



New, Emerging & Strategic Technologies Division

Ministry of External Affairs

Government of India

TECH

PULSE

NEST NEWSLETTER

AUGUST 2025



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 - *India Hosts First-Ever 3GPP RAN Meetings on 6G Standardization in Bengaluru*
 - *SEMICON 2025: Building the Next Semiconductor Powerhouse*
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ARTIFICIAL INTELLIGENCE

International

1. *A new AI breakthrough is helping scientists tame the extreme heat of fusion plasma*



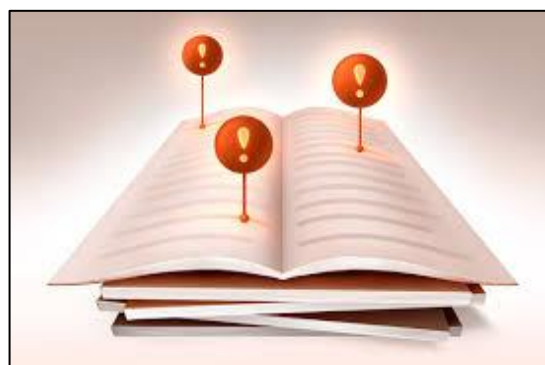
A major breakthrough in fusion energy research has emerged with the development of HEAT-ML, an artificial intelligence system designed to manage the extreme heat inside fusion reactors. Developed by Commonwealth Fusion Systems (CFS), Princeton Plasma Physics Laboratory (PPPL), and Oak Ridge National Laboratory, HEAT-ML can predict ‘magnetic shadows’ - areas shielded from plasma heat in milliseconds, a task that previously took over 30 minutes using the traditional HEAT toolkit.

Fusion reactors, which replicate the Sun’s energy process, face the challenge of plasma temperatures hotter than the Sun’s core, threatening reactor walls with potential damage. Identifying safe zones is crucial for placing heat-resistant components and maintaining reactor integrity. HEAT-ML, trained on around 1,000 HEAT simulations, enables rapid, accurate mapping, allowing engineers to test more designs and make real-time adjustments. Initially applied to SPARC’s high-heat exhaust tiles, the system enhances planning, extends component lifespan, and reduces shutdown risks.

Looking ahead, HEAT-ML could be adapted to any tokamak geometry, offering universal application for future commercial

fusion plants. This innovation accelerates design cycles, improves operational safety, and marks a transformative step toward realizing fusion as a sustainable, limitless energy source. [Read More](#)

2. *AI exposes 1,000+ fake science journals*



An AI-powered system developed by researchers at the University of Colorado Boulder has identified over 1,400 suspicious scientific journals out of 15,200 analyzed, exposing more than 1,000 as likely predatory. These journals lure researchers, often in developing countries, into paying hefty fees without providing genuine peer review, undermining the credibility of science.

The AI scans for red flags such as fake editorial boards, excessive self-citation, poor grammar, and unusually high publication volumes. While not perfect, the tool acts as a pre-screening system to help human experts flag fraudulent publications more efficiently. Predatory journals have grown rapidly since the term was coined in 2009, targeting the pressure on researchers to publish, especially outside the US and Europe. The CU Boulder team designed the system to be transparent, showing why it flags a journal as questionable. Researchers hope to make it available to universities and publishers soon, framing it as a “firewall for science” to safeguard research integrity. By

curbing the spread of fake journals, the tool helps protect the foundation of scientific progress, which relies on building upon validated, peer-reviewed knowledge. [Read More](#)

3. *Why AI emails can quietly destroy trust at work*



A recent study highlights a paradox in workplace communication. While AI tools like ChatGPT, Copilot, and Gemini make writing more professional and efficient, over-reliance can undermine trust between managers and employees. Surveying 1,100 professionals, researchers Anthony Coman (University of Florida) and Peter Cardon (USC) found that employees judged messages differently depending on the level of AI assistance.

Low-level AI help, such as grammar correction, was widely accepted, with 95% finding such messages professional and 83% perceiving them as sincere. However, when supervisors used medium to high levels of AI assistance, perceptions shifted negatively. Only 40–52% of employees viewed heavily AI-assisted messages as sincere, and professionalism ratings dropped to 69–73%. Employees often interpreted such reliance as laziness, lack of caring, or diminished leadership credibility.

The study reveals a clear ‘perception gap’: individuals evaluate their own AI use leniently but are skeptical when supervisors use it extensively. Relationship-oriented messages, like praise or congratulations, suffered the most, affecting perceptions of integrity and ability - key elements of trust.

Researchers advise managers to tailor AI use carefully, reserving it for routine, factual communication, while keeping personal, motivational, or empathetic messages authentically human to preserve sincerity and leadership credibility. [Read More](#)

National

4. *India’s workforce goes AI-First as Frontier Firms lead the transformation: Microsoft Work Trend Index 2025*



India is undergoing a decisive transformation toward an AI-first future of work, according to Microsoft’s 2025 Work Trend Index. With 90% of Indian leaders calling 2025 a pivotal year to rethink strategies, organizations are embedding AI into core operations at an unmatched pace globally.

Frontier Firms - India’s most forward-looking enterprises, are leading this shift by redesigning workflows around human-agent collaboration, with 59% already using AI to automate entire processes.

Leadership sees AI as a strategic lever, with 93% planning to deploy digital agents to expand capacity in the next 12-18 months. Organizations are also preparing for new AI-powered roles, such as AI Workflow Designers, while prioritizing skilling, 51% cite upskilling as their top priority. With 92% of firms considering AI-specific roles and 57% expecting multi-agent systems, India’s workforce is embracing agility and reinvention.

Globally, Microsoft's Copilot tools now serve over 800 million active users, underscoring the scale of AI adoption. In India, leaders and partners like PwC, LTIMindtree, and Cognizant are integrating AI deeply, redefining productivity, collaboration, and culture. The findings position India not only as an adopter but as a global leader shaping the AI-powered workplace of the future. [Read More](#)

BIOTECHNOLOGY & HEALTH

International

5. *New AI model predicts which genetic mutations truly drive disease*



Researchers at the Icahn School of Medicine at Mount Sinai have developed an AI-driven approach to predict the likelihood of developing disease from rare genetic mutations, addressing long-standing uncertainty in genetic testing. The model combines artificial intelligence with routine lab data - such as cholesterol, kidney function, and blood counts, using over one million electronic health records. Unlike traditional studies that provide binary outcomes, this system quantifies disease risk on a spectrum, offering nuanced insights into penetrance, or the probability that a genetic variant causes disease.

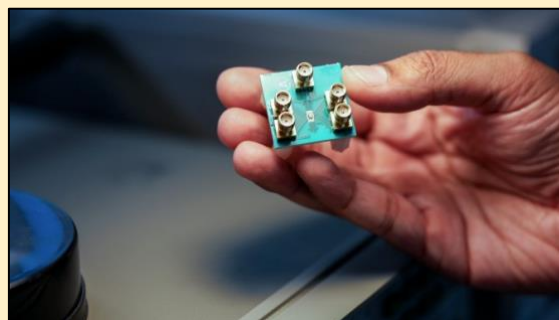
The team generated 'ML penetrance' scores for more than 1,600 genetic variants across 10 common diseases, with results showing some previously uncertain variants displaying strong disease signals, while

others thought harmful appeared less impactful. By providing real-time, data-backed risk scores between 0 and 1, the tool can help doctors decide on screenings or preventive steps, while also preventing unnecessary interventions for low-risk cases.

While not intended to replace clinical judgment, the AI model could become a valuable guide in precision medicine. Researchers aim to expand the system to include more diseases, diverse populations, and long-term validation, potentially transforming how genetic test results are interpreted and acted upon.

[Read More](#)

6. *Researchers build first 'microwave brain' on a chip*



Cornell researchers have created the world's first "microwave brain" microchip, a low-power processor capable of computing directly on ultrafast data and wireless signals by leveraging microwave physics. This breakthrough marks the first

fully integrated microwave neural network on silicon, performing real-time frequency domain computations such as radio signal decoding, radar tracking, and data processing, while consuming less than 200 milliwatts of power.

Unlike conventional digital neural networks that rely on clock-driven, step-by-step operations, this chip uses analog, nonlinear microwave behavior to process data streams at tens of gigahertz speeds. Designed as a neural network with tunable waveguides, it can recognize patterns, learn from data, and deliver results at a fraction of the size and power of digital systems. On multiple wireless signal classification tasks, it achieved over 88% accuracy, comparable to digital models but with significantly less overhead. Its sensitivity to input makes it ideal for hardware security applications and anomaly detection in wireless communications.

Researchers envision future uses in edge computing, enabling devices like smartwatches and phones to run native AI models without relying on cloud servers. Supported by DARPA and NSF-backed Cornell facilities, the innovation holds promise for scalable, high-performance, energy-efficient computing. [Read More](#)

7. Researchers develop AI model that predicts the accuracy of protein-DNA binding



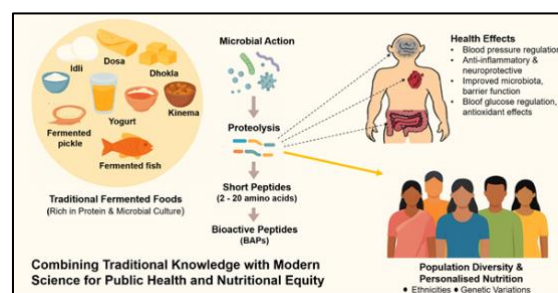
Researchers at University of Southern California have developed 'DeepPBS', an advanced AI model that predicts how proteins bind to DNA. Unlike traditional

methods that require high-throughput sequencing or structural biology experiments, DeepPBS uses geometric deep learning to analyze protein-DNA complexes and predict binding specificity with high accuracy across multiple protein families. The tool creates spatial graphs of protein structures and their DNA interactions, offering a universal approach beyond single protein families.

This breakthrough builds on advances like DeepMind's AlphaFold and complements protein structure prediction by enabling functional insights into binding. DeepPBS could accelerate drug discovery, especially for treating mutations in cancer cells, while also advancing synthetic biology and RNA research. By eliminating experimental bottlenecks, it provides a scalable, accessible way to design new proteins and medical treatments, significantly reducing time and resources required for biomedical innovation. [Read More](#)

National

8. Fermented food can personalise nutrition for India's diverse population



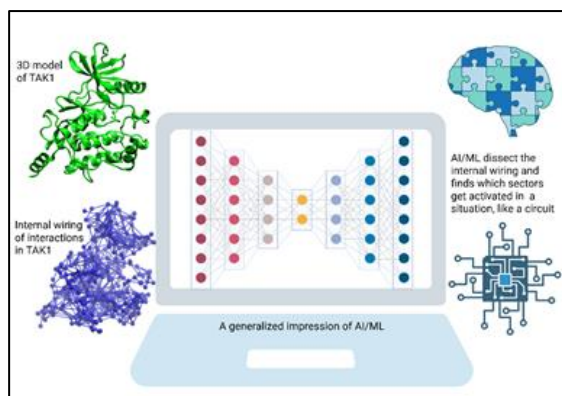
A recent study by the Institute of Advanced Study in Science and Technology (IASST), Guwahati, highlights how fermented foods can enable personalized nutrition for India's diverse population. Fermented foods like yogurt, idli, miso, kimchi, natto, and fermented fish are rich in bioactive peptides (BAPs) - short protein fragments with proven antimicrobial, antioxidant, antihypertensive, and immune-modulatory properties. These peptides can regulate

blood pressure, blood sugar, immunity, and inflammation, thereby influencing cardiac, metabolic, and immune health.

However, their effectiveness differs across populations due to genetic variations, gut microbiota composition, dietary patterns, and health conditions. For example, gene polymorphisms in ACE or IL-6 may alter individual responses. This underlines the importance of precision nutrition tailored to India's genetic and cultural diversity.

The study calls for integrating traditional fermented foods into public health programs and leveraging omics-based research to strengthen rural food systems. By addressing challenges like fermentation variability and peptide stability, India can emerge as a leader in personalized nutrition and health innovation globally. [Read More](#)

9. The biochemist's path to artificial intelligence



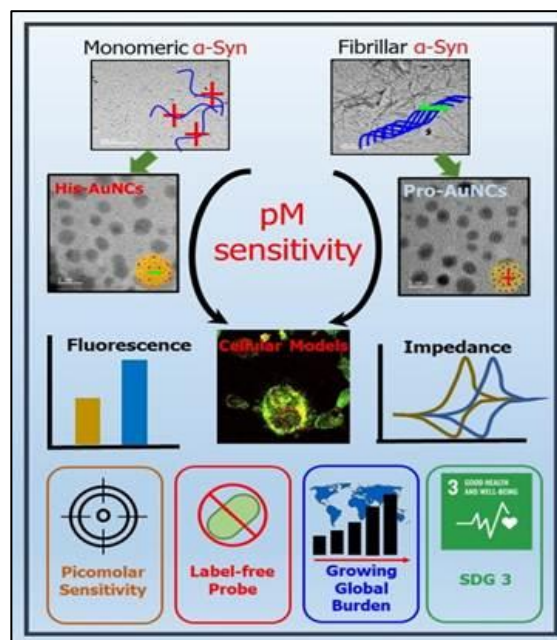
A team from the Bose Institute has uncovered evidence suggesting that proteins may demonstrate rudimentary intelligence at the molecular level. Their work focused on TAK1 kinase, a protein vital for stress signaling, immune response, inflammation, and cell survival. Proteins are built from chains of amino acids that fold into specific 3D structures through countless atomic interactions.

The researchers showed that this intricate internal “wiring” not only makes proteins functional but can also enable them to

respond in a context-dependent, cognitive-like manner. TAK1’s internal circuits allow it to process signals, such as chemical modifications or interactions with other molecules and adapt its function accordingly, resembling decision-making processes. Using a blend of biochemical research and machine learning (ML), the team demonstrated how TAK1’s atomic network encodes memory and evolves new characteristics, opening up fresh insights into drug targeting.

The findings extend the classical paradigm of ‘sequence-structure-function’ in proteins to ‘sequence-structure-function-intelligence’ for specific molecules. This breakthrough highlights how the building blocks of life themselves may exhibit primitive forms of intelligence, bridging biochemistry and artificial intelligence. [Read More](#)

10. Tiny Gold Particles can help early detection of Parkinson's Disease



Researchers at the Institute of Nano Science and Technology (INST), Mohali, have developed a nanotechnology-based tool using tiny gold nanoclusters (AuNCs) to enable early detection of Parkinson's

disease (PD). PD, a rapidly growing neurological disorder, is usually diagnosed only after major brain cell damage, highlighting the need for early, accurate diagnostic tools.

The team focused on the protein α -synuclein, which changes from a harmless form into toxic aggregates that damage neurons. By coating gold nanoclusters with amino acids, they created a selective biosensor capable of distinguishing between the normal and pathological forms of α -synuclein. Proline-coated clusters bound to healthy proteins, while histidine-coated ones targeted the harmful aggregated forms.

Extensive experiments, including spectroscopy, fluorescence imaging, electron microscopy, and electrochemical analysis, validated the sensor's sensitivity

and safety, even in human-derived neuronal cells. In collaboration with experts from CSIR-IMTECH, Chandigarh, the research demonstrated how a simple idea evolved into a proof-of-principle biosensing platform.

This innovation offers the potential for early PD diagnosis, opening doors for timely treatment, improved patient outcomes, and reduced healthcare costs. The approach may also extend to detecting other protein misfolding disorders, such as Alzheimer's, and could evolve into a low-cost, label-free diagnostic tool for widespread clinical use. [Read More](#)

CLEAN TECHNOLOGIES

International

11. Leaf-inspired bioplastic achieves strength and biodegradability at room temp



Scientists at Washington University in St. Louis have developed a groundbreaking bioplastic, called LEAFF (Layered, Ecological, Advanced, and multi-Functional Film), that outperforms petrochemical plastics in strength, functionality, and sustainability. Inspired by the natural structure of leaves, the

innovation integrates cellulose nanofibers into a multilayer design, creating a material that is strong, multifunctional, and able to biodegrade at room temperature, addressing two major limitations of current bioplastics.

Unlike existing bioplastics, which often require high-temperature composting and lack durability, LEAFF offers superior tensile strength, low air and water permeability, and can be directly printed on, eliminating the need for additional packaging labels. Tested with common bioplastics like polylactic acid (PLA) and polyhydroxybutrate (PHB), LEAFF demonstrates enhanced strength and rapid degradability, while maintaining cost-effectiveness for manufacturers.

With the global plastic packaging market valued at \$23.5 billion and dominated by non-biodegradable petroplastics, LEAFF has the potential to revolutionize sustainable packaging. By leveraging the

U.S.'s strong agricultural base to provide low-cost feedstocks, such as lactic acid and fatty acids from microbial fermentation, this technology also supports the transition toward a circular economy. Researchers envision scaling LEAFF for commercial use, creating new markets, jobs, and sustainable solutions to tackle plastic waste and pollution. [Read More](#)

12. *Scientists found a new way to turn sunlight into fuel*

University of Basel researchers have developed a plant-inspired molecule that marks a key advance toward artificial photosynthesis, offering a potential pathway to carbon-neutral fuels. The new molecule can simultaneously store four charges - two positive and two negative, when exposed to light. This ability is crucial for driving chemical reactions such as splitting water into hydrogen and oxygen, a foundational step in producing



solar fuels like hydrogen, methanol, or synthetic petrol.

Unlike previous efforts that required intense laser light, the Basel team's design works with dimmer light, moving closer to real-world sunlight conditions. The molecule is composed of five linked parts: two electron donors that become positively charged, two electron acceptors that become negatively charged, and a central light-absorbing unit that initiates the process. By using two successive flashes of light, researchers were able to generate and stabilize all four charges.

Although not yet a complete artificial photosynthesis system, this innovation demonstrates that stepwise excitation can achieve stable charge storage under realistic light levels.

The findings improve understanding of electron transfer in such systems and lay the groundwork for developing sustainable solar fuels that are carbon-neutral, offering promise for future clean energy solutions. [Read More](#)

QUANTUM & PHOTONICS

International

13. *Living night lights: Succulents that store sunlight and shine for hours*

Scientists at South China Agricultural University have created glow-in-the-dark succulents by injecting their leaves with afterglow phosphor particles, offering a new approach to decorative 'living lighting'. The study describes how strontium aluminate-based phosphors absorb energy from sunlight or ultraviolet light and re-emit it in various colors for up

to two hours. Unlike genetically engineered bioluminescent plants, which produce only faint green light, these succulents can glow

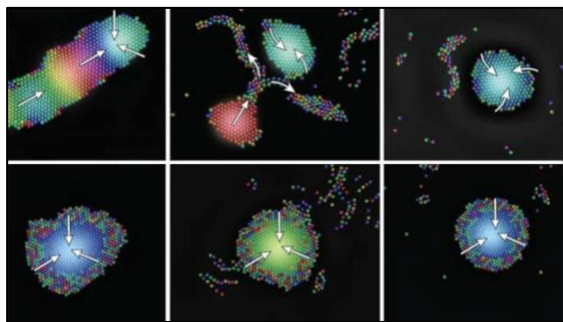


in a spectrum of hues, including red, blue, violet, and white.

The team's favorite subject was 'Echeveria Mebina', a common houseplant with dense, fleshy leaves that could uniformly host the particles. Each leaf required about 10 minutes for injection, and the glow could be repeatedly triggered over 10 days. Larger particles, about 7 micrometers, proved more effective than nanoparticles, producing a brighter and more consistent glow. The estimated cost of creating one glowing plant is just 10 yuan (US \$1.40).

While the plants cannot yet replace traditional lighting, they represent a playful fusion of nanotechnology and horticulture. Safety testing remains a priority, particularly around toxicity if ingested. For now, these glowing succulents are less about function and more about charm - bringing a touch of science-inspired magic into everyday spaces. [Read More](#)

14. Scientists create micro-robots that swarm using sound waves



Tiny robots that “talk” using sound waves could soon form swarms capable of adapting, self-healing, and tackling complex tasks. The Penn State researchers and collaborators demonstrated how acoustic communication can coordinate micromachines, much like bees buzzing together or fish schooling in the sea.

Each robot is strikingly simple - containing just a motor, oscillator, microphone, and speaker, yet when grouped, they

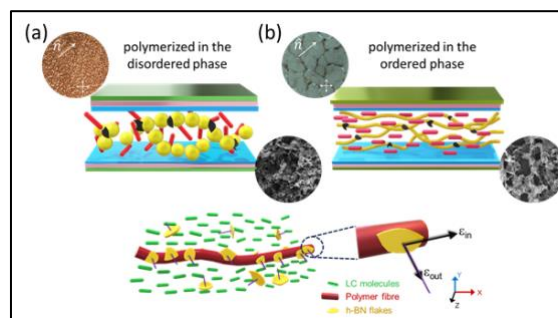
synchronize with the swarm's acoustic field and move toward stronger signals. This enables the collective to self-organize, reshape in response to obstacles, and reform if damaged. The result is a kind of emergent intelligence, far greater than the sum of individual parts.

Such swarms could revolutionize diverse fields. In the environment, they might clean polluted areas or explore disaster zones too dangerous for humans. In medicine, they could deliver drugs directly inside the body, navigating tight spaces and targeting diseased cells with precision. Their ability to sense surroundings collectively and heal themselves also opens avenues for surveillance, security, and sensor networks.

By showing that sound waves - faster and more efficient than chemical signals, can coordinate swarming behavior, the study marks a breakthrough in active matter research and points toward the next generation of resilient microrobots. [Read More](#)

National

15. Crafting smart materials: Tiny flakes and material design impact energy saving technologies



Smart windows designed with nanomaterials could significantly reduce energy use by cutting the load on air conditioners. Researchers at the Centre for Nano and Soft Matter Sciences (CeNS), Bengaluru, have demonstrated that adding tiny flakes of hexagonal boron nitride (h-

BN) to ‘Polymer Network Liquid Crystals’ (PNLCs) enables precise control of infrared (IR) light. Since IR radiation contributes heavily to unwanted indoor heat, this breakthrough offers a promising way to manage thermal load in buildings.

In conventional PNLC systems without h-BN, the polymer network forms a coarse, bead-like structure, leading to minimal IR scattering and limited control. By contrast, incorporating h-BN nanoflakes produces a smoother, continuous network with numerous local scattering sites. This modification allows the material to strongly scatter IR radiation and enables electrical switching between transparent and heat-blocking states.

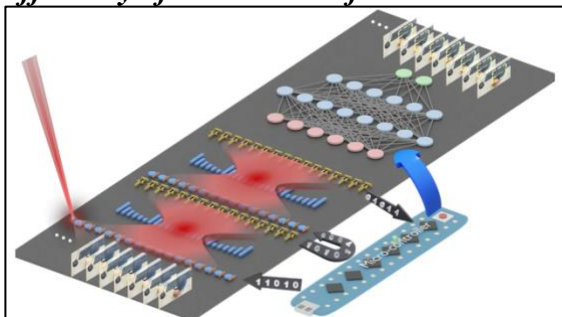
The team optimized parameters like nanoflake size, concentration, and process conditions to ensure seamless blending within the polymer. The result is a material capable of high-contrast, fast-response IR control.

Such scalable smart windows could regulate heat transfer in real time, reducing dependence on air conditioning while improving energy efficiency. Beyond buildings, they also hold potential for broader applications in light and heat management technologies. [Read More](#)

SEMICONDUCTORS

International

16. New light-based chip boosts power efficiency of AI tasks 100 fold



AI's growing energy demands may soon find relief in a breakthrough silicon photonic chip developed by researchers at the University of Florida. The chip performs convolution operations - core computations in machine learning by using light instead of electricity, achieving up to 100 times greater energy efficiency without sacrificing accuracy.

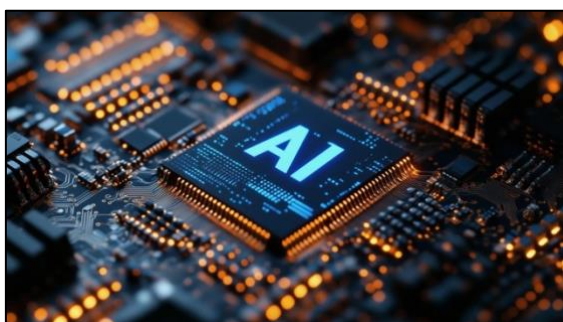
Convolutions, essential for pattern recognition in images, video, and text, typically consume significant power. The new design integrates microscopic Fresnel lenses directly onto silicon, allowing laser

light to carry out the mathematical transformations. Input data is converted into light, processed through the lenses, and then translated back into digital signals, completing the task with about 98% accuracy - on par with conventional chips.

The chip also supports wavelength multiplexing, meaning it can process multiple data streams at once by using lasers of different colors. This ability to run parallel computations further enhances its efficiency and speed. Researchers emphasize that such optical computation could be pivotal for scaling AI systems sustainably. With chipmakers like NVIDIA already incorporating optical elements, integration of this technology into mainstream AI hardware may not be far off. [Read More](#)

17. Scientists turn spin loss into energy, unlocking ultra-low-power AI chips

Scientists in South Korea have discovered a groundbreaking way to harness ‘spin loss’ in magnetic materials, opening the door to ultra-low-power AI chips and next-generation computing devices. Traditionally, spin loss - when some electron spins dissipate instead of switching magnetization - was seen as wasted energy. However, a team at KIST, working with DGIST and Yonsei University, found that this loss can instead trigger spontaneous magnetization switching, effectively turning waste into a source of efficiency.



In magnetic materials, information is stored or computed by flipping magnetization directions, representing binary states of 1 and 0. Conventional methods require large currents, consuming significant power. The new approach achieves the same switching with up to three times greater efficiency, needing less power as spin loss increases. Remarkably, this does not rely on exotic materials or complex structures, making it scalable, compatible with existing semiconductor processes, and suitable for mass production.

The breakthrough could revolutionize spintronics, a field central to ultra-low-power memory, neuromorphic computing, and AI semiconductors. With potential applications in edge computing and probabilistic devices, this advance paves the way for efficient, miniaturized AI hardware. [Read More](#)

SPACE & DEFENCE

National

18. *Aatmanirbhar Bharat: DRDO & AIIMS Bibinagar unveil first Make-in-India cost-effective advanced Carbon Fibre Foot Prosthesis*



In a significant advancement for indigenous medical and rehabilitation technology, the Defence Research and Development Laboratory (DRDL), Hyderabad, in

collaboration with AIIMS Bibinagar, has developed ADIDOC - an Optimised Carbon Foot Prosthesis. This is India's first advanced carbon fibre foot prosthesis, fully designed and manufactured in the country, tailored for high-performance, active users.

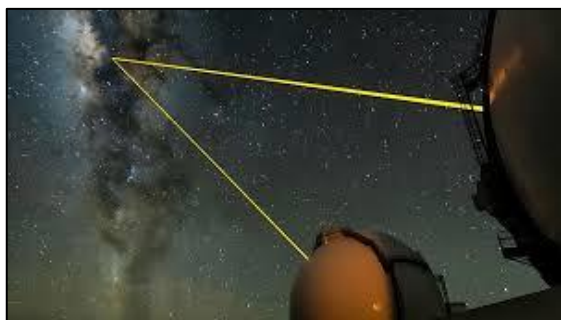
Engineered with advanced carbon fibre technology, the ADIDOC Foot has undergone rigorous biomechanical testing and can support loads up to 125 kg, ensuring safety and durability. It is optimized for K3-level active users - those capable of walking with variable cadence and navigating environmental barriers, providing enhanced mobility, stability, and long-term performance.

Importantly, the device is cost-effective, offering a high-profile prosthetic solution at a fraction of the price of imported alternatives, thus making it accessible to a

wider range of users. The development of ADIDOC highlights the successful synergy between the defence R&D sector and the medical community, showcasing the potential of collaborative innovation.

This achievement not only meets international standards but also strengthens the vision of Aatmanirbhar Bharat by delivering a world-class assistive device made entirely with indigenous innovation and materials. It marks a step forward in self-reliance and affordable healthcare solutions. [Read More](#)

19. *A new window into the stars by modeling stellar atmosphere*



Scientists at the Indian Institute of Astrophysics (IIA), in collaboration with France's IRAP, have developed a new method to model stellar atmospheres with far greater realism, marking a breakthrough in computational astrophysics. Traditional models assumed atoms in stars followed predictable velocity distributions

(Maxwellian curves), even when their energy states deviated from equilibrium. But real stellar atmospheres are chaotic, with photons scattering, atoms shifting between energy levels, and velocities straying from equilibrium. Capturing this complexity requires full non-local thermodynamic equilibrium (FNLTE) modelling, a challenge first identified in the 1980s but left unsolved due to computational limits.

The team has now advanced from solving the two-level atom case to the more complex three-level atom problem, incorporating processes like Raman scattering, where atoms absorb and re-emit light at different frequencies. Their simulations showed striking departures from traditional models, particularly in the velocity distribution of excited hydrogen atoms near stellar surfaces, precisely where astronomers capture starlight for analysis.

This achievement brings astrophysicists closer to generating stellar spectra with unprecedented accuracy. The ability to better decode starlight will refine estimates of stellar temperatures and compositions, deepen understanding of circumstellar disks and interstellar clouds, and aid in detecting Earth-like exoplanets. Researchers are now extending the method to more complex atoms and faster computational schemes. [Read More](#)

REPORTS/POLICY DOCUMENTS

International

20. *McKinsey Technology Trends Outlook 2025*

McKinsey's Technology Trends Outlook 2025 highlights thirteen frontier technologies that are reshaping global business, with artificial intelligence (AI) playing a central, foundational role. AI is now both a standalone trend and a catalyst

accelerating progress across other domains. Notably, agentic AI - AI systems that can autonomously plan and execute multi-step workflows, is emerging as a fast-growing area of interest. Another trend gaining ground is application-specific semiconductors, reflecting the intense demand for compute power, better energy efficiency, and reduced heat in AI systems. The report underscores several cross-cutting themes: first, autonomous systems

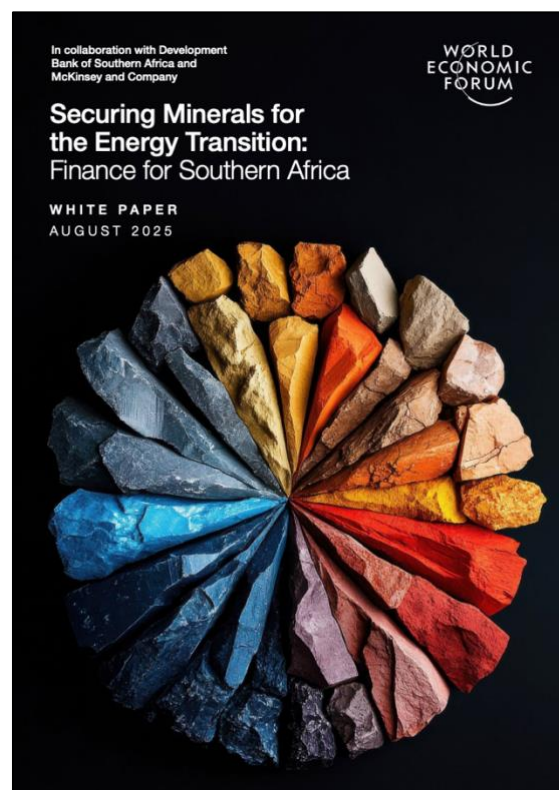
(robots, digital agents) are transitioning from experimentation to real-world deployment. Second, human-machine collaboration is evolving, with more natural interfaces and adaptive intelligence shifting perspectives from AI as a tool to AI as an augmenting partner. Third, scaling challenges, including energy, infrastructure, supply chain, regulatory, and talent constraints are becoming critical bottlenecks.



In response, nations and corporations are doubling down on sovereign infrastructure and local capabilities (e.g. in quantum, chips), accelerating competition in strategic technology arenas. Also emphasized is the growing importance of responsible innovation: ethics, accountability, and trust are no longer optional - they're vital for adoption and long-term success. For business leaders, the report suggests choosing the trends most relevant to their sectors, investing in talent and infrastructure, and navigating complexity with agility. [Download Report](#)

21. WEF - Securing Minerals for the Energy Transition: Finance for Southern Africa

The report 'Securing Minerals for the Energy Transition: Finance for Southern Africa', developed under the World Economic Forum's SMET initiative with the Development Bank of Southern Africa and McKinsey & Company, highlights the region's pivotal role in the global clean energy economy. Southern Africa holds nearly 30% of the world's reserves of critical minerals such as cobalt, copper, lithium, graphite, manganese, and platinum-group metals - essential for electric vehicles, renewable energy, and storage technologies. Yet, the region attracts less than 10% of global exploration financing, underscoring a major gap between potential and investment.



Unlocking this mineral wealth is not only vital for strengthening global supply chain resilience but also for fostering inclusive and sustainable growth across Southern Africa. The report identifies key financing barriers holding back development of critical mineral value chains and offers practical solutions to address them. Through multistakeholder consultations, it presents replicable case studies that

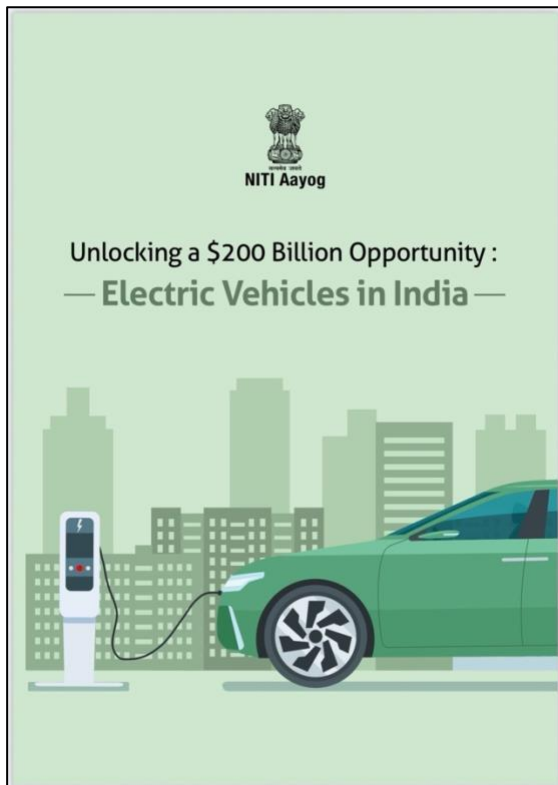
demonstrate how investment can be de-risked, infrastructure strengthened, and local value addition supported.

By scaling exploration and production while building regional capabilities, Southern Africa can position itself as a central hub in the energy transition, ensuring both global energy security and regional socio-economic development.

[Download Report](#)

National

22. NITI Aayog Launches the Report on 'Unlocking a \$200 Billion opportunity: Electric Vehicles in India'



NITI Aayog has released the report 'Unlocking a \$200 Billion Opportunity: Electric Vehicles in India', providing a roadmap to accelerate the country's EV transition. India aims for EVs to make up 30% of total vehicle sales by 2030. While sales have grown from 50,000 in 2016 to 2.08 million in 2024, penetration still lags global averages, though it is steadily improving.

Developed through seven rounds of stakeholder consultations, the report highlights key barriers and strategic opportunities to scale EV adoption. It emphasizes immediate actions needed to fast-track progress, including stronger policy alignment, investment in charging infrastructure, and measures to boost affordability and local manufacturing. The recommendations are designed to enable data-driven decision-making and foster cross-sector collaboration for a unified national push.

The report positions EV adoption as not only an environmental necessity but also a \$200 billion economic opportunity for India. Leaders at the launch underscored the importance of advancing clean mobility, with Member Rajiv Gauba calling it a 'transformative shift,' and CEO B.V.R. Subrahmanyam reaffirming NITI Aayog's role in driving India's EV revolution.

[Download Report](#)

23. NASSCOM - India Generative AI Startup Landscape 2025: Mapping the Momentum



The NASSCOM report 'India Generative AI Startup Landscape 2025: Mapping the Momentum' highlights India's rise as the world's second-largest hub for GenAI startups, with over 890 ventures by mid-2025, reflecting a 3.7x surge in just a year. Application-focused startups dominate, growing 4X to comprise 83% of the ecosystem, with many pivoting toward vertical SaaS and domain-specific models.

Globally, GenAI startups crossed 4,500, with funding reaching \$54 billion - though concentrated in late-stage US-based firms backed by strong compute infrastructure and deep-pocketed VCs. In India, funding touched \$990 million (30% YoY growth) but still lags peers, with resource bottlenecks around compute, talent, and patient capital.

Indian startups are advancing in data sophistication - 79% use proprietary customer data, and nearly half leverage synthetic data, while aligning with global tech stacks through autoregressive models. Enterprise adoption is accelerating, though 30% of startups lack active partnerships, citing regulatory and IP hurdles.

The report stresses that India's differentiated edge lies in vernacular LLMs, AI agents, and integration with Digital Public Infrastructure (DPI). To sustain momentum, strategic interventions are needed in compute access, long-term funding, and scalable adoption enablers, positioning India to shape the next decade of global AI innovation. [Download Report](#)

TECHNOLOGY ENGAGEMENTS/NEWS BYTES

International

24. *Nvidia and AMD Agree to Pay 15% of China Chip Revenues to US Government*



Nvidia and AMD have struck an unprecedented deal with the US government to pay 15% of their China chip revenues in exchange for export licences. The arrangement allows Nvidia's H20 and AMD's MI308 chips, both developed for the Chinese market, to be sold despite earlier US export bans citing national security risks.

Critics argue the deal sets a dangerous precedent, likening it to an unconstitutional export tax and warning it undermines national security concerns. The agreement

highlights escalating US-China tech trade tensions, placing financial pressure on chipmakers. Security experts caution that China could use these AI-optimized chips for military purposes. Nvidia CEO Jensen Huang has lobbied for months, even meeting President Trump before the deal was announced. Meanwhile, Intel's CEO also met Trump after facing calls for resignation over alleged China ties. The deal underscores both the strategic stakes of AI chips and the political controversy over balancing security with market access. [Read More](#)

National

25. *National Space Day: Celebrating Atmanirbharta In Space*

At the National Space Day celebrations, Union Minister Dr. Jitendra Singh announced a bold vision that an Indian astronaut will proclaim 'Viksit Bharat 2047' from the Moon's surface by 2040, symbolizing India's arrival as a global power. He highlighted India's 15-year space roadmap, with over 100 satellites planned,

70% of them small satellites, through government missions and private sector-led initiatives. Stressing that India's space programme goes beyond rockets and satellites, he underlined its role in empowering people and shaping the nation's future.



India's space programme has evolved into a global powerhouse under ISRO, marked by milestones from Aryabhata (1975) to Chandrayaan-3 (2023) and beyond. Major reforms since 2014 opened the sector to private players and international collaboration, driving self-reliance and innovation. Achievements include the Chandrayaan-3 soft landing at the lunar south pole, Aditya-L1 solar mission, NavIC navigation system, EOS Earth observation series, and NISAR (2025), a landmark Indo-US Earth observation mission. India also advanced human spaceflight through Axiom-4, and demonstrated satellite docking via SpaDeX, positioning itself among a select group of nations.

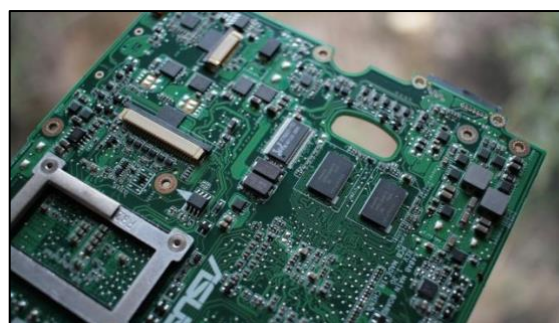
Looking ahead, the ₹20,193 crore Gaganyaan mission will send Indian astronauts to low Earth orbit, supported by new infrastructure, crew training, and test flights. Future plans include Chandrayaan-4, designed for lunar sample return, and the development of reusable Next-Generation Launch Vehicles (NGLV) with 30,000 kg payload capacity. ISRO also plans to build a modular space station and expand into interplanetary exploration. These strides - backed by PSUs, private firms, and start-ups, underscore India's Atmanirbharta in space,

combining indigenous design, cost-effective innovation, and global collaboration. By blending scientific ambition with strategic autonomy, India is strengthening its role in global space leadership and advancing the vision of Atmanirbhar Bharat.

The Minister lauded student innovators from the Bharatiya Antariksh Hackathon and ISRO Robotics Challenge, emphasizing the role of youth in interplanetary exploration and AI/ML applications. He noted that India's space sector, once government-led, now includes hundreds of start-ups driving innovation in areas like disaster management, smart cities, and land mapping. Looking ahead, he outlined key missions including Gaganyaan (2027), Chandramitra (2028), Chandrayaan-4, a Venus mission, and Bharat Antariksh Station (2035). India also aims to place an astronaut on the Moon by 2040.

Reflecting on India's journey from Aryabhata to Gaganyaan, Dr. Singh said space achievements are stepping stones toward a larger vision where science, innovation, and public welfare converge to build a developed India by 2047. [Read More](#)

26. **Cabinet clears four new chip plants worth Rs 4,600 crore in Odisha, Punjab and Andhra Pradesh**



The Union Cabinet has approved four new semiconductor manufacturing projects under the India Semiconductor Mission (ISM), with a total investment of ₹4,600 crore. These units will be established in Odisha, Punjab, and Andhra Pradesh,

creating over 2,000 skilled jobs and many indirect opportunities, further boosting India's electronics manufacturing ecosystem.

The projects include 'SiCSem' (in collaboration with Clas-SiC Wafer Fab, UK) and '3D Glass Solutions Inc.' in Odisha, which will set up India's first commercial Silicon Carbide (SiC) compound semiconductor fab and an advanced packaging and embedded glass substrate unit respectively. 'Continental Device India Ltd. (CDIL)' will expand its Mohali facility in Punjab to produce high-power discrete semiconductor devices, while 'Advanced System in Package Technologies (ASIP)', with South Korea's APACT, will establish a unit in Andhra Pradesh.

Together, these initiatives mark a milestone by introducing advanced packaging, compound semiconductors, and new-age applications in defence, EVs, renewable energy, AI, and high-performance computing, significantly advancing India's Atmanirbhar Bharat vision in semiconductors. [Read More](#)

27. India - Japan Joint Vision for the Next Decade: Eight Directions to Steer the Special Strategic and Global Partnership



India and Japan adopted a Joint Vision for the Next Decade on 29 August 2025 during Prime Minister Modi's visit to Tokyo, outlining eight key directions to deepen their Special Strategic and Global Partnership. The vision begins with a next generation economic partnership that seeks to double Japanese private investment in India, enhance trade, foster SME cooperation, expand ICT collaboration, and promote joint initiatives in Africa under India's MAHASAGAR vision and Japan's Indian Ocean–Africa strategy. An economic security partnership will focus on resilient supply chains in semiconductors, critical minerals, pharmaceuticals, clean energy, AI and telecommunications, supported by mechanisms such as the Japan-India AI Cooperation Initiative.

The two sides also launched a next generation mobility partnership to cooperate on high-speed rail, smart cities, electric vehicles, disaster-resilient infrastructure, and joint manufacturing in India for global markets. A focus on ecological legacies will include collaboration on Mission LiFE, green hydrogen, clean energy, biodiversity conservation, waste-to-energy, sustainable agriculture, and circular economy practices. In technology and innovation, both countries will strengthen cooperation in frontier research such as quantum, nuclear, space through LUPEX, high-performance computing, and startups, alongside food sciences and agricultural technologies.

On health, the partnership aims to promote universal health coverage through joint research in regenerative medicine, digital health, geriatric medicine, and cancer treatment, while also expanding cooperation in Ayurveda, yoga, and holistic wellness. People-to-people exchanges will be deepened through the mobility of over 500,000 personnel in the next five years, vocational training, academic collaboration, tourism, and language education. Finally, state-prefecture

partnerships will be expanded through new sister-city ties, regional business forums, enhanced flight connectivity, and regular delegation exchanges. Together, these eight areas mark a comprehensive roadmap for India and Japan to strengthen ties in the Indo-Pacific and beyond, while delivering tangible benefits for future generations.

[Read More](#)

28. India Hosts First-Ever 3GPP RAN Meetings on 6G Standardization in Bengaluru

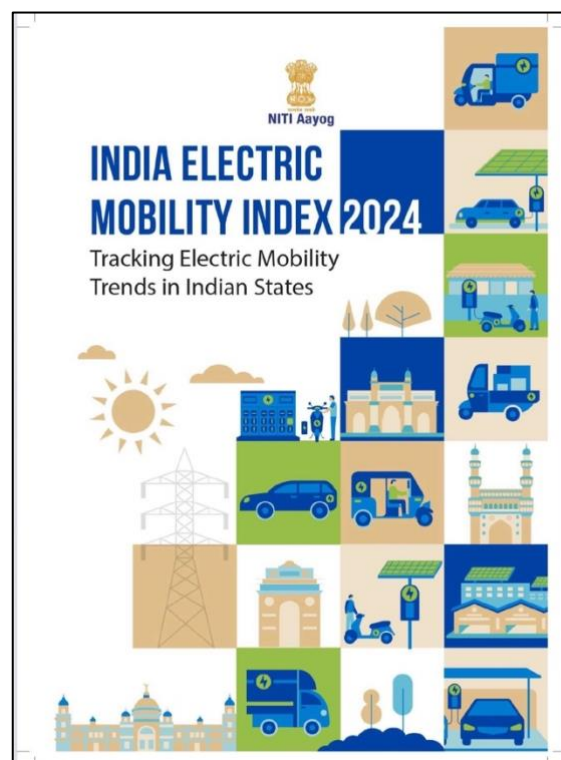


India hosted the 3GPP Radio Access Networks (RAN) Working Group meetings (RAN1–RAN5) for the first time in Bengaluru from 25-29 August 2025, marking a historic milestone in global telecom standardization. Supported by the Department of Telecommunications (DoT) and organized by the Telecommunications Standards Development Society, India (TSDSI), the event commenced discussions on 3GPP Release 20, which will form the foundation of global 6G specifications, alongside finalizing Release 19 for advancing 5G Advanced. Over 1,500 delegates from more than 50 countries, the highest-ever participation in a 3GPP meeting attended, reflecting global interest in shaping the transition from 5G to 6G.

Hosting these deliberations in India gives local researchers, companies, and academic institutions unprecedented access to contribute directly to global telecom standards without needing to travel abroad. It underscores India's rising influence in technology leadership and its commitment to shaping future communications through

active government and industry engagement. The event is also expected to catalyze stronger industry-academia collaboration, foster domestic innovation, and enhance India's role as a key player in the international telecom standards ecosystem. [Read More](#)

29. India Launches a Pioneering India Electric Mobility Index (IEMI) to Track States/UTs Progress in EV Transition



NITI Aayog launched the India Electric Mobility Index (IEMI) on 4 August 2025, the first tool of its kind to comprehensively track and benchmark the progress of States and Union Territories in advancing electric mobility. Released by Shri Rajiv Gauba, Member, NITI Aayog, in the presence of senior officials, the index evaluates states on a 100-point scale across 16 indicators under three themes: transport electrification progress, charging infrastructure readiness, and EV research and innovation status.

The IEMI aims to inform decision-making, foster healthy competition among states, and promote best practice sharing by identifying both strengths and gaps in

policy and implementation. Highlighting the crucial role of states in achieving India's net-zero target by 2070, the index emphasizes the need for integrated planning, cross-sectoral collaboration, and equitable deployment of EV benefits. Officials underscored that the IEMI provides a transparent, comparative framework to benchmark efforts, strengthen state-level coordination, and accelerate India's transition towards a decarbonized and energy-secure future.

[Read More](#)

30. *National Cybersecurity Exercise 2025 Concludes with Strategic Focus on Emerging Threats*



The Bharat National Cybersecurity Exercise 2025, jointly organized by the National Security Council Secretariat (NSCS) and Rashtriya Raksha University (RRU), concluded with strong emphasis on tackling emerging cyber threats. With over 600 participants, the exercise focused on Industrial Control Systems (ICS) security and AI-driven threats like adversarial attacks and deepfakes, alongside core modules on SOC operations, API security, malware analysis, and digital forensics.

Key highlights included the Bharat CISOs Conclave and Cybersecurity Startup Exhibition, which fostered dialogue and showcased innovations, and the Strategic Exercise (Stratex), which tested inter-agency coordination and crisis response through national-level threat simulations.

Deputy NSA T. V. Ravichandran stressed the need to integrate evolving cyber risks into national security frameworks and build synergy across agencies. Senior officials highlighted lessons on adaptive defenses, intelligence sharing, and capacity building, while academia was recognized for its role in advancing research and workforce development.

The exercise concluded with a call for sustained collaboration, innovation, and preparedness, reinforcing India's commitment to safeguarding its digital sovereignty and building a resilient, self-reliant cybersecurity ecosystem. [Read More](#)

31. *PM Launches EV Exports to 100 Countries as US Tariffs Loom, Declares 'Make for the World'*

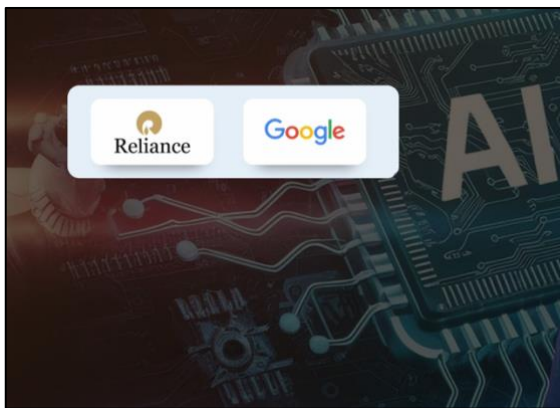


Prime Minister Narendra Modi inaugurated green mobility initiatives at Hansalpur, Gujarat, marking a major milestone in India's EV journey. He flagged off Suzuki's first Made-in-India global strategic Battery Electric Vehicle, the "e VITARA," which will now be exported to over 100 countries, including Japan and Europe, positioning India as Suzuki's global EV hub. Alongside, he launched hybrid battery electrode manufacturing at the TDS Lithium-Ion Battery plant, a Toshiba-Denso-Suzuki venture, making over 80% of battery value indigenously produced.

PM Modi emphasized India's strengths of democracy, demography, and skilled

workforce, calling it a win-win for global investors. Highlighting India-Japan ties, he lauded Maruti Suzuki's role as a "brand ambassador" of Make in India and reaffirmed Japan's trusted partnership. He noted reforms and schemes like PLI have boosted electronics, mobile, and defence production, while EVs and clean energy now drive future growth. [Read More](#)

32. Reliance, Google tie up to boost India's AI infra, to build AI cloud region in Jamnagar



Reliance Industries has announced the launch of 'Reliance Intelligence', a new subsidiary to drive AI infrastructure, alongside a strategic partnership with Google to build a dedicated AI-focused cloud region in Jamnagar, Gujarat. The facility, powered by Reliance's clean energy and connected through Jio's advanced network, will be designed and built by Reliance while Google provides world-class AI compute and cloud expertise. The cloud region will be fully compliant with Google Cloud's global standards, enabling high-performance AI workloads for enterprises, startups, developers, and the public sector.

The collaboration combines Reliance's large-scale execution capability with Google's leading AI technologies to accelerate innovation across sectors like energy, retail, telecom, and financial services. Sundar Pichai emphasized that the partnership builds on a decade of joint work

in powering India's digital revolution and will now support the country's next leap with AI. This marks a major step in scaling India's AI infrastructure, positioning Jamnagar as a hub for advanced cloud and AI services. [Read More](#)

33. SEMICON 2025: Building the Next Semiconductor Powerhouse



SEMICON India 2025, India's largest semiconductor and electronics show and its fourth edition, was held from September 2nd to 4th, 2025, in New Delhi, with the theme 'Building the Next Semiconductor Powerhouse'. The event brought together global industry leaders, policymakers, academia, and startups to foster investment, dialogue, and strategic partnerships, playing a catalytic role in advancing the goals of the India Semiconductor Mission (ISM).

The conference was inaugurated by PM and during his address, he highlighted India's 7.8% GDP growth in the first quarter, noting that while oil was 'black gold,' chips are "digital diamonds" that will drive the 21st century's progress. He stated that the

global semiconductor market, currently at \$600 billion, is expected to exceed \$1 trillion by 2030, with India aiming for a significant share. He underscored India's rapid progress, noting that since the Semicon India program launched in 2021, ten semiconductor projects totaling over ₹1.5 lakh crore (over \$18 billion) have been approved or are underway.

A historic highlight was the presentation of the first set of 'Made-in-India' chips from a pilot line to PM by Union Minister of Electronics and Information Technology, Shri Ashwini Vaishnaw. This achievement, reached in just three and a half years since the ISM's launch in December 2021, was celebrated as a moment of pride and a testament to India's transformation into a "lighthouse of stability". The Union Minister also announced the Deep Tech Alliance with nearly a billion dollars committed to drive the semiconductor revolution in clean energy, quantum technologies, and other frontier sectors. ISM 2.0 is planned to further broaden support for fabs, OSAT units, capital equipment, and materials to cover the entire semiconductor value chain.

Semicon India 2025 featured nearly 350 exhibitors from 33 countries and regions, over 15,000 expected visitors, 6 country roundtables, and 4 country pavilions. The event saw the announcement of 12 Memorandums of Understanding (MoUs) focusing on product development, service capabilities, and skill development. These included collaborations between Tata Electronics and Merck for manufacturing, Tata Electronics and C-DAC for design, Kaynes Semicon for camera modules and microphone packages, and L&T Semiconductor for secure chips and a National Innovation Hub with IISc Bangalore. MoUs also covered skill development with NIELIT and the Singapore Semiconductor Industry Association, and between ISM and NAMTECH for talent pipelines. The conference also highlighted features like a Workforce Development Pavilion, aiming to attract a diverse talent pipeline to meet the need for one million additional skilled workers by 2030, and a SEMI University Program offering over 800 on-demand courses. Discussions on sustainability, global warming, and supply chain resilience were also part of the agenda. India's semiconductor production is reportedly 15–30% more cost-competitive globally.

WHAT'S UPCOMING?

34. *European Hydrogen Week (29 Sept - 3 Oct 2025)*



The European Hydrogen Week is a premier event for the hydrogen industry, taking place in Brussels from September 29 to October 3, 2025. Co-organized by Hydrogen Europe, the European Commission, and the Clean Hydrogen Partnership, it brings together key stakeholders, including policymakers, industry leaders, and researchers. The week features a high-level policy conference, a B2B forum for business networking, and an innovation forum focused on new technologies and startups. It provides a crucial platform for discussing the latest

developments in hydrogen policy, market growth, and technology, with the goal of advancing Europe's clean energy transition and strengthening its position in the global hydrogen economy. [Know More](#)

35. *Global Fintech Fest (7- 9 October 2025)*



The Global Fintech Fest (GFF) 2025 is scheduled to be held from October 7-9, 2025, at the Jio World Convention Centre in Mumbai. The event's theme is 'Empowering Finance for a Better World - Powered by AI: Augmented Intelligence | Innovation | Inclusion.' It is a large-scale event supported by various government ministries and bodies, including the New, Emerging, and Strategic Technologies (NEST) Division of the MEA, MEITY, and RBI.

The festival will feature discussions and showcases on several key areas. These include: Fintech Innovation, which focuses on new technologies and disruptive solutions; Digital Transformation, exploring how technologies like AI and cloud computing are reshaping financial services; Sustainable & Climate Finance, which highlights green investments and climate-resilient financial strategies; Risk, Compliance & Data, addressing challenges related to cybersecurity and data governance; and Rural Finance & Economic Empowerment, with a focus on driving financial inclusion in underserved economies. The GFF is a vital platform for showcasing India's growing expertise in fintech and fostering international collaboration. [Know More](#)

36. *World Hydrogen Week (6 – 10 October)*



The World Hydrogen Week is a five-day event taking place from October 6-10, 2025, at the Bella Center in Copenhagen. It is a major gathering for senior hydrogen professionals, designed to accelerate hydrogen projects from the final investment decision (FID) phase into operational status. The event features a conference, an exhibition, specialized networking opportunities, and 'Hydrogen Field Trips.' It will address key topics such as regulation, policy trends, investment, infrastructure, and supply chain resiliency, with the goal of fostering progress and confidence in the global hydrogen market. [Know More](#)



THE TECH SHOWCASE! (ANNEXURE)

Compilation of Technology Innovations by premier research institutions of India. The details are shared in the Annexure.

Council of Scientific and Industrial Research (CSIR)

Controlled Blasting Techniques for Mining and Civil Infrastructure Projects

NEST Reports and Research Papers

NEST Division has prepared/brought out the following research papers*:

1. Block-chain application in Indian Agriculture, 2021
2. Emerging Technologies in Agriculture : Realizing the Export Potential of India's Agriculture Produce, 2022
3. National Education Policy and the Role of Emerging Technologies, 2022
4. Covid-19 saliva test and other expeditious modes of testing/treatment, 2022
5. Semiconductor, 2022
6. Brief on Smart Materials, 2022
7. Assessment of Renewable Energy Potential in Northeast India, 2022
8. Magnetomicrometry for Prosthetics Control, 2022
9. Brief on Metal-air Batteries for Energy Storage Application, 2023
10. Critical Minerals and Materials needed for Green Hydrogen Transition, 2023
11. Responsible Innovation for Synthetic and System Biology and Spheroids / Organoids / Organ-on-Chip, 2025
12. India-Australia Partnership in New, Emerging and Strategic Technologies, 2025
13. India's Critical Mineral Diplomacy in the Global South, 2025
14. Tech-Enabled Developments: India's Digital Public Infrastructure (DPI) model as a tool for South-South Cooperation, 2025
15. Global Tech Alliance, 2025
16. Technology Diplomacy in the Digital Era: Mechanisms and Strategies, 2025
17. A glossary of NEST terms has been prepared by the Division

*The Division may be reached out for more details on the reports/papers.



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For suggestions/feedback, please reach out to us on:

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The New, Emerging, and Strategic Technologies (NEST) Division, established in 2020 under the Ministry of External Affairs (MEA), focuses on technology diplomacy and the international aspects of critical, strategic and emerging technologies. It enhances India's participation in global forums, shaping technology governance and safeguarding national interests. As technology has become central to economic and geopolitical agendas, the Division coordinates with domestic and international stakeholders on advancements like Artificial Intelligence, Quantum Technology, 5G/6G, Biotechnology, Green energy, Semiconductors, and others. NEST also builds internal capacity within MEA, facilitates policy engagement, and assesses foreign policy implications. It plays a key role in shaping India's stance on global tech governance and cooperation.



New, Emerging & Strategic Technologies Division

Ministry of External Affairs

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