# DEPARTMENT
# OF
# SCIENCE & TECHNOLOGY

- MANDATE
  - VISION
    - ACTIVITIES

सत्यमेव जयते

**DEPARTMENT OF SCIENCE & TECHNOLOGY**
**MINISTRY OF SCIENCE & TECHNOLOGY**

**1 — MANDATE**

Department of Science & Technology (DST) was established in May 1971, with the objective of promoting new areas of Science & Technology and to play the role of a nodal department for organising, coordinating and promoting S&T activities in the country. DST functions as the nodal agency to connect science and technology sector to Government verticals. DST provides the largest extramural research and development support in the country to strengthen national S&T capacity and capability through a competitive mode to scientists cutting across institutions and disciplines. This strategically important function mutually reinforces outcomes of our country's educational, scientific and industrial R&D initiatives and helps transform the S&T landscape of the country.

**2 — VISION**

"To continuously shape a seamless science, technology and innovation ecosystem, which is cutting-edge, collaborative, inclusive, relevant and aligned to our national priorities, to create new opportunities today while addressing the challenges of tomorrow."

**Building Blocks for Vision with Strategy**
Within the major mandates of DST in the creation of S&T infrastructure and manpower, S&T led innovation and startups, technology development and seeding the cutting-edge, futuristic areas of S&T, our programs and schemes should address several challenges and opportunities that connect with and empower the following stakeholder base.

- Universities: IITs: R&D institutions
- Women Scientists: Scientists of Weaker Segments
- Industry: Community based organizations:
- International connects
- Youth: Students: Scientists, Researchers:
- Innovators: Entrepreneurs: Startups
- State Governments: Ministries:

Aim is to position India within top 4 countries in the scientific research and connecting our research to national priorities by augmenting the accessible R&D infrastructure to reach the unreached, enhancing number of active quality scientists, emphasizing quality and relevance of research in both discovery and solution research and by forging the best of international connects.

**The major schemes, programmes and missions of the DST in the last five years (2014-19) are derived directly from the overall vision coupled with an evidence based analysis and wide ranging stakeholder consultations.**

**3 — ONGOING SCHEMES AND PROGRAMMES**

### 3.1    Major Initiatives and Programmes launched during last 5 years

The Department of Science & Technology (DST) supports and encourages the whole gamut of S&T ecosystem from seeding and capacity building in the cutting-edge research areas; translational research; technology development and deployment; innovation and startup ecosystem; and international collaborations. This is achieved by supporting S&T infrastructure, scientists and students in academic and R&D institutions across the country.

- ◆ **DST's Investment into S&T system** increased by about 90 percent compared to preceding 5 years period from 2009-10 to 2013-14.

- ◆ **Empowering the young and reversing the Brain Drain to Brain Gain:** Several new schemes to attract Young Researchers viz. National Post Doctoral Fellowship; Early Career Research Award; Overseas Doctoral Fellowship; and Overseas Post Doctoral Fellowship; and Teacher Associates for Research Excellence have been launched. These schemes have almost doubled the opportunities for young and aspiring researchers for carrying out R&D in their chosen areas of science and engineering.

- ◆ **Bringing the best of Global Science and Scientists to India: VAJRA** scheme initiated to bring best of global science and scientists to India including NRIs.

◆ **Empowering Women Scientists**: To address gender imbalance, a new scheme viz. **KIRAN** was launched and a pilot scheme **VIGYAN JYOTI**was tested on limited scale and duration to attract and encourage young women in the underrepresented areas (e.g., engineering, mathematics) in the top institutions (e.g., IITs).

◆ **AWSAR** scheme launched to encourage PhD students and young scientists to write popular science articles on their research pursuits. Target is 5000+ articles per year.

◆ **Boost to Innovation and Start-up Activity**: A national programme titled **NIDHI** (National Initiative for Developing & Harnessing Innovations) which addresses the entire value chain of Innovations has been launched. Budget for innovation and Start-up activities increased by 5 fold in 2018-19 compared to 2013-14.

◆ **Taking Innovation to Schools**: To encourage young students to think innovatively, a new programme **MANAK** (Million Minds Augmenting National Aspirations and Knowledge) has been launched in 2018 to target 10 lakh students every year from class 6 to 10, which is to be scaled up in numbers and also to include classes 11th and 12th.

◆ A **National Mission on Interdisciplinary Cyber-Physical Systems** has been Cabinet approved and launched in 2019 (first 100 days) at a total outlay of Rs. 3660 crore for a period of five years.

◆ **DD Science and India Science** – An internet based dedicated Science Channel and a hourly daily programme on Doordarshan (DD Science from 5-6 pm)

◆ New **Public-Private Partnerships** forged to offer opportunities for collaborative R&D between academia and industry.

◆ Aligning with national agenda, new schemes such as **Super Computing Mission; Advanced Manufacturing; Waste Management; and Science and Technology of Yoga and Meditation (SATYAM)** initiated.

◆ Excellent progress made in programmes on **Clean Energy and Water**.

**International Connects**: New international S&T collaboration to connect with the best global science initiated such as participation in Thirty Meter Telescope Project; and India-Israel Industrial R&D and Technological Innovation Fund of USD 40 million plus industrial R&D funds with 5 Nations.

## 3.2 Major achievements in the schemes and programmes for promotion of people participation in research and development

Some major achievements of DST through its various schemes and programmes for promotion of people participation in research and development include the following-

◆ 4,50,000 INSPIRE (Innovation in Science Pursuit for Inspired Research) awards to school children of class VI to X

◆ 50,000 INSPIRE scholarships for university level education

◆ 4000 INSPIRE doctoral Fellowships in last 5 years to young students

◆ 700 INSPIRE faculty to young researchers in last 5 years

◆ 80,000 PhD, Post-Doctoral & Project Fellowships awarded

◆ 2,500 National Post-Doctoral Fellowships

◆ 2,000 Institutes supported with grant & resources for advancement in research

- 4,00,000 Science publications on Scopus Database India attains fifth position globally

- 1,50,000 trained and given exposure under public awareness programmes in climate change

- 28,000 grass-root innovations supported

- 2,000 Start-Ups incubated as part of NIDHI

- 1,500 Early Career Research awards to young researchers for pursuing exciting and innovative research

- 100 Overseas Doctoral Fellowship & Overseas Post-Doctoral Fellowship

100 faculty members provided mobility under Teacher Associates for Research Excellence scheme

### 3.3 Some key initiatives and schemes initiated during last 5 years

A summary of some of the key initiatives and schemes of DST initiated during last 5 years which made significant impacts along with some new initiatives that are being launched shortly is provided beow. These are broadly categoried under three umbrella schemes of DST viz., (a) S&T Institutional and Human Capacity Building; (b) Research & Development and (d) Innovation, Technology Development and Deployment. Initiatives of Science & Engineering Research Board and Survey of India have been provided separately.

### I. S&T INSTITUTIONAL & HUMAN CAPACITY BUILDING

### a) *MANAK Awards (Million Minds Augmenting National Aspiration and Knowledge)*

The thrust of the programme launched on a limited scale in 2018 is on 'Original ideas' having potential to address societal needs through Science & Technology especially in context of National flagship programmes  such as Swachh Bharat, Digital India, Swasth Bharat, Make in India, Energy, Environment, Sanitation etc.Ten (10.0) lakh ideas during a FY are to be targeted from more than five (05) lakh middle and high schools across the  country, outof which one (1.0) lakh ideas are to be shortlisted for an initial award of Rs. 10000/- for preparation of project/model/showcasing of idea and participation in the District Level Exhibition & Project Competition (DLEPC). From theses, best ten thousand projects (10000) are to be selected for participation in the State Level Exhibitions & Project Competitions (SLEPC) and among SLEPC participants top one thousand (1000) projects are to be selected for National Level Exhibition & Project Competition (NLEPC). The participants selected for National Level Exhibition will be provided mentoring support in association with NIF.

### b) *SWARNA JAYANTI FELLOWSHIPS*

The fellowship is offered to Indian Scientists, in the age group below 40 years, having permanent posting at Academic Institution/ University/ National Lab/ College etc. These fellowships are Scientist specific and Scientist or Academician with proven track record of outstanding research work exploring new frontiers in their field of expertise are eligible to apply. The fellowships include an attractive incentive of Rs 25000/- per month apart from Salary, a Research grant for a period of 5 years for equipment, consumables, domestic & international travel, contingencies, research manpower support and any other special requirement by the Scientist pertaining to the project.

### II. RESEARCH & DEVELOPMENT

### a. *MEGA FACILITIES FOR BASIC RESEARCH*

The scheme is implemented through a number of mega science projects, which are long-term projects and involve sophisticated and yet unexplored technologies and these require large resources and highest degree of scientific and technological competence for their implementation. These are sourced by pooling resources and expertise from best of institutions in the world, making such projects manifestly multi-agency, multi-institutional and, most often, international in character. The Department of Science & Technology (DST) and the Department of Atomic Energy (DAE) have been jointly promoting most of such projects in the country.

**b.      *NATIONAL SUPERCOMPUTING MISSION***
The mission aims to enhance the research capacities and capabilities in the country by connecting them to the Supercomputer grid, with National Knowledge Network (NKN) as the back bone. The NSM intends to set up a grid of supercomputing facilities, using both "buy" and "build" approach at academic and research institutions across the country.

The Mission is being jointly steered by the Department of Science and Technology (DST) and the Ministry of Electronics and Information Technology (MeitY) along with the Implementing Agencies namely Indian Institute of Science (IISc), Bengaluru and Centre for Development of Advanced Computing (C-DAC), Pune.

**c.      *INTERDISCIPLINARY CYBER PHYSICAL SYSTEMS (ICPS)***
The programme aims to foster and promote R&D in this emerging field of research. A Cyber Physical System (CPS) is a mechanism controlled or monitored by computer-based algorithms, tightly integrated with internet and its users. A limited pilot in this area was launched in 2017 with a few cutting-edge projects. It's now ready for launch as a National Mission.

**d.      *SCIENCE AND TECHNOLOGY OF YOGA AND MEDITATION(SATYAM)***
In the year 2015, Department of Science and Technology (DST) conceptualized a new research program 'Science and Technology of Yoga and Meditation' (SATYAM) under Cognitive Science Research Initiative (CSRI). As Yoga and Meditation are interdisciplinary endeavors that interface with Neuroscience, Medicine, Psychology, Physiology, Philosophy, and so on, therefore an interdisciplinary approach is needed to converge different & diverse disciplines as well as approaches & methods in the study of yoga and meditation. Thus comprehensive research on yoga and meditation is expected to address various challenges confronting physical and mental health.

## III. INNOVATION, TECHNOLOGY DEVELOPMENT AND DEPLOYMENT

**a.      *CLEAN ENERGY RESEARCH INITIATIVE***
The scope of initiative includes oriented fundamental research and development of devices, sub-systems and systems. The initiative supports fresh ideas/ concepts, including feasibility assessment of various emerging and disruptive technologies, for their potential conversion into useful technology/ product. The scheme components includeresearch, development and demonstration of materials, devices, sub-systems and systems in the domains of Solar Energy, Smart Grids, Energy Storage, Cleaner Fuels, Energy Efficiency, Clean Coal, and Emerging energy technologies.

**b.      *WATER TECHNOLOGY INITIATIVE***
Based on assessment of nation's needs for meeting prevalent and emerging water challenges as assessed through various brainstorming /interaction with stakeholders, as well as experience of mounting research based technological solutions,the programme is evolvedto a need based demand oriented thematic initiative focussing to successively progress to higher technology readiness levels and sustainable solutions. The scheme strives to integrate research outcomes to mount sustainable solutions. The scheme components include R,D&D of materials, devices, sub-systems and systems in the following domains:
- Winning of water from sustainable sources
- Augmentation of water quality to specific applications
- Recycling and Reuse of Water

**c.      *NATIONAL INITIATIVE FOR DEVELOPING AND HARNESSING INNOVATIONS (NIDHI)***
NIDHI program caters to the entire innovation value chain and built largely around Technology Business Incubators with the following components
- Institutional mechanisms with capital/equipment support through NIDHI-Technology Business Incubator (TBI), NIDHI-Centres of Excellence (NIDHI-CoE) NIDHI-Promotion and Acceleration of Young and Aspiring technology entrepreneurs (NIDHI-PRAYAS), Innovation and Entrepreneurship Development Centres (IEDCs)

- Seeding and Acceleration support through NIDHI-Seed Support System(NIDHI-SSS), NIDHI-Accelerator,
- Human Capacity Building, Scouting and support through NIDHI-Entrepreneur in Residence (NIDHI-EIR), NIDHI- Grand Challenges and Competitions, Trainings on STI based Entrepreneurship.

### d. *INDIA SCIENCE CHANNEL*

The Science Channel Project is being executed in two parts – a one-hour slot from 5 pm to 6 pm from Monday to Saturday on DD National, in collaboration with Doordarshan, and a 24x7 internet-based Over-The-Top (OTT) channel called India Science.

- **DD Science:** This is a one-hour telecast slot on Doordarshan, six days a week from Monday to Saturday. This is governed by a MoU between Vigyan Prasar (VP) and PrasarBharati / Doordarshan, which articulates roles and responsibilities of both parties.
- **OTT based Internet channel (India Science):** The fresh content for the OTT channel is generated using a turnkey solution of outsourcing to vendors and hiring a studio with all material and human resources. VP provides content guidance.

### e. *AUGMENTING WRITING SKILLS FOR ARTICULATING RESEARCH (AWSAR)*

AWSAR programme is focused on motivating young research scholars (PhD & Post Doc Fellows) with an interest in communicating science to a wider audience. An award was institutionalised to encourage and recognise outstanding written communicator among the scholars. It is also to provide platform to young researcher to communicate their work with its societal relevance to common people.

### IV. SCIENCE & ENGINEERING RESEARCH BOARD (SERB)
### a. *FELLOWSHIP SCHEMES*
### (i) *Visiting Advanced Joint Research (VAJRA) Faculty Scheme*

Science and Engineering Research Board (SERB) has instituted VAJRA Faculty Scheme for distinguished overseas scientists and academicians including Non-resident Indians (NRIs) and Overseas Citizen of India (OCI) to create an opportunity to contribute to growth of research and development in the country. The scheme will bring the best global science and scientists to India. It is also expected to enhance global ranking of our institutions. The area of research to be undertaken by the Adjunct/Visiting Faculty should be of cutting-edge and interest to India.

### (ii) *Overseas Visiting Doctoral Fellowship*

The fellowship scheme was formulated in 2015-16 to facilitate overseas collaborative research training for Indian Ph.D. Scholars registered in Indian institutions. Fellowships will be implemented in overseas institutions of repute and areas of importance to the country. Fellowship amount of US $ 2000 p.m. for a period of up to 12 months will be provided. One visit by the Indian supervisor to the overseas institution and overseas faculty to the host Indian institution of the student during the tenure of the fellowship will also be supported. It is estimated that 350 fellowships will be awarded for the period 2016-19.

### (iii) *Early Career Research Award*

A new scheme viz. Early Career Research Award (ECRA) launched in 2015-16 to provide quick research support to the researchers who are in their early career for pursuing exciting and innovative research in frontier areas of science and engineering. The scheme aims to minimise the time required for the young scientist to initiate their research. The award carries a research grant up to Rs. 50 lakhs for a period of three years. More than 600 young scientists have responded in November 2015 for the Award. Nearly 1500 young faculties/scientists have been supported under this scheme in the past three years.

**(iv)    National Postdoctoral Fellowship (N-PDF) Scheme**

In order to attract and retain young scientists and discourage brain drain immediately after Ph.D. in academic/R&D institutions, a National Postdoctoral Fellowship (N-PDF) scheme was launched in 2015-16. It aims to identify motivated young researchers and provide them support for doing research in frontier areas of science and engineering. The fellow will work under a mentor, and it is expected that the training will provide him/her a platform to develop as an independent researcher. 600-700 young scientists are supported every year. As many as 2500 have been awarded N-PDF during last 5 years.

*(v)    Teacher Associates for Research Excellence (TARE) Mobility Scheme*

This scheme, launched in 2017, aims to facilitate mobility of faculty members working in a regular capacity in state universities / colleges and in private academic institutions to carry out research work in an established public funded institution such as IITs, IISc, IISERs, NITs, CSIR, ICAR, ICMR labs and other central institutions and central universities, located preferably closer to the institution where the faculty member is working. Research work will be carried out to ensure that the principal investigator continues to work in the host institute as well as his / her parent institute on mutually agreed terms between the PI and the mentor. Provision of fellowship amount of Rs. 5,000 p.m., contingency grant of Rs. 5 lakh per annum and overhead for a period of 3 years has been made. Nearly 100 faculty members have been awarded TARE.

**c.    *IMPACTING RESEARCH INNOVATION AND TECHNOLOGY : IMPRINT***

IMPRINT (Impacting Research Innovation and Technology), is a program piloted by the Ministry of Human Resource Development (MHRD) aims to address and provide solutions to the most relevant engineering challenges faced by our nation by translating knowledge into viable technology (product and processes) in selected technology domains. IMPRINT 2, a new and revised edition of IMPRINT Programme, has been launched to streamline and simplify the processes and sharpen the focus on translational research and also to attract wider participation of stakeholders including industry. IMPRINT – 2 is sourced on a corpus set up jointly by the Ministry of Human Resource Development (MHRD) and DST and it also intends to derive contribution from various participating Ministries. SERB has been entrusted for the implementation of IMPRINT projects. A total of 118 projects of translational potential costing Rs. 99 crore was sanctioned last year.

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