

## Department of Science & Technology

### Monthly Report

February, 2024

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

##### **A. National Science Day-2024**

- The National Science Day is celebrated every year on 28<sup>th</sup> February, to commemorate the discovery of 'Raman effect'. The theme of National Science Day (NSD) 2024 "Indigenous Technologies for Viksit Bharat" was released by Dr Jitendra Singh, Hon'ble Minister of S&T on 6th February 2024 at National Media Centre, New Delhi. 22 State S&T Councils participated in NSD celebrations, which reached out to 13,29,275 students, teachers and general public through multiple activities funded by DST.
- The main function of NSD 2024 was organized on 28<sup>th</sup> February, at Vigyan Bhawan, New Delhi by DST. The Chief Guest of day was Dr. Jitendra Singh, Hon'ble Minister of Science and Technology. The function was attended by Scientific Secretaries, distinguished guests, scientists, technocrats, policymakers, students from schools and colleges, research scholars, and stakeholders from various states in hybrid mode. This year the event went beyond boundaries and was attended by the officials from Embassy of India in Japan, Indian students and researchers in Japan.
- The Hon'ble Minister of Science and Technology launched a film highlighting the remarkable achievements of the Department of Science and Technology (DST) over the past decade, "Vigyan ki Aawaz," a podcast series showcasing Indian scientists and their ground breaking accomplishments from various autonomous institutes of DST. He also unveiled a compendium of projects from the Initiative for Research and Innovation in Science (IRIS), providing insights of annual IRIS program, recently concluded IRIS National Fair, and abstracts of the top 20 selected projects. Hon'ble Minister also felicitated three SATHI Centers, namely, Institute of Chemical Technology (ICT), Mumbai; Indian Institute of Technology (IIT), Hyderabad; and Birla Institute of Technology and Science, Pilani. A White Paper titled "Evolution: Catalysing Technology-Led Ecosystem for Bharat e-Mobility," shedding light on the evolution of technology in fostering a sustainable e-mobility ecosystem for India was also released during the function.
- A lecture was delivered by Prof. Bhaskar Ramamurthi, IIT-Madras on Telecom technologies for making India a developed nation @ 2047 and Prof. Urvashi Sinha, Raman Research Institute, Bangalore presented her thoughts on Quantum technologies for Viksit Bharat@2047. In addition, two panel discussions on topics: 'Bridging the Knowledge Gap: Effective Science Communication for Viksit Bharat by 2047' and 'Strengthening Research and Developing Indigenous Technologies for Viksit Bharat by 2047' featuring eminent science communicators were also organized.

## **B. Science for Society**

- Indian Institute of Astrophysics (IIA) organised a night sky watching program to see Jupiter through their telescopes, on 09 February, 2024 and around 600 people attended this program. IIA also organized an Astronomy Olympiad Exposure Camp jointly with TIFR.
- Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST) organized ‘SCTIMST Open Day 2024’ on 23rd February, 2024. The Biomedical Technology Wing was thrown open to students, researchers, health practitioners, the medical device industry and public on this day (around 1000 participated), so that they can get exposure to the wonderful world of medical device development and public health related activities.
- Institute of Advanced Study in Science and Technology (IASST) organized a transformative event comprising a Continuous Medical Education (CME) session and a two-day international symposium titled “SnakeSymp-2024” during 08 – 10 February, 2024. The primary objective was to provide a collaborative platform addressing the multifaceted challenges of managing snakebite incidents, particularly in the North Eastern region.
- Indian Institute of Geomagnetism (IIG) organized “IMPRESS” programme for post-graduate students from universities, to attract, motivate and train young talent to undertake research in geomagnetism and allied fields at IIG Panvel campus during February 12-15, 2024 and 80 students participated in this program from 35 different National Universities.
- North East Centre for Technology Application and Reach (NECTAR) conducted a comprehensive five-day training program on 'Drone Manufacturing and Assembly Technician' in association with the National Skill Development Corporation (NSDC) during 19-23 February, 2024. The participants explored drone technology intricacies, covering components, assembly, troubleshooting, and quality assurance. Hands-on sessions and theoretical instruction ensured holistic learning for real-world challenges.
- Bose Institute (BI) conducted three days of Non-Communicable Disease Screening Camp for tribal communities at Mirual, Khadimpur, and Chota Parua Health Wellness Centre at North Dinajpur, West Bengal from 19-22 February, 2024 jointly with Raiganj University.
- National Innovation Foundation (NIF) organized an Innovation Exhibition at Regional Science Centre, NCSM, Ministry of Culture at Guwahati during 22-23 February, 2024 where more than twenty innovators participated from different North Eastern states.
- The Inter Academy Panel (IAP) on Women in STEMM (Science, Technology, Engineering, Mathematics & Medicine) constituted by Indian National Science Academy (INSA), National Academy of Sciences (NASI) and Indian Academy of Sciences (IASc), has taken an initiative for developing a ‘SWATI’ (Science for Women-A Technology & Innovation) Portal. This portal was launched on 11th February, 2024 on International Day of Women and Girls in Science, with a view to focus on the role of Science for Women as well as emerging opportunities and inclusiveness of women in S&T endeavors. INSA also organized a 7-day workshop on ‘Multidisciplinary Approaches on Recent Trends and Emerging Opportunities in Career Growth’. It focused on building a cohesive relationship between academics, the relevant industry, and government institutes.

- Indian Science Congress Association (ISCA) Coimbatore chapter organized a computer literacy programme for school children and a digital literacy programme for rural areas on 16th February 2024.
- Two Projects supported by DST under the Smart Grids Programme have been showcased at ACREX India 2024 during February 15-17, 2024 at the India Expo Mart Ltd., Greater Noida, New Delhi, which is an annual event organized by Indian Society of Heating, Refrigerating and Air Conditioning Engineers (ISHRAE). The objective was to identify suitable industrial partners who can scale up the technologies developed under this programme.
- A project briefing meeting of “Technology Acceleration Platform for Rural Innovation and Social Entrepreneurship (TAP-RISE)” organized by Society of Development Alternatives, New Delhi and Vigyan Ashram, Pune with DST supported organizations was conducted on 22<sup>nd</sup> February 2024 to discuss the importance of the platform and gathering the requirements regarding project output issues being faced by Principle Investigators.
- A brain storming consultation on “Review of National Awards for Women’s Development through Application of Science & Technology” under Science & Technology for Women (STW) programme of DST was conducted with awardees, technical experts from academia & labs and PAC members on 15th Feb. 2024 at Development Alternatives, New Delhi and 20th Feb. 2024 at BAIF Development Research Foundation, Pune.

### **C. Technology Development**

- Researchers of Centre for Nano and Soft Matter Sciences (CeNS) and Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) together have devised anode materials for advanced sodium-ion batteries (SIBs), which require major improvements with regard to their cycling stability, a crucial parameter for long-term battery operation.  $3\text{RNbS}_2$ , synthesized by a simple solid-state annealing route was used as an anode for SIBs with remarkable cycling stability for 2500 cycles at  $0.5 \text{ A g}^{-1}$ . The stable nature of the  $\text{NbS}_2$  anode was attributed to its dominant capacitive behavior.
- International Advanced Research Centre Powder Metallurgy and New Materials (ARCI) reported the following activities: 10 piston rings were supplied for real-time testing under a CARS-DRDO project. 23 kg of AM grade Fe-Mn-Si-Cu powders was supplied to the research partner WIPRO 3D Bengaluru under an IGSTC project;  $\text{SnO}_2$  electron transport layers prepared from precursor, were deposited by bar coating compatible for large area (100mm x 100mm) uniform film suitable for perovskite solar module development under a TRC project.

### **D. Human Capacity Building**

- A brainstorming meeting under the Chairpersonship of Secretary, DST was organized on “**Key Challenges of Women Researchers and Faculties in STEM and Solutions**” to discuss existing challenges in the S&T career path of women. Experts from various institutions from all over the country have participated in this meeting and deliberated on

challenges faced by women scientists at recruitment level, career progression, leadership and recognition.

- Under Vigyan Jyoti Scheme, various activities such as orientation sessions, career counselling sessions, role model interaction, tinkering activities, science camps and special classes were held.
- A one-month Orientation program was organized for Women Scientists selected under the 1<sup>st</sup> batch of WISE Internship in IPR (WISE-IPR). During the month, experts from different domains of Intellectual Property Rights have given lectures to provide theoretical knowledge about IPRs. In the valedictory session, the Secretary, DST delivered a talk and motivated women scientists for career pursuit in this domain.
- INSPIRE Scholarship, of an amount of ₹39,41,40,000/- was released towards Scholarship for 5195 ongoing students (Direct Mode), ₹2,72,85,375/- was released towards Scholarship for 471 ongoing students in (Institutional Mode) and ₹29,76,000/- was released towards KVPY Fellowship for 30 ongoing students.
- INSPIRE Fellowship, ₹2,80,27,336/- was released towards ongoing Fellowship for 82 INSPIRE Fellows, ₹16,07,58,240/- was released towards fresh Fellowship for 291 INSPIRE Fellows.
- Under INSPIRE Faculty Fellowship component, performance of 44 Faculty Fellows were reviewed for the subject areas of Mathematical Sciences and Chemical Sciences and 58 Faculty Fellows' performance were reviewed for the subject areas of Physical Sciences and Engineering Sciences. Research and Fellowship grant of Rs. 4.05 crore was sanctioned and released to 29 ongoing IFF beneficiaries.
- DST-Center of Excellence on Water Resources, Cryosphere and Climate Change Studies established" at the Department of Geology, Sikkim University organized the 4th "Advanced Training Program on Water Resource Management, Glacier Monitoring & Climate Change Studies from 15th February to 1st March 2024. This capacity-building program was intended to provide advanced training to young academician researchers and scientists working in areas of water resource management, cryosphere, and climate change studies. Around 35 participants enrolled for the training program.
- The Technology Information, Forecasting & Assessment Council (TIFAC), organized an In-house workshop on MCDA & Technology Prioritization and Technology Prioritization under the project on Technology Need Assessment supported under the National Mission of Strategic Knowledge on Climate Change (NMSKCC).
- DST-Center of Excellence on Climate Change supported under the National Mission for Sustaining Himalayan Ecosystem (NMSHE) at the Department of Environmental Science, Tezpur University organized a 5-day training program on "From Data to Decisions: Ecological Modelling for Assessment of Biodiversity" from 19th-23rd Feb 2024. The training program was designed for early career faculties and research scholars in the fields of environmental science, biological, and applied science where the aim was to equip participants with a strong foundation in ecological modelling techniques with a focus on skills in data analysis and interpretation.

- A Brainstorming Session was organized on 26th February 2024 at New Delhi, to contemplate upon the way forward to strengthen Survey of India(SoI) and delineate the role of SoI in Ecosystem to be created and mandated by the National Geospatial Policy-2022. SoI Officials of various levels participated in Session.
- Surveyor General of India delivered a Special Address in the Inaugural Session of “India Geospatial Leadership Summit 2024” on the theme: “Geospatial Technologies Accelerating National Development” on 20th February 2024 at New Delhi.

## **E. Scientific Research**

- Electrochemical urea oxidation reaction (UOR) is an efficient way to produce cost-effective hydrogen from urea-based wastes. A study led by scientists of Centre for Nano and Soft Matter Sciences (CeNS) showed that a chemical modification involving partial oxidation of the spent catalyst consisting of Ni@CNT, generated from industrial methane decomposition plants, is found to augment sustained UOR activity for a prolonged time in extensive alkaline conditions. In another study CeNS reported that, Lead halide perovskite (LHP) nanocrystals (NCs) are promising for optoelectronic devices due to their adjustable band gap through anion exchanges. However, rapid anion migrations at layer interfaces hinder well-defined interfaces. Researchers of CeNS introduced an ultrathin alumina layer via atomic layer deposition (ALD) at the interface of CsPbBr<sub>3</sub>/CsPbI<sub>3</sub> NC films. It temporally restrains anion migration, with the rate decreasing as alumina thickness increases. In a different study, researchers of CeNS demonstrated a protocol employing surfactant-assisted exfoliation and centrifugation-based size selection of nanosheets for synthesizing heterostructures through electrostatic self-assembly.
- In a study related to the quantum theory of gravity, researchers of Bose Institute (BI) have estimated the effects of higher derivative corrections to LVS inflationary cosmological models to test their robustness. In another study, BI scientists working on the sequential and direct breakup nuclear reactions of the radioactive nucleus <sup>7</sup>Be on a light target like <sup>12</sup>C, have reported interesting results corresponding to high relative energy of the breakup fragments. BI also reported successful demonstration of enrichment of the GM2-synthase target locus using enChIP assay for eventual analysis of the proteome associated with the GM2-synthase Transcription Start Site (TSS). It is expected that successful identification of the proteome associated with the TSS of GM2-synthase could identify novel players and identify potential targets for reversing GM2-synthase over-expression in cancer.
- Faculties of Indian Association for the Cultivation of Science (IACS) explored a promising strategy for developing cancer treatments by targeting specific four-stranded DNA structures within the cell called G-quadruplexes (G4s). These G4s play important roles in cellular processes, making them potential targets for therapeutic intervention in diseases like cancer. In this study, a group of potential therapeutic drugs containing aromatic carbazole and dibenzofuran structures were developed to stabilize G4s and disrupt the expression of proteins which are critical in cancer cell function and maintenance. A carbazole derivative, MC-4 was identified that interacts with the c-KIT G4 and influences cellular processes by causing cell cycle arrest, DNA damage, and programmed cell death in leukemia cells with high c-KIT activity. Findings of the study suggest that MC-4 has potential as a targeted

cancer therapy drug by specifically binding and stabilizing the c-KIT G-quadruplex leading to the death of only cancer cells without affecting the healthy cells of the body.

- S. N. Bose National Centre for Basic Sciences (SNBNCBS) reported that the Glycated haemoglobin (GHb), found in mammals undergoes irreversible damage when exposed to external redox agents, which is much more vulnerable than its normal counterpart haemoglobin (Hb). Besides the oxygen regulation throughout the body, Hb plays a vital role in balancing immunological health and the redox cycle. SNBNCBS has shown that a well-known mutagen Ethidium Bromide (EtBr) reduces GHb in femto second time scale (efficiently) upon photoexcitation after efficient recognition in the biomolecule.
- Indian Institute of Astrophysics (IIA) reported in a study that the Crab Nebula is an astrophysical system that exhibits complex morphological patterns at different observing frequencies. A systematic investigation of the structural complexity of the nebula using publicly available imaging data at radio frequency was carried out using the well-known multifractal detrended fluctuation analysis in two dimensions. It is found that the radio data exhibit long-range correlations, as expected from the underlying physics of the supernova explosion and evolution.
- A study led by scientists of Aryabhata Research Institute of Observational Sciences (ARIES) showed that the influence of fossil fuel combustion on air pollution in the Himalayas extends throughout the year with greater impact on warming than biomass burning.
- Wadia Institute of Himalayan Geology (WIHG) reported the following research activities: Seven peri-glacial lakes near Pensilungpa pass and two proglacial lakes near the front of Durung-Drung Glacier (DDG) were studied. Peri-glacial lake dimensions showed a marginal rise of about 6.5% in surface area and around 7% in water volume, highlighting their dependence on non-glacial water sources; Meteorological data analysis and its relation with melt dynamics of Dokriani and Chorabari glaciers, Bhagirathi Basin were carried out; Stability analysis for foundation design of Ropeway project in Uttarakhand was done; The zircon and apatite fission track low-temperature thermochronological analyses have been carried out along the axis of the Tso Moriri Crystalline (TMC) dome to examine the shallow crustal exhumation history of the TMC; The shallow and deep subsurface structure beneath the Chandigarh-Ambala region was imaged.
- National Innovation Foundation (NIF) examined a poultry supplement for its usefulness in feed conversion ratio (FCR) that had demonstrated efficacy at par with commercial supplement. Also, three herbal medications were found to minimize elevated level of creatine kinase and pyrexia due to ephemeral fever among dairy animals. Three innovations viz. Paddy thresher cum winnower, Manual weeder and Jute seed dibbler were tested in field conditions.
- Agharkar Research Institute (ARI) published 11 research papers, Aryabhata Research Institute of Observational Sciences (ARIES) published 08 research papers, Birbal Sahni Institute of Palaeosciences (BSIP) published 06 research papers, Centre for Nano and Soft Matter Sciences (CeNS) published 07 research papers, Institute of Advanced Study in Science and Technology (IASST) published 01 research papers, Indian Institute of Astrophysics (IIA) published 08 research papers, Sree Chitra Tirunal Institute for Medical Science and Technology (SCTIMST) published 12 research papers in refereed journals. 02

Indian patents of CeNS, 11 Indian patent of SCTIMST and 01 Indian patent of International Advanced Research Centre Powder Metallurgy and New Materials (ARCI) were granted. Indian Academy of Sciences (IASc) reported that 113 articles were published in their 11 different journals. Indian National Science Academy (INSA) published the March 2024 issue of Indian Journal of Pure and Applied Mathematics (IJPAM). National Innovation Foundation (NIF) facilitated in granting 28 patents and Technology Information Forecasting and Assessment Council (TIFAC) facilitated in granting 02 patents.

## **F. International Cooperation**

- Two Consortia pre-proposals were shortlisted under Multilateral Clean Energy Transition Partnership (CETP) call module for RD&D on CCUS. 45 National projects with Mission innovation partnership were shortlisted under FOA 2023 for CCUS RD&D.
- A 9th National Scientific Advisory Committee meeting was held online on February 01, 2024 to review the progress of the projects supported under India-EU joint call on Integrated Local Energy Systems.
- A Field visit cum Project Monitoring Committee (PMC) meeting was held during February 10-13, 2024 at New Delhi to review the progress of 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.

## **G. National Technology Mission**

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

- The 4th meeting of the re-constituted Mission Governing Board (MGB) of NM-ICPS held on February 12 and 22, 2024 through virtual mode, to discuss following points:
  - Detailed proposal on Bharat-GPT
  - Closing of activities of the Hubs at IIT, Kharagpur and ISI Kolkata & Strengthening AI activities in the existing Hubs in the areas of LLM and AI in Natural Sciences
  - Consolidating the activities in Quantum technologies
  - Mission extension & Setting-up of Technology Translation Research Parks (TTRPs)
- The Mission Office, NM-ICPS, has conducted site visit to Divyasampark I-Hub Device Material & Technology, IIT Roorkee on 2nd Feb 2024, to review the current progress of activities.

### **National Quantum Mission (NQM)**

- A Brainstorming meeting was organized on 20th February 2024 at New Delhi, to create awareness among researchers about the Call for Pre-Proposals. The meeting was attended by nearly 700 stakeholders (both offline and online).

## **H. Scientific Infrastructure Building**

- A preparatory review meeting relating to the Second Geospatial Data Promotion & Development Committee meeting (GDPDC) as envisaged in the National Geospatial Policy, 2022 was held on 1<sup>st</sup> Feb, 2024 under the Chairmanship of Secretary-DST. Discussion on possible activities towards, Development of Geospatial Data infrastructure, Technology Infrastructure, establishment of Geospatial Hub and creation of Industry Board were carried out. On 9<sup>th</sup> Feb, 2024, second meeting of GDPDC was also held to discuss the various activities crucial for implementation of the National Geospatial Policy.
- 4th Half Yearly meeting of the Empowered Arctic Policy Group (EAPG) was held to discuss the various issues including ways to increase Country's participation in Arctic related activities, enhance engagement with Arctic Economic Council (AEC) and encourage relevant autonomous Institutions to not only become members but also showcase their best practices etc.
- A meeting under the Chairmanship of Secretary, DST to discuss various ways to devise an appropriate mechanism for 'Registration and Certification of Surveyors in Geospatial sector of India', as mandated by the National Geospatial Policy, 2022 was held on 8<sup>th</sup> Feb, 2024, where senior officers from Department of Science and Technology, Survey of India (SOI), Ministry of Mines (MoM) and Geological Survey of India (GSI) participated.
- A meeting was held on 19<sup>th</sup> February, 2024 to discuss a collaborative, synergized & coordinated effort to be made by all stakeholders for standardization of Geospatial education curriculum and its integration with the innovation system of the Country. Representatives of UGC, NCERT, CBSE, DoPT, SOI, NATMO, NCG-Kanpur, DTU-New Delhi etc attended the meeting. The issues relating to Granting Capacity Building Programs of the National Geospatial Programme the equivalence of UGC Refresher Course; Inclusion of the existing Geospatial related subjects in NET examination; Inclusion of Geospatial/Geoinformatics in the list of emerging subjects and feasibility of integrating iGet portal initiated by DST to develop capacity and enhance training in geospatial science and technologies in India, with iGOT portal was explored for wider proliferation of its contents having tutorials on GST.
- A meeting with team members of Vidhi Centre for Legal Policy was held under the Chairmanship of AS (Geospatial) to discuss possible aspect of key legal issues related to creating a geospatial Data Sharing platform.
- Virtual monthly meeting of DST and UGI-X team at FSID, IISc, Bengaluru was held on 28<sup>th</sup> Feb, 2024 were representatives of Survey of India and Ministry of Panchayati Raj also participated. The key points of discussions were the progress of the project and deliberations on getting relevant data from Svamitva and mechanisms of hosting "open" vs. "closed" access data.
- Varahamihira Centre for Excellence in Climate Change at the University of Allahabad was inaugurated under NMSKCC on 25-26 Feb 2024.
- **Fund for Improvement of S&T Infrastructure in Universities and Higher Educational Institutions (FIST)**
  - a. India's first Hypervelocity Expansion Tunnel Test Facility was successfully established and tested by Indian Institute of Technology, Kanpur (IITK). The development of the

facility was supported by FIST Program of the Department of Science & Technology (DST) with Rs 4.5 Crores in 2018. This is a major achievement that puts India amongst a handful of countries with this advanced hypersonic testing capability.

- b. The FIST-Life Science Subject Experts Committee midterm review meeting was held on 9<sup>th</sup> & 10<sup>th</sup> February, 2024. During the meeting a total of 52 number of ongoing and completed projects' progress were evaluated.

- **Promotion of University Research and Scientific Excellence (PURSE)**

- a. University of Calicut, Kerala has organized a national seminar series titled "Frontiers in Chemical Sciences" from 13-15 Feb 2024, supported by PURSE program.
- b. A workshop titled "Exploring Opportunities to Enhance Research and Development in Academic Institutions of Arunachal Pradesh" was held on February 23, 2024 at Rajiv Gandhi University, bolstered by the PURSE program as part of Scientific Social Responsibility (SSR) initiatives.
- c. One Day Congregation on "Staring the startups" was organized on 17th February 2024 by Dibrugarh University which is supported under PURSE program.
- d. On February 17<sup>th</sup> and 18<sup>th</sup>, 2024, IIIT Hyderabad hosted a Workshop on Circuits and Sensing Techniques for Healthcare Applications, backed by the PURSE program.

- **Sophisticated Analytical Instruments Facility (SAIF):** SAIF Centre at IIT Bombay organized a one-day Workshop on Electron Spin Resonance Spectroscopy and its Applications on 22nd Feb 2024. This workshop was attended by large numbers of students, researchers and technical staff of various organizations.
- A final defense expert panel meeting was held from 08<sup>th</sup> to 09<sup>th</sup> February 2024 to evaluate the selected DPRs against the DST call on the Hydrogen Valley Innovation Cluster (HVIC) at the Department of Science and Technology (DST), New Delhi.
- A Field Monitoring Committee meeting was held on February 23-24, 2024 at Ghoramara Island, West Bengal to review the progress to review the project entitled: Renewable Energy EMPOWERING European and Indian communities (RE-EMPOWERED).
- A test bed for deploying CCU in an Industrial unit for converting CO<sub>2</sub> to Dimethyl Ether has been supported.