

Department of Science & Technology

Monthly Report

July, 2024

I. Important policy decisions taken and major achievements during the month:

- The Hon'ble Prime Minister of India's visited the Russian Federation on 8th July, 2024 and discussed Bilateral Cooperation and Exchange of Experiences & Knowledge in Geodesy, Cartography, Spatial Data Infrastructure and strengthen mutual relationship. A MoU was signed between Survey of India and the Federal Service for State Registration, Cadastre and Cartography (Rosreestr), of the Russian Federation.

A. Technology Development

- International Advanced Research Centre in Powder Metallurgy and New materials (ARCI) reported the following technology developments: Large scale production (1 kg/batch) of Sodium Vanadium phosphate cathode for battery application; Development of a 15W open cathode PEM fuel cell; Development of high-performance gradient index double layer broadband antireflective coatings with omni-directional transmission and broadband antireflective property; Fabrication of Low Expansion Glass Ceramic (LEGC) block was explored for new gyroscope applications at RCI, DRDO; Developed at lab-scale a self-powered photodetector based on 1D-TiO₂-3D-CdS hetero structure, fabricated at low temperature.
- Researchers at Centre for Nano and Soft matter Sciences (CeNS) have developed aqueous electrochromic batteries (ECBs). This finding reveals that Jahn–Teller distortion induced by inter layer water serves as an excellent ion host for zincion aqueous electrolyte ECBs. This innovation yields ECBs with superior optical modulation (50%) capacity (200 mAh/m²), and cyclic stability, confirmed by ex situ X-ray diffraction and Raman spectroscopy. The findings promise significant advancements in ECB applications, marking a milestone in electrochemical research.
- CeNS researchers have also developed a complementary electrochromic device (CECD) utilizing WO₃ and NiO electrodes fabricated via pneumatic spray-pyrolysis, addressing the mounting energy crisis and global warming concerns. With buildings contributing to 40% of global energy consumption, smart windows offer a sustainable solution. The optimized CECD shows exceptional visibility modulation, with the WO₃ cathode achieving 66% and 71.5% modulation at 550 nm and 700 nm, and the NiO anode achieving 51.5% and 44.5%. The 5 × 5 cm² device demonstrates stability over 400 cycles, high areal capacitance, and significant coloration efficiencies, promising scalable fabrication for energy-efficient applications.
- Scientists of Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) were motivated by the success of a previously developed passive insulin release system. In that study, insulin was encapsulated in the silk protein “fibroin” and injected under the skin, resulting in the slow diffusion of insulin over a period of five days. Building on these findings, scientists of JNCASR modified the silk protein to create a super smart system that releases insulin in response to glucose levels in the blood.

B. Science for Society

- International Advanced Research Centre in Powder Metallurgy and New materials (ARCI), Hyderabad, conducted a 2-day workshop on ‘Recent Advancements and Applications of High Temperature Materials: Processing, Manufacturing and Diagnostics (RAATEM 2024), during July 15-16, 2024.
- Indian Institute of Astrophysics (IIA) organised a public talk and hands-on experiments for school and college students on International Asteroid Day. Another public talk on two recent important announcements of international astronomy discoveries was also organised. A one-day workshop was organised at Kodaikanal on 6 July, 2024 for Vidyarthi Vigyan Manthan (VVM) a National Science Talent Search Examination for New India.
- Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) organised on 1st July 2024, "Outstanding Science Teachers Award" under the Science Outreach Program. The programme had a special lecture on “Science for All”, followed by a science experiment demonstration. A visit to the Galleries and ChemExpo was also organised. 625 participants participated in the event, including 530 students and 95 teachers of various grades from Uttarakhand, Laxmeshwar, Sagar and around Bengaluru. This programme was aimed to honour outstanding science educators and enhance the appreciation for science education in these regions.
- A group of 55 talented students who are the National Level Winners of Vidyarthi Vigyan Manthan 2023-24 visited Institute of Nano Science and Technology (INST), Mohali on 16th July, 2024 as a part of national outreach activity to popularize science among the school students of standard VI to XI with an intent of identifying “ignited minds” as per Dr. A. P. J. Kalam. The visit has provided a great opportunity to the selected students to enrich their knowledge through popular science lectures, high-end instruments visit and interactive scientific demonstration on Nano Science.
- National Academy of Sciences (NASI) conducted that a two-day lecture workshop on ‘A Holistic Approach towards National Development with S&T Interventions - Focus on Ayodhya’ on July 19-20, 2024. The programme aimed to address the current status and future projections in various frontier areas of Science and Technology (S&T) – focused on Ayodhya. The programme provided valuable insights into the current and future trends in Science and Technology but also fostered a spirit of collaboration and learning among the students, researchers, and eminent scientists.
- North East Centre for Technology Application and Reach (NECTAR) organised a 10-day training program from 2nd July to 12th July 2024, focused on the craft of bamboo bottle making. The program was designed to provide participants with both the theoretical knowledge and practical skills required to produce high-quality bamboo bottles. 10 participants participated in this programme. Also, a 7-day training program was conducted from 8th July to 16th July 2024 to equip participants with the skills and knowledge required for the carpenter trade under the FFS/Q2203 standard, as part of the Pradhan Mantri Viswakarma Yojana (PMVKY). The program is tailored to provide a blend of theoretical insights and practical hands-on experience, preparing candidates to excel in the field of carpentry. 19 participants participated in this programme.
- NECTAR successfully completed the 1st batch of the RPC (Remote Pilot Certificate) course at NECTAR Remote Pilot Training Organization (RPTO). This milestone event was

specifically designed for female candidates, providing them with a unique opportunity to gain skills and knowledge in remote piloting.

- The First National CME of the Indian Society of Transfusion Medicine (ISTM) was held in Trivandrum on 11th and 12th July 2024. This prestigious event was hosted by Sree Chitra Tirunal Institute for Medical Sciences & Technology (SCTIMST). 349 registered delegates, representing Transfusion Medicine faculty and post graduate students from across the country participated in the two-day academic extravaganza. The theme of the CME was 'Unlocking the future of Transfusion Medicine'. This CME created a platform for collaboration, knowledge exchange, and establishment of valuable connections within the ever-growing Transfusion Medicine community. The event witnessed 34 guest lectures by eminent transfusion medicine experts and 104 research presentations by the post graduate students as oral and poster presentation.
- The Asian Stroke Summer School 2024, was organized jointly by SCTIMST and the University of Bern, Switzerland from 11th to 14th July 2024 at Thiruvananthapuram. This four-day teaching course included didactic lectures and challenging case discussions. In addition, there was a neurointervention workshop in which more than seventy neurointerventionalists was given training on stroke thrombectomy using stimulators and flow models.
- Indian National Science Academy (INSA) and National Centre for Good Governance (NCGG) organised the third batch of INSA-NCGG Leadership Development Programme in Science and Technology from 08 - 14 July, 2024 at INSA, New Delhi. This programme aimed to bridge the gap between scientific community and administrative ecosystem. The programme hosted 37 participants from 14 states of India. INSA also organized the event "Science Camp on Experiential Agri Analytics: Field-to-Lab Knowledge Pathways" from 01-05 July 2024 at ICAR-CMFRI, Kochi, in which 21 students and 30 farmers participated. This provided a transformative experience fostering a profound grasp of agricultural science and fisheries through interactive learning and data analysis.
- The project closure meetings to review the progress and achievements of the projects under MES-2018 and HFC-2018 were held from July 24th to 26th, 2024, at Banaras Hindu University (BHU) in Varanasi, Uttar Pradesh.
- Second level evaluation on shortlisted proposals received against the WTI call 2023 under technology development, technology assessment and convergent solution streams, was held in CSIR-CSIO, Chandigarh from 17th - 19th July 2024.
- DST organised the second meeting of the high-level task force for paving DST's future roadmap for accelerating CCUS technologies in India on 11th July 2024 at Aryabhata Hall, ground floor, New S&T Block-1, Technology Bhawan, DST, New Delhi.
- A meeting to discuss DST's future roadmap for accelerating CCUS technologies in India, was held on 23rd July 2024.
- Group Monitoring Workshop (GMW) Meeting for Scheduled Caste Sub Plan (SCSP) and Tribal Sub Plan (TSP) was held on July 11th-13th 2024, GITAM University, Vishakhapatnam.

- Under S&T for Women programme an MoU was signed between CSIR-National Metallurgical Laboratory and National Institute of Advanced Manufacturing Technology (NIAMT), Ranchi for designing course content for a six-months certificate entrepreneurship development Train the Trainers (TTT) programme on innovative product development to create a pool of competent women trainers.
- Sethu Institute of Technology, Tamil Nadu has published a paper “An automated approach for CNN based Detection of Fetal breathing movement using LSTM architecture” in proceedings of International Conference on “Recent Trends in Information, Communication and Electrical Engineering”.
- NITT, Tamil Nadu has developed the “Thirumathikart” app to connect customers with Self-Help Groups (SHGs), empowering women with sustainable income-generation opportunities. This app is available at Thirumathikart NITT – YouTube.
- Under DST’s coordinated Programme for Arid, Semi-Arid and Cold Desert Regions (ASACODER), CSIR-Central Salt and Marine Chemicals Research Institute (CSMCRI) G. B. Marg, Bhavnagar released a technical Booklet for Small scale salt manufacturers “Improving quality of salt and value addition of bittern through scientific approach in Halvad Region”.
- People’s Science Institute (PSI) Dehradun prepared a PoP (Package of Practices) for System of Crop Intensification (SCI) for Black Gram, Green Gram, Sorghum, Pearl Millet, Okra and Sugarcane in consultation with KVK Dhanauri.
- Patent Information Centres at S&T Council of Uttarakhand facilitated the filing of 3 patents, 1 copyright and publishing of 2 patents.
- 26 new projects and 19 ongoing projects were supported under SEED Division with an expenditure of Rs. 5.28 cr and 11.54 cr.
- Ongoing and completed projects resulted in 16 publications and 6 patents were published under various programmes of SEED Division.

C. Human Capacity Building

- Under Vigyan Jyoti programme, 142 Orientation sessions, 322 Student & Parent counseling sessions, 1262 subject specific lectures, 52 career counseling sessions, 100 Role Model sessions, 13 Knowledge Partners (KP) visits, fifty-two (52) tinkering workshops, and twenty-four (24) science camps have been organized for Vigyan Jyoti Scholars.
- Knowledge Centre Ri Bhoi has celebrated ‘National Space Day’ at North Eastern Space Applications Centre (NESAC) and conducted an online quiz session on ‘Scientific Discoveries’ for Vigyan Jyoti Scholars.
- Under WISE Post-Doctoral Fellowship (WISE-PDF), Subject Expert Committees (SECs) Meetings were held on July 29-30, 2024 to evaluate proposals received under Life Sciences category. 60 women scientists presented project proposal before the Expert Committee to carry out Post-Doctoral research in different areas of Life Sciences.

- A SEC meeting was organized on 31 July 2024 to review the progress and outcomes of the ongoing projects supported under WOS-A programme.
- Under INSPIRE–MANAK Scheme, State Level Exhibition and Project Competitions were organized in Chhattisgarh, Madhya Pradesh, Manipur, Navodaya Vidyalaya Sangathan; District Level Exhibition and Project Competition were organized in Punjab for all the districts; Mentoring Workshop were organised for selected students of Maharashtra, Odisha, Karnataka, Andhra Pradesh, Tamil Nadu, Puducherry, Chhattisgarh, Madhya Pradesh, Telangana; District Nodal Officers meeting was organised in Jharkhand, Himachal Pradesh, Maharashtra, Karnataka, Kashmir; 10 Teachers workshop were organised in Haryana and Madhya Pradesh.
- Under INSPIRE Internship scheme, Science Camp was organized at (i) Shoolini University, Solan from 2-6th July, 2024 were 145 students participated; (ii) Miranda House, New Delhi from 8-12 July, 2024 were 262 students participated; and (iii) GLA University, Mathura from 16-20 July, 2024 were 147 students participated.
- Under INSPIRE Scholarship, ₹ 9,21,60,000/- was released towards Scholarships for 1266 ongoing students (Direct Mode); and ₹ 11,00,000/- was released towards Scholarships for 19 ongoing students in (Institutional Mode).
- Under INSPIRE Fellowship, ₹ 6,96,60,664/- was released towards Fellowships for 127 newly selected INSPIRE Fellows; ₹ 39,97,17,850/- was released towards Fellowships for 688 Ongoing INSPIRE Fellows; and 71 INSPIRE Fellows have been converted from JRF to SRF.
- A meeting with Amity Software Systems Limited was held on 26th July 2024 at DST to discuss the online portal issues w.r.t. different components of INSPIRE Program as well as to discuss recently closed Call for the year 2024 under IFF Component.
- IIT Delhi & Thermax Limited Pune signed an MoU on 23rd July 2024 for a Joint Venture to set up a Pilot test bed for the deployment of CCU techs to capture and convert CO₂ to methanol in a Coal gasification facility in Pune.
- Manipur State Climate Change Cell organized one-day interaction programme on 27th July, 2024 for the 5th Media Fellowship for the FY 2024-25 on climate change reporting in Manipur. 25 participants benefitted from the programme.
- Manipur State Climate Change Cell organized Awareness programme on Climate Change and Health: Vector-Borne Diseases and their Relevance to Climate Variability on 31st July 2024 and 30 participants attended this programme.

National GLP Compliance Monitoring Authority (NGCMA)/ GLP Cell

- NGCMA has signed a MoU with TIFAC (An Autonomous Institution of DST) for logistics and operational support towards GLP inspections and Capacity Building Programmes of NGCMA on July 16, 2024 for next 3 years.

- The Application Fee and Annual Certification Fee for GLP certification, payable by GLP applicant/ certified Test Facilities to Consolidated Fund of India has been increased from Rs. 30,000/- to Rs. 50,000/- w.e.f. August 1, 2024.
- MoU between Survey of India and the National Highways Authority of India (NHAI) was signed on 2nd July, 2024 for the Capacity Building Program for Development and Validation of GIS-Based Land Acquisition Plan (LAP) for NH Projects.
- MoU between Survey of India and Indian Meteorological Department was signed on 29th July 2024 for sharing of CORS Infrastructure.
- The first review meeting for the project on 'Establishing project Geospatial data exchange platform' supported under a call for proposal on "Geospatial Science Development (GSD) including Geospatial Data Science" was held on 19th July 2024 at IISc Bangalore with an aim of having a critical technical review of its activities, suggest the mid-course correction, if any and strategy for future roadmap.
- Three Geo-Innovation challenge programs of 03 days were held at Government Lohia College, Churu, Rajasthan; Department of Civil Engineering, College of Engineering Guindy, Anna University, Chennai and Sophia Girls College, Ajmer with an aim to recognize, encourage and nurture innovation for national socio-economic developmental processes among the youth of our country. During these events, talks were delivered on status of Geospatial capacity building in the Country, various initiatives of Government for strengthening the Institutional as well as individual capacity building, role of Geoinnovation Challenge for promoting and stimulating Geospatial Innovation in the country.
- GISE Hub, IIT Bombay established by NGP-DST has organised one week of Summer School Open Stack on three tracks: Water, Transportation, and Health from July 25-31, 2024 for various stakeholders.

D. Scientific Research

- Scientists at Agharkar Research Institute (ARI) have uncovered a new strain of lactic acid bacterium *Streptococcus thermophilus* MCC0200 that could be a promising candidate for broader probiotic utilization beyond the dairy industry. The study uncovered a repertoire of genes that can help acid tolerance and bile resistance, shedding light on the molecular mechanisms underpinning its survival strategy.
- Researchers from Centre for Nano and Soft Matter Sciences (CeNS), in collaboration with Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), have optimized the anodic component (NiO) of electrochromic (EC) devices to enhance their performance. NiO received less attention as past researches were mainly focused on the cathodic WO₃ component. By reducing the NiO layer to an ultrathin 50 nm using a sputtering technique, over 50% optical modulation at 550 nm and a coloration efficiency of 23.7 cm² C⁻¹ was achieved. Electrolytic studies showed superior performance with aqueous LiOH. Additionally, NiO's dual functionality was demonstrated in an ITO/aqueous LiOH/NiO/ITO structure. This work could lead to affordable, high-performance electrochromic smart windows.

- Scientists of Indian Institute of Astrophysics (IIA) reported the discovery of a barium blue straggler star (BSS) in M67, exhibiting enhancements in slow neutron-capture process elements. The first 'sighting' of the White Dwarf (WD) in this barium BSS is achieved through multi-wavelength spectral energy distribution (SED) with the crucial far-UV data from the UVIT/AstroSat. The observed enhancements are attributed to a mass transfer (MT) from a companion asymptotic giant branch star, now a WD.
- Sree Chitra Tirunal Institute of Medical Sciences (SCTIMST) carried out first successful heart transplant in the institute in a 13-year-old child under cardiology department on 22 July 2024, by combined efforts of the cardiac surgery, cardiology and other coordinating and support teams. The recipient of the heart was diagnosed with dilated cardiomyopathy and was in end stage heart failure requiring multiple and frequent hospital admissions. The donor of the heart was a school teacher who had sustained subarachnoid haemorrhage due to ruptured intracranial aneurysm.
- Scientists of Bose Institute (BI) have introduced peptide derivatives from the SARS CoV E protein for materials science applications. The viral origin provides inherent bioactivity and self-assembly propensity that could enable smart biomaterials. This will achieve multiscale hierarchy across molecular, nano, and macroscales via simple peptide sequence rearrangement, and thus provides a facile yet powerful handle for tuning self-assembled morphologies.
- In the area of quantum gravity, scientists of Bose Institute have presented a general set of generic master formulae which not only formulate the scalar potential in a compact way but allows reading of various scalar potential pieces from set of topological data of the compactifying Calabi Yau and its mirror threefold. The applicability of these formulae has been demonstrated for several models. In the area of nuclear astrophysics, scientists of BI have found that in the breakup of the radioactive nucleus ^7Be on a light target like ^{12}C , wide-angle breakup contributions are coming from direct breakup.
- Scientists of Birbal Sahni Institute of Palaeosciences (BSIP) presented a study that provides an assessment of the distribution of key Non-Timber Forest Product species present in the Western Ghats regions, Central Highlands, North-eastern India and Siwalik hills. The current study suggests that under the future climate change, the suitable habitat for *A. marmelos* and *T. bellirica* is expected to increase while for *B. lanzan*, *M. longifolia* and *P. emblica*, it is projected to decline. *A. marmelos* and *T. bellirica* are anticipated to exhibit resilience to future climate changes and are expected to be minimally affected, while *B. lanzan*, *M. longifolia* and *P. emblica* are highly sensitive to high temperature and alteration in rainfall pattern expected under future climate changes.
- Wadia Institute of Himalayan Geology (WIHG) reported the following findings: Seismic stations of Joshimath network recorded the landslide activity occurred on 09, 10 and 15 July 2024. The seismic records are very useful for monitoring the landslide activities; Barite (BaSO_4) mineralisation was found in the Tons valley section of Lesser Himalaya, associated with tectonically damaged shear zone, reflect veins and pinch-swell structure, which is predominantly hosted in the quartzite and tuffaceous rock manifests multistage deformation features; The paleoseismological studies suggest that the Darjeeling-Sikkim Himalaya is a 150 km-long independent segment bounded by a transverse ridge and fault and has a recurrence interval of ~ 949–1963 years, which is significantly larger than Nepal (~700–900 years) and Bhutan Himalaya (~339–761 years) events; A seismotectonic study of Siang

Valley, Arunachal Pradesh, reveals that the western limb of the Siang antiform exhibits a higher level of seismic activity than its eastern counterpart.

- Agharkar Research Institute (ARI) published 08 research papers, Aryabhata Research Institute of Observational Sciences (ARIES) published 06 research papers, Centre for Nano and Soft Matter Sciences (CeNS) published 06 research papers, Institute of Advanced Study in Science and Technology (IASST) published 03 research papers, Indian Institute of Astrophysics (IIA) published 08 research papers, Indian Institute of Geomagnetism (IIG) published 06 research papers, Sree Chitra Tirunal Institute of Medical Science and Technology (SCTIMST) published 19 research papers, Birbal Sahni Institute of Palaeosciences (BSIP) published 07 research papers in various scientific journals of national and international repute. SCTIMST reported that 07 Indian patent were granted and ARI reported that 01 patent was granted. Indian Academy of Sciences (IASC) reported that 104 articles were published in their 11 different journals covering all major disciplines of science and engineering. North East Centre for Technology Application and Reach (NECTAR) reported that one design registration was granted. National Innovation Foundation (NIF) reported that they facilitated in granting 07 patents.

E. National Technology Mission

National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS)

- The 5th meeting of the re-constituted Mission Governing (MGB) of NM-ICPS was held on July 4, 2024 in hybrid mode, with the following agenda items:
 - a. Presentation of Third Party Evaluation Committee (NM-ICPS) Report & recommendations of the third party evaluation committee.
 - b. Final settlement of Technology Innovation Hub (TIH) at ISI Kolkata & IIT Kharagpur and Review report of TIH at IISER Pune.
 - c. Discussion on extension of the Mission.
- An event -“India-Japan Partnership in Science & Technology: Focus on Robotics & Cobotics” - organised by Embassy of India in Japan was held on 25th July 2024 in virtual mode, for collaboration between Japanese Technical Institutions and IHFC (NM-ICPS -TIH), IIT Delhi, in the area of Robotics & Cobotics.
- Interactions were held with IIT Palakkad & IIT Bombay, at DST, for assessing the ongoing activities and discussing future course of action.

National Quantum Mission (NQM)

- The 1st Working Group Committee meeting for organising STI-Conclave was held on July 5, 2024 to discuss, formulate the strategy for successfully organizing the STI Conclave.
- The 2nd Working Group Committee meeting for organising STI-Conclave was held on July 15, 2024 to discuss, formulate the strategy for successfully organizing the STI Conclave.
- The Expert Committee meeting for evaluation of proposals received under National Quantum Mission was held during 04-05, 11-12 and 22 July 2024.

F. Scientific Infrastructure Building

- The 6th meeting of the BRICS Working Group on Research Infrastructures and Mega Science Projects was held at the NRC “Kurchatov Institute” (Moscow) and the Joint Institute for Nuclear Research (JINR) in Dubna, Moscow Region, Russia, from July 1-5, 2024. The Indian delegation from DST deliberated on the strategic plan for sharing and accessing each other's Large Research Infrastructures (LRIs) among BRICS member countries and presented updated plans for sharing access to facilities at the Inter-University Accelerator Centre, New Delhi. Additionally, the Indian team highlighted the state-of-the-art facilities established under the Sophisticated Analytical & Technical Help Institutes (SATHI) and Fund for Improvement of S&T Infrastructure in Universities and Higher Educational Institutions (FIST) schemes of the Department of Science and Technology for sharing research infrastructures among the BRICS member states.
- The research carried out at the Analytical Biology Facility at IISER Kolkata with its DST-FIST supported Isothermal Titration Calorimetry (ITC) and stopped-flow fluorimeter was featured in PIB. The story emphasizes on uncovering a new mechanism which will pave the way for new therapeutic interventions.
- Five Subject Expert Committee (SEC) Meetings in Life Sciences, Physical Sciences, Earth Sciences, Mathematical Sciences & Engineering Sciences subject areas of FIST program were organised in the month of July. 667 proposals were evaluated by the Expert Panel based on the Academic merit, Research profile, achievements, extra-mural research grants received, thrust/ focuses of future research plans, publication records, requirement of funds and expected outcomes etc.
- Review Meeting for monitoring of eleven ongoing projects supported under Mathematical Sciences Subject Area of FIST was organised at IIT Bombay on 26th July 2024. The Departments presented their technical and financial progress during the Review Meeting held on 26th July 2024 at IIT Bombay. The presentation of the departments was focused on the details of procured Equipment, Utilization of grants in various heads, usage of Equipment, Academic/Research achievements, publication records, outcomes of the project etc. and same was graded by the Committee accordingly.