

Department of Science & Technology
Monthly Report
November, 2023

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

A. Science for Society

- National Innovation Foundation (NIF) reported that two grassroots innovation-based technologies viz.: Rotavator mounted fertilizer spreader and Cage wheel with drum were tested in field conditions at innovators places in Bargarh and Sonepur districts of Odisha.
- MACS-Agharkar Research Institute (ARI) organized a hands-on workshop on "Molecular Cloning" during 21-24 November, 2023.
- Technology Information Forecasting and Assessment Council (TIFAC) presented the White Paper on Power Electronics, Machines and Drives under DST initiative 'Technologies to Overcome the Hindrances to Electric Mobility on India', on 16th November, 2023.
- Institute of Nano Science and Technology (INST) celebrated its 10th anniversary with an international conference on "Trends in Emerging Nano Science: Energy, Healthcare & Quantum Materials (TENS)" from 5-8 November, 2023.
- North East Centre for Technology Application & Reach (NECTAR) organized a 05 days training program on Bamboo Treatment and Processing, from 06-11-2023 to 10-11-2023. 20 participants ranging from university students, artisans and entrepreneurs participated in the program. Asharikandi Craft mela event was organized on 2nd November, 2023. NECTAR also reported that the successful culmination of the second phase of the Saffron Pilot Project in Arunachal Pradesh, Sikkim, and Meghalaya marks a significant milestone in agricultural innovation.
- Indian National Academy of Engineering (INAE) Youth Conclave 2023 under the aegis of SERB-INAE Innovation Hackathon was held during November 3-4, 2023 at GITAM University, Visakhapatnam. The theme of the conclave "Innovation and Technology for Global Challenges," highlighted the importance of technological advancements in addressing pressing global issues. A two-days Symposium was organized for Young Women Engineers during November 20-21, 2023 at Tezpur University, Assam. The topic of the Symposium was "Technologies for sustainable developments in North-Eastern Region". Young women engineers from engineering and technological Institutions/Universities covering all the states of North-Eastern region (NER) participated in this symposium.
- Indian Institute of Astrophysics (IIA) showcased the Hanle Dark Sky Reserve at the International Astronomical Union Symposium 386 at Addis Ababa, Ethiopia on "Dark sky and astronomical heritage in boosting astro-tourism around the globe", from 11-17 November, 2023.
- Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST) organized a 03 days National workshop on "Laboratory Accreditation & Internal Quality Audit as per ISO/IEC 17025:2017" from 8-10th November, 2023. Also, the Comprehensive Stroke Care Program of Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST), Trivandrum organized multiple events for sensitizing public, patients and care givers and healthcare workers

on the importance of stroke prevention, risk factor control, early identification of stroke and its management, secondary prevention and integration of stroke survivors back to the community.

- Aryabhata Research Institute of Observational Sciences (ARIES) organised a national conference 'Advances in Relativistic Astrophysics (AReA)' during 2-4 November, 2023 for researchers to discuss and share results on various topics of relativistic astrophysics.
- Indian National Science Academy (INSA) has reported that the event "Science for Society" was conducted by the Indian National Young Academy of Sciences (IN-YAS), on November 3, 2023. This provided a unique platform for 108 participants including students and researchers to delve into the latest scientific advancements.
- The Consultative Brainstorming Meeting was organized by DST on 28th November 2023 in New Delhi, coordinated and hosted by IIT Delhi and IIT Bombay with experts/representatives from relevant Industries, PSUs, Research groups, Academia, Government, and policymakers envisioning to further strengthen the CCUS value chain along its TRL trajectory and for ensuring the crucial last mile connectivity of Technology towards the real field and market. The brainstorming is envisioned to help boost the dialogue between relevant industry, academia, research groups, and policymakers highlight national CCUS efforts, assess national status, and explore potential public-private partnership areas.
- As part of celebration of Janjatiya Gaurav Diwas (National Tribal Day), a workshop on "Capacity building on systemic S&T intervention for development of Scheduled Tribe Communities" was organized virtually on 24th November, 2023 to sensitize stakeholders about the STI HUB concept and to motivate them for improving the livelihood system of Tribal/Scheduled Caste Communities through need-based location specific S&T interventions.

B. Technology Development

- Centre for Nano and Soft Matter Sciences (CeNS) developed energy-storing batteries that have the unique ability to change color. These batteries have practical applications in both buildings and wearable devices by indicating the remaining energy levels. Unlike most materials that change color through ion movement, these batteries exhibit stronger colors and better energy retention. This improvement is achieved through special ions that carry extra electrons, enhancing color intensity and energy storage.
- International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI) reported that the following technologies were developed: Lithium Iron Phosphate (LFP) synthesis was carried out using different Lithium precursors, and pre-heating of milled powders followed by final heating cycle; Novel heat transfer fluids with various percentage of composition mixture were prepared and tested at low temperatures for coolant applications; High entropy alloy of the composition AlCoCrFeNi is being developed as bond coat for thermal spray coating applications required in power and aerospace industries; High efficient skutterudite thermoelectric legs were fabricated; Charging of Supercapacitor with regenerative braking system for possible application in hybrid electric vehicles (e-rickshaws) was demonstrated. ARCI also reported that the Differential Scanning Calorimetry (DSC) equipment was installed and commissioned.

C. Human Capacity Building

• **Activities under Vigyan Jyoti Scheme**

(i) **VigyanJyotiConclave2023**: JNV Mahe has organised three days Conclave under Vigyan Jyoti for South region. The event was focussed on creating awareness about space research, and latest achievements of ISRO in space science among children. The conclave showcased the best competency-based learning practices in STEM and achievements of learning outcomes through various activities.

(ii) **Knowledge Centre Una** conducted a session on "Origami & Aerospace"; **Knowledge Centre Alleppey & Bankura** organized a session on "Science Quiz" on World Science Day; **Knowledge Centre Adilabad** organized a session on "NCSC Orientation & Preparing Working Model with STEM Kits"; **Knowledge Centre Sangli** conducted "Maths Inter House Quiz"; **Knowledge Centre Bhavnagar** organized a debate on the topic "Future of Space in India"; **Knowledge Centre North 24 Parganas** conducted a session on Cyber Security"; **Knowledge Centre Mahbubnagar** organized a "Quiz on Electricity".

• **Innovation in Science Pursuit for Inspired Research (INSPIRE) Scheme**

INSPIRE Awards - Million Minds Augmenting National Aspirations and Knowledge (Manak)

- Department of Science and Technology in collaboration with the **Japan Science & Technology Agency (JST)**, is implementing the **SAKURA Science High School Program**, where winners of **INSPIRE-MANAK** visit universities and research institutes in Japan, attending lectures by Japanese Nobel laureates.
- **55 students** and **6 supervisors** participated in the **SAKURA Science High School Program (SSHP) in Japan** from **5th November to 11th November, 2023**. **Professor Abhay Karandikar, Secretary, DST** interacted with the students and officially flagged off the enthusiastic group of students for this program on **November 4th, 2023**.

INSPIRE Scholarship:

- An amount of **₹29,89,40,000/-** was released towards **Scholarship** for **3612 ongoing** students (**Direct Mode**).
- An amount of **₹93,20,000/-** was released towards **Scholarship** for **200 ongoing** students in (**Institutional Mode**).

INSPIRE Fellowship:

- An amount of **₹9,44,60,582/-** was released towards **ongoing Fellowship** for **221 INSPIRE Fellows**.
- **101 INSPIRE Fellows** have been upgraded from **JRF to SRF**.

INSPIRE Faculty Fellowship:

- An amount of ₹3,35,00,000/- has been approved for the sanction of first instalment grant to 27 **INSPIRE Faculty Fellow** during this month.

D. Scientific Research

- S.N. Bose National Centre for Basic Sciences (SNBNCBS) reported that nano hybrid comprising two-dimensional (2D) materials have surfaced as potential building blocks for manipulating carrier confinement and transportation in electronic devices. In another study, using appropriate numerical and analytical techniques, it is shown that the topologically nontrivial bands present in the Bilayer kagome compounds at the Fermi energy can realize fractional Chern insulator states.
- Wadia Institute of Himalayan Geology (WIHG) reported the following research activities: Identification of the causes and consequences of the bank breaching of South Lonak Lake, a glacial lake situated in the upper reaches of Sikkim, subsequent to a cloud burst in the catchment of the Lachung River on September 3, 2023 was done; Mineral chemistry of olivine and spinel was carried out to compute the temperature of crystallization (~1200 degree Centegrade) of peridotite from Nidar Ophiolite, Ladakh; Identification of the glacier surge process in Dhauliganga valley Central Himalaya was done; Older than 500 million years zircons have been noticed in the gneissic dome of Ladakh Himalaya, this result has direct implication on the mass recycling process; The electric resistivity tomography survey was conducted and it identified the subsurface distributary channels along the periphery of Pangong Tso, eastern Ladakh Himalaya.
- Indian Institute of Astrophysics (IIA) reported an interesting connection between black hole shadow parameters and the acceleration bounds for radial linear uniformly accelerated (LUA) trajectories in static spherically symmetric black hole spacetime geometries of the Schwarzschild type. It was found that for a particular boundary data, the photon sphere radius is equal to the bound on radius of closest approach of the incoming radial LUA trajectory while the shadow radius is equal to the inverse magnitude of the acceleration bound or the LUA trajectory to turn back to infinity.
- Centre for Nano and Soft Matter Sciences (CeNS) carried out Liquid Phase Exfoliation of antimony and studied its dispersion stability. By employing the Hansen solubility sphere method, the Hansen solubility parameters of antimony are determined to be 22.53, 14.03, and 18.31 MPa^{1/2}, corresponding to the dispersion interactions, polar interactions, and hydrogen bonding interactions, respectively. CeNS also described the first investigations on the influence of flexible spacer parity of the guest photoactive liquid-crystalline dimer on the photonic bandgap (PBG) features of the cholesteric (Ch) and twist grain boundary smectic C* (TGBC*) phases of the host molecule.
- Bose Institute (BI) reported that they have developed a machine learning based prediction tool *LncRTPred* for long noncoding RNA target prediction, which can be used to predict RNA-RNA mode of interaction mediated by lncRNA. This can be used by the scientific community globally. In another study, BI demonstrated the role of Hsp20 in determining the polarity of growth during budding in

Ustilago maydis. Another significant demonstration includes a condition-specific mosaic functional behavior of thermosome (Hsp60), the key player in archaeal protein folding. BI also reported that Pilot experiments to achieve enrichment of desired genetic locus by pull down for proteome identification have been successfully performed and the gene-specific primers to validate promising lignin-related pathway genes through qRT-PCR have been designed.

- An international team led by an Aryabhata Research Institute of Observational Sciences (ARIES) scientist for the first time detected the secondary black hole in the binary system of a unique blazar 5.2 billion light years away by measuring polarized light from it.
- Birbal Sahni Institute of Palaeosciences (BSIP) reported that the fan development, sedimentation history, and depositional processes in the lower Bengal Fan have been documented. Also a site-to-site comparison of stratigraphy and channel migration since the Late Tortonian (ca. 7.5 Ma) from sedimentological and physical property records at Site U1451 of IODP Expedition 354 to 8°N in the lower Bengal Fan have been presented.
- Raman Research Institute (RRI) reported that Using data collected from the soft X-ray telescope and the Large Area X-Ray Proportional Counter (LAXPC) on board AstroSat, X-ray astronomers at RRI and collaborators have performed timing and spectral analyses of a particular Magnetar during its first detected x-ray burst. RRI also explored special features of quantum light-matter interactions inside structured wave guides due to their finite bandwidths, band edges and nontrivial topological properties.

E. International Cooperation

- **Social Innovators from India won accolades at the 4th edition of ASEAN India Grassroots Innovation Forum (AIGIF) in Malaysia:** Two grassroots innovators and one student innovator hailing from India secured accolades in the grassroots innovation and student innovation competition respectively during the 4th edition of the ASEAN India Grassroots Innovation Forum (AIGIF). This flagship program, hosted by Malaysia's Ministry of Science, Technology, and Innovation (MOSTI), concluded on November 30, 2023. Mr. Dipak Bharali, representing Sualkuchi, Kamrup, Assam, India, clinched the 1st prize in the grassroots innovation competition category for his creation, the Weft Insertion Device. Simultaneously, Mr. Sunil Shinde from Jalna, Maharashtra, earned the 3rd prize in the same category for his innovative Silkworm Breeding Net Folding Machine. In the student innovation competition, Ms. Aanchal Aggarwal from Delhi secured the 3rd prize for her inventive creation, Parkinson Lathi.
- **Brazil, Russia, India, China, and South Africa (BRICS):** On 9th November, 2023, an online meeting of the BRICS Call Secretariat took place to discuss the development of the framework for the BRICS STI Flagship Projects Call. The agenda included topics such as thematic areas, selection mechanisms, assessment formats, and related considerations. The 22nd BRICS STI Steering Committee convened online on 16th November, 2023 to deliberate on the follow-up actions pertaining to the commitments outlined in the 13th BRICS STI Ministerial Declaration, 2023.

◦ **9th Finance Committee meeting of the Indo-German Science & Technology Centre (IGSTC)**

- Head International Cooperation DST led an Indian delegation to Germany during November 20 - 24, 2023 to attend the 16th Governing Body meeting; 9th Finance Committee meeting of the Indo-German Science & Technology Centre (IGSTC), meeting with German Federal Ministry of Education & Research (BMBF) and meeting with other stakeholders for promotion of bilateral scientific cooperation.
- Head, ICD Co-chaired 16th Governing Body meeting of the IGSTC along with Head of the Division, Federal Ministry of Education and Research (BMBF), Government of Germany at Dresden on 22nd November, 2023. The GB approved launching of 2+2 project call of the IGSTC in AI for sustainability in 2024. The GB also considered and approved Audited accounts for FY 2022-23, forecast budget for 2023-24 and budget for 2024-25 apart from approving other scientific activities such as fellowships, Workshops etc.
- During the meeting with BMBF, it was agreed to explore launching of new call with BMBF in mutually identified areas like AI, Clean Energy, Advanced Materials for sensors. It was also agreed to organize next Joint S&T Committee in India in March 2024. Along with BMBF, it was also agreed to celebrate 50 years of Indo-German S&T Cooperation during 2024. First event to be organized in March 2024 and last in December with Indo-German Frontier of Engineers. It was agreed to design a logo for 50 years celebration. IGSTC to launch a design competition and finalise the logo for consideration of the two governments.
- **71st meeting of the Scientific Council of the Indo-French Centre for Promotion of Advanced Research (IFCPAR):** The 71st meeting of the Scientific Council of the Indo-French Centre for Promotion of Advanced Research (IFCPAR) was held during 27 - 30 November, 2023 at Goa. Out of over 100 new proposals received and initial screening, the SC recommended 16 proposals in the areas of Life & Health Sciences, Pure and Applied Physics; Pure and Applied Chemistry; Materials Science; Mathematics including AI & Big Data. The SC recommended 6 additional proposals as wait listed subject to availability of budget. The Council also evaluated the final review of completed projects, midterm review of ongoing projects. The SC recommended organisation of 6 workshops in India and France.
- A Field visit cum Project Monitoring Committee (PMC) meeting was held during November 8-10, 2023 at Kanpur to review the progress of a project entitled "U.S.-India Collaborative for smart distribution System with Storage (UI-ASSIST)" supported under the Indo-US Joint Clean Energy Research and Development Centre (JCERDC) program.
- International Cooperation: DST India-RCN Norway, and Clean Energy Transition Partnership (CETP) Funding Opportunities within CCUS. The CETP call for preproposals closed on 22nd November, 2023 and has mobilized 13 multilateral projects with CETP member countries and India being a partner. The preproposals have been submitted by premier academic and research organizations from India as leads (India) having tie-ups with relevant industries in India. The eligibility checks and Joint evaluation of the proposals are in progress.

- A study tour to Europe under the India-EU Clean Energy and Climate Partnership (CECP) from 20th - 24th November 2023 organized by the delegation of the European Union to India (DEUI). The study tour was focused on the issue of green hydrogen, with an emphasis on the role of green hydrogen in the (hard to abate) industry sector, including the value chain and standards, as well as on the link with offshore wind. Further, it also assesses other key aspects related to green hydrogen usage such as bulk storage, adoption of standards and certifications, application in vehicles, and blending in gas pipeline networks.

F. Publications & Patents by Research Institutes

- Institute of Advanced Study in Science & Technology (IASST) published 04 research articles, Indian Institute of Astrophysics (IIA) published 12 papers, Centre for Nano and Soft Matter Sciences (CeNS) published 05 articles, Indian Institute of Geomagnetism (IIG) published 03 papers, Birbal Sahni Institute of Palaeosciences (BSIP) published 07 research papers, Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST) published 18 research papers in refereed journals. SCTIMST reported that 04 Indian patent were granted and 03 Indian patent application was filed. International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI) reported that 02 national patents were granted. National Innovation Foundation (NIF) facilitated in granting of 08 patents. Indian Academy of Sciences (IASc) approved 99 articles for online publication in 11 different journals.

G. National Technology Mission

- A Sub-Committee of Mission Governing Board (MGB) under NM-ICPS has been formulated to assess the cases of the under performing hubs and the 1st meeting was conducted on 15th October 2023 at DST in hybrid mode.
- The Mission Office, NM-ICPS has conducted site visit at Pravartak Technologies Foundation, IIT Madras, Chennai on 7th November, 2023 to review the current progress of activities of the Hub.
- Workshop for collaborative healthcare initiatives among Technology Innovation Hubs (TIHs) held on 29th November, 2023 at IIIT Delhi Campus, New Delhi, where nine TIHs have participated and presented their ongoing medical/healthcare initiatives & way forward.

H. Scientific Infrastructure Building

- A Memorandum of Understanding (MoU) was signed on 28th November, 2023 amongst NGP Division of DST, NIGST (SOI) & TiHNavishkar (IIT Tirupathi), for establishing and operationalizing Geospatial Innovation hub/ Centre of Excellence (as a Pilot). This hub shall also become a single point contact for national and international collaborations for the Geospatial Ecosystem in India. The event chaired by Secretary, DST and was marked by the presence of Surveyor General of India, Head NIGST, Joint Secretary and

Head (NGP) amongst others from DST, NIGST and TiHNavishkar. The signing of this MoU with focus on creation of a CoE which will cater to Technology Development, Capacity Building, Creation of IPs, Job creation & support start-ups, innovators and entrepreneurs marking a pivotal milestone in the collaborative journey toward realizing the vision empowered India with Geospatial Technology.

- Inputs from user agencies towards challenges and specific problem statements faced in delivering geospatial solutions via R&D were invited based upon the inputs and various stakeholder interactions a **draft Call for Proposal is being developed from the division for inviting proposals in consortium mode on innovative Geospatial Technology and Solutions**. It is envisaged that, this call may serve not only serve as a catalyst for stimulating the development of impactful project proposals while providing vital support for successful implementation and ongoing operations via utilizing Geospatial tools etc but also discover inventive and practical ways of incorporating cutting-edge geospatial technology and capabilities, as well as maximizing the utilization of data and tools.
- A document on the **Current Status of Geospatial R&D in the Country** and possible way forward was prepared. The write-up covers the status of the R&D in major Institutions of the Country and depicts the possible gap areas in view of the requirement of National Geospatial Policy (2022) and Global scenario.
- A **concept paper was developed on Long-Term Geospatial Research and Development (R&D) strategies** as base for holding a brainstorming for not only fostering innovation and disruption in the geospatial domain, but also to enhance understanding and capabilities for planning the Long-Term Geospatial Research and Development (R&D) strategies.

R&D Support was provided for the following:

- Financial support was provided to Indian Institute of Science Education and Research, Bhopal for developing "Deep Learning Based Approach to quantify the Emergency Vehicle Accessibility in Urban Areas using LiDAR and Images".
- Financial support was provided to Indian Institute of Technology, Chennai for "Development of Coastal water quality information system (CWIS) for the coastal states of India"
- Financial support was provided to Indian Institute of Science, Bangalore for developing "Unified Geospatial Interface UGI enabled Data Exchange and Spatial Analytics Engine for Geo-spatial Data Science Applications".
- Process for release of budget for 30 recommended project proposals under Geospatial Capacity Building i.e., 21 days Summer/Winter School and 3 day Geo Innovation challenge (11 Level 1, 4 Level 1 Spatial, 8 Level 2 & 7 Geo Innovation challenge) has been initiated._
- **Support for Up-gradation Preventive Repair & Maintenance of Equipment (SUPREME)**The department has launched a novel and innovative program called SUPREME scheme, to provide financial support for annual maintenance contracts as well as repair, up-gradation, maintenance, retrofitting, or acquiring additional attachments to increase the functional capabilities/extend the lifecycle of existing analytical instrumentation facilities (AIFs) supported by DST in various institutions, laboratories, and academic institutions.

- The 2nd SUPREME meeting at the Center for Nano and Soft Matter Sciences (CeNS) in Bangalore was held for the final selection of proposals. With 91 proposals submitted in the first call, 18 were screened and invited for presentation. After careful consideration, the committee recommended six projects for financial support totaling Rs.11.30 crore over three years. The minutes are currently being processed.
- **Sophisticated Analytical & Technical Help Institutes (SATHI):** The SATHI meeting was held on November 4, 2023, at the IIT Kanpur Outreach Center in Noida, Uttar Pradesh. The recommendation of the committee to examine the proposals to identify new SATHI centres are under consideration by the Department of Science and Technology.
- **Sophisticated Analytical Instrument Facilities (SAIF) Scheme:** The Facility Management Committees (FMC) of SAIF Center conducted a meeting to review the technical (such as publications, users, samples analyzed, earnings, working conditions & downtime of the existing instruments, etc.) and financial progress of centres at SAIF- Panjab University, Chandigarh; SAIF-Shivaji University, Kolhapur; SAIF- Guwahati University, Shillong; and SAIF-North Eastern Hill University.
- MoU between Survey of India and Govt. of Puducherry, signed for large scale mapping of the Union Territory of Puducherry.
- Survey of India participated in Twelfth plenary meeting of the Regional Committee of United Nations Global Geospatial Information Management for Asia and Pacific (UNGGIM-AP) & APGF 2023 was held from 06-11-2023 to 10-11-2023 at Bali, Indonesia, attended by Shri Sunil Kumar, JS&SGI as leader of delegation and Shri Pankaj Mishra, DSG, NIGST, Survey of India.
- A delegation of officers visited Denver, USA and met delegation of United States Geological Survey (USGS) – National Geospatial Program (NGP) & National Map Services, from 13-11-2023 to 17-11-2023.
- Survey of India participated in the Digital Twin Mapping Program Launch by Genesys International Corporation Ltd. showcasing 3D Digital Twin of several Indian cities and their practical use-cases solving many governance and citizen centric problems was held at New Delhi on 22-11-2023, attended by, SGI and SoI Official.
- Expert Advisory Group (EAG) meeting for reviewing the proposals funded under Biomedical Device and Technology Development (BDTD) programme on 2nd & 3rd November, 2023 at IIT Delhi.
- EAC-WMT midterm evaluation and onsite review meeting of DST funded ongoing project during 25th to 26th November 2023 at Karunya Institute of Technology and Sciences, Coimbatore.
- Final evaluation meeting for the proposals received under open call for proposals under Technology Development Programme (TDP) under thrust area Agro-tech and Food processing on 27-28th November 2023 at Delhi.
- **Projects Supported:**
 - a. 10 new projects supported under AMT program
 - b. 1 new project supported under Therapeutics Chemicals – Rare/KSM program
 - c. 3 new projects supported under AMT program
- 2nd Meeting of the re-constituted Technical Committee on GLP was held on November 16, 2023 in DST. The committee considered 17 cases of various test facilities for GLP certification/ Re-certification/ extension in scope/ Continuation

of GLP certification, on the basis of GLP inspections conducted.

- A Brainstorming meeting to harmonize the GLP scope provided by NGCMA was organized in DST on November 16, 2023. This meeting was attended by members of Technical Committee on GLP, subject matter experts, representatives from Regulatory Authorities, GLP Inspectors and industry representatives. After detailed deliberations, the first draft of the harmonized scope of GLP certification was prepared which would be placed on the public portal for stakeholders comments.
