



Science Diplomacy Alert

A Monthly Newsletter on S&T, Science Policy and Diplomacy

Focus

India-Japan Science, Technology, and Innovation Cooperation: Past, Present and Future



India–Japan science and technology cooperation has followed a clear and consistent trajectory since the establishment of diplomatic relations in 1952. Shared national priorities, particularly India’s Viksit Bharat 2047 and Japan’s Society 5.0 provide a strong foundation for both countries to deepen collaboration through greater emphasis on co-development, co-innovation, and the practical application of advanced technologies. Sneha Sinha writes.

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SCIENCE POLICY & DIPLOMACY

International S&T Cooperation

South Africa and Germany Deepen Strategic Partnership on Critical Minerals and Clean Energy

South Africa and Germany reaffirmed their Strategic Partnership, reviewing progress under the Joint Action Plan and agreeing to deepen cooperation on critical raw materials, battery value chains, and the Just Energy Transition. The two countries also committed to expanding collaboration in vocational education, trade, investment, and green industrial development.

Indian Council of Agricultural Research and Seychelles MoU Strengthens Agricultural Cooperation

The Indian Council of Agricultural Research (ICAR) and the Agriculture Department of Seychelles signed an MoU to enhance bilateral cooperation in agricultural research, education, capacity building and technology transfer. A five-year Work Plan (2026–2031) will advance collaboration in climate-smart agriculture, horticulture, livestock development, post-harvest management, and sustainable food and nutritional security.

Serbia Becomes 69th Signatory to Artemis Accords

Serbia joined the Artemis Accords on 16 July 2026, becoming the 69th nation to commit to principles for the peaceful, sustainable and responsible exploration and use of outer space. The signing reflects growing international cooperation under the U.S.- and NASA-led framework for civil space activities.

India and Indonesia Deepen Strategic Partnership in Science, Technology and Emerging Technologies

India and Indonesia agreed to significantly expand cooperation in science, technology, innovation, space, critical and emerging technologies as part of their Comprehensive Strategic Partnership. The Joint Statement advances collaboration in AI, digital public infrastructure, cybersecurity, critical minerals, space, peaceful uses of nuclear energy, joint research, and higher education.

India and Australia Advance Technology, Innovation and Energy Security Partnership

At the 3rd India-Australia Annual Summit, the two countries launched the Partnership on Cyber, Critical Technologies and Supply Chains (PACTS) to deepen collaboration in AI, quantum technologies, semiconductors, cybersecurity, and resilient supply chains. The Summit also advanced cooperation in clean energy, critical minerals, defence innovation, and research, reinforcing technology as a key pillar of the bilateral Comprehensive Strategic Partnership.

India and Australia Partner to Protect Traditional Knowledge Through CSIR-TKDL Access Agreement

India and Australia signed an agreement granting IP Australia access to the CSIR-Traditional Knowledge Digital Library (TKDL) during the 3rd India-Australia Annual Summit. The agreement strengthens intellectual property cooperation by helping prevent the erroneous patenting of India's traditional knowledge while promoting evidence-based patent examination and safeguarding indigenous knowledge systems.

India and New Zealand Launch Roadmap 2030

The India-New Zealand Strategic Partnership: Roadmap to 2030 identifies education, research, science and technology as a key pillar of bilateral cooperation. It promotes partnerships in research, science, technology and innovation, with a focus on agriculture, climate, digital transformation and emerging technologies, alongside collaboration on clean energy and disaster management.

Emerging Tech & Governance

Electrically Controlled Magnetic Switching for Next-Generation Cryogenic Devices Demonstrated

Researchers at the Indian Institute of Science (IISc) have demonstrated a new method to switch a material between two distinct magnetic states using an electric current, enabling reversible, electrically controlled magnetic phase transitions. The breakthrough could support the development of low-power cryogenic memory and logic devices for future quantum computing applications.

New Ultra-Clean Technique for Atomically Thin Material Stacks Could Advance Quantum Computing

Researchers from the University of Southampton and the National University of Singapore have developed a cleaner and more precise method for fabricating ultra-thin 2D heterostructures by replacing polymer adhesives with the natural mineral mica (muscovite). The technique minimizes contamination, enables highly accurate stacking of atomic layers, and could accelerate the development of next-generation quantum computing, nanoelectronics, and advanced semiconductor devices.

Events & Meetings

3rd India–EU Trade and Technology Council Advances Research, Innovation and Critical Technologies

The 3rd India–EU Trade and Technology Council (TTC) reinforced cooperation in research and innovation, strategic technologies, digital connectivity, clean energy, semiconductors, AI, and resilient supply chains. Both sides agreed to strengthen the TTC framework, deepen collaboration through innovation hubs, and advance India's potential association with the Horizon Europe programme.

Third Global Conclave on Plastic Recycling and Sustainability Held in New Delhi

The 3rd Global Conclave on Plastic Recycling and Sustainability (GCPRS) brought together policymakers, industry leaders, researchers, and technology providers to advance plastic recycling and circular economy solutions. The four-day conclave showcased cutting-edge recycling technologies, promoted sustainable waste management, and emphasised global collaboration to address plastic pollution, in line with emerging international frameworks such as the UN Global Plastics Treaty.

BRICS Science Academies Forum 2026 Held at IIT Hyderabad

The BRICS Science Academies Forum 2026, held at IIT Hyderabad, focused on the theme 'Harnessing Artificial Intelligence for Sustainable Development and Strengthening Global South Cooperation.' The Forum brought together BRICS member and partner countries to deliberate on collective, collaborative and context-sensitive (3Cs) approaches to AI. The Joint Statement, reflecting the shared vision and recommendations of the participating academies, will be presented at the forthcoming BRICS Science, Technology and Innovation (STI) Ministerial Meeting in August 2026.

INDIAN SCIENCE NEWS

ARCI Scientists Achieve Breakthrough in Bi-Metallic Superalloy Manufacturing

Researchers at the International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI), Hyderabad, have developed a crack-free stainless steel-Inconel bi-metallic structure using laser-based additive manufacturing. The innovation reduces the use of costly imported superalloys while enabling high-performance components for aerospace, nuclear, thermal power, and advanced energy applications.

SASTRA Deemed University Develops Technologies to Advance Rechargeable Zinc-Air Batteries

Researchers have developed a suite of technologies, including a patented nanofluid electrolyte, low-cost bifunctional catalysts, and waste-derived electrode materials to improve the performance of electrically rechargeable zinc-air batteries. The innovations enhance battery efficiency, safety, and durability, supporting next-generation green energy storage for grid-scale applications and electric mobility.

Ultra-Sensitive Wearable Ammonia Sensor for Real-Time Toxic Gas Detection Developed

Researchers at the Centre for Nano and Soft Matter Sciences (CeNS), Bengaluru, have developed an ultra-sensitive ammonia sensor capable of detecting toxic gas at concentrations as low as 319 ppb while operating at room temperature. The technology has

been demonstrated in portable, self-powered, and wearable prototypes, offering a low-energy solution for real-time ammonia monitoring in industrial, agricultural, and environmental settings.

India Launches Its First Hydrogen-Powered Train

Indian Railways has launched India's first indigenous hydrogen fuel cell-powered train on the Jind–Sonipat section, marking a major milestone in clean rail mobility. Developed under the National Green Hydrogen Mission, the pilot project integrates indigenous hydrogen propulsion technology with dedicated refuelling infrastructure to demonstrate zero-emission rail transport.

Ultrafast Organic Anode for Next-Generation Rechargeable Batteries Developed

Researchers from the Indian Association for the Cultivation of Science (IACS) and the S. N. Bose National Centre for Basic Sciences (SNBNCBS) have developed a porous organic anode material that enables 80 per cent battery charging in just over one minute. The breakthrough could support faster, safer, and longer-lasting lithium-ion and future sodium-ion batteries for electric vehicles and portable electronics.

Skyroot's Vikram-1 Marks India's First Private Orbital Launch

Skyroot Aerospace successfully launched Vikram-1 under Mission Aagamam, becoming the first Indian private company to place payloads into orbit. The mission marks a major milestone for India's commercial space sector, demonstrating indigenous launch capabilities and reinforcing the country's growing private participation in space technology and satellite launch services.

IISc Researchers Develop Next-Generation Lightweight Aluminium Alloy for High-Temperature Applications

Researchers at the Indian Institute of Science (IISc) have developed a lightweight cast aluminium alloy with 50 per cent higher strength and 400 per cent greater ductility than conventional aluminium eutectic alloys. The alloy also retains high mechanical strength at 250°C, making it a promising material for automotive, aerospace, and energy applications.

Borophene-Based Green Lubricant to Improve Energy Efficiency

Institute of Advanced Study in Science and Technology (IASST), Guwahati, have demonstrated the first use of borophene as a high-performance lubricant additive in biodegradable castor oil. The innovation reduces friction by about 42 per cent, offering a sustainable solution to improve machine efficiency, reduce wear, and lower energy consumption across industrial applications.

ADVANCES IN S&T

MIT Engineers Develop Recyclable Elastic Yarn for a Circular Textile Economy

The Problem: Stretchable textiles are among the most difficult materials to recycle because they typically combine spandex with polyester or nylon, creating blended fibres that cannot be separated and recycled economically. As a result, the vast majority of elastic

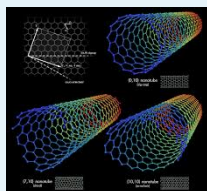
garments end up in landfills or incinerators, with millions of tonnes of textile waste generated annually. The absence of scalable textile-to-textile recycling technologies remains a major challenge for achieving a circular fashion industry.



The Method: Researchers at MIT have developed a polyethylene-based elastic yarn that delivers the strength, flexibility and durability of conventional spandex while being fully recyclable. The yarn is produced using compatible polyethylene materials for both its elastic core and protective sheath, allowing the entire fibre to be melted and re-spun without chemical separation. Laboratory tests showed that the yarn retained its mechanical performance even after 10 recycling cycles, demonstrating its potential for repeated reuse.

Future Prospects: The innovation could enable the production of fully recyclable stretchable garments, reducing dependence on mixed-fibre textiles that are difficult to process at the end of their life. The technology also has the potential to support large-scale textile-to-textile recycling, lower demand for virgin plastic materials, and advance sustainable manufacturing and circular economy practices in the global apparel industry. Beyond clothing, the recyclable material could also be used to produce plastic accessories such as buttons, buckles and fasteners, further extending its applications.

Nanotube-Nanosheet Hybrid Electrode Enhances Fast Energy Storage



The Problem: The increasing deployment of renewable energy sources such as solar and wind requires energy storage systems that can charge rapidly, deliver high power and remain stable over long periods. While batteries offer high energy density, they charge relatively slowly, whereas supercapacitors charge quickly but typically have limited energy-storage capacity. Developing materials that combine both high energy density and rapid charge-discharge performance remains a key challenge.

The Method: Researchers from National Taiwan University and National Sun Yat-sen University developed a mixed-dimensional hybrid electrode by combining two-dimensional vanadium disulfide (VS_2) nanosheets with one-dimensional porous graphitic carbon nitride ($\text{g-C}_3\text{N}_4$) nanotubes. The nanotubes create an open framework that improves ion transport and prevents nanosheet stacking, while the VS_2 nanosheets enhance charge transfer and electrochemical reactions. The resulting solid-state supercapacitor achieved high energy density and retained 90 per cent of its capacitance after 10,000 charge-discharge cycles.

Future Prospects: The hybrid electrode design provides a promising strategy for developing next-generation supercapacitors that combine fast charging, high energy storage

and long-term durability. The approach could support more efficient energy storage solutions for renewable energy integration, electric vehicles, portable electronics and other clean energy applications.

INSIGHTS & RESOURCES

NITI Aayog Releases Strategic Roadmap for Globalisation of Ayurveda

NITI Aayog has released the report outlining a phased strategy to transform Ayurveda into a scientifically validated, globally accepted healthcare system by 2047. The roadmap identifies regulatory, scientific, commercial, and institutional measures to expand Ayurveda's international footprint, strengthen evidence generation, promote quality standards, and position India as the global hub for traditional medicine.

Key Highlights

- Position Ayurveda as an integral part of healthcare systems worldwide, moving beyond its current perception as primarily a wellness product.
- Strengthen clinical research, evidence generation, and international collaborations to enhance global credibility and acceptance.
- Develop internationally harmonised quality, safety, and regulatory standards for Ayurvedic medicines and practices.
- Establish an international registry of qualified Ayurveda practitioners to improve recognition and professional mobility.
- Expand global education, training, accreditation, and capacity-building programmes for Ayurveda professionals.
- Promote high-quality manufacturing, regulatory compliance, and exports of Ayurvedic products to international markets.
- Encourage inclusion of Ayurveda within insurance systems and national healthcare frameworks to improve accessibility and acceptance.
- Position India as a global destination for evidence-based Ayurvedic treatment through integrated wellness and healthcare services.
- Launch coordinated global branding, digital outreach, and international partnerships to strengthen Ayurveda's visibility and market presence.
- The roadmap proposes short-, medium-, and long-term actions involving government, industry, academia, healthcare providers, and international stakeholders to achieve global adoption by 2047.

CSIR-NIScPR Releases Technical Report on Human-Centered AI for Sustainable Energy

CSIR-NIScPR has released the technical report, Human-Centered AI and Sustainable Development: Holistic Pathways for Energy Security, outlining a human-centred approach to

AI for strengthening energy security. The report advocates the use of AI for smart grids, renewable energy integration, predictive maintenance, and decentralised energy systems, while emphasizing ethical governance, human oversight, and Green AI for sustainable development.

NITI Aayog Releases Roadmap to Position India as a Global Bioeconomy Powerhouse

NITI Aayog has unveiled a 10-year roadmap to transform India into a leading global bioeconomy by 2035, with a target of a \$691 billion bioeconomy by 2035 and \$2.6 trillion by 2047. The roadmap proposes six National BioMissions, a ₹50,000 crore BioEconomy Growth Fund, and an AI-enabled biomanufacturing ecosystem to accelerate innovation, commercialization, and biotechnology-led economic growth.

Key Highlights:

- Position India as a leading global bioeconomy powerhouse, with the bioeconomy projected to reach US\$691 billion by 2035 and US\$2.6 trillion by 2047.
- Launch six mission-mode programmes: GeneIndia, AgriBio 2.0, BioX Foundry, One Health Grid, Marine Biotechnology, and BioPharmaNext, to drive innovation in healthcare, agriculture, industrial biotechnology, blue economy, and advanced biomanufacturing.
- Promote AI-enabled biotechnology through computational biology, biofoundries, digital twins, robotics, biosensor networks, and Design-Build-Test-Learn (DBTL) platforms.
- Strengthen high-performance biomanufacturing capabilities in biologics, biosimilars, vaccines, synthetic biology, fermentation technologies, biomaterials, and advanced therapeutics.
- Establish a dedicated fund within the existing RDI framework to support scale-up, commercialization, manufacturing infrastructure, and deep-tech biotechnology startups.
- Accelerate implementation of the BioE3 Policy by linking research, entrepreneurship, manufacturing, and market access to create globally competitive biotechnology enterprises.
- Strengthen research infrastructure, translational research, technology transfer, startup ecosystems, skilled workforce development, and industry–academia collaboration.
- Focus on biotechnology solutions for healthcare, agriculture, food systems, climate resilience, industrial biotechnology, marine resources, and sustainable manufacturing.
- Position India as a global hub for biotechnology innovation, biomanufacturing, and exports by strengthening regulatory frameworks, financing mechanisms, and international partnerships.

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