

Brief Account of

**TWO YEARS
ACHIEVEMENTS**

2014-16

MAY 2016



सत्यमेव जयते

DEPARTMENT OF SCIENCE & TECHNOLOGY
Ministry of Science & Technology
Government of India



Ministry of Science & Technology
Government of India



Dr. Harsh Vardhan
*Honourable Union Minister
for Science & Technology
& Earth Sciences*

FOREWORD

I derive a sense of fulfilment to dedicate the present document to our country. I invite my fellow citizens to take note of successes articulated about pursuits in the fields of science and technology in our country especially over the past two years. The outputs and outcomes stated have been through the dedication and excellence of scientists in our research and development institutions across our country.

The DST as the largest extramural R&D agency has aligned several of its programmes with the national agenda of the Government such as Startup India, Make in India, Swachh Bharat and Digital India etc.

Several scores of achievements are stated in this document. These include India's leadership in scientific arena and value added services for the common man. Human and institutional development programmes are critical components of the programme of DST. To name a few - India's participation in the Thirty Meter Telescope programme, National Supercomputing Mission, New Inter-Ministerial Co-operations, Shoring up Innovation Eco-system and several initiatives on S&T led growth with inclusion and equity are major new initiatives launched over the past two years.

I take my fellow scientists and other staff in all institutions of the DST with me in dedicating this statement on achievements in the past two years. I call upon them to continue on their missions through pursuit of excellence for our country's glory and her emphatic role to establish a prosperous and peaceful present and future.



Ministry of Science & Technology
Government of India



Shri Y.S. Chowdary
*Honourable Minister of State
for Science & Technology &
Earth Sciences*

PREFACE

Informing people about what we intend to do in terms of deliverables from time to time and about how much of what has been intended to be done has indeed been accomplished is a good practice in democracy, as it inculcates the culture of accountability. Accountability of people doing science to the public is a welcome development. The objective of this publication is to disseminate the major outputs and outcomes in public-funded S&T and R&D sectors, during the last two years of present Government.

Reorienting and alignment of the existing programs and schemes of the Department with the India's national missions and enhancing their societal relevance as well as impact have been on top priority. I am happy to share that several new initiatives to arrest brain drain such as Early Career Research Award, National Post Doctoral Fellowship Scheme, scheme for funding High Risk-High Reward Research have been launched. Besides that, several Industry-relevant R&D programmes, new Technical Research Centres have also been established. Further, to add value to the national flag-ship programs like Make in India and Swachh Bharat, some new initiatives like advanced manufacturing and technology development for waste management have also been taken up with full vigour. Several new programmes to boost innovation and start-up ecosystem have also been launched during the past two years.

Initial enthusiasm and zeal generated must be made sustainable so that their outcomes become more prolonged and useful to the larger sections of the society. Publications of this kind will improve the intra and inter-departmental coordination and connect the scientific fraternity to the shared common objectives and ensure that they continue to serve the public better, by way of sustaining their motivation levels.

When we talk of science & technology, newer things are always on the horizon and they keep emerging on a continual basis. India's niche at the frontiers has to be consolidated further and we have to ensure that there is no back sliding.

I am sure that Department of Science & Technology and its institutions are geared up to take the inclusive agenda of the Govt. forward. I join the scientific community and fellow citizens in dedicating this effort to our country and for the larger good of mankind.

DEPARTMENT OF SCIENCE & TECHNOLOGY

The Department of Science & Technology functions as the nodal agency to connect science & technology sector to Government verticals. The DST provides the largest extramural research and development support in India to strengthen national capacity and capability to foster excellence to fulfill the developmental aspirations of our country. This strategically important function mutually reinforces outcomes of our country's educational, scientific and industrial R&D initiatives and help transform the S&T landscape of the country.

The DST aligned its plans and programmes; especially over the past two years with the national agenda of the Government embedded in such programmes as Make in India, Startup India, Digital India, Swachh Bharat, Swasth Bharat, etc. An outline of some of these initiatives is presented in the following. These include excellence in frontiers of science in association with many countries, immediate benefits for communities and engagement with the public.

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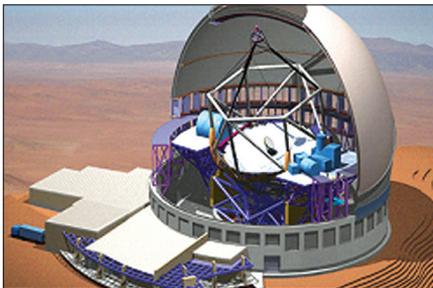
EXPLORING FRONTIER AREAS OF SCIENCE : AN INTEGRATED APPROACH DELIVERS MANY BENEFITS

Exploration and experimentation in frontier areas of science requires large investments to create mega science facilities. This requirement was addressed by DST through an integrated approach. DST established linkages with multi-institutional and multi-country mega science projects. This helped access state-of-the-art facilities that could be used by the Indian scientific community to carry out investigations at a fraction of the cost. Some typical examples include the Facility for Antiproton and Ion Research (Germany); Large Hadron Collider (Geneva) etc. The added advantage is for private industry to connect with corresponding technology platforms to access cutting edge technologies and manufacture various components to be used in investigations by scientists.

Some major mega science projects in progress since 2014 reflect the above stated objectives. These are the Thirty Meter Telescope, the Laser Interferometer Gravitational-Wave Observatory (LIGO) Project, the Ultra Violet Imaging Experiment on ASTROSAT, Technical Activation of 3.6m Devasthal Optical Telescope (DOT).

THIRTY METER TELESCOPE

India's Participation in Thirty Meter Telescope (TMT) project was approved by the NDA Government at a total cost of Rs.1299.8 crores in September 2014.



The Department of Science and Technology on behalf of Government of India executed TMT international Observatory partnership documents becoming a full member in the project on 2nd December 2014. The other countries in the project are USA, Canada, China and Japan. On the technology front, design,

prototyping, testing, validation and manufacturing of various in-kind items will bring in know-how for new and cutting edge technologies into our country. These will also help sustain the momentum of transitions to higher level investigations in our country.

LASER INTERFEROMETER GRAVITATIONAL-WAVE OBSERVATORY (LIGO) PROJECT

Significant contributions made by 37 Indian Scientists in the discovery of Gravitational Waves are well recognized world over.

The Govt. has agreed in-principle to set up an advanced gravitational-wave (GW) observatory in the country. This will emerge as only the third such observatory across the world. This will be a nationally coordinated project. Three lead Indian institutions, namely the Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune, Institute for Plasma Research (IPR), Gandhinagar and Raja Ramanna Centre for Advanced Technology (RRCAT), Indore will steer this project in collaboration with LIGO laboratories of California Institute of Technology (Caltech) and Massachusetts Institute of Technology (MIT), USA.

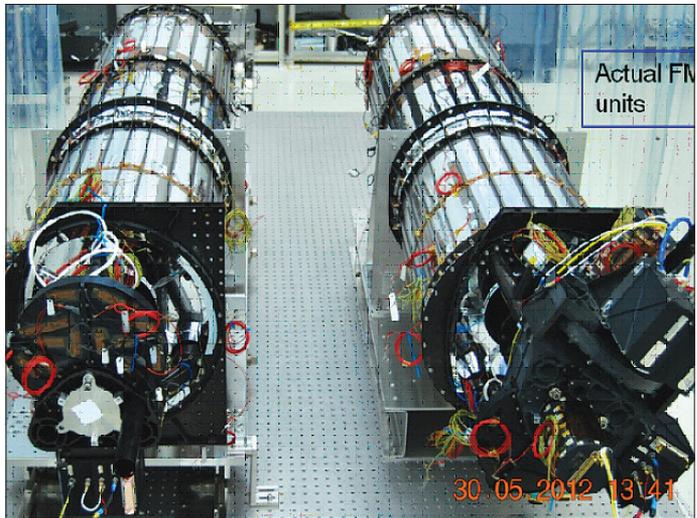
On March 31, 2016, a MoU was signed, in the presence of Hon'ble Prime Minister of India, between India and National Science Foundation (NSF), USA to establish an advanced gravitational-wave detector in India.



Hon'ble PM of India with Director NSF, Director LIGO Labs & others on 31.03.2016 at Washington DC, USA

THE ULTRA VIOLET IMAGING EXPERIMENT ON ASTROSAT

The nature of cosmic sources, their radiation processes and environment are understood on the basis of emissions over the entire electromagnetic spectrum. Importantly, multi-wavelength studies can be made only from coordinated observations with different satellites. The most efficient and effective approach is to have a dedicated satellite with several co-aligned instruments covering the desired spectral bands (UV and X-ray). It will then be possible to simultaneously observe all the desired wavebands. The ASTROSAT Mission is one such endeavor.



The Indian Institute of Astrophysics, Bengaluru designed and built the Ultra Violet Imaging Telescope (UVIT) payload and calibrated in partnership with the Canadian Space Agency; Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune; Tata Institute of Fundamental Research (TIFR); and Indian Space Research Organisation (ISRO). The pay load was successfully integrated and flown on board ASTROSAT satellite on Sept 28th 2015.

Some of the main objectives of UVIT are to study time variations in UV of X-ray sources in coordination with the X-ray payloads, star formation in nearby galaxies, star formation history of universe, hot stars in Globular clusters and UV emission from Planetary nebulae.

Performance verification of UVIT after launch has validated that the angular resolution of UVIT is exactly as designed, making it the highest angular resolution UV telescope in space to date. The experiment is expected to have a nominal operational time of 5 years or more. Payload operations are coordinated by the Payload Operations Center (POC) situated at IIA. From October 2016, the facility will be made available to the larger astronomical user community.

TECHNICAL ACTIVATION OF 3.6M DEVASTHAL OPTICAL TELESCOPE (DOT)

A 3.6 meter diameter optical telescope, optimized for imaging and spectroscopic exploration of the Milky Way and the distant celestial objects in the universe has been successfully established by the Aryabhata Research Institute of Observational Sciences (ARIES), Nainital. This is at the Devasthal site, about 60 km east from the Nainital city in the Central Himalayan Region. The 3.6m Devasthal Optical Telescope (DOT) is the largest fully steerable optical telescope in Asia.

It is matter of great pride that the Devasthal Optical telescope has been technically activated on 30th March 2016 jointly by Hon'ble Prime Minister of India, Shri Narendra Modi and Hon'ble Prime Minister of Belgium, Mr. Charles Michel, remotely from Brussels.

The optical telescope located at Devasthal assumes global importance for observing a number of time-critical cosmic events such as Gamma Ray Bursts, Supernovae and other faint/distant objects. This is possible because it is located in the middle of a crucial longitudinal gap of nearly 180 degree (twelve hours) between such observing facilities in Australia in East and the Canary Islands in West.



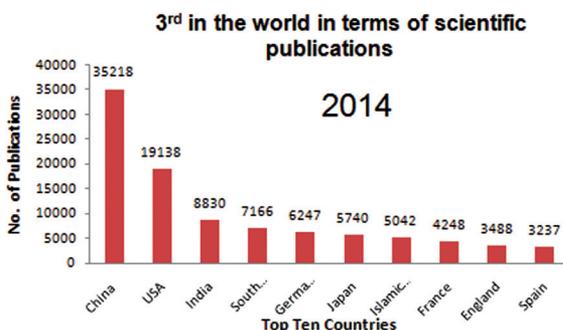
Our Prime Minister, Shri Narendra Modi and the Prime Minister of Belgium, Mr. Charles Michel, during the Remote Technical Activation of India-Belgium Aryabhata Research Institute of Observational Sciences (ARIES) Telescope, in Brussels, Belgium on March 30, 2016.

The telescope building activity has brought in a few cutting edge technologies such as aluminisation of mirrors for the first time in the country.

Considering the global importance of 3.6m aperture telescope at an excellent site, the Belgian government participated in the project financially at 7 percent level.

THE NATIONAL MISSION ON NANO SCIENCE AND TECHNOLOGY

This mission was launched as an umbrella programme to promote R&D. India has secured third positions amongst nations of the world in terms of scientific publications in this emerging area.



2

BRAIN DRAIN TO BRAIN GAIN

DST connects with over 10,000 scientists on an annual basis. These include research scholars and eminent scientists who are provided opportunities to carry out research and development in addition to other scientific assignments/engagements. Some path breaking decisions have been taken during past two years to this end.

HIKE IN RESEARCH FELLOWSHIPS

The NDA Government revised the fellowships for various categories of research fellows. This is seen as an across the board hike in fellowship amount by about 50%; effective from 1st October 2014.

THE EARLY CAREER RESEARCH AWARD SCHEME

helps pursue exciting and innovative research in frontier areas of science and engineering. 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 to the call for the award.

THE NATIONAL POST-DOCTORAL FELLOWSHIP (N-PDF) SCHEME ATTRACTS AND RETAINS

young scientists and in this process discourages brain drain in academic/R&D institutions. Selected fellows will initially work under a mentor, and are expected to evolve as independent researchers in the longer run.

INSPIRE FACULTY SCHEME

DST's INSPIRE Scheme offers contractual positions to doctoral students both in basic and applied sciences for pursuing 5 years independent research activities at any recognized University/Academic Institution/Laboratory in the country. The Scheme was initiated in 2011 and so far around 1000 students have been offered the INSPIRE Faculty Award.

SCHEME FOR FUNDING HIGH RISK-HIGH REWARD RESEARCH

The Science and Engineering Research Board (SERB) has approved a new significant initiative to support proposals that are conceptually new and risky, and if successful, expected to exert a paradigm-shifting influence on the S&T landscape. New and significant theoretical or experimental advances, new hypotheses, or breakthrough science that could lead up to new technologies could emerge.



S&T INFRASTRUCTURE STRENGTHENING

is through State-of-the-art scientific equipment and national facilities created in the past two years. 332 departments are identified and supported for new S&T infrastructure. About 30000 scientists used Sophisticated Analytical Instrument Facilities (SAIFs) to analyze about 2,50,000 samples.

300 KV Field Emission Gun Transmission Electron Microscope facility at IIT Mumbai supported under DST-SAIF

3

ADDRESSING NATIONAL PRIORITIES THROUGH S&T

TECHNICAL RESEARCH CENTRES

The Honourable Finance Minister announced setting-up of Five Technical Research Centres (TRCs) in autonomous institutions of the Department of Science & Technology. TRCs have been set up to further enhance translational research on biomedical devices, energy, water, nanotechnology and advanced materials.

INDUSTRY-RELEVANT R&D

Recognizing the need to facilitate increased Public Private Partnerships, the Science and Engineering Research Board (SERB) has approved a scheme that provides an opportunity for collaborative research between academic institutions and industry. This scheme will target solution driven research to address industry specific problems aligned with the Make in India agenda.

THE ADVANCED MANUFACTURING PROGRAMME

launched to promote such areas as robotics and automation, nano-materials, precision manufacturing, etc. The call for proposals has already been given.

TECHNOLOGY DEVELOPMENT FOR WASTE MANAGEMENT SERVES

the Swachh Bharat agenda. This is especially to tackle hospital waste, plastic waste, e-waste, etc. The first call for proposals has received an overwhelming response.

SCIENCE AND TECHNOLOGY OF YOGA AND MEDITATION (SATYAM)

DST has launched a new programme “Science and Technology of Yoga and Meditation (SATYAM)” in 2015 to rejuvenate research on yoga and meditation. The objective is to tap the potential for safer, holistic and cost effective treatment of physical and mental health problems.

An overwhelming response was received against a call for proposals made in 2015. 26 of the 578 received are approved for financial support.

BIG DATA INITIATIVE

Big Data Initiative programme was started by DST in 2014. A special focus was on Data Science, Technology, Research and Big Data Analytics Applications, Research in Internet of Things (IoT) with respect to core generic technologies, tools and algorithms for wider applications in Govt.

Indian Digital Heritage project on Hampi (IDH-Hampi), a multi-disciplinary and multi-institutional network project, is on the verge of completion. It developed 37 generic technologies, 7 prototype products, trained around 500 students, produced around 20 publications, books and monographs in the areas of fusion technologies in the heritage space.



***Rural Industry complex,
Village-Malunga, Jodhpur***

DEMONSTRATION OF INDIGENOUS TECHNOLOGY FOR APPROPRIATE AND SUSTAINABLE RURAL INDUSTRIALISATION

Sustainable industrial activities using local resources in the rural areas are extremely important for inclusive development of the country. The DST has prioritized interventions for the benefit of rural populations in particular.

A Rural-Industry Complex has been established at Malunga village in Jodhpur district of Rajasthan in 2015-16. Integration of technology in this industry complex has been done in such a manner that satisfies local needs by utilization of local resources, converts waste to wealth in environmentally friendly approaches to fulfill the objectives of Swachch Bharat, Swastha Bharat and Samarth Bharat initiatives.

The facility can crush 30 tonnes of castor seeds per day. Farmers can save money and reduce the bother of transporting castor seeds over long distances. Some of the best examples of multiple benefits are as follows: The facility uses the oil cakes, which is a waste product, as a fuel for boilers. The controlled burning of the bio-mass (oil cakes) reduces carbon emission. Farmers also get paid for the oil cake. The steam generated by the boilers is used for vapour absorption machine (VAM) based cooling system for cooling four cold rooms. Each cold room with the capacity of 10 tonnes per day will be used by the farmers for cold storage of their produce and ripening of fruits. The trials for banana ripening have been successfully carried out. Steam is also being used for industrial level multi effect distillation system for production of distilled water (2000 litres per hour). This water can be used for industrial purposes as battery water and with mineral additives as drinking water. A bottling plant is a part of the industry complex. Since Malunga area has brackish water, the facility would provide potable drinking water at affordable cost (Rs.5 per litre) to local rural population. The steam is also used for generation of 150 kilo watt of power for running various machines including the oil mill in the industry complex.

The project has been supported at a cost of Rs.7 cr (approx.) by the Department of Science & Technology. A team of Professors and experts from Indian Institute of Technology, Delhi have customized and integrated the technology for establishment of the industry complex. School of Desert Science (SDS) Jodhpur through School of Desert Science (SDS) Enterprises have provided the land (10 acres) for the industry complex and also constructed extensive rainwater harvesting structures for ground water recharge. SDS Enterprises will run the facility on a commercial basis and re-deploy all profits for rural development.



CLEAN ENERGY SOLUTIONS

25 new projects for development of materials, devices, coatings, storage options, grid connectivity etc. have been supported to drive down the cost of delivered energy.

SURYA JYOTI FOR LIGHTING UP HOMES OF POOR

In order to capture day light and concentrate the same inside the dark rooms, a low cost device named Surya Jyoti has been developed and tested with the support of a project from Department of Science & Technology over 2015-16. Surya Jyoti is basically a Micro Solar Dome which has a transparent semi-spherical upper dome made of acrylic material. This captures the sunlight that

passes through a sun-tube of a thin layer of highly reflective coating on the inner wall of the passage. During the daytime, illumination of Surya Jyoti goes upto an equivalent of 15-watt LED lamp. The dome has also been integrated with Photo Voltaic (PV) panel to enable the dome to provide light upto 4 hours after sunset. The cost of Photo Voltaic integrated Surya Jyoti works out to Rs.1200 and without Photo Voltaic panel it works out to Rs.500. The cost is expected to come down drastically after scaling up of the manufacturing process.



Inert glove box based organic solar cell device fabrication facility created under INDO-UK Solar Energy



Photo Voltaic integrated Surya Jyoti

One of the eight Groups of Secretaries on Energy Conservation and Efficiency, constituted some time

ago, has recommended to reach out to 10 million households/dwellings through Surya Jyoti. The DST has prepared the action plan on this recommendation for further field trials. The Ministry of New and Renewable Energy in partnership with Department of Science & Technology will work out a mechanism to implement the recommendation after further field trials and discussion with stakeholders for bulk production and procurement of Surya Jyoti for deployment in needy households. Once deployed, this technology solution will cheer up the faces of millions of poor people who are not fortunate enough to live in spacious homes.



WATER TECHNOLOGY INITIATIVES

Technologically feasible solutions for 19 site-specific water challenges such as scarcity and water quality in 212 villages across 23 states with pathways for upscaling have been demonstrated.

4

NEW INTER-MINISTERIAL CO-OPERATIONS

THE NATIONAL SUPERCOMPUTING MISSION TO ADDRESS NATIONAL NEEDS

This is a visionary programme to enable India leapfrog to the league of world class computing power nations. The NDA Government approved the Supercomputing Mission at a total cost of Rs 4500 crore in March 2015. Implementation of the mission jointly by the Department of Science and Technology (DST) and Department of Electronics and Information Technology (DeitY) has been started in a full-fledged manner.

Some of the applications that are likely to be developed are: Drug discovery platform for neglected diseases in the Indian context; Predictive and personalized medicine for health care; Package for analysis and design of engineering products and processes for “Make-in-India” initiative; Design of new molecules and materials for societal benefit; Integrated weather and disaster prediction package;

Urban well-being and smart cities package; E-teacher for use in digital agriculture, computational sociology, optimization in face recognition; GIS applications etc.

Collaboration in Impacting Research Innovation and Technology (IMPRINT) Projects address major societal and developmental needs such as healthcare, information and communication technology, energy, sustainable habitat, nano technology, water resources and river systems, advanced materials, security and defence, and environment and climate. The Department of Science & Technology (DST) has joined hands with Ministry of Human Resource Development (MHRD) to implement IMPRINT projects especially on nano technology and advanced materials

JOINT R&D INITIATIVE WITH MINISTRY OF RAILWAYS (MOR) WITH THE DST spans 3-5 years. These are on challenges in fuel efficiency and emission control technologies, alternative fuels, fuel conservation in diesel traction etc. The outcomes will strengthen the Swachh Bharat Mission of the Government.

THE COLLABORATION ON NATIONAL MISSION FOR ELECTRIC MOBILITY is with the Department of Heavy Industry (DHI).

5

SHORING UP INDIA'S INNOVATION ECOSYSTEM

START-UP NIDHI (NATIONAL INITIATIVE FOR DEVELOPING AND HARNESSING INNOVATION) supports 200 best student startups/innovative ideas that have converted their ideas to a prototype/viable business plan. 20 innovators/ideas would be selected for enhanced support under the Start-up NIDHI Programme.

The Department of Science & Technology (DST) and Ministry of Human Resource Development (MHRD) have launched a joint initiative of promoting Start-up

Ecosystem in National institutes of repute. DST has been promoting establishment of Technology Business Incubators and MHRD has been establishing Research Parks in the country. Under this joint initiative, it is proposed to establish a 'Start-up Centre', a 'Technology Business Incubator' or a 'Research Park' depending on the preparedness of the institution in commercialization of technologies, supporting industrial research and nurturing and mentoring start-ups. It is proposed that the Research Parks shall be funded by MHRD, TBIs by DST and Startup Centres shall be jointly funded by DST & MHRD. IIT Hyderabad and IIT Gandhinagar have been recommended for establishing Research Parks, 11 IIT/NITs have been recommended for establishing Technology Business Incubators and 10 IIT/NIT/ IIITs have been recommended for initiating Start-up Centres.

6

ENCOURAGING INNOVATIONS AMONG SCHOOL CHILDREN

Reorientation of Innovation in Science Pursuit for Inspired Research (INSPIRE) Scheme has been conceptualized during 2015. The programme has been modified to encourage children to visualise/analyse needs of the nation; develop critical thinking about national issues and problems pertaining to everyday life, as well as create awareness and inspire them to devise innovative ideas to address them. Follow-up mechanism to further fine tune the best creative ideas/concepts will be put in place.

The second component of the INSPIRE scheme deals with organizing Science Camps for science students of Class 11th. Through the Science Camps, these students are provided an opportunity and exposure for interaction with scientists and academicians including Nobel Laureates. Now, "Innovative Idea Writing" has been introduced on specific themes like Water, Energy, Security etc. in keeping with the current initiatives of the Government like Make in India, Swachh Bharat etc. In each Camp, the ideas are being screened for finding the 3 best innovative ideas.



DEVELOPING SCIENTIFIC TEMPER AND AWARENESS CREATION

THE SCIENCE EXPRESS – CLIMATE ACTION SPECIAL (SECAS),

a unique exhibition mounted on a specially designed 16 coach AC train was flagged off on October 15, 2015 from Delhi Safdarjung Railway Station on its VIII phase. In its current phase, it has been visited by around 20 lakh people mostly school children. Science communicators have conducted several kinds of platform activities such as puppet shows, plays, lectures etc. during the different station halts of Science Express in the country.

INDIA INTERNATIONAL SCIENCE FESTIVAL (IISF) 2015

IISF 2015 was organised in IIT, Delhi over the 4th of Dec. to the 8th Dec. 2015. Approximately 10,000 delegates from all over



the the country participated in the young scientists conference, techno-industrial expo, science film festival, national level exhibition and project competition. The Largest Practical Science Session with 2000 students, on 7th Dec. 2015, found the entry in the *Guinness Book of World Records*.

7

S&T FOR GROWTH WITH INCLUSION AND EQUITY

INCLUSION OF WOMEN TO SCIENCE AND TECHNOLOGY

Knowledge Involvement in Research Advancement through Nurturing (KIRAN) programme was launched in the year 2014 to bring gender parity in science through nurturing the research career of women scientists. The programme is aimed at providing opportunities to women scientists who had a break in their career.

Around 650 women in S&T have been supported in past two years.



Women Technology Park@Aulgappe Village, Tumkur district, Karnataka

Women Technology Parks

act as a single window hub for convergence of diverse technologies, integrated with forward and backward linkages leading to socio-economic development of women through capacity building and adoption of location-specific technologies,

integrated with forward & backward linkages leading to development of women entrepreneurs. So far, 19 Women Technology Parks (WTPs) are fully functional benefitting about 20000 women while 13 WTPs have been established during past two years targetting another 25000 women.

NORTH EASTERN CENTRE FOR ETHNO MEDICAL RESEARCH

Establishment of an Ethno Medicinal Research Centre in Manipur with budgetary support of approx. Rs.6.00

crores has been approved. This Centre aims to undertake ethno phyto-chemical research of wild herbs available in the NE region that have unique medicinal and aromatic properties, particularly in our traditional systems. The Centre will enable scientific validation of traditional herbs and help improve quality of life and economic status of local community through product development.

IMPROVING TRADITIONAL WATER MILLS IN ARUNACHAL PRADESH

An indigenous technology on improving Traditional Water Mills for Income Generation to enhance the livelihood of Tribals in Arunachal Pradesh was demonstrated at two places Rikpu Ronya and Mukyom-Kojak village, West Siang District, Arunachal Pradesh.



Traditional water mill demonstration in the State of Arunachal Pradesh

ELECTRONIC CORDLESS JACQUARD LOOM WEAVING CENTRE FOR MARGINALIZED HANDLOOM WEAVERS IN KANCHIPURAM, TAMILNADU.

The system is unique as this is an indigenous development to alleviate occupational stresses of the weaver and help develop design conversion tool using visual basic on windows operating platform. This will also help in the creation of new business opportunities for the handloom weavers.

SETTING UP OF DEMONSTRATION PLANTS FOR PINEAPPLE LEAF FIBRE AND BANANA FIBRE USING ANAEROBIC EXTRACTION

A demonstration plant was designed, fabricated and installed in Maneed Panchayat, Ernakulam District, Kerala for extracting pineapple fiber from a batch of 300 kg leaves. The plant is run by “Kudumbashree”, the collaborating agency under the Kerala state government.



SETTING UP OF 2 *100 KW MICRO HYDEL PLANT AT THANGU, NORTH SIKKIM.

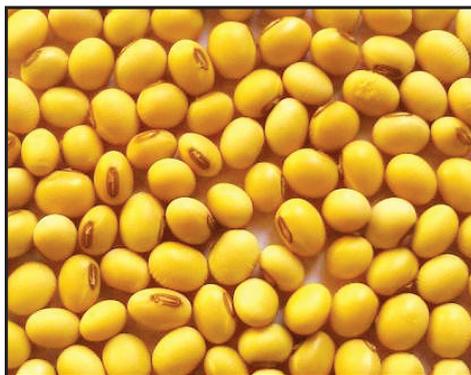
A 2* 100 kw Micro Hydel Plant has been commissioned at height of 13000 feet in Thangu, North Sikkim based on Cross flow turbine technology.

DEVELOPMENT OF CROP VARIETIES

Wheat: The Agharkar Research Institute, Pune had contributed to the development of ten wheat varieties, which include five durum, four aestivum and one dicoccum variety.

The recently developed 10th variety - MACS 6478 was released and notified by the Central Subcommittee on Crop Standards on 30 July 2014 for timely sown irrigated conditions of the Peninsular Zone.

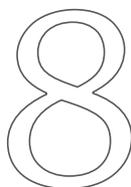
Soybean variety MACS 1188 was released and notified by the Central Varietal Release & Notification Committee of the Indian Council of Agricultural Research, for cultivation in Southern Zone. Field trials at the farmers' fields in kharif season of 2014 gave maximum yield of 3250 kg/ha.



The salient features of this variety include short maturity of 98 days; seed germination is above 90%; resistant to pod shattering and suitable for mechanical harvesting; and highly resistant to diseases like Rhizoctonia aerial blight, bacterial pustule and charcoal rot, major insect-pests like stem fly, pod borer, leaf folder, leaf miner and defoliators.

MICROBIAL ENHANCED TECHNOLOGY FOR OIL RECOVERY (MEOR)

Agharkar Research Institute developed a microbial process for the recovery of crude oil from depleted wells having temperatures exceeding 91°C using a consortium of hyperthermophilic bacteria. Oil recovery to the tune of 60% was achieved by using this consortium during simulated sand pack experiments. This process was developed in collaboration with Institute of Reservoir Studies, Oil and Natural Gas Corporation Ltd (IRS-ONGC). The technology was implemented in field (ONGC owned oil well in South Kadi, Gujarat).



LEVERAGING INTERNATIONAL S&T COOPERATION

International S&T Cooperation programmes create strategically important links with countries around the world to hybridize knowledge and enhance India's S&T Competitiveness. Important new initiatives during past two years are:-

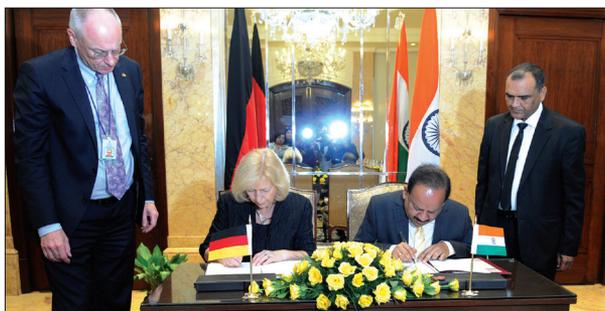
- Launched Phase II of the Australia-India Strategic Research Fund (AISRF) for promoting socially relevant



Secretary, DST concluding the MoU with CNRS, France during the Indo-French Summit meeting in Paris in April 2015

R&D projects in areas of human health science and agriculture biotechnology for enhancing crop production and a new program on Indo-Canadian R&D Centres (IC-IMPACTS) in the topical areas of “Sustainable Infrastructure” and Water Management”.

- Concluded MOU with Centre National de la Recherche Scientifique (CNRS) of France to further accelerate scientific cooperation in frontier areas of mutual interest



Hon'ble S&T Minister of India Dr. Harsh Vardhan and the German Federal Minister for Education and Research, Ms. Johanna Wanka signing an agreement for furthering cooperation between Govt. of India and Federal Republic of Germany in the field of S&T, in New Delhi on October 05, 2015.

through thematic networked Centres.

- Extension of the bilateral Indo German S&T Centre for 5 years (2017-22) with doubling of annual financial allocation from 2 m to 4 m euro from each side to further strengthen industrial R&D cooperation on 2+2 (academia + industry) model of participation,

focussed on areas such as advanced manufacturing, energy technologies, bio-medical devices, ICT etc.

- Relationship with Japan was substantially strengthened by initiating a new programme for establishing Indo-Japan Joint laboratories in the areas of Internet-of-things, Big data analysis and artificial intelligence.
- The Phase II of the Indian Beamline at the synchrotron facility at KEK in Tsukuba, Japan was launched in Nov 2016. The Indian beamline at the Photon factory will be augmented for conducting studies on nano-material characterization for energy storage and generation.
- Launched a new programme with Russian Ministry of Education and Sciences (RMES) to support joint research projects in the areas of Applied Sciences.
- The S&T collaboration with the United Kingdom got a major boost with the launch of the new Newton-Bhabha

programme covering people, project and translation strands. Under this program, scientists and researchers from two countries will collaborate to address grand societal challenges confronting Public Health & Well Being; Food-Water-Energy nexus; and Sustainable Cities. Advanced Manufacturing and Big Data Analysis will be underpinning themes for research collaboration. United Kingdom will be the partner country for the 2016 Technology Summit to be organised by CII in partnership with DST.



Dr. Harsh Vardhan, Minister for S&T and ES inaugurating the Technology Expo at the Indo-U.S. Technology Summit 2014

programme has significantly contributed in establishing Indian footprint in Africa. Considering the success of the program, it has been decided to increase annual award up to 200 Fellowships under India Africa Forum Summit III.

- Launched India Science and Research Fellowship (ISRF) scheme for neighbouring countries (Afghanistan, Bhutan, Bangladesh, Maldives, Myanmar, Nepal, Sri Lanka) for undertaking R&D work in India. Thirteen researchers from Bangladesh & Sri Lanka were awarded fellowships against the maiden call. In 2016, all the countries except Maldives will be covered under the award.

For more details please visit
<http://www.dst.gov.in>