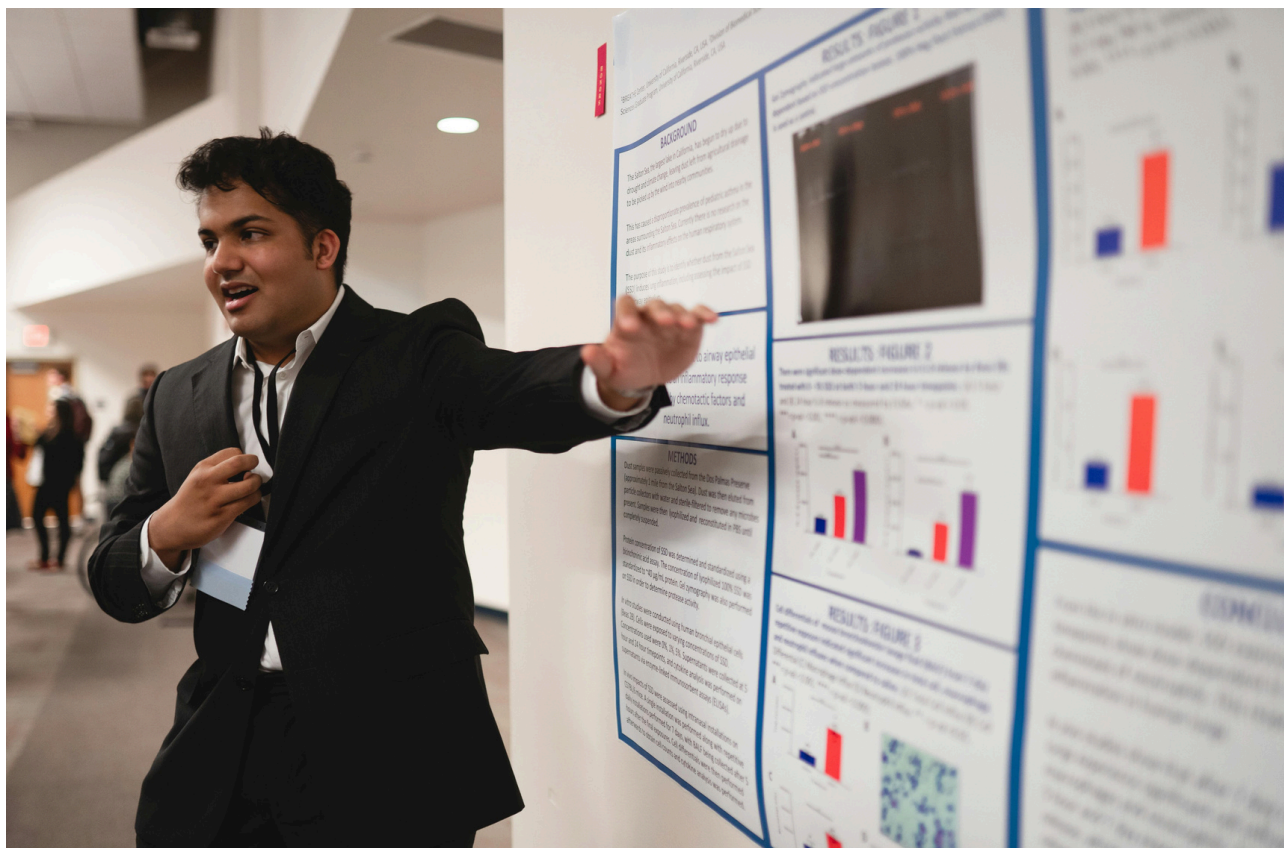




SCIENCE AND TECHNOLOGY PULSE

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ICMR's SHINE Initiative Ignites Scientific Passion Among 13,000 Students Nationwide

The SHINE initiative can boost demand in the edtech and scientific equipment industries by promoting hands-on STEM learning in schools. It also opens avenues for healthcare and biotech companies to engage early with future talent and foster science-led brand visibility.

The Indian Council of Medical Research (ICMR), in collaboration with the Department of Health Research, hosted the SHINE (Science, Health & Innovation for Nextgen Explorers) initiative on 7–8 August 2025. This nationwide outreach engaged 13,150 students from grades 9 to 12, drawn from over 300 schools across 39 districts and 16 states/UTs. Students took part in guided laboratory tours, research exhibitions, poster walks, video presentations, and live demonstrations of real-world biomedical and health research. A mascot, Dr Curio, made interactions engaging, and films showcased ICMR's flagship programmes, including Covaxin development, iDRONE healthcare, TB elimination, and pandemic readiness drills. The event reflects ICMR's commitment to fostering scientific curiosity and encouraging future careers in health research as part of India's "Viksit Bharat" vision.

In this newsletter
you can expect
updates from:

Government Initiatives

Emerging Technologies

Health and Medicine

Environmental Science

Food and Agriculture

Space Exploration



India Launches Advanced Animal Stem Cell Biobank to Drive Livestock Innovation

The facility will drive innovations in regenerative therapies and veterinary diagnostics, benefiting the dairy, meat, and veterinary pharmaceutical industries through improved livestock productivity and advanced animal biotech solutions.

Union Minister Dr. Jitendra Singh inaugurated India's first Animal Stem Cell Biobank and Laboratory at NIAB, Hyderabad, built over 9,300 sq ft at a cost of ₹1.85 crore. Equipped with stem cell culture units, a 3D bioprinter, cryostorage, and advanced labs, it will support regenerative medicine, tissue engineering, disease modelling, and reproductive biotechnology for livestock under the DBT-BIRAC National Biopharma Mission. He also launched five advanced veterinary diagnostic tools for brucellosis, mastitis, antimicrobial resistance, toxoplasmosis, and Japanese encephalitis, aimed at improving animal health, boosting livestock productivity, and supporting the 'One Health' approach and rural economy.



Smart Nano-Layers Set New Standard for Explosives and Chemical Detection

Provides high-sensitivity, long-life explosive and contaminant detection for security, defence, and environmental monitoring industries. Reduces operational costs and enhances safety in high-risk or regulated environments.

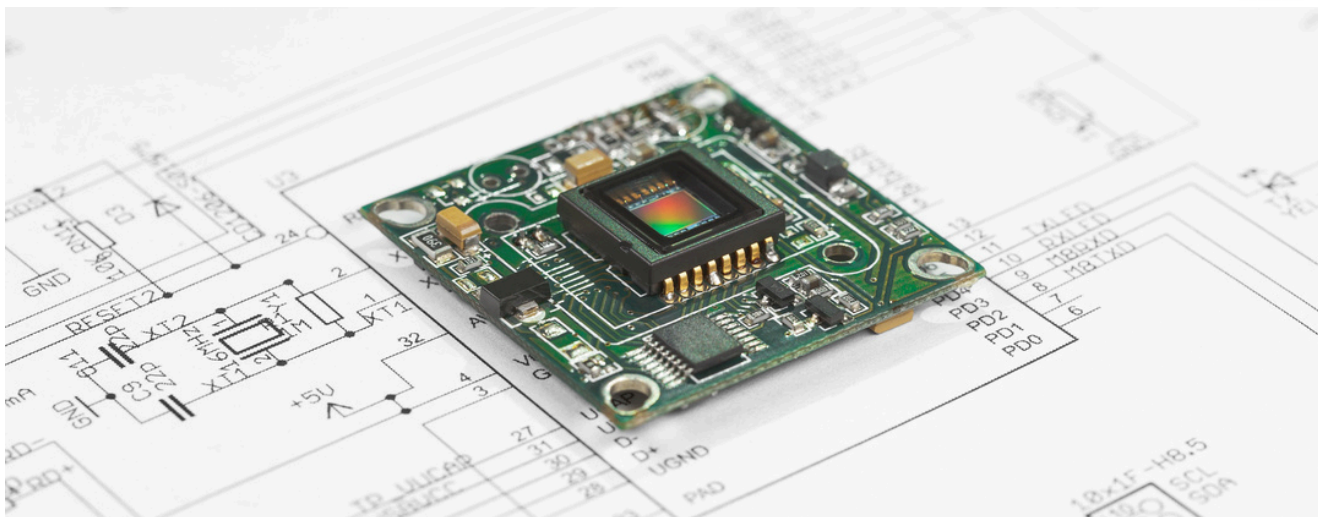
Researchers at the Centre for Nano and Soft Matter Sciences (CeNS), Bengaluru, have developed a multi-layer nanomaterial combining reduced graphene oxide (rGO), silver nanoparticles, and cerium oxide on a glass substrate to detect harmful chemicals, including explosives like TNT and RDX, at trace levels. Built using physical vapour deposition, the design uses silver for powerful Raman signal enhancement, cerium oxide for protection against oxidation and humidity (up to 90% RH and 70 °C), and rGO to reduce fluorescence interference. This innovation offers excellent sensitivity, detecting analytes like 4-mercaptobenzoic acid at just 10 nM, along with high durability and scalability, making it ideal for high-security and environmental applications.



Protein Study Reveals AI-Like Intelligence at Molecular Level

The discovery offers major potential for the pharma and biotech industries, enabling AI-assisted drug design against TAK1 for inflammatory, immune, and cancer-related diseases, while also opening avenues for AI-driven molecular engineering to develop smarter biomolecules for diagnostics and therapeutics.

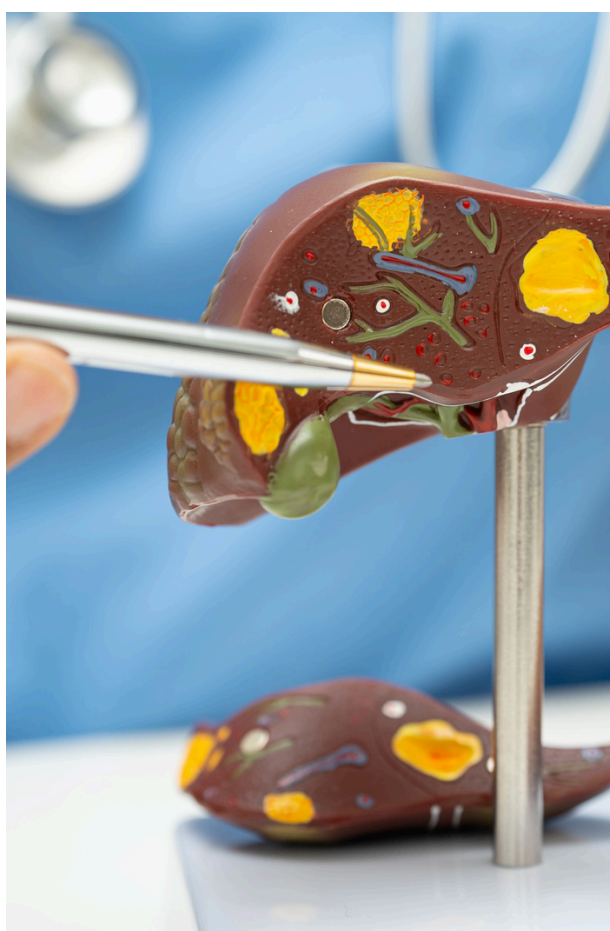
Researchers at the Bose Institute, supported by the Department of Science and Technology, have found that TAK1 kinase, a protein linked to immunity, inflammation, and cell survival, shows context-dependent "pseudo-intelligence." Published in the Journal of Chemical Information and Modeling, the study used biochemical analysis and machine learning to reveal that TAK1's unique 3D electrostatic interactions act like internal circuits, enabling selective responses to signals. This shifts the traditional "sequence-structure-function" model to a "sequence-structure-function-intelligence" concept, opening new possibilities for advanced drug targeting and molecular research.



Portable Nano-Sensor Enables Rapid Sepsis Detection in Minutes

This nano-sensor technology can transform the medical diagnostics industry by enabling faster, point-of-care detection of sepsis, reducing mortality and treatment costs. It also benefits the food safety, pharmaceutical, and water quality sectors by allowing rapid contamination screening, improving compliance, and reducing product recall risks.

Scientists from the National Institute of Technology, Calicut have developed a portable, low-cost electrochemical biosensor that detects endotoxins (sepsis biomarker) in blood serum within 10 minutes. Using nanomaterials like gold clusters, Copper oxides, MoS₂, reduced graphene oxide, and Carbon nanotubes, the team led by Prof. N. Sandhyarani created eight sensor designs, with the CNT-Cu₂O chip showing the highest selectivity even in complex samples. The platforms also detected E. coli in water with accuracy comparable to conventional methods, while reducing test time. This research, published in *Langmuir*, *Biosensors and Bioelectronics*, and other journals, has also secured a granted patent, paving the way for on-site diagnostics in healthcare and water safety.



Nano-Enabled Protein Therapy Offers New Hope for Advanced Liver Cirrhosis

Targeted nanocarrier therapy opens opportunities for the pharmaceutical and nanomedicine industries to develop precision biologics for liver cirrhosis, advancing drug delivery solutions that improve outcomes and lower healthcare costs.

Scientists from the Institute of Liver and Biliary Sciences (ILBS) and NIPER Guwahati have developed a nanocarrier-based delivery system for vascular endothelial growth factor-C (VEGF-C) to restore lymphatic drainage in advanced liver cirrhosis. VEGF-C, a key lymph vessel growth stimulator, was encapsulated in reverse micelle-based nanocarriers to overcome its short half-life and side effects, targeting VEGFR-3 receptors for precise action. In animal models, oral delivery improved mesenteric lymph drainage, reduced abdominal fluid accumulation (ascites), lowered portal pressure, enhanced cytotoxic T-cell immunity, and reduced bacterial load. The research, funded by DST's Nano Mission and published in *JHEP Reports*, is the first to show that targeted therapeutic lymphangiogenesis can reconstruct fragmented lymphatic networks and restore drainage in cirrhosis.

Novel RNA-Based Approach Could Transform Alzheimer's Treatment

This research provides the pharma and biotech industries with a novel RNA- and small-molecule-based drug target for neurodegenerative diseases. It also supports the diagnostic industry in developing miRNA-based early detection tools for Alzheimer's.

Researchers from Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), supported by the Department of Science and Technology, have identified the miR-7a-Klf4 axis as a novel therapeutic target for Alzheimer's Disease, as published in NAR Molecular Medicine. Using a double transgenic AD mouse model, they found miR-7a levels were significantly elevated in AD brains, triggering neuroinflammation and ferroptosis (iron-dependent neuronal cell death) via suppression of Klf4. The team developed a modified miR-7a mimic and used honokiol, a natural compound from Magnolia bark, to modulate this pathway, reducing inflammation and neuronal damage. They also identified altered miRNAs as potential early biomarkers, offering prospects for targeted therapies and improved diagnosis beyond current symptom management.



Machine Learning Maps the Pace of Glacier-Driven Earth Shaping Worldwide

Accurate glacier erosion predictions help industries like nuclear waste management, hydropower, and mining choose geologically stable sites. They also enable better infrastructure planning by forecasting long-term landform and sediment changes.

Scientists from the University of Victoria and an international team have used machine learning to estimate how fast more than 180,000 glaciers erode the Earth, offering the most detailed global picture to date. Their analysis, published in Nature Geoscience, predicts erosion rates for 85% of modern glaciers, showing that 99% erode between 0.02 and 2.68 millimetres per year, about the thickness of a credit card. The speed is influenced by multiple factors, including temperature, subglacial water, rock type, and geothermal heat. This data is critical for understanding sediment movement, nutrient cycles, long-term landscape change, and planning sensitive projects such as nuclear waste storage. The research was supported by the Canadian Nuclear Waste Management Organisation and involved collaborations with institutions in France, the US, and Canada.

Ultra-Processed Foods Under the Spotlight: Health Risks and Industry Implications

Food manufacturers can reformulate products to lower saturated fats, sugars, and sodium, improving health profiles while meeting evolving regulations. Retailers and food service industries can leverage front-of-pack labelling and healthier product lines to appeal to increasingly health-conscious consumers.

A new American Heart Association Science Advisory warns that high consumption of ultra-processed foods (UPFs), which make up 55% of calories for US adults and nearly 62% for youth – is linked to a 25-58% higher risk of heart disease, stroke, obesity, Type 2 diabetes, and a 21-66% higher risk of death. These foods, typically high in saturated fat, added sugar, and salt, are especially prevalent among lower-income groups (54.7% intake in the lowest vs 50.4% in the highest income). While some UPFs, such as whole-grain breads or low-fat dairy, can be part of a healthy diet, most contribute to poor nutrition and chronic disease. Experts are calling for clearer labelling, better food additive regulation, and more research to identify whether the harm comes from processing itself or from unhealthy ingredients. The report urges policies to reduce harmful UPF intake and replace them with nutrient-rich foods like fruits, vegetables, nuts, whole grains, fish, and lean proteins.



Six Solar Blasts, One Epic Storm: New Insights to Shield Earth's Tech

Enables satellite, telecom, and power grid industries to take early protective measures, reducing operational disruptions and equipment damage. Supports aerospace and defence sectors in improving mission safety and asset resilience through accurate space weather predictions.

In May 2024, Ladakh witnessed rare northern lights caused by an exceptional geomagnetic storm triggered by six successive coronal mass ejections (CMEs) from the Sun, a solar event unlike any in the past 20 years. Using NASA and ESA space mission data, a team from the Indian Institute of Astrophysics (IIA) applied the Flux Rope Internal State (FRIS) model to track these CMEs' thermal and magnetic evolution from the Sun to Earth. They discovered that the blasts initially released heat but later absorbed it, with unique "double flux rope" magnetic structures detected near Earth. This continuous thermodynamic monitoring published in *Astronomy and Astrophysics* is the first global study to capture CME interactions over such vast distances, paving the way for better space weather forecasting to protect Earth's technology infrastructure.



NISAR Launch Ushers in New Era of High-Resolution Earth Monitoring

Provides agriculture, infrastructure, and insurance industries with accurate, frequent Earth surface data to enhance risk assessment, resource planning, and disaster resilience. Enables mining, logistics, and renewable energy sectors to optimise operations through precise monitoring of environmental and land changes.

NASA and ISRO have successfully launched the NISAR (NASA-ISRO Synthetic Aperture Radar) satellite from India's Satish Dhawan Space Centre on 30 July 2025, marking the most advanced radar-based Earth observation mission to date. Equipped with dual-band L- and S-band radar systems, NISAR will scan nearly all of Earth's land and ice surfaces twice every 12 days over its minimum three-year mission. Its high-resolution, cloud-penetrating capabilities will track earthquakes, volcanic activity, landslides, melting glaciers, deforestation, and infrastructure stability, while providing crucial data for disaster response during hurricanes, floods, and other severe events. The mission's unprecedented ability to synchronise radar data will offer detailed insights into vegetation, soil moisture, and surface deformation, with special coverage of Antarctica to study ice sheet changes. This collaboration bridges more than 9,000 miles and 13 time zones, delivering a powerful new tool for climate science, environmental monitoring, and infrastructure risk assessment.

Thank you for reading!

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