

**Department of Science & Technology**  
**Monthly Report**  
**January, 2024**

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

**A . Ninth edition of India International Science Festival (IISF-2023):**

- 9<sup>th</sup> edition of IISF was organized from **January 17th to 20th, 2024**, at the **DBT Translational Health Science and Technology Institute (THSTI) - Regional Centre for Biotechnology (RCB)** campus in Faridabad, Haryana. Theme of IISF 2023 was ***“Science and Technology Public Outreach in Amrit Kaal”*** with the objective of dissemination of scientific information among the general Public.
- IISF 2023 was a rich array of **17 events**, which involved a diverse range of participants, including **students, teachers, researchers, scientists, academicians, entrepreneurs, startups, grassroots and student innovators, literature enthusiast, media personnels, officials from scientific fraternity, international delegates**, and individuals from various backgrounds who share an interest in science and technology.
- Around **21 countries** participated and **33 international speakers** from across the globe delivered their talks. They also signed **MoUs with the National Innovation Foundation (NIF)** for fostering international relations and joining hands through scientific collaboration.
- At 9<sup>th</sup> India International Science Festival (IISF-2023) in Faridabad, Haryana from January 17-20, 2024 a key event, “New Age Technology Show (NATS)” was also held. NATS aimed to showcase, create awareness and enhance the knowledge base about the great strides made by India in New & Emerging Technologies cutting across disciplines. The 4-day event included: Panel Discussions, Interactive talks, Workshops, Exhibition in emerging technologies such Augmented Reality (AR) & Virtual Reality (VR), Artificial Intelligence (AI) & Machine Learning (ML), Internet of Things (IoT) & Industry 4.0; 5G/6G, Semiconductor Chip Design, Advanced Drone Technologies, 3D Printing, Cyber security, Quantum Computing etc. Experts from industry, academia, and the Government actively engaged in the sessions, and the event had participation of approximately 100 selected UG, PG and PhD students from various parts of the country.

- The Exhibition of NATS at IISF 2023 during January 17-20, 2024, in Faridabad, Haryana, featured the impacts and applications of the engineered prototypes/impactful technologies/products in the various cutting-edge areas. The Expo included participation from the 13 Technology Innovations Hubs (TIHs) under NM-ICPS at IIT Delhi, IIT Kanpur, IISER Pune, IIIT Bangalore, IIT Hyderabad, IIT Jodhpur, IITBombay, IIT Indore, IIT Roorkee, IIT Mandi, IIT Ropar, IIT Guwahati & IITMadras.
- IISF challenge was a world record making attempt titled '**Most people assembling models of picosatellite kits simultaneously**' **567 students of Class 9<sup>th</sup> & 10<sup>th</sup>** participated and **508 students successfully assembled WeMoSat pico satellite kit in 75 minutes** and **launched** it from a **height of 500 feet** with the help of **Para motors** from **Pisharoty launching pad** in RCB campus. The data of 4 weather parameters **temperature, humidity, pressure** and **altitude** was received by individual students on their smartphones and on the LED display, in the form of graphs and values.

#### **Space Hackathon- DST & ISRO-**

- Series of space Hackathon on technical issues related to the BHUVAN portal were presented to participants and over **four thousand teams** were registered in the **span of one month**. **57 teams were shortlisted for the grand finale at Faridabad in a 30 hours long hackathon**. After the conclusion of a 30-hour hackathon, **initial jury** shortlisted the top **24 Teams** and **were presented to the main jury which in turn selected 16 teams for the pitch presentation, finally four teams were declared as winners and their ideas will be supported by ISRO for further development**.

#### **B. Science for Society**

- The “State S&T Ministers and Centre and State S&T Secretaries and Officials Conclave” was held during 17-18th January 2024 at BSC BioNEST Bio-Incubator, Regional Centre for Biotechnology, Faridabad, Haryana to deliberate the strengthening Centre-State S&T cooperation to catalyze State STI ecosystem. During the round table discussion of S&T Ministers, Dr. Jitendra Singh, Hon'ble Minister of State (Independent Charge), Ministry of Science and Technology and the State S&T Ministers of the state of Assam, Haryana and Madhya Pradesh deliberated on future strategy to catalyze the STI ecosystem in states.
- The two days “State S&T Ministers and Centre and State S&T Secretaries and Officials Conclave” facilitated in-depth deliberations, knowledge sharing, and the formulation of actionable strategies for propelling India towards a brighter, self-reliant future. The conclave featured panel discussions on the Regional S&T strengthening and Our problems and Our solutions: Strengthening the Tech Neev (Technology Foundation). During the panel discussions, the need for regional collaborations and identification of S&T Needs of the States/UT were

discussed. The case studies of best practices were showcased by the S&T Councils of Assam, Karnataka, Chhattisgarh, Haryana, Madhya Pradesh and Arunachal Pradesh.

- International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI) reported that a Workshop on “Advanced X-Ray Techniques for Powder Metallurgy and Particulate Materials (AXT-PM2) was organized jointly by Powder Metallurgy Association of India (PMAI) and ARCI, during January 17-19, 2024 at ARCI, Hyderabad.
- Indian Institute of Astrophysics (IIA) organized a Winter School at the Kodaikanal Solar Observatory during January 03-10, 2024, in which 35 college students participated. IIA also reported that a set of three info posters were made for the conjunction of Venus, Moon and Mercury on January 08, 2024. These three posters were made for public dissemination and translated in 08 different languages in total.
- A conference on "Green Hydrogen," was organized as the INAE and Royal Academy of Engineering (RAEng) Exchange Program 2024 on January 31, 2024 at CSIR-National Chemical Laboratory (NCL), Pune. The conference aims to foster collaboration and knowledge exchange between Indian and UK experts in the field of green hydrogen.
- A seven day National Workshop on “Multidisciplinary Approaches on Recent Trends and Emerging Opportunities in Career Growth” was organised during January 24-31, 2024 by NASI- Bhopal Chapter.
- A technology upgradation awareness camp was organized in Bhadohi Carpet Cluster near Varanasi on January 15, 2024 jointly with IIT-BHU Varanasi.
- North East Centre for Technology Application and Reach (NECTAR) sponsored a combined awareness and training program titled "Natural Packaging for Organic Agriculture & Horticulture Products from Bamboo" conducted jointly by the South Asia Bamboo Foundation and Manipur State Rural Livelihood Mission. NECTAR hosted a workshop at its Shillong office in collaboration with Casley India Pvt Ltd., focusing on the quantification and tasting of fruits through remote sensing technology. The workshop aimed to explore innovative approaches for fruit assessment and flavor analysis, emphasizing the integration of remote sensing techniques. From January 03 to January 12, 2024, NECTAR organized an extensive ten-day training program focused on bamboo bottle production in Tripura. The training involved the participation of 20 individuals, offering them comprehensive insights and hands-on experience in the intricate process of crafting bamboo bottles.

### **C. Technology Development**

- Centre for Nano and Soft Matter Sciences (CeNS) in collaboration with Malaviya National Institute of Technology (MNIT), Jaipur have developed iron phosphide ( $\text{Fe}_2\text{P}$ ) particles embedded in carbon

structures doped with nitrogen ( $\text{Fe}_2\text{P@NC}$ ) for all-solid-state lithium-ion batteries. The design enhances battery performance with high conductivity, robust framework, and abundant redox active sites.

- Centre for Nano and Soft Matter Sciences (CeNS), in collaboration with Tripura University, have developed an innovative oxygen evolution catalyst (OEC) coupled photo anode for enhanced water oxidation kinetics. The design features Sb-doped  $\text{TiO}_2$  nanorods coupled with an ultrathin amorphous  $\text{CoAl}(\text{OH})_x$  OEC using citrate anion bridging. This design strategy showcases effective solar water splitting. In another study, CeNS in collaboration with Rice University have successfully harnessed the potential of naturally abundant Biotite, a Van der Waals mineral, for advanced energy storage. Through bulk exfoliation, ultrathin 2D layers of Biotene were obtained, showcasing exceptional anode properties for both Li- and Na-ion batteries.
- Raman Research Institute (RRI) have conceived, designed and built POLIX (X-ray Polarimeter), which was the primary payload aboard ISRO's XPoSat (X-ray Polarimetry Satellite) and was launched on January 01, 2024. RRI mentioned that POLIX will be the first-ever satellite-mounted scientific instrument that will perform polarization measurements of X-ray sources in the medium band (8-30keV) and the instrument will study a few tens of bright astronomical sources of different categories during the planned lifetime of the XPoSat mission of about five years.

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

- Under Vigyan Jyoti Scheme, Activities under Vigyan Jyoti Scheme Fifty-three Career counselling session and one Hundred (100) Role Model Sessions were conducted at different JNVs.
- Also fifty-four tinkering workshops for Vigyan Jyoti scholars and fourteen science camps were conducted by different JNVs.
- For the benefit of Vigyan Jyoti scholars, one hundred thirty-nine subject-specific lectures, Science Quiz sessions and Cyber Awareness Program were conducted.
- For last minute preparation for competitive examinations like JEE-mains, Quick Revision sessions were conducted through online mode.
- **Innovation in Science Pursuit for Inspired Research (INSPIRE) Scheme**
- ***INSPIRE Awards - Million Minds Augmenting National Aspirations and Knowledge (Manak)***
- State Level Exhibition and Project Competitions were organized in

Himachal Pradesh and Meghalaya.

- District Level Exhibition and Project Competition were organized in Madhya Pradesh (10), Kerala (3), Jammu (10), Tamilnadu (8) and Uttrakhand (4).
- **INSPIRE Scholarship:**
- An amount of ₹15,72,60,000/- was released towards Scholarship for 3324 ongoing students (Direct Mode).
- An amount of ₹96,60,000/- was released towards Scholarship for 161 ongoing students in (Institutional Mode).
- An amount of ₹1,71,04,000/- was released towards KVPY Fellowship for 169 Ongoing students.
- **INSPIRE Fellowship:**
- An amount of ₹9,31,18,391/- was released towards ongoing Fellowship for 224 INSPIRE Fellows.
- 115 INSPIRE Fellows have been upgraded from JRF to SRF.
- **INSPIRE Faculty Fellowship:**
- An amount of ₹,28,00,000/- has been sanctioned as first instalment to 04 INSPIRE Faculty Fellows.
- Performance Review Meeting was held at CCMB, Hyderabad during 30-31 January, 2024 for 50 INSPIRE Faculty Fellows for sanction of ₹17,00,000/-. In this meeting, the subject areas were Materials Sciences, Life Sciences - Biotechnology, Life Sciences - Plant and Animal and Agriculture, Earth and Atmospheric Sciences.
- A two-day Refresher Training Course for GLP Inspectors was organized at Institute of Pesticide Formulation Technology (IPFT), Gurugram on January 30 & 31, 2024, which focused on Computerized Systems, Data Integrity, Quality Assurance, Emerging technologies (Cloud computing) and Characterization, Management and use of test items. The training course was conducted by faculty members, who represented various sectors, including industry professionals, subject matter experts, and senior GLP inspectors. A total of twenty-six participants took part in the training program.
- The Second Brainstorming meeting of stakeholders of NGCMA to harmonize the scope of GLP certification was organized in Institute of Pesticide Formulation Technology (IPFT) on January 31, 2024. The meeting was attended by GLP inspectors of NGCMA, members of Technical Committee on GLP, subject experts and industry representatives. The comments received from various stakeholders on the draft scope were considered by the group. After detailed deliberations, the harmonized scope of GLP certification was finalized.

## **E. Scientific Research**

- Birbal Sahni Institute of Paleosciences (BSIP) generated and published genetic data of 108 unrelated individuals from Ladakh belonging to three population groups namely, Changpa, Brokpa and Monpa. It was reported that maternal ancestry of the three Ladakhi groups are highly diverse carrying lineages specific to Tibet and South Asia. These findings conclusively indicate possible matrilineal genetic inflow in Ladakh from three directions, primarily from Tibet and South East Asia during post-glacial, West Eurasia and also from South Asia.
- Centre for Nano and Soft Matter Sciences (CeNS) reported that for urea-assisted electrochemical hydrogen generation, the capability of the electrocatalyst to sustain the NiOOH active species is of paramount importance as it ensures the optimal engagement of the maximum pool of active Ni centers in the electrocatalytic process. CeNS have unveiled the UOR prowess of a rare earth nickelate - NdNiO<sub>3</sub> showcasing high urea electrooxidation reaction (UOR) activity with a reduced burden of Ni mass loading.
- Indian Association for the Cultivation of Science (IACS) have successfully synthesized the N-heterocyclic carbene based porous organic polymers (NHC-01 and NHC-02) using the Friedel-Crafts reaction with the imidazolium salt. Among the two porous polymers NHC-01 exhibited outstanding stability, high flexibility and high BET surface area (1298 m<sup>2</sup>g<sup>-1</sup>). This high surface area of NHC-01 material displayed high CO<sub>2</sub> uptake capacity of 2.85 mmolg<sup>-1</sup> under 1.0 bar pressure and at 273 K. NHC-01/02 have been utilized as a metal-free organocatalyst for the CO<sub>2</sub> conversion reaction due to its high surface area, high CO<sub>2</sub> absorption capacity and as it bearing the NHC moiety in the organic network.
- Indian Institute of Astrophysics (IIA) have studied the mechanics of dynamical aspects of information geometry and applied the results to thermodynamic geometry of black holes. They have applied their results for the Riemannian information metric to describe dynamical evolution of thermodynamic geometry for Kerr and Reissner-Nordström black holes.
- Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST) reported that a new Interventional Neuroradiology-BIPLANE DSA LAB was inaugurated on 19<sup>th</sup> January, 2024.
- S.N. Bose National Centre for Basic Sciences (SNBNCBS) has demonstrated rational and effective design of stabilizing Ru single atom (SA) dispersed on the CeOx catalyst coupled with one-

dimensional (1D) Sb-doped TiO<sub>2</sub> nanorods (Sb-TiO<sub>2</sub> NRs) for remarkably enhanced photo electrochemical water oxidation activity. The role of Ru SAs in the electronic structure, separation, and transfer of photo generated charge carriers and water oxidation pathways of the CeO<sub>x</sub> catalyst coupled photo anode has been investigated. It is reported that this work provides an effective strategy to promote the water oxidation activity of metal oxide-supported SA catalysts to boost the overall performance of photoanodes. SNBNCBS also reported that, citrate modulation of CoAl(OH)<sub>x</sub> catalyst/Sb-TiO<sub>2</sub> nanorods interface boosting photocarrier separation and injection for enhanced water oxidation was studied. This work demonstrates an effective design strategy to boost the performance of OER catalyst coupled photo harvesting semiconductor photoanodes to achieve efficient solar water splitting.

- Wadia Institute of Himalayan Geology (WIHG) reported the following research activities during January, 2024. Attention-driven convolutional neural network is developed for landslide event extraction from remote sensing data. Geological-geotechnical study of the Silkyara Tunnel disaster was conducted. Landslide lake and its feasibility for development of a permanent lake in TarakTaal in Almora District, Uttarakhand is being studied. Intra-crustal high conducting layer based on attenuation tomography in the Garhwal region is identified. Evidence of Microbial Sulphide activity in the Himalayan melange rock has been collected.
- Bose Institute (BI) have developed a tissue-specific CRISPR system for tomato plants. The efficacy of the system has been confirmed by successfully knocking down the expression of the endogenous gene and GUS reporter gene expressed in a transgenic plant. Also, a method for targeted genome engineering as well as for small molecule inducible CRISPR system is developed. BI also reported that, a redox-sensitive YFP sensor is developed for the detection of intracellular reactive oxygen species (ROS) in planta.
- National Innovation Foundation (NIF) reported that the bio efficacy of two herbal hydro-alcoholic extracts were tested individually and in combination against the castor butterfly - *Ariadne merione*. Also, the performance evaluation trial of Riyawan Silver-garlic variety was carried out.
- National Academy of Sciences (NASI) reported that three issues of their Journals viz. Proceedings of the National Academy of Sciences, India (PNASI) Sec. A (Physical Sciences), Proceedings of the National Academy of Sciences, India (PNASI) Sec. B (Biological Sciences) and National Academy Science Letters, containing 59

articles were published in the month of January 2024. NASI also published 18 articles of different scientific disciplines in this month online.

## **F . Publications of research papers, articles, journals & granting of Patents by Research Institutes**

Agharkar Research Institute (ARI) published two research papers, Aryabhata Research Institute of Observational Sciences (ARIES) published 10 research papers, Birbal Sahni Institute of Palaeosciences (BSIP) published 08 research papers, Centre for Nano and Soft Matter Sciences (CeNS) published 04 articles, Institute of Advanced Study in Science and Technology (IASST) published 03 research papers, Indian Institute of Astrophysics (IIA) published 20 research papers, Indian Institute of Geomagnetism (IIG) published 04 research papers, Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST) published 19 research papers in various national and international refereed journals. Indian Academy of Sciences (IASc) published more than 135 articles in their 11 different scientific journals covering all major disciplines in Science & Engineering. One national patent of International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI), one National patent of Agharkar Research Institute (ARI), one national patent of Centre for Nano and Soft Matter Sciences (CeNS), two national patents of Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST) were granted. National Innovation Foundation (NIF) facilitated 26 patents and Technology Information, Forecasting & Assessment Council (TIFAC) facilitated one patent.

## **G. International Cooperation**

- A virtual meeting was held with Experts from IIT Bombay and Experts IIT Kharagpur on 24th January, 2023 to discuss on projects supported under India-EU joint call on integrated local energy systems.
- DST participated in Clean Energy Transition Partnership (CETP) -joint call 2023 in the area of CCUS, and joint evaluation process has been carried-on in the month of January 2024.
- DST-India participated in the 9th Smart Cities INDIA EXPO on 17th - 19th January 2024 at Pragati Maidan, New Delhi. 04 technology/ startups with various innovative technologies has been showcased during the event.
- DST participated in the 2nd meeting of the Indo-French Joint S&T Committee at Translational Health Science and Technology Institute (THSTI), Faridabad which was co-chaired by Prof. Abhay Karandikar, Secretary, Department of Science & Technology and Mrs Claire Giry, General Director for Research and Innovation, French Ministry of Higher Education & Research respectively on the Indian and French side to discuss on priority thematic areas for future cooperation under Energy and Sustainable Development.
- During IISF 2023, **21 countries** participated and **33 international speakers**



from across the globe delivered their lectures. They also signed **08 MoU's and 03 Sol with the National Innovation Foundation (NIF)** to foster international relations and join hands through scientific collaboration. **A roundtable discussion titled "Science, Technology and Innovations: Learning from overseas" was conducted.** A common line of thought adopted by International delegates was that **"countries must learn from experiences of each other.**

## **H. National Technology Mission**

- The 4<sup>th</sup> Meeting of the re-constituted Scientific Advisory Committee (SAC) for National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS) was held on 5<sup>th</sup> Jan 2024 in virtual mode, to review and shortlist the preliminary proposals on LLM received from 09 Host Institutes under NM-ICPS.
- Five Technology Innovations Hubs (TIHs) established under NM-ICPS at IIT Bhilai, IIIT Hyderabad, IIT Delhi, IIT(ISM) Dhanbad & IIT Palakkad, showcased their latest technologies/products during 31<sup>st</sup> Convergence India and 9<sup>th</sup> Smart Cities India Expo organized during 17-19 January, 2024 at Pragati Maidan, New Delhi.
- The Quarterly Bulletin (Jan, 2024 edition) on the activities undertaken by 25 Technology Innovation Hubs (TIHs) indicating theme-wise highlights of their achievements was brought out and published.
- A Workshop and Training Program "Lab to Market", focused on strategies for commercialization of Prototypes/Technologies, facilitated by the TIH-IHFC organised from 11-13 Jan 2024 at IIT Delhi. A total of 55 representatives from 13 TIHs under NM-ICPS participated in the workshop. The key highlights of the event included in-depth insights into advanced commercialization strategies; Networking opportunities with esteemed industry experts and practical knowledge acquisition for successfully transitioning technologies from the lab to the market.

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

- The 1<sup>st</sup> meeting of Mission Governing Board (MGB) for National Quantum Mission (NQM) was held under the Chairmanship of Dr. Ajai Chowdhry on 16<sup>th</sup> January, 2024 at DST, New Delhi, to evolve the Mission Guidelines for setting up the 4 Thematic Hubs (T-Hubs) in the areas of Quantum Computing, Quantum Communication, Quantum sensing and Metrology and Quantum Materials And Devices.
- DST has launched the Call for Pre-proposal for setting up the Thematic Hubs under National Quantum Mission on 20th January

2024. Under the Call, pre-proposals from researchers, scientists, and institutions working in diverse fields related to quantum science and technology are invited. This includes, quantum computing, quantum communication, quantum sensing and metrology and quantum materials and devices.

## **I. Scientific Infrastructure Building**

- A virtual meeting was conducted on 18th January, 2024 to discuss items pertaining to the establishment of Geospatial Innovation Hub (CoE) as a pilot. The possible nomination of various representative for the PAC (Principal Advisory Committee) its TOR along with future activities of the hub were discussed in detail.
- A virtual meeting of the NGP Expert Committee was organized to assess the progress of 11 ongoing projects in landslide hazard mitigation along with few projects on Coastal Hazard Risk Assessment and Remediation. Project Completion reports of more than 26 projects were also discussed during the meeting. Expert members provided the inputs for future R&D areas in spatial disaster risk reduction for divisional future call for proposals.
- A meeting was held with representatives of Survey of India and SMP-DST, on 23<sup>rd</sup> January, 2024, to discuss the details of the proposal submitted by Geospatial World for co-organizing India Geospatial Business Summit and Showcase Indian Pavilion scheduled during 13<sup>th</sup> to 16<sup>th</sup> May, 2024 at Rotterdam.

### **R&D Support was provided for the following:**

- Financial support was provided as R&D support to:-
  - (i) IIT, Tirupati for “Improvement of Geoid model derived from EGM at regional scale by advanced gravimetric geoid modelling, a case study in Kanpur and Unnao district of UP”.
  - (ii) IISc, Bengaluru for “Assessing ecosystem tipping points using high-resolution geospatial data”.
  - (iii) IIT, Indore for “From Pixels to Forests: SAR-Based 3D Degradation Mapping across the Sub-continent”.
  - (iv) IIT, Bombay for “Geoid Analysing using rigorously Unique Methods, for DEM and its Applications GARUDA”.
  - (v) Chandigarh University, Mohali for “Groundwater spring potential mapping in Meghalaya using state-of-the art ML and AI algorithms for assessing safe potable water availability”.

- **Sophisticated Analytical & Technical Help Institutes (SATHI)**

Highlighting a promising avenue for scientific and academic institutions, three SATHI facilities established at IIT Delhi, BHU- Varanasi and IIT Kharagpur, has showcased their distinctive achievements through Science and Technology (S&T) interventions using a variety of promotional materials (including posters, banners, pamphlets, presentation books, and concise video clips). This exposition took place during the 9th India International Science Festival (IISF-2023) at DBT THSTI-RCB Campus in the NCR Biotech Science Cluster, Faridabad, Haryana, from January 17th to 20th, 2024.

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

The International Conference "Valorization 2024" on Science & Technology Integration for Circular Economy (on Hybrid Mode) was organized by Birla Institute of Technology & Science (BITS) Pilani, Hyderabad Campus, Hyderabad under aegis of DST-PURSE program. The conference was held on 18th & 19th Jan 2024. A post conference hands-on workshop on the thematic areas such as Bio methanation, Biogas to Electricity, Methane to Hydrogen, Membrane Fuel Cells, Energy Management, Environment & Waste Management of the conference, for offline participants was also organized on 20th Jan 2024.