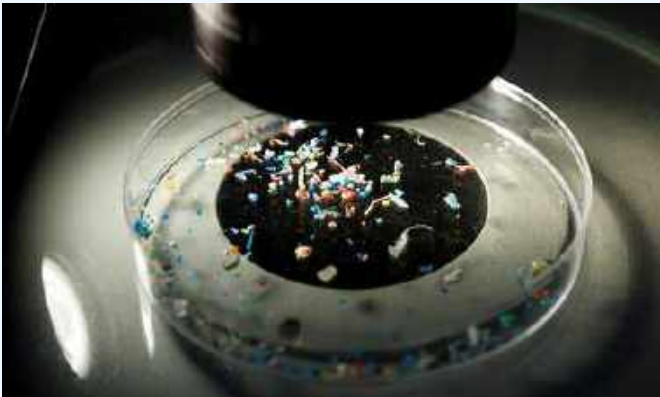




# ENVIRONMENT

## JAPANESE SCIENTISTS FIND MICROPLASTICS ARE PRESENT IN CLOUDS

When microplastics reach the upper atmosphere and are exposed to ultraviolet radiation from sunlight, they degrade, contributing to greenhouse gases.



Researchers in Japan have confirmed microplastics are present in clouds, where they are likely affecting the climate in ways that aren't yet fully understood.

In a study published in *Environmental Chemistry Letters*, scientists climbed Mount Fuji and Mount Oyama in order to collect water from the mists that shroud their peaks, then applied advanced imaging techniques to the samples to determine their physical and chemical properties.

The team identified nine different types of polymers and one type of rubber in the airborne microplastics -- ranging in size from 7.1 to 94.6 micrometers.

Each liter of cloud water contained between 6.7 to 13.9 pieces of the plastics.

What's more, "hydrophilic" or water-loving polymers were abundant, suggesting the particles play a significant role in rapid cloud formation and thus climate systems.

"If the issue of 'plastic air pollution' is not addressed proactively, climate change and ecological risks may become a reality, causing irreversible and serious environmental damage in the future," lead author Hiroshi Okochi of Waseda University warned in a statement on 28th September 2023, Wednesday.

When microplastics reach the upper atmosphere and are exposed to ultraviolet radiation from sunlight, they degrade, contributing to greenhouse gases.

Source: <https://www.thehindu.com/sci-tech/energy-and-environment/japanese-scientists-find-microplastics-are-present-in-clouds/article67356549.ece>

## NEW STUDY ESTABLISHES LINK BETWEEN GREENHOUSE GASES AND POLAR BEAR SURVIVAL

A 2008 Department of Interior legal opinion said greenhouse gas emissions didn't have to be considered because the impact from specific projects couldn't be distinguished from that of all historic global emissions.



Fifteen years after polar bears were listed as threatened, a new study says researchers have overcome a roadblock in the Endangered Species Act that prevented the federal government from considering climate change when evaluating impacts of projects such as oil and gas drilling.

The act requires agencies to ensure projects they approve don't further harm listed species. But a 2008 Department of Interior legal opinion said greenhouse gas emissions didn't have to be considered because the impact from specific projects couldn't be distinguished from that of all historic global emissions.

A study published in *Science's Policy Forum* says scientists for the first time are able to directly quantify the impact of human-caused greenhouse gas emissions from specific sources on polar bear cub survival. It "just seems odd" that polar bears were listed because of the loss of sea ice due to global warming "but emissions have not been considered," said lead author Steven C. Amstrup, Chief Scientist Emeritus at Polar Bears International and a Professor at the University of Wyoming.

Polar bears, which occur in 19 sub populations throughout the Arctic, rely on sea ice to hunt for seals. As ice melts, they either end up on land or must swim farther from shore to find ice, which hurts their ability to find food and leads to long periods of fasting that deplete fat reserves. Human-caused global warming means there are fewer days of sea ice to help build up those reserves and longer fasting periods, and scientists have said most polar bears could become extinct by the end of the century unless warming is curbed.

Source: <https://www.thehindu.com/sci-tech/energy-and-environment/new-study-establishes-link-between-greenhouse-gases-and-polar-bear-survival/article67259041.ece>



# ENVIRONMENT

## HOW ANTARCTICA'S MELTING SEA ICE KILLED THOUSANDS OF EMPEROR PENGUINS CHICKS

In late 2022, four out of five emperor penguin colonies located in Antarctica's Bellingshausen Sea region experienced total breeding failure due to sea ice loss.



*Emperor penguin chicks stand together in Antarctica on December 21, 2005. (Zhang Zongtang/Xinhua via AP, File)*

Up to 10,000 emperor penguin chicks across four colonies in Antarctica's Bellingshausen Sea may have died as the sea ice underneath their breeding grounds melted and broke apart in late 2022, according to a new study. It's the first recorded incident of widespread breeding failure of emperor penguins at multiple sites in a region due to sea ice loss.

The sea ice disappeared before the start of the emperor chicks' fledging period, during which they develop their waterproof adult wings and learn to swim. The birds most likely either drowned or froze to death — they couldn't regulate their body temperature after getting drenched, the research said.

The study, 'Record low 2022 Antarctic sea ice led to catastrophic breeding failure of emperor penguins', was published on August 24 in the journal *Communications Earth & Environment*. It was conducted by Peter T Fretwell and Norman Ratcliffe of the British Antarctic Survey (Cambridge) and Aude Boutet, an independent researcher based in Paris.

Source: <https://indianexpress.com/article/explained/explained-climate/emperor-penguins-chicks-die-antarctica-8912851/>

## BIRD SPECIES PLUMMETING IN INDIA, SAYS NEW REPORT: WHAT ARE THE MAJOR THREATS TO THEM?

The key factors responsible for the decline are urbanisation, ecosystem degradation, infrastructural development, environmental pollutants, and climate change, the report said.



*Vultures in the nest (Gyps indicus), on the tower of the Chaturbhuj Temple, Orchha, Madhya Pradesh, India. (Photo: Wikimedia Commons)*

A large number of bird species in India are either currently declining or projected to decline in the long term, according to a report based on data from about 30,000 birdwatchers that was released on Friday (August 25). Out of the 942 bird species that were assessed, 142 are diminishing and only 28 are increasing.

While raptors, migratory shorebirds, and ducks have declined the most, birds living in habitats like open ecosystems, rivers, and coasts are among the worst affected, the State of India's Birds (SoIB) report added.

The key factors responsible for the decline are urbanisation, infrastructural development, environmental pollutants, and climate change. Here is a detailed look at some of these threats to birdlife in India, the extent of their severity, and how they affect birds.

Source: <https://indianexpress.com/article/explained/threats-bird-species-india-8911046/>





# ENVIRONMENT

## BIODIVERSITY LOSS: 37,000 'ALIEN SPECIES' INTRODUCED BY HUMAN ACTIVITIES

The study, conducted over a four-year period, was done by 86 experts from 49 countries, drawing on over 13,000 references.



*These include more than 3,500 invasive alien species, which have played a key role in 60% of global plant and animal extinctions recorded. (Representational Image)*

In the most extensive study on invasive species carried out till date, the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) in its new publication – the “Assessment Report on Invasive Alien Species and their Control” – has found that there are 37,000 alien species, including plants and animals, that have been introduced by many human activities to regions and biomes around the world, including more than 3,500 invasive alien species and that invasive alien species have played a key role in 60% of global plant and animal extinctions recorded.

The report, which was released on Monday, said that invasive alien species are one of the five major direct drivers of biodiversity loss globally, alongside land and sea use change, direct exploitation of organisms, climate change, and pollution.

The IPBES released its report following a week-long plenary from August 28th, with representatives of the 143 member States which have approved the report. IPBES is an independent intergovernmental body established to strengthen the science-policy interface for biodiversity and ecosystem services, working in a similar way to the IPCC, which is the UN's climate science body. The study, which has taken place over a period of four years, has been by 86 leading experts from 49 countries, drawing on more than 13,000 references. The report has noted that the number of alien species (species introduced to new regions through human activities) has been rising continuously for centuries in all regions, but are now increasing at unprecedented rates, with increased human travel, trade and the expansion of the global economy.

Source: <https://indianexpress.com/article/india/biodiversity-loss-37000-alien-species-introduced-by-human-activities-says-report-8924756/>

## G-20 SUMMIT | NEW DELHI DECLARATION ACCEPTS DISPROPORTIONATE IMPACT OF CLIMATE CHANGE ON WOMEN

‘We commit to close gender gaps, promote full, equal, effective women’s participation in the economy as decision-makers,’ the G-20 declaration said



*The G-20 declaration adopted here accepted the disproportionate impact of climate change on all women and girls. Representational file image. | Photo Credit: PTI*

The G-20 nations on September 9 resolved to increase women’s participation and leadership in climate change mitigation and adaptation, and support gender-responsive solutions to build resilience to the impact of climate change.

The G-20 declaration adopted here accepted the disproportionate impact of climate change on all women and girls, and decided to accelerate climate action with gender equality at its core.

“To this end, we will support and increase women’s participation, partnership, decision-making and leadership in climate change mitigation and adaptation, and disaster risk reduction strategies and policy frameworks on environmental issues, support gender-responsive and environment-resilient solutions, including water, sanitation and hygiene (WASH) solutions, to build resilience to the impact of climate change and environmental degradation,” the declaration said.

The document further agreed to establish a new Working Group on Empowerment of Women in order to further empower women and promote gender equality. The working group will hold its inaugural meeting during the Brazilian G-20 Presidency

Source: <https://www.thehindu.com/sci-tech/energy-and-environment/g-20-summit-2023-new-delhi-declaration-accepts-disproportionate-impact-of-climate-change-on-women/article67289341.ece>



# AGRICULTURE

## M.S. SWAMINATHAN, EMINENT AGRICULTURAL SCIENTIST, PASSES AWAY

M.S. Swaminathan was the key architect of India's 'Green Revolution'



M.S. Swaminathan | Photo Credit: Nagara Gopal

Mankombu Sambasivan Swaminathan, popularly known as M.S. Swaminathan, the legendary agricultural scientist and a key architect of the country's 'Green Revolution,' passed away at his residence in Chennai on September 28, 2023 at 11.20 am, following age-related issues. He was 98.

He is survived by three daughters — Soumya Swaminathan, former Chief Scientist, World Health Organisation; Madhura Swaminathan, professor, economic analysis unit, Indian Statistical Institute, Bengaluru and former chairperson, MSSRF, and Nitya Rao, director, NISD, University of East Anglia, UK. His wife, Mina Swaminathan, who was Distinguished Chair, Gender and Development, M. S. Swaminathan Research Foundation (MSSRF), died in March 2022.

### Role in 'Green Revolution'

The back-to-back severe drought in mid-1960s compelled the political leadership and scientific fraternity to look for solutions to overcome the "ship-to-mouth" existence when the country was dependent on foodgrains imported from the U.S.

Dr. Swaminathan worked closely with two Union Agriculture Ministers, C. Subramaniam (1964-67) and Jagjivan Ram (1967-70 & 1974-77) for the success of the 'Green Revolution,' a programme that paved the way for quantum jump in productivity and production of wheat and rice through adaptation of chemical-biological technology. The discovery of Norman Bourlag, a celebrated American farm scientist and 1970 Nobel Laureate, on wheat had played a huge role in this regard.

Source: <https://www.thehindu.com/sci-tech/agriculture/agricultural-scientist-architect-of-green-revolution-ms-swaminathan-passes-away/article67356103.ece>

## INDIA IS RUNNING OUT OF PHOSPHORUS. DOES THE SOLUTION LIE IN OUR SEWAGE?

Phosphorus is an essential ingredient in fertilisers as well as a major pollutant. We need to address both problems.



Farmers sprinkle fertiliser on a wheat field on the outskirts of Ahmedabad, December 15, 2015. | Photo Credit: Reuters

The problem with the fertilisation of land is as old as agriculture itself. When early humans first began to engage in settled agriculture, they quickly realised that while crops require nutrients for their growth, repeated cycles of cultivation and harvest depleted these nutrients, reducing yield over time. Early agricultural societies began to notice that certain areas produced better crops and that soils could be replenished.

This observation led to practices to restore essential nutrients in the soil necessary for plant and crop growth. Indigenous communities around the world developed methods of fertilisation, for example, using fish remnants and bird droppings (guano) as fertilisers.

This changed in the 19th century, which saw significant advancements in chemistry, leading to the creation of synthetic fertilisers as well as the identification of nitrogen, phosphorus, and potassium. They're the foundation of modern synthetic chemical fertilisers and have caused agricultural productivity to boom. The Green Revolution of the mid-20th century accelerated the adoption of high-yield crop varieties and intensive use of these fertilisers, and today these substances are crucial to sustain global food production.

But we now have a problem. Phosphorus is scarce and exists only in limited quantities, in certain geological formations. Not only are we running out of it, it also pollutes the environment. It doesn't exist as a gas, which means it can only move from land to water, where it leads to algal blooms and eutrophication.

Source: <https://www.thehindu.com/sci-tech/science/phosphorus-shortage-fertilisers-pollution-sewage-recovery/article67322261.ece>





# AGRICULTURE

## GEOGRAPHY GRADUATE IN BIHAR USES INNOVATIVE METHODS TO SUCCESSFULLY GROW CAPSICUMS, CORIANDER, MUSHROOMS

After a short course at Agriculture Technology Management Agency, run by the Bihar government, Aryan Kumar began cultivating crops, achieving success in a relatively short period and inspiring other farmers



Aryan Kumar at his mushroom farm in Bettiah

Aryan Kumar, 22, in Bettiah city of West Champaran district has left behind his family's traditional cultivation practices of food-crop plantation and weather-dependent farming. The geography graduate, who took a week-long course offered by the Bihar government's Agriculture Technology Management Agency (ATMA), has taken up cash crop farming that provides high yields, uses less water, and has lower risk than the traditional wheat, sugarcane, and paddy. He grows coriander, mushroom and capsicum, earning ₹10 to ₹12 lakh annually.

"I first started shade net farming of capsicum in 2021 on 7 katha of land [less than 1 acre]. We use fibre net, which helps control the sunlight according to the needs of the crops," he says, adding that the company supplying the net also sells drip irrigation equipment for capsicum and sprinklers for coriander.

His initial expenditure in 2021 was ₹42,000, with ₹22 lakh provided as a subsidy by the government. He gets seeds from Excellence For Vegetable – Horticulture Farm in Chandi town, Nalanda district. The State's agriculture department provides subsidies up to 90% on cash crop farming for the purchase of equipment.

He does two rounds of coriander farming a year, and a single batch of capsicum, scheduled to begin in October. Each time, he produces 70 quintals of capsicum, which grows across five months. Similarly, 2 quintals of coriander leaves are produced per katha, which means 28 quintals annually.

Source: <https://www.thehindu.com/sci-tech/agriculture/geography-graduate-in-bihar-uses-innovate-methods-to-successfully-grow-capsicums-coriander-mushrooms/article67315365.ece>

## EMERGING TECHNOLOGIES AND PRECISION FARMING SaaS TO DESIGN FUTURE LANDSCAPE FOR AGRICULTURE



Agriculture 4.0 embodies the fourth agriculture revolution that makes use of digital technologies and has shifted towards a smarter, more environmentally responsible, and more resourceful agriculture sector. Agricultural technologies have emerged to enhance sustainability and discover more effective farm methods. This encompasses all digitalisation and automation processes, including Artificial Intelligence (AI), robotics, big data, the Internet of Things (IoT), and virtual and augmented reality. From a real-world perspective, it brings us to precision farming.

### Precision Farming Software-as-a-Service (SaaS)

Precision farming Software-as-a-Service (SaaS) is playing a significant role in transforming the sector. As per a report by EMR, the Indian agriculture market was valued at USD 435.9 billion in 2022. It is further anticipated to grow at a CAGR of 4.9 per cent between 2023 and 2028 and reach a value of USD 580.82 billion by 2028. Furthermore, the TechSci Research report, "India Precision Agriculture Market by Technology" highlights that India's precision agriculture market is projected to grow at over 10 per cent to reach US\$99 million by 2025 due to increasing apprehensions for food security and growing demand for maximising yields.

Precision agriculture offers a data-driven strategy for efficiently growing and sustaining crops on cultivable land, allowing farmers to use most of the resources at their disposal. Even in the supply chain, daily operations generate a huge amount of data. Most of this information was previously untouched, but with the help of big data technologies, such information can be used to advance the performance and production of any crop. Depending on the crop type and its growth needs, digitised harvesters can help deal with vast areas in diverse situations, predominantly agriculture.

Source: <https://agriculturepost.com/opinion/emerging-technologies-and-precision-farming-saas-to-design-future-landscape-for-agriculture/>





# HEALTH

## ICMR TO EXPAND ITS NETWORK OF BSL-3, BSL-4 LABORATORIES

It is also working with eight premier scientific organisations in India to establish the National Institute of One Health to roll out the National One Health Mission across the country.



Under the Prime Minister-Ayushman Bharat Health Infrastructure Mission (PM-ABHIM), the Indian Council of Medical Research is collaborating with eight premier scientific organisations in India to establish the National Institute of One Health to roll out the National One Health Mission across the country to strengthen multidisciplinary approaches in health research. The ICMR is also working to expand its network of BSL-3 and BSL-4 laboratories to strengthen diagnostic infrastructure and enhance access to laboratory services across the country, Rajiv Bahl, Director-General, ICMR, said at a press conference earlier this week outlining the council's vision for health research in India.

Dr. Bahl said the government has undertaken various interventions to strengthen and advance public health research in India. "As part of these ongoing interventions, ICMR has worked to streamline its Intramural Research Programme funding to strengthen research on various priority health issues. It has also worked to expand funding under its Extramural Research Programme to enhance funding for research on vaccines, drugs, disease diagnostics, and treatments for stronger public health systems," he said.

He said that with the launch of the National Health Research Programme, the ICMR would also be collaborating on large multi-stakeholder studies with national and State-level Departments of Health and Family Welfare on 12 key health areas, including infectious diseases, non-communicable diseases, child health and nutrition, and generating critical evidence for strengthening health interventions on these issues.

Source: <https://www.thehindu.com/sci-tech/health/icmr-to-expand-its-network-of-laboratories-to-strengthen-health-research-and-diagnostic-infrastructure/article67315150.ece>

## INDIANS CONTINUE TO EAT MORE SALT THAN WHO RECOMMENDATION

Men, those in rural areas and those fighting obesity and hypertension leading the salt overdose.



*The mean dietary salt intake is high in the Indian population, which calls for planning and implementing control of dietary salt consumption measures, says a recent survey by the Indian Council of Medical Research.*

The estimated mean daily salt intake in India stands at 8.0 g (8.9 g/day for men and 7.1 g/day for women) against the World Health Organisation (WHO) recommendation of up to 5 g daily.

Additionally the salt intake was significantly higher in men, those in rural areas and overweight and obese respondents, according to a recent survey by the Indian Council of Medical Research (ICMR) published in the Nature journal. The study is based on a sample survey carried out as part of National NCD Monitoring Survey (NNMS) in India.

It also noted that the perception of the harmful effects of high salt intake and practices to limit intake was low in the study population.

"The mean dietary salt intake is high in the Indian population, which calls for planning and implementing control of dietary salt consumption measures. We need to cut down on eating processed foods and those cooked outside home. 10,659 adults aged 18–69 years participated in the survey [response rate of 96.3%]," said Prashant Mathur, lead author of the study and director of ICMR-National Centre for Disease Informatics and Research.

The study also notes that salt intake was higher in employed people (8.6 gm) and current tobacco users (8.3 gm) and those with high blood pressure (8.5 gm). It specifies that reducing the intake is a beneficial and cost-saving way to reduce elevated blood pressure by 25% and advocates a 30% reduction in mean population salt intake by 2025.

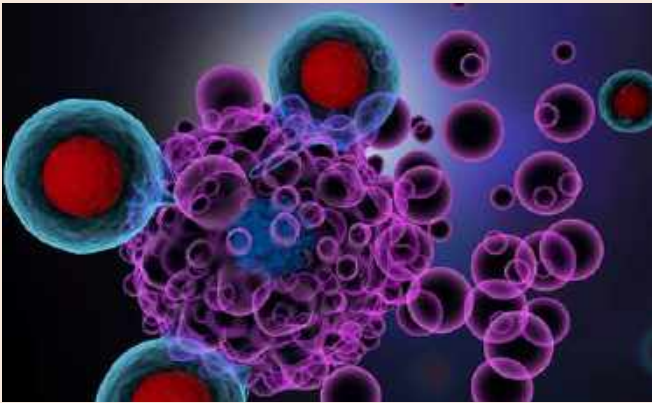
Source: <https://www.thehindu.com/news/national/indians-continue-to-eat-more-salt-than-who-recommendation/article67348080.ece>



# HEALTH

## PILOT STUDY ON 'LOW DOSE IMMUNOTHERAPY' CLAIMS EFFECTIVE RESULTS IN TREATMENT OF HEAD AND NECK CANCER PATIENTS

Over two lakh cases of head and neck cancers are detected every year in India



A multicentric randomised pilot study on “low dose immunotherapy” taken up by doctors at a private cancer hospital in Bengaluru has claimed effective results on head and neck cancer patients.

“This open-labelled prospective study provides an affordable cancer treatment option in the management of head and neck cancers,” claimed doctors at the HCG Cancer hospital where the study was done.

Addressing presspersons here on 13th September 2023, Satheesh C.T., Consultant - Medical and Hemato Oncology - and director of Clinical Trials at the hospital said the multicentric study assesses the effectiveness of neoadjuvant therapy combining low-dose immunotherapy Nivolumab and the TPF regimen (docetaxel, cisplatin, and 5-fluorouracil) compared to neoadjuvant chemotherapy (NACT) with the TPF regimen alone. “It has a potential role in improving the quality of life and longevity of patients with locally advanced carcinoma of the buccal mucosa,” the doctor said.

As part of the pilot study, 12 cases were studied in the 54 - 76 age group. “In the pilot study, standard NACT is combined with low-dose Nivolumab immunotherapy, administering 40 mg every two weeks, as opposed to the full dose of 3 mg per kg of body weight,” Dr. Satheesh explained.

Source: <https://www.thehindu.com/sci-tech/health/pilot-study-on-low-dose-immunotherapy-claims-effective-results-in-treatment-of-head-and-neck-cancer-patients/article67303167.ece>

## MONKEYPOX SURVEILLANCE HELPS IDENTIFY VARIANT OF VIRUS CAUSING CHICKENPOX

This is the first study reporting the circulations of varicella zoster virus clade 9 in India, whereas clade 9 is the most common strain in circulation in countries such as Germany, the UK, and the USA.



The Indian Council of Medical Research-National Institute of Virology (ICMR-NIV) has for the first time found the presence of Clade 9 variant of varicella zoster virus (VZV) in India.

“The multi-country mpox (monkeypox) outbreak across the globe has led to the systematic surveillance of mpox cases in India. During the surveillance of mpox, we encountered cases of VZV in suspected mpox cases amongst children and adults,” said the new study published in the Annals of Medicine journal. This study focused on the genomic characterization of VZV in India.

Chickenpox or varicella is caused by the varicella-zoster virus (VZV), a herpesvirus with worldwide distribution. It establishes latency after primary infection, a feature unique to most herpes viruses.

It added that this is the first study reporting the circulations of VZV clade 9 in India, whereas the variant is the most common strain in circulation in countries such as Germany, the UK, and the USA.

Monkeypox disease symptoms are frequently mistaken for VZV, as their clinical presentations often closely resemble each other. There is a need for clinical differentiation between mpox and VZV for accurate diagnosis, said the study.

It added that despite infection with the VZV clade 9 strain there were no significant indications of heightened disease severity in the patients.

Source: <https://www.thehindu.com/sci-tech/health/monkeypox-surveillance-throws-up-variant-of-chickenpox-causing-virus-for-the-first-time-in-india/article67288280.ece>





# HEALTH

## SURMOUNTING THE ACOUSTIC BARRIER WITH NEURAL IMPLANTS AND THE BIONIC EAR

The advanced technology of cochlear implants has successfully managed to integrate people with hearing loss into normal society and provide them with a highly productive quality of life.



The burden of hearing loss in India is significant as it is one of the most common congenital anomalies to affect children. The World Health Organisation reports that severe to profound hearing loss affects nearly 2 - 3 per 1000 live births, making it the most common congenital abnormality to affect newborns the world over. This scenario is even more pronounced in developing countries such as the Indian sub-continent, especially with the continuing problem of consanguinous marriages. Hearing loss at birth is considered a social stigma even in present-day society and results in a double tragedy, as it leads to not only deafness but also speech and language deprivation and communication problems.

In the past, individuals with severe to profound hearing loss with no benefit from hearing aids were condemned to live in a world of silence. However, hearing loss today, is the only truly remediable handicap, due to remarkable advances in biomedical engineering and surgical techniques. Rather than mend a diseased organ, the emphasis has shifted to bypassing it with a bionic prosthetic device.

Cochlear implants (CI) can help deafened individuals living in a world of silence enter the world of sound. The advent of this technology has successfully broken the acoustic barrier, thus integrating people with hearing loss into normal society and providing them with a highly productive quality of life.

Source: <https://www.thehindu.com/sci-tech/health/surmounting-the-acoustic-barrier-with-neural-implants-and-the-bionic-ear/article67287786.ece>

## FREE DEMENTIA SUPPORT LINE AND ONLINE MEMORY CLINIC LAUNCHED IN INDIA

Those seeking guidance, support, or assistance related to dementia or memory-related issues, can call 8585 990 990



DIA office-bearers Prem Kumar Raja, Shyam Viswanathan, Dr. Radha S. Murthy, Wing Commander C.D.R. Sabharwal, Renu Sachdeva, Dr. N.S. Raju, and Mr. Srivals at launch of dementia support line and DemClinic on September 5, 2023.

To assist individuals and families facing the challenges of dementia, a neurodegenerative brain disease, Dementia India Alliance (DIA), a non-profit, family carer-centered organisation, launched a national dementia support line and DemClinic, an online memory screening clinic, on September 5. The support line services include information, support and guidance, and promotion of timely diagnosis, intervention through online memory screening services.

“All services provided through this support line will be offered entirely free of cost, ensuring access to crucial assistance to all. The free online memory screening aims to mitigate the stigma and encourage senior citizens to get an assessment to promote early diagnosis,” said Radha S. Murthy, DIA president.

Addressing mediapersons in Bengaluru, Dr. Murthy said the support line will operate from 8 a.m. to 6 p.m. all through the week, except on Sundays. Services will be offered in English, Hindi, Tamil, Malayalam, Kannada, and Telugu languages.

“Trained psychologists and social workers will be at the forefront of addressing callers’ needs, providing empathetic and informed assistance. For those seeking guidance, support, or assistance related to dementia or memory-related issues, the support line can be reached at 8585 990 990,” she said.

Source: <https://www.thehindu.com/sci-tech/health/free-dementia-support-line-and-online-memory-clinic-launched-in-india-blue-button/article67273028.ece>



# S&T COOPERATION FOR GLOBAL SOUTH

## IS THE G-20 A SUCCESS FOR GLOBAL COOPERATION?

What are the issues, apart from the Ukraine war, on which there is consensus in the New Delhi declaration? Why is the summit important to India and the Global South?



The G-20, comprising 19 countries and the European Union, that was founded in 1999, is finally in Delhi, with all eyes on the New Delhi declaration issued at the end of the summit. While India took presidency of the G-20 with what seemed to be insurmountable odds, a global economic crisis spurred by the COVID-19 pandemic, the Ukraine conflict in its second year with more entrenched positions between the Western alliance and the Russia-China combine, as well as growing geopolitical tensions in the Indo-Pacific, its biggest challenge has been ensuring a moment of truce that would allow for a joint communique to be agreed upon at the summit.

### What are the takeaways from the Summit?

The big takeaway is the New Delhi Declaration that forged a consensus between the G-20 nations, bitterly divided between the G7-EU and Russia-China, on the issue of Ukraine. The final language is a shift from the 'Bali Paragraphs', with language critical of Russia erased, on a firm proposal from G-20 hosts of past and future years — Indonesia, India, Brazil and South Africa. The final 83-paragraph declaration, with eight paragraphs on "geopolitical issues", on which consensus was reached included language on everything from climate action, financing, and fossil fuel phaseout, to debt restructuring, the biofuel alliance, health, digital infrastructure, regulating crypto currency and other issues.

Bringing the African Union into the G-20 fold will be credited to India, and future summits in Brazil and South Africa are likely to take India's Global South initiative forward. It will be interesting to see if other hosts also follow India's example in holding G20 meetings throughout its term in multiple cities.

Source: <https://www.thehindu.com/news/national/explained-is-the-g-20-a-success-for-global-cooperation/article67289802.ece>

## ASEAN IS 'CENTRAL PILLAR' OF INDIA'S ACT EAST POLICY, SAYS MODI: THE GROUP AND ITS HISTORY

In his address at the ASEAN-India summit in Jakarta, Prime Minister Narendra Modi said India supports ASEAN's centrality and outlook on the Indo-Pacific.



Prime Minister Narendra Modi addresses the 20th ASEAN-India Summit, in Jakarta, Thursday, Sept 7, 2023. (PTI Photo)

Speaking at the 20th ASEAN-India summit in Jakarta, Indonesia's capital, Prime Minister Narendra Modi on Thursday (September 7) said ASEAN (Association of Southeast Asian Nations) is the "central pillar" of India's Act East Policy and the country fully supports the group's centrality and outlook on the Indo-Pacific.

Highlighting the need to build a rule-based post-Covid world order, Modi added that the progress of a free and open Indo-Pacific and elevating the voice of the Global South is in the common interest of all. Moreover, the prime minister congratulated Indonesian President Joko Widodo for organising the summit and said, "Our partnership has reached the fourth decade. It is an honour for me to co-chair this summit." India and ASEAN started to hold summits together in 2002 — a decade after the country established formal engagement with the group. Here is everything you need to know about ASEAN

### What is ASEAN?

On 8 August 1967, five leaders – the Foreign Ministers of Indonesia, Malaysia, the Philippines, Singapore and Thailand – came together in Bangkok, according to the website of ASEAN. Thailand was brokering some disputes among Malaysia, Indonesia and the Philippines, and it eventually led to the signing of a document.

"The five Foreign Ministers who signed it – Adam Malik of Indonesia, Narciso R. Ramos of the Philippines, Tun Abdul Razak of Malaysia, S. Rajaratnam of Singapore, and Thanat Khoman of Thailand – would subsequently be hailed as the Founding Fathers of probably the most successful inter-governmental organisation in the developing world today. And the document that they signed would be known as the ASEAN Declaration," the website added.

Source: <https://indianexpress.com/article/explained/everyday-explainers/what-is-asean-8929002/>





# S&T COOPERATION FOR GLOBAL SOUTH

## CRITICAL FOR CITIES IN GLOBAL SOUTH TO LOCALISE CLIMATE AGENDA

For India, 'Panchamrit' Action Plan is the anchor for tackling issues faced by climate change with a major thrust on urbanising cities, the Union Minister said.



Union Minister for Petroleum and Natural Gas, Housing and Urban Affairs Hardeep Singh Puri at the inaugural session of Urban Shift Asia Forum in New Delhi

Union Housing and Urban Affairs Minister Hardeep Singh Puri on September 25 said that cities need to reduce dependence on central funds for their financial needs to address climate change. He said that there was a need to complement traditional revenue streams with innovative instruments and more diverse access to finance for climate action at the urban level.

Addressing the first Urban Shift Forum (Asia) programme here, Mr. Puri observed that for cities in the Global South, it is critical to localise the climate agendas. "No discussion on urban planning can be removed from fiscal health. Cities depend heavily on central grants to meet basic financial needs. This needs to change," he said. The Union Minister said that for India, the 'Panchamrit' Action Plan was the anchor for climate response with the thrust centred on rapidly urbanising cities. He pointed out that the results were already showing.

The Panchamrit Action Plan pledges to reach 500 gigawatts (GW) of non-fossil energy capacity by 2030, meet 50% of India's energy requirement from renewable energy (RE) sources by 2030, reduce the carbon intensity of the economy by 45% below 2005 levels by 2030, reduce total projected carbon emissions by one billion tonnes by 2030 and achieve the target of net zero emissions by 2070.

The Urban Shift Forum brings together diverse expertise, trainers and businesses to find holistic and hands-on solutions for tackling urban challenges.

Source : [https://www.thehindu.com/sci-tech/energy-and-environment/critical-for-cities-in-global-south-to-localise-climate-agenda-hardeep-purilarticle67345050.ece?cx\\_testId=10&cx\\_testVariant=cx\\_1&cx\\_artPos=0&cx\\_experienceId=EXDJ12CX29QX#cxrecs\\_s](https://www.thehindu.com/sci-tech/energy-and-environment/critical-for-cities-in-global-south-to-localise-climate-agenda-hardeep-purilarticle67345050.ece?cx_testId=10&cx_testVariant=cx_1&cx_artPos=0&cx_experienceId=EXDJ12CX29QX#cxrecs_s)

## G-20: WHAT ARE THE EMISSIONS-RELATED COMMITMENTS OF THE COUNTRIES?

Countries in the G-20 bloc form around 85% of the global GDP, over 75% of the global trade, and about two-thirds of the world population.



Prime Minister Narendra Modi with United Nations Secretary-General Antonio Guterres during the G20 Leaders' Summit in New Delhi

The story so far: United Nations Secretary-General Anthony Guterres on 11th September 2023 urged the G-20 leaders to take strong action against the climate crisis, emphasising the need for immediate response to address the climate emergency. Countries in the G-20 bloc form around 85% of the global GDP, over 75% of the global trade, and about two-thirds of the world population.

"I come to the G20 with a clear and urgent plea: we cannot continue as we are. We must unite and act for the common good," Secretary-General Guterres said. He also asked the bloc to stop licensing and funding for new fossil fuel projects, in alignment with the Paris Agreement's goal of limiting global warming to 1.5 degrees Celsius (°C) above preindustrial levels.

What are the emissions-related NDCs of G-20 countries? The 2015 Paris Agreement, reached by world leaders at the UN Climate Change Conference (COP21), requires all countries to submit updated national climate action plans every five years. These are known as nationally determined contributions (NDCs) and are a roadmap to greenhouse gas (GHG) emission reduction to eventually limit global temperature increase to 1.5 °C.

According to Climate Watch, all G-20 countries except Russia and Argentina submitted their updated first NDCs between December 2020 and April 2023. Russia submitted its first NDC in 2020 and has not presented an update yet, while Argentina submitted its second NDC in November 2021.

Source : <https://www.thehindu.com/sci-tech/energy-and-environment/g-20-what-are-the-emissions-related-commitments-of-the-countries-explained/article67288727.ece>



## OTHERS

### SCIENTISTS UNCOVER A SCALY SURPRISE WITH NEW PANGOLIN SPECIES

Pangolin scales are coveted for use in traditional medicine, despite being made of keratin, just like fingernails, and the diminutive creature is also hunted for its meat.



The small, scaly, and highly endangered pangolin has been keeping a secret: it comprises not eight species but nine, with a new one discovered through analysis of confiscated scales.

Scientists previously believed there were four Asian and four African varieties of the shy, nocturnal creature, which is often described as the world's most trafficked mammal. However, even as the species was discovered, there are signs it may be disappearing, according to research published Tuesday in the journal *Proceedings of the National Academy of Sciences*.

Pangolin scales are coveted for use in traditional medicine, despite being made of keratin, just like fingernails, and the diminutive creature is also hunted for its meat.

More than a million are believed to have been poached from the wild in the decade to 2014, according to conservationists, and all international trade has been banned since 2016.

Despite its elusive nature, there have been suggestions before that the pangolin family might be bigger than believed.

Analysis of 27 scales confiscated in Hong Kong in 2012 and 2013 suggested a lineage unrelated to the eight known species. But only limited gene fragments were available, and no definitive conclusion could be reached.

Picking up that trail, researchers analysed scales from two confiscations in China's Yunnan province in 2015 and 2019 and compared them against whole genome data from all previously known species.

Source: <https://www.thehindu.com/sci-tech/energy-and-environment/scientists-uncover-a-scaly-surprise-with-new-pangolin-species/article67350415.ece>

### KUFOS SUCCEEDS IN CAPTIVE BREEDING OF THREATENED INDIAN ORNAMENTAL FISH

Due to high demand among ornamental fish lovers, the species has been subjected to unregulated aquarium trade and its natural habitat is under pressure from tourism, urbanisation, and agricultural pollution



*The Indigo barb is a species of great visual attractiveness, found in freshwater streams in Goa and Karnataka.*

Scientists at the Kerala University of Fisheries and Ocean Studies (Kufos) have developed artificial breeding technology of Indigo barb (*Pethia setnai*), an ornamental fish native to the western part of India, which is under threat of extinction due to overfishing.

The Indigo barb is a species of great visual attractiveness, characterised by the presence of two vertical bands in its olive-grey body. It was found in freshwater streams in Goa and Karnataka. The rare species fetches around \$3 per fish seedling in the international ornamental fish market. Due to the high demand among ornamental fish lovers across the world, the species has been subjected to unregulated aquarium trade and its natural habitat is under pressure from tourism, urbanisation, and agricultural pollution. The fish is included in the threatened category of the International Union for Conservation of Nature (IUCN) Red List.

The scientists at Kufos, in collaboration with the Central Coastal Agricultural Research Institute (CCARI) in Goa, conducted a two-year research to develop artificial breeding technology for Indigo barb. The research was led by Anvar Ali, assistant professor in the department of Fisheries Resources Management at Kufos.

The team was supported by CCARI with the supply of brood stock fishes (parent fishes) collected from freshwater streams in the backwaters of Goa. The team successfully developed the artificial breeding technology from experiments held at the Kufos hatchery. The species was bred in captivity with and without hormone induction in indoor and outdoor systems and the larvae were developed in mixed zooplankton culture.

Source: <https://www.thehindu.com/news/cities/Kochi/kufos-succeeds-in-captive-breeding-of-threatened-indian-ornamental-fish/article67322524.ece>





# OTHERS

## 2023 NOBEL PRIZE IN MEDICINE OR PHYSIOLOGY: WHAT ARE mRNA VACCINES AND HOW DO THEY WORK?

Dr. Karikó and Dr. Weissman were awarded the Nobel Prize for their “discoveries concerning nucleoside base modifications that enabled the development of effective mRNA vaccines against COVID-19”



2023 Nobel laureates Katalin Kariko of Hungary (L) and Drew Weissman of the US

The 2023 Nobel Prize in Physiology or Medicine has been awarded to Katalin Karikó and Drew Weissman for their research that enabled the development of mRNA vaccines against COVID-19. The prize was announced by The Royal Swedish Academy of Science on October 2, 2023.

Dr. Karikó and Dr. Weissman were awarded the prize for their “discoveries concerning nucleoside base modifications that enabled the development of effective mRNA vaccines against COVID-19”.

The first vaccines to use the mRNA technology were those made by Pfizer/BioNTech and Moderna against COVID-19.

### What are mRNA vaccines?

mRNA stands for messenger RNA, is a form of nucleic acid which carries genetic information. Like other vaccines, the mRNA vaccine also attempts to activate the immune system to produce antibodies that help counter an infection from a live virus. However, while most vaccines use weakened or dead bacteria or viruses to evoke a response from the immune system, mRNA vaccines only introduce a piece of the genetic material that corresponds to a viral protein. This is usually a protein found on the membrane of the virus and is called spike protein. Therefore, the mRNA vaccine does not expose individuals to the virus itself.

Source: <https://www.thehindu.com/sci-tech/health/2023-nobel-prize-medicine-physiology-what-are-mrna-vaccines-how-they-work-explained/article67372457.ece>

## NOBEL PRIZE 2023 IN PHYSICS AWARDED TO PIERRE AGOSTINI, FERENC KRAUSZ, ANNE L’HUIILLIER FOR RESEARCH ON ELECTRONS IN FLASHES OF LIGHT

The Nobel Prizes for 2023 in Physics has been awarded to Pierre Agostini, Ferenc Krausz and Anne L’Huillier



The Nobel Prizes for 2023 in Physics has been awarded to Pierre Agostini, Ferenc Krausz and Anne L’Huillier

The 2023 Nobel Prize in Physics has been awarded to Pierre Agostini, Ferenc Krausz, and Anne L’Huillier “for experimental methods that generate attosecond pulses of light for the study of electro dynamics in matter”, The Royal Swedish Academy of Science announced on October 3, 2023.

The three Nobel Laureates in Physics 2023 are being recognised for their experiments, which have given humanity new tools for exploring the world of electrons inside atoms and molecules. Pierre Agostini, Ferenc Krausz and Anne L’Huillier have demonstrated a way to create extremely short pulses of light that can be used to measure the rapid processes in which electrons move or change energy, the press release said.

Their experiments granted the Laureates to observe extremely brief events that transpire in a few tenths of attoseconds—a quintillionth (10<sup>-18</sup>) of a second. An attosecond is so short that there are as many in one second as there have been seconds since the birth of the universe.

This brief pulses of light can be used to provide images of what occurs inside atoms and molecules.

The research conducted by the Laureates over a span of several decades allowed them to investigate processes that were so rapid that they were previously impossible to follow. This new technology is important to understand and control how electrons behave in a material.

Source: <https://www.thehindu.com/sci-tech/science/nobel-prize-physics-winner-2023-pierre-agostini-ferenc-krausz-anne-lhuillier/article67374928.ece>