

Department of Science & Technology
Monthly Report
December, 2023

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

A. Science for Society

- The Hon'ble Minister of State (Independent Charge), Ministry of Science and Technology inaugurated Nano Anusandhan Bhawan at Institute of Nano Science (INST), Mohali, India's very first institute dedicated to the study of Nano Science.
- Aryabhata Research Institute of Observational Sciences (ARIES) in association with National Institute of Technology (NIT), Delhi organised a Winter School on Concepts in Solar Physics-2023 for researchers, young PhD's and motivated final year M.Sc students on various topics of solar physics and data analysis techniques/tools.
- The National Mathematics Day (December 22) was celebrated all over the country. DST in association with State S&T Councils, organized nationwide activities such as mathematics quiz competitions, exhibitions, hands on workshops, awareness creation programmes, through schools, colleges, universities, R&D laboratories, S&T based NGOs, academic institutions etc.
- Birbal Sahni Institute of Palaeosciences (BSIP) conducted an exposure visit programme for CBSE school principals. BSIP also showcased good scientific practices and unique fossil collection in Bhartiya Vigyan Sammelan 2023, during 21-24 December, 2023 in Ahmadabad, Gujarat.
- At Global Bio-India Exhibition held in New Delhi, the Institute of Advanced Study in Science and Technology (IASST) showcased cutting-edge biotechnology-based innovations and bio products that have transformed Northeast India's bio-economy scene.
- International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI) hosted Materials Characterization Workshop Series using Powder X-ray Diffraction during December 04- 05, 2023.
- Institute of Nano Science and Technology (INST) organized a National conference on "Crystals for Quantum Technology" on thin films and crystals essential to the field of Quantum Technology. Indian Association for the Cultivation of Science (IACS) conducted public lecture on Quantum entanglement in nature: Super Conductors and black holes, on 22.12.2023.
- Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR) organised Annual International Winter School "Frontiers in Materials Science" and Recent Advances in Materials (RAM-90) Conferences on latest research in the area of materials science, including quantum entanglement to oxides, semiconductors etc.

- National Academy of Sciences (NASI) organized its 93^d Annual Session jointly with the Bhabha Atomic Research Centre (BARC), Mumbai and a symposium on “India Secure @75” during December 03-05, 2023 with an endeavor to celebrate and support ‘*AtmaNirbhar Bharat*’. Eminent scientists addressed different session of the programme on topics of national relevance such as agriculture & food security, drug-pharmacy and bio-application, forest, climate & environment, energy, electronics & cyber security, space, and medical health.
- North East Centre for Technology Application and Reach (NECTAR) conducted a comprehensive training program focusing on disaster response and emergency measures. NECTAR also organized a training session aimed to enhance participants' proficiency in ArcGIS Pro, providing valuable insights and skills for effective utilization of this geospatial technology.
- NECTAR organized an exclusive placement drive on 6th and 7th December 2023, for the students of North East in collaboration with Garuda UAV, a leading organization in the field of Unmanned Aerial Vehicles (UAVs). NECTAR also organized a comprehensive one-month training program for students of North East, imparting essential skills and knowledge in the creation and utilization of bamboo-based utility products.
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- S.N. Bose National Centre for Basic Sciences (SNBNCBS), in collaboration with various educational institutes, organized an International Conference series STATPHYS-Kolkata, focusing on the broad area of Statistical Physics and providing a platform to exchange and share ideas.
- Technology Information Forecasting and Assessment Council (TIFAC) participated in the BRICS Science, Technology and Innovation Policy and Foresight Symposium at Pretoria, South Africa during 4th-5th December, 2023.
- Wadia Institute of Himalayan Geology (WIHG) and Indian Institute of Astrophysics (IIA) organized outreach programmes for Indian International Science Festival (IISF) - 2023 for students.
- Indian National Academy of Engineering (INAE) organized its Annual Convention 2023 on December 9-11, 2023 which was attended by national and international fellows, young associates and invitees.

B. Technology Development

- The 54th meeting of Empowered Technology Group (ETG) under the chairmanship of Principal Scientific Adviser to Government of India was held on 29th December to discuss an ETG proposal on draft Cabinet Note on continuation of DST's Unified Umbrella scheme "Vigyan Dhara". DST presented the proposal to the committee. ETG recommended continuation of the scheme.

- International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI) reported that thermal Barrier Coatings were successfully deposited on Single Crystal HP turbine blades of HAL-AERDC, Bangalore using EBPVD coating system and delivered for further evaluation.
- Indian Institute of Astrophysics (IIA) designed a Solar radio Spectro-polarimeter to measure magnetic field strengths in the solar corona using Zeeman effect. Another study by IIA indicates that the near-sun rotation of the filament during its eruption to the CME is the key to the negative Bz-component and consequently the intense geomagnetic storm. Identification of the geomagnetic source regions is very important to understand the characteristics of the magnetic structure responsible for the CME eruption and its evolution in the sun-earth line.
- S.N. Bose National Centre for Basic Sciences (SNBNCBS) investigated the magnon-magnon coupling in Ni80 Fe20 nano-cross arrays, with a focus on controlling the anti-crossing phenomenon. The findings open avenues for efficient magnon-based technologies and systems enabling efficient control of spin-wave propagation characteristics and coupling, with implications for efficient quantum information processing architectures. SNBNCBS also reported that the strange Photo induced micro actuation (PIMA) properties associated with Cu doped Co-Ni-Al Ferromagnetic Shape Memory Alloys (FSMA) has showed enhancement of mechanical properties. This enhancement and optimized PIMA properties have opened a scope of various laser-controlled real engineering applications.

C. Human Capacity Building

- Under Vigyan Jyoti Scheme, career counselling sessions, role model interactions, tinkering workshops and visits to knowledge partners were organized for students of various Jawahar Navodaya Vidyalayas.
- **Innovation in Science Pursuit for Inspired Research (INSPIRE) Scheme**
- Under INSPIRE Awards - Million Minds Augmenting National Aspirations and Knowledge (Manak) programme, district level exhibitions, workshops and project competitions were organized in the States of Himachal Pradesh, Bihar, Jharkhand and UTs of Jammu & Kashmir and Laddakh.
- Under the INSPIRE Scholarship & Fellowship Programme, Rs. 49.31 crore was released as scholarship to 6942 students and Rs. 7.32 crore was released as fellowship for 172 INSPIRE fellows.
- A workshop on GLP was organized for the students and researchers during 53rd Annual Conference of Indian Pharmacological Society-2023 (IPSCON-2023).

D. Scientific Research

- DST participated in the 13th National Higher Education Summit 2023 on 13th December 2023 on the theme " Leveraging Industry-Academia Partnership for

Social Development" and was part of a special session on "Leveraging the National Research Foundation for addressing future technological challenges".

- Bose Institute made significant progress on a fundamental question in quantum gravity. The four-dimensional non-geometric scalar potential in the presence of the generalized U-dual fluxes by considering an explicit type IIB toroidal compactification model based on an orientifold of $T6/(Z2 \times Z2)$ orbifold is studied. It is observed that the flux superpotential induces a huge scalar potential having a total of 76276 terms involving 128 flux parameters and 14 real scalars. In another study, the institute has further identified a few potent chemicals, of which *Epigallocatechin gallate* (EGCG) from green tea is the most promising.
- Bose Institute also continued working on cancer cell-specific CRISPR- based gene-editing and transcriptional regulation to reduce on-target *genotoxicity* in gene-therapy. A method for targeted genome engineering has been developed. A method for small molecule presentation on CRISPR- enzyme was also developed.
- Birbal Sahni Institute of Palaeosciences (BSIP) reported that a study from Vardnagar, Gujrat presents an archaeological and botanical record spanning the last two millennia in northwest India. The temporal scale of these data is unprecedented for the region and provides insight into the ways that variation in agricultural practices allowed responses to Late Holocene climate changes. These long-term data allow insight into resilient responses in food production to meet the challenges of projected future climate change.
- Indian Association for the Cultivation of Science (IACS) studied the phenomenon of photon axion conversion occurring in the spacetime surrounding a black hole. The findings contribute to a better understanding of photon axion conversion in the environment of a black hole spacetime and helps us explore the possible existence of extra spatial dimension. In another study, numerous synthetic techniques have been developed to synthesize rutaecarpine and its analogues, which demand costly reagent and rigorous conditions.
- Wadia Institute of Himalayan Geology (WIHG) reported the following research findings: The morphometric indices along the Satluj valley is estimated to understand the surface processes and landscapes modulated by the interaction of climate and tectonic forces during the late Quaternary; Deep learning assisted fault network prediction from pre-trained models using seismic data; P-T evolution of Higher Himalayan Crystalline Sequence in the Dhauliganga valley of Garhwal Himalaya was carried out; Single-staged convolutional neural network for landslide event extraction from satellite images was developed; New fossil discoveries were reported from the Siwalik sediments exposed around Dunera area of Pathankot district.

E. International Cooperation

- Field Monitoring Committee meetings were held at Keonjhar, Odisha and 17th

December, 2023 at Ghoramara Island, West Bengal to review the progress of the project Renewable Energy Empowering European and Indian communities (RE-EMPOWERED).

- The Department participated in the Multilateral Clean Energy Transition Partnership (CETP) Funding program in the area of CCUS (Carbon Capture Utilisation and Storage). Under the CETP platform, 13 proposals have been submitted in the CCUS area by premier academic and research organizations from India having tie-ups with relevant industries in India along with CETP member countries.
- DST-NWO jointly agreed to support 3 joint proposals submitted under Indo-Netherlands research cooperation on Water Disaster Management.
- DST-India participated in the 2nd International Meeting on Energy Storage Devices and Industry-Academia Conclave (IMESD-2023), held at IIT Roorkee.

F. National Technology Mission

- The Mission Office of National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS) in association with the experts from Scientific Advisory Committee (SAC) reviewed the current progress of activities, at the Technology Innovation Hubs (TIHs) set-up at IIIT Delhi, IIT Palakkad and IIT Guwahati:
- As part of National Mission on Interdisciplinary Cyber Physical Systems (NM-ICPS), implemented by the Department, SAMRIDHI Conclave 2.0 was organized at the Technology Innovation Hub, IIT Ropar, to spur the deep tech startup ecosystem in the domains of Agritech. The Conclave hosted 50 investment partners, showcased 20 Exhibitions and 5 products and facilitated in , signing of 5 MoUs.

G. Scientific Infrastructure Building

- Officials of DST participated in the 3^d addition of IEEE India Geoscience and Remote Sensing Symposium [InGARSS 2023] held from 10th to 13th December, 2023 at International Institute of Information Technology Bangalore (IIIT-B).
- A Capacity Building Workshop was organized for teachers and educators from the Hyderabad area for raising their knowledge in geographic technologies and their applications
- The Department participated in a meeting to discuss principles for categorization of attributes as sensitive in the context of guidelines for acquiring and producing geospatial data and data services including maps.
- **Sophisticated Analytical & Technical Help Institutes (SATHI)**

The initiation of SATHI facilities across the country adopts a consortium approach involving academia, research institutes, non-government organizations, S&T

councils, and industries. Initiatives have been taken to set up three new SATHI centers at IIT Hyderabad, ICT Mumbai, and BITS, Pilani for establishing National Level Research Infrastructure Facilities.

- **Sophisticated Analytical Instrument Facilities (SAIF) Scheme**

Six Facility Management Committee (FMC) meetings were held for the SAIF centres located at IIT Madras, IIT Bombay, CDRI Lucknow, IISc Bangalore, AIIMS, New Delhi, and IIT Patna for reviewing the technical and financial progress of SAIF centres, in parameters such as publications, users, samples analyzed, earnings, etc. and the status of the already sanctioned instruments including their procurement, installation and working conditions and downtime of existing instruments.

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

- DST-PURSE programme support at Guwahati University in Assam has achieved a significant milestone by developing a formalin sensor to revolutionize the method of detecting formalin in fish at room temperature which is highly effective, low-cost and non-invasive. This breakthrough will significantly benefit the fishing industry by ensuring safety and quality of fish products.

H. Implementation of National Geo-Spatial Policy -2022

- For implementation of **National** Geo-Spatial Policy -2022, Surveyor General of India held meetings with the stakeholder Ministries, namely, Ministry of Ports, Shipping and Waterways, Ministry of Housing and Urban Affairs, Ministry of Petroleum & Natural Gas, Ministry of Water Resources, River Development and Ganga Rejuvenation and Ministry of Skill Development and Entrepreneurship.
- An MoU was signed between Survey of India, the subordinate office of DST, and Ministry of Housing and Urban Affairs for formulation of GIS based master plan at class II town with population 50,000 to 99,999 level, using drone technology.