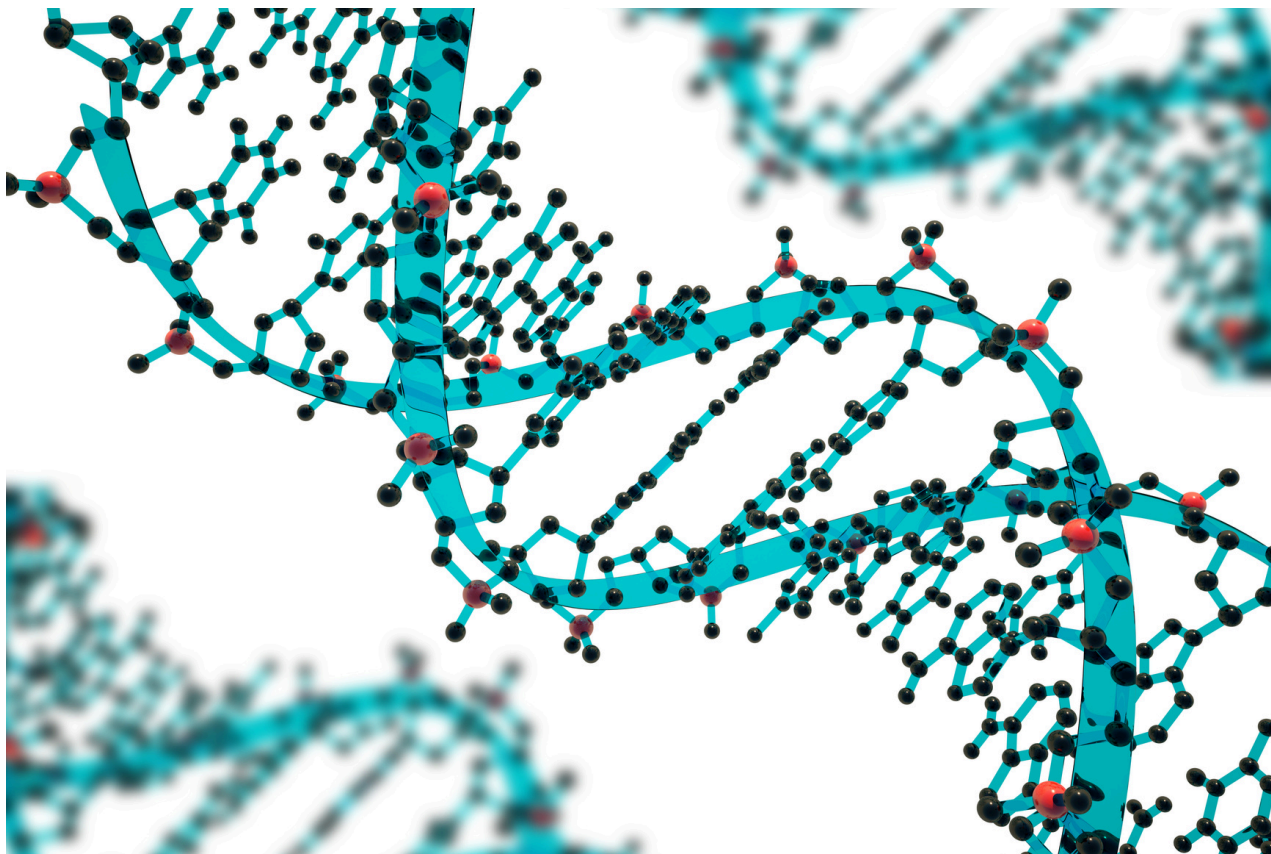




SCIENCE AND TECHNOLOGY PULSE

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India to Establish Second Gene Bank to Strengthen Agricultural Biodiversity

The second Gene Bank will support agriculture, biotechnology, and food industries by providing a diverse genetic pool for developing high-yield, pest-resistant, and climate-resilient crops. This will enhance seed production, ensure stable supply chains, and strengthen India's position in global agricultural innovation.

India will establish a second National Gene Bank to conserve its rich agricultural biodiversity and ensure food security for future generations, as announced by Prime Minister Narendra Modi in a post-budget webinar. The new facility, proposed in the 2025-26 budget, will store 1 million germplasm lines, significantly expanding the capacity of the existing ICAR-NBPGR Gene Bank, which currently houses 0.47 million accessions. India, home to 811 cultivated crops and 902 wild relatives, plays a crucial role in global biodiversity conservation. This initiative will safeguard vital plant species from climate change, natural disasters, and geopolitical risks while supporting SAARC and BRICS nations in genetic resource management. Strengthening India's leadership in agricultural innovation, the Gene Bank will enhance crop resilience and sustainability, ensuring long-term food security.

In this newsletter
you can expect
updates from:

Government Initiatives

Health and Medicine

Emerging Technologies

Environmental Science

Space Exploration

Food and Agriculture



How Stress and Obesity Team Up to Fuel Pancreatic Cancer Growth

Pharmaceutical companies can develop targeted cancer therapies by repurposing beta-blockers for oncology. The nutraceutical and wellness industries can create stress and weight management solutions to reduce cancer risks, while healthcare and diagnostic firms can integrate stress and obesity-related markers into early cancer screening programs.

A UCLA-led study found that chronic stress and obesity accelerate pancreatic cancer by activating the cancer-promoting protein CREB through different biological pathways. In preclinical models, mice on a high-fat diet developed precancerous pancreatic lesions, with social isolation worsening the condition, especially in females due to estrogen-related stress responses. The study suggests beta-blockers, commonly used for hypertension, could help counteract stress-induced cancer progression. Funded by the National Cancer Institute, it highlights how lifestyle factors contribute to pancreatic cancer and suggests potential medical interventions.



Pregnancy Nutrients Cut Midlife Hypertension Risk

This research enables the healthcare and nutraceutical industries to develop targeted prenatal supplements and fortified foods for maternal health. Pharmaceutical companies can explore preventive treatments for hypertension, driving innovation in preventive healthcare solutions.

A study presented at the American Heart Association's 2025 Scientific Sessions found that women with higher levels of essential minerals like copper and manganese, along with vitamin B12, during pregnancy had a 20-25% lower risk of developing high blood pressure in middle age. The research, based on data from Project Viva, tracked nearly 500 women for over 20 years, revealing that doubling copper and manganese levels during pregnancy significantly reduced midlife hypertension risk. Vitamin B12 was also linked to lower blood pressure, with a 3.64 mm Hg drop in systolic and 2.52 mm Hg in diastolic pressure. These findings highlight the potential of optimizing maternal nutrition to reduce long-term cardiovascular risks.



Rapid Airborne H5N1 Detection: New Biosensor Enhances Farm Disease Monitoring

This innovation is vital for the poultry and dairy industries, helping farms mitigate losses by enabling early outbreak detection and rapid response. It reduces reliance on slow lab tests, preventing culling delays and production losses. Additionally, the food safety sector can use this sensor to enhance biosecurity measures, ensuring disease-free supply chains and stable market prices.

Researchers at Washington University in St. Louis have developed a fast and affordable biosensor that detects airborne H5N1 avian flu within five minutes. It uses an integrated sampling unit and electrochemical biosensor with aptamers to bind virus proteins, ensuring high sensitivity. Unlike traditional methods that take over 10 hours, it enables real-time monitoring and preserves samples for further analysis. The sensor can also detect other pathogens like H1N1, SARS-CoV-2, and harmful bacteria. This innovation helps prevent outbreaks in poultry and dairy farms, enhancing disease control.



Hydrogen Fuel Cells: Clean Backup Power for Telecom Towers

The telecom industry can cut operational costs and reduce diesel dependency, while hydrogen production, energy storage, and logistics sectors will see growth opportunities. Companies in clean energy technologies can expand their market presence, driving innovation and sustainability across industries.

India's telecom sector, with over a million towers, often relies on costly and polluting diesel generators for backup power, especially in remote areas. Proton Exchange Membrane (PEM) fuel cells, developed by ARCI and supported by the Department of Science and Technology, offer a cleaner, more efficient solution. These fuel cells use hydrogen to generate electricity, emitting only water vapor, and feature a plug-and-play design for easy deployment and shared use across multiple towers. This innovation aligns with India's renewable energy goals and TRAI's mandate for greener telecom infrastructure, reducing carbon emissions while ensuring uninterrupted connectivity.



IISc Develops High-Strength, Fatigue-Resistant Alloys for Industrial Use

These advanced alloys enhance durability and performance in aerospace, automotive, and heavy machinery, reducing maintenance costs. The energy and construction sectors benefit from stronger, more resilient infrastructure, improving safety and efficiency in demanding environments.

Researchers at IISc Bangalore, led by Dr. Ankur Chauhan, have designed innovative multi-principal element alloys (MPEAs) with exceptional fatigue resistance by optimizing microstructural features. By adjusting the Cr/Ni ratio, they developed single-phase and dual-phase alloys in the Cr-Mn-Fe-Co-Ni system, with the dual-phase variant showing a 50–65% increase in cyclic strength while maintaining fatigue life. These advancements, supported by the Anusandhan National Research Foundation, offer a blueprint for creating durable materials for high-stress applications.

Amazon Deforestation Alters Rainfall Patterns, Threatening Ecosystems and Industries

The study provides critical insights for agriculture, energy, and insurance sectors. Agribusinesses can use this data to develop better irrigation strategies and crop planning, while renewable energy firms, especially those relying on hydropower, can assess water availability risks. The insurance industry can refine climate risk models to account for shifting rainfall patterns and drought threats.

A new study in *Nature* by Qin et al. highlights how Amazon deforestation disrupts rainfall patterns, increasing wet season (December–February) precipitation but reducing it during the dry season (June–August) when the forest needs moisture most. Using satellite data and climate simulations from 2000–2020, researchers found that tree loss reduces water evaporation, weakening the region’s natural rainfall cycle. Warmer deforested land creates low-pressure zones in the wet season, drawing in moisture locally while reducing rainfall upwind. In the dry season, less evaporation leads to widespread drought risks, with up to 47% of the Amazon at risk of transitioning to a savanna-like state by 2050. This shift could trigger severe ecological collapse and amplify global climate change impacts.



Glacial Melt Threatens Seafood Safety but Opens Doors for Green Mining

The seafood and aquaculture industries must monitor heavy metal contamination in marine life to ensure food safety. Renewable energy and electronics sectors can benefit from phytomining kelps for rare earth elements, supporting sustainable resource management.

*Climate change-driven glacial melt is altering Arctic coastal ecosystems by increasing heavy metal concentrations, such as mercury, in kelps—key habitat-forming brown algae. A study published in *Scientific Reports* reveals a 72% rise in mercury levels in kelps from high run-off areas, raising concerns about bioaccumulation in marine organisms and food safety. Conducted under EU projects FACE-IT, ECOTIP, and SEA-Quester, the research highlights how meltwater introduces both beneficial micronutrients and harmful metals, disrupting kelp microbiomes and marine biodiversity. These changes could impact fisheries and socio-economic systems, but kelps' ability to absorb metals also presents an industrial opportunity. Harvesting kelps from affected fjords could provide a sustainable method for extracting rare earth elements, essential for renewable energy, electronics, and high-tech industries.*



Ancient Martian Beaches Suggest Long-Lost Ocean and Potential for Life

These findings enhance space exploration strategies, aiding companies involved in planetary resource extraction and future Mars colonization efforts. The use of advanced radar imaging can benefit oil, gas, and mineral exploration by improving subsurface mapping techniques. Additionally, aerospace and robotics industries can refine autonomous rover technologies for better planetary and deep-sea exploration.

Scientists using China's Zhurong rover have discovered hidden rock layers in Utopia Planitia that resemble Earth's coastal deposits, suggesting Mars once had a vast ocean with beaches and waves. The study, published in PNAS, provides strong evidence that Mars had a habitable environment for millions of years, with dynamic landscapes shaped by tides and sediment movement. Using ground-penetrating radar, researchers found sloping formations similar to Earth's foreshore deposits, further supporting the theory of an ancient northern ocean. This discovery enhances planetary exploration strategies and helps in the search for past life on Mars.



New Clues About Dark Matter Could Transform Space Tech and Energy Research

This discovery has significant implications for the space industry, advancing deep-space exploration and cosmic radiation shielding technologies. It may also impact energy sectors by inspiring new ways to harness particle interactions for advanced energy generation. Understanding dark matter's properties could refine predictive models for satellite performance and interstellar communication.

Scientists have identified an unusual energy source at the center of our galaxy, suggesting a new type of low-mass dark matter. Unlike traditional Weakly Interacting Massive Particles (WIMPs), these lighter particles may collide and produce charged particles, ionizing hydrogen gas in the Central Molecular Zone (CMZ). This challenges previous cosmic ray explanations and offers fresh insights into dark matter's nature. Researchers at King's College London propose that this energy interaction could also explain the puzzling 511-keV emission line observed in the Milky Way. By studying space-based ionization, they are bringing us closer to detecting dark matter directly.



Scientists Unlock Genes for Bigger, Better Tomatoes and Eggplants

These findings enable the agriculture and seed production industries to develop high-value, larger fruits, enhancing profitability and market appeal. Food processors and retailers benefit from uniform, attractive produce, while global markets, especially in Africa and Brazil, gain access to high-yield, locally adaptable crops, promoting sustainable farming and genetic research expansion.

Researchers from Johns Hopkins University and Cold Spring Harbor Laboratory have identified key genes that control the size of tomatoes and eggplants, paving the way for larger, tastier varieties. Using CRISPR-Cas9 gene-editing technology, they discovered that duplicating or editing specific genes, such as CLV3 and SaetSCPL25-like, can significantly increase fruit size and improve traits like seed cavity numbers. This research, part of a broader effort to map the genomes of 22 nightshade crops, could revolutionize agriculture by enabling the development of high-yield, market-friendly produce for regions where current varieties are too small for large-scale farming.

Thank you for reading!

VeK is a policy advisory and research firm, distinguished by data-driven approach to analyse policy and regulatory developments in India and globally.

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