

DRDO NEWSLETTER

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National Science Day (2016) Celebration

DRDO National Science Day Oration

on

Renewal Energy Roadmap – R&D Issues

by

Shri Upendra Tripathy, IAS

Secretary Ministry of New and Renewable Energy

being presided over by

Dr. S. Christopher

Secretary DD R&D and Director General DRDO



Visitors to DRDO Labs/Estts

Centre for High Energy Systems and Sciences

Shri G Mohan Kumar, Secretary, Defence, Govt of India, visited the outdoor facilities of Centre for High Energy Systems and Sciences (CHESS), Hyderabad, on 19 February 2016. Shri Suranjan Pal, OS and Director, CHESS, briefed him on critical technologies related to Directed Energy Laser Systems. He also appraised the Defence Secretary about the lab's technical achievements, as well as various infrastructural facilities developed. Shri G Mohan Kumar also witnessed the demonstration of the high speed active target tracking and precision HPL beam pointing on moving targets.



Shri G Mohan Kumar at DLRL, Hyderabad

Hyderabad, on 19 February 2016. Dr CG Balaji, DS and Director, DLRL, briefed the Defence Secretary about the status of various ongoing and technology development projects.



Shri G Mohan Kumar being briefed about CHESS technology

Defence Electronics Research Laboratory

Shri G Mohan Kumar, IAS, Defence Secretary, visited Defence Electronics Research Laboratory (DLRL),

Electronics & Radar Development Establishment

A committee comprising 13 MPs under the Chairmanship of Shri Tarun Vijay, Rajya Sabha Member, visited Electronics and Radar Development Establishment (LRDE), Bengaluru, on 1 February 2016. Hon'ble MPs also visited the exhibition showcasing DRDO products. The exhibition was opened to DRDO employees during 2-3 February 2016. Around 3500 employees visited the exhibition.



Hon'ble MPs at LRDE Bengaluru

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Cover (L to R): Dr AK Singh, Director INMAS, Shri Upendra Tripathy, Secretary, Ministry of New and Renewable Energy, Govt of India, Dr S Christopher, Secretary Department of Defence R&D and DG DRDO, and Shri Gopal Bhushan, Director, DESIDOC, releasing Compendium of National Science Day Orations.

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DRDO celebrates National Science Day

National Science Day (NSD) is celebrated all over India to commemorate the discovery of 'Raman Effect' by Dr CV Raman. Dr Raman was awarded the Nobel Prize in Physics in 1930 for the work on the scattering of light, which was named Raman Effect. DRDO, like every year, celebrated the day with great enthusiasm. Scientific lectures/talks by invited guests and DRDO scientists were organised by all DRDO labs/estts.

Defence Science Forum in Delhi, organised DRDO National Science Day Oration on the 'Renewal Energy Roadmap—R&D Issues' by inviting Shri Upendra Tripathy, IAS, Secretary, Ministry of New and Renewable Energy, Government of India, at DRDO HQ. The function was presided over by Dr S Christopher, Secretary, Department of Defence R&D (DDR&D) and DG, DRDO.

In his oration, Shri Tripathy brought out India's aspiration and plans of utilizing the renewable sources of energy. "Our overall cumulative achievement in terms of solar energy today is five thousand five hundred megawatts. Globally India's position has gone up from 10th to 8th during last year and by 2022 it will be in first three positions with hundred thousand megawatts being achieved," highlighted Shri Tripathy. Appreciating

DRDO's spin-off benefits of DRDO technologies, he proposed to find the common areas where the convergence and synergy can be brought in the area.

Dr Christopher, in his address, encouraged young scientists to think out of the box and pursue the path of Raman and Ramanujam to be successful.

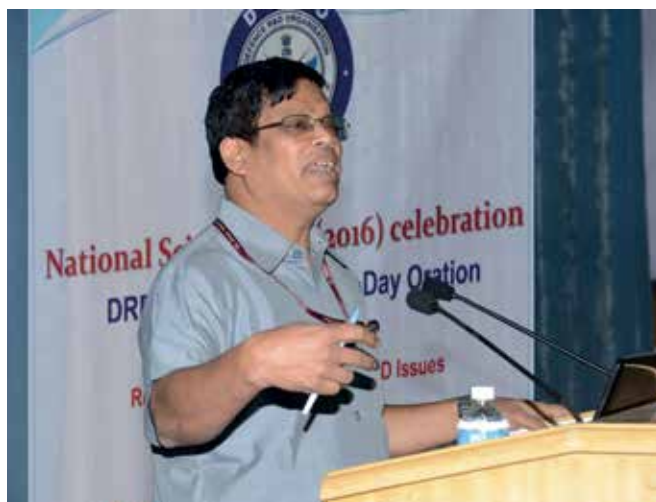


Dr S Christopher delivering NSD inaugural address

DRDO Science Spectrum, a compendium of collections of orations of the DRDO scientists published by Defence Scientific Information and Documentation Centre (DESIDOC), Delhi, was released by Shri Tripathy and Dr Christopher.

Three young scientists, Dr Vijay Kumar Bharti from Defence Institute of High Altitude Research (DIHAR), Leh, Shri RP Raju from Naval Physical Oceanographic Laboratory (NPOL), Kochi, and Shri Prasanta Kumar Ojha from Naval Materials Research Laboratory (NMRL), Ambernath, delivered lectures on "Studies on Seabuckthorn Plant Produce as a Novel Feed Additive for Animals at High Altitude", "Underwater Acoustic Propagation of LFM Pulse", and "Modified Borosilicate Glasses as Sealant for Solid Oxide Fuel Cell", respectively.

Medallions and certificates were presented by the Chief Guest and Secretary DDR&D to the orators from Delhi-based labs/estts also.



Shri Upendra Tripathy delivering NSD oration on Renewal Energy Roadmap—R&D Issue



The following DRDO labs/estts organised NSD at their respective places.

Advanced Systems Laboratory

Shri Sachin Jain, Sc D, delivered NSD oration on "New Generation Telemetry System." Shri S Bhaskar, Sc G, Technology Director, ACC, also delivered a colloquium talk on Exploring the Basics of Life. Dr Tessy Thomas, OS and Director, Advanced Systems Laboratory (ASL), awarded NSD medallion and certificate to Shri Jain.



Centre for Air Borne Systems

Shri Jawed Qumar, Sc E, delivered NSD oration on "Multi-static Radar Extended to Multi Dynamic Radar for Airborne Surveillance Systems." Shri MS Easwaran, OS and PD (AEW&C) and Director CABS awarded NSD medal and certificate to the orator.



Centre for Artificial Intelligence & Robotics

Shri Kethavath Rajkumar, Sc C, delivered NSD oration on "Autonomous Navigation", a critical technology



for imparting autonomy to mobile robots. In his oration he spoke about requirement of development of several components such as path planning, map building and obstacle avoidance for autonomous navigation.

Centre for Military Airworthiness & Certification

Shri Gaurish Kumar Tripathi, Sc E, delivered NSD oration on "Design Approach, Harmonics Reduction and Efficiency Improvement in Transformer Rectifier Unit for Airborne Applications". His talk covered the analysis of current harmonics generated across the aircraft alternator for different configurations of Transformer Rectifier Unit. He was given NSD medallion and certificate by Shri P Jayapal, Chief Executive, CEMILAC.



Combat Vehicles Research & Development Establishment

Shri G Srinivasan, Sc F, gave NSD oration on "Development of Indigenous Remote Controlled Weapon Station for Main Battle Tanks and its Variants." Smt V Uma, Sc E, also presented a lecture on "Latest Trends in Power Train Technologies". Science Quiz,

Essay and Poster competitions were conducted and prizes were awarded to the winners by Dr P Sivakumar, DS and Director, CVRDE.



Defence Bio-Engineering & Electromedical Laboratory

Dr K Kadirvelu, Sc E, delivered NSD oration on "Fluorescent Nanodots: Future Perspectives in Defence Applications". In his oration, he explained the evolution of 'Fluorescent Nanodots' and the wide range of their applications in analytical and biomedical fields. The potential utility in the field of detection of chemical threat agents and toxins in the environment and to recognize biomolecules for medical application and physiological monitoring were described with examples.



Defence Electronics Research Laboratory

Shri N Satish Kumar Reddy, Sc F, delivered NSD oration on "Latest Trends in Jammer/Exciter Technologies". Dr CG Balaji, DS and Director, Defence Electronics Research Laboratory (DLRL), Hyderabad, presented NSD medallion and certificate to the speaker.



Defence Food Research Laboratory

Shri A Ramakrishna, Sc F, delivered NSD oration on "Development of Breathable Packaging and Bioemulsions Film to Maintain Post Harvest Storage Quality Attributes of Fresh Produce". He highlighted methods of developing active breathable package and bioemulsions by using biopolymers for increased quality and shelf-life of fresh fruits and vegetables produces. Dr GK Sharma, Officiating Director, DFRL, presented NSD medal and certificate to Shri Ramakrishna.



Defence Materials & Stores Research & Development Establishment

Prof. P Venkitnarayanan, IIT, Kanpur, graced the occasion as Chief Guest and delivered the keynote address on the occasion. Dr N Eswara Prasad, Director, Defence Materials and Stores Research and Development Establishment (DMSRDE), Kanpur, in his NSD address, delivered a talk on 'Frontiers of Science', wherein he emphasized the need to establish state-of-the-art analytical and characterization tools/facilities at DMSRDE.

Shri Amit Saraiya, Sc E, gave NSD oration on "Nanostructure Material Applications as Gas and Strain Sensor". He was presented NSD medallion and certificate by the Chief Guest. Ms Neha Agarwal also delivered a lecture on "Carbon Nanomaterials based Polymer Nanocomposites and their Applications".



Defence Scientific Information & Documentation Centre

Smt Kavita Narwal, Sc C, Defence Scientific Information and Documentation Centre (DESIDOC), Delhi, delivered lecture on "Digital Publishing in DESIDOC". She discussed developments and evolution in the publishing world with focus on DESIDOC's adaptation to digitalization in publishing. Dr M Madhusudhan, Assoc. Professor, Delhi University delivered an invited talk on Mobile Libraries.



Electronics & Radar Development Establishment

Shri SS Nagaraj, Director, LRDE, inaugurated the celebrations and brought out the importance of the Day. Shri Ramakrishnan S, Sc F, delivered NSD oration on "Development of Synthetic Aperture Radar (SAR) – Technology Challenges." Shri Nagaraj presented NSD oration medal and certificate to the orator.



Gas Turbine Research Laboratory

Shri Debabrata Roy, OS, GTRE, in his address delineated the efforts and achievements in the field of science for human welfare. Shri Mohamed Tabraiz Pasha, Sc D, delivered NSD oration on "Development of Safety-Critical Digital Engine Controller for Small Turbo Fan Engine." In his oration he explained design and development facets of a fault tolerant-ruggedized embedded controller and its engine level integration. He was given NSD medallion and certificate.



Institute of Nuclear Medicine & Allied Sciences

Dr Manju Bala Popli, Sc F, delivered NSD oration on "Recent Technical Innovations for Imaging of Breast Cancer: A summation of Engineering and Medicine."

Institute for Systems Studies & Analyses

Smt Ramita Sardana, Sc C, delivered NSD oration on "Design Patterns based Inter-Process Communication in a Military Simulation".

Institute of Technology Management

Dr A Senthil Kumar, Director, Indian Institute of Remote Sensing (IIRS), ISRO Dehradun, was the Chief Guest of the NSD function and delivered

an invited talk on "Geospatial Technology and its Societal Benefits." He accentuated the application of Geospatial Technology for monitoring humanitarian needs. Shri M Sankar Kishore, Director, ITM, in his address, emphasised on developing scientific temper, inculcating research activities and managing knowledge keeping in tune with the technical advancements. The event was conducted by Ms Gopa B Choudhury, Sc E.



Integrated Test Range

Integrated Test Range (ITR), Chandipur, celebrated NSD during 22 February to 4 March 2016. Dr BK Das, OS and Director ITR inaugurated the programme. Shri Angshuman Roy, Sc C, delivered NSD oration on "Implementation of CDMA-based Tele-command System for Range". He was presented NSD oration medal and certificate by Shri MV Bhaskarachary, Sc G and Associate Director, ITR. Debate, essay, slogan, poster, quiz competitions were organised during the celebration.



Microwave Tube Research & Development Establishment

Shri P Sri Krishna, Sc E, delivered NSD oration on "Thermal and Fluid Sciences behind Thermal

Management of Electronics." He was awarded NSD oration medal and certificate by Dr Sudhir Kamath, Director, MTRDC.



Naval Materials Research Laboratory

Students of 8th and 9th standard from the nearby schools participated in the oration competition, science exhibition and quiz contest organized by the laboratory.



A visit of the students was also arranged to some of the technical departments to nurture scientific spirit in them. Winners of the events were awarded certificate and trophy.

Naval Physical & Oceanographic Laboratory

As part of the celebrations, an invited talk on "Optics and Photonics: Revolution in Defence and Security" by Dr VPN Namboori, Emeritus Professor, Cochin University of Science and Technology and Science Quiz Programme were organized at NPOL.

Proof & Experimental Establishment

Dr AK Sannigrahi, Sc F and Additional Director, Proof and Experimental Establishment (PXE), Chandipur, delivered NSD oration on "Institutional Role on Clean Energy Production for Reducing Energy Demand as well as Mitigating Climate Change". Dr N Nayak, Sc G and Associated Director, presented NSD medal and certificate to Dr Sannigrahi.



RCI signs MoU

Research Centre Imarat (RCI), Hyderabad, and Indian Institute of Chemical Technology (IICT), Hyderabad, signed a Memorandum of Understanding (MOU) to explore, extend and strengthen academic and research collaboration in all relevant areas of interest between national labs by sharing facilities and expertise available with them.

Dr G Satheesh Reddy, SA to RM and Director, RCI and Dr S Chandrasekhar, Director, IICT signed the MoU on 22 February 2016 at IICT, Hyderabad. The MoU will be effective for a period of five years.



Indian Navy showcased Biodiesel Patrolling Boats



The Green Strike Force fleet of Indian Navy

During the recently held International Fleet Review (IFR) 2016 at Visakhapatnam, patrolling boats named Fast Interceptor Crafts (FICs), in the presidential column were run on B20 blend of biodiesel. These FICs, running on biodiesel, bears two green coloured bands, and are called 'Green Strike Force'. DRDO's Defence Institute of Bio-Energy Research (DIBER), Haldwani, has produced the biodiesel at its Project Site Secunderabad.

DIBER owns nearly three lakhs Jatropha plants at Project Sites Ahmednagar, Mhow and Secunderabad, and over the years has successfully demonstrated the use of B20 blend of Jatropha derived biodiesel in Navy vehicles and equipment without compromising with the efficiency of the machines with obvious environmental benefits.

DIBER was also the part of 'Clean Initiatives' Pavilion of Indian Navy in maritime exhibition during IFR 2016. Admiral RK Dhowan, Chief of the Naval Staff and Vice Admiral Ashok Subhedar, Chief of the Material, appreciated the joint efforts of Indian Navy and DIBER.

DIBER's stall was visited by the Hon'ble Prime Minister Shri Narendra Modi who was accompanied by Raksha Mantri Shri Manohar Parrikar, Chief Minister of Andhra Pradesh Shri N Chandrababu Naidu, Raksha Rajya Mantri Shri Rao Inderjit Singh, Chief of the Army General Dalbir Singh, and Chief of the Naval Staff Admiral RK Dhowan.



Prime Minister Narendra Modi at DIBER's stall in Clean Energy Initiatives Pavilion of Indian Navy

CHES develops High Speed Tracker Module for Directed Energy Laser System

Centre for High Energy Systems and Sciences (CHES), Hyderabad, has developed and successfully tested a single-board High Speed Tracker Module (HSTM) incorporating field-programmable gate array (FPGA) and digital signal processor (DSP).

The system acquires images from a high frame rate camera (> 1000 fps), pixel size 512 x 512, using CAMLINK interface, computes the



High Speed Tracker Module

centroid of the distant target and tracks the target, and controls a two-axis Fast Steering Mirror (closed loop bandwidth ~400 Hz) for precisely maintaining the laser beam spot onto the target centroid during the period of illumination.

Single frame latency and Jitter correction of 95 per cent, 90 per cent and 80 per cent has been achieved for 10 Hz, 20 Hz and 30 Hz jitter frequencies and

$\pm 0.3 \mu\text{rad}$ jitter amplitude, respectively under lab simulation conditions. The system would provide improved compensation of atmospheric effects on laser

beam propagation in comparison to the commercial NI-based system being used presently.

ARDE establishes state-of-the-art Fixed Firing Stand Facility

Armament Research and Development Establishment (ARDE), Pune, has successfully designed, developed and commissioned a state-of-the-art facility in the form of a fixed firing stand, which will pave the way for generating experimental data and qualifying the sub-systems for final realisation of the 155 mm/52 calibre Advanced Towed Artillery Gun System (ATAGS).



The first dynamic firing of the integrated ATAGS Ordnance and Recoil System on the Fixed Firing Stand was conducted at Proof and Experimental Establishment (PXE), Balasore, during 19-20 February 2016. The results of the trials have established the successful design and manufacturing of the ATAGS Ordnance and Recoil System.

ATAGS is a major complex weapon system consisting of several sub-systems such as Gun Structural System, Ordnance and Recoil, Ballistics, Automation and

Control, Automotive System, Sighting System and C4I.

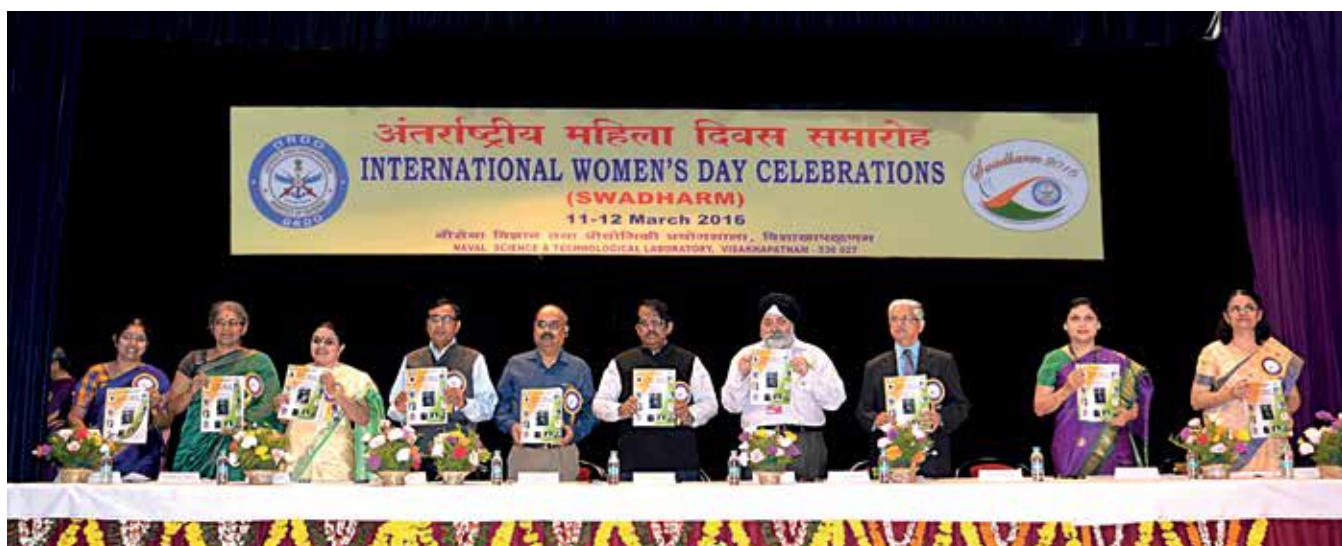
ARDE is the lead system integrator of the gun system being developed in collaboration with several industrial partners, PSUs, OFB and sister DRDO labs, viz., Vehicles Research and Development Establishment, Ahmednagar; Instruments Research and Development Establishment, Dehradun; Centre for Artificial Intelligence and Robotics, Bengaluru; Defence Electronics Applications Laboratory, Dehradun; Proof and Experimental Establishment, Chandipur and Defence Metallurgical Research Laboratory, Hyderabad.

DRDO Celebrates International Women's Day

International Women's Day (IWD) is celebrated on 8th March every year to commemorate the achievements of women past, present and future. DRDO celebrated IWD 2016 at Naval Science and Technological Laboratory (NSTL), one of the DRDO's laboratory at Visakhapatnam. A workshop on Scientific Women and DRDO—Harnessing Research and Management SWADHARM-2016" was organised to mark the occasion. Dr S Christopher, Secretary Department of

Defence R&D and DG DRDO was the Chief Guest of the inaugural function.

The workshop comprised Invited Talks by Dr Gayatri Sankaran, the first visually-challenged musician to receive Padma Shri, by Ms Shiela Sri Prakash, the first Indian Architect to serve on the World Economic Forum, and by Ms Ranjana Kumar, former Chairperson NABARD and Indian Bank. The talks were followed by Panel discussions and technical paper presentation.



Release of Workshop Compendium

The following DRDO labs/estts also celebrated IWD at their respective places:

Advanced Systems Laboratory

Advanced Systems Laboratory (ASL) celebrated IWD on 4 March 2016. A 'Stay fit' campaign organized by Women's Cell to create awareness among women employees, had a walkathon for over a kilometer and training in aerobics under expert's guidance. Dr Hemalatha Devi, Director, Tharuni, an NGO, delivered an Invited Talk wherein she underlined the need of 'gender equality at home' to achieve gender parity.

Dr Tessy Thomas, OS and Director, ASL, stressed upon 'equality in every respect and togetherness'. Indoor games, organised on the occasion, had active

participation from employees. A cultural programme, showing in-house talent of ASL, was also organised.

Combat Vehicles Research & Development Establishment

Combat Vehicles Research and Development Establishment (CVRDE), Avadi, celebrated IWD in a grand manner with the theme on "Pledge for Parity."

Smt S Savithri, Senior Scientist, presented the welcome address. Dr P Sivakumar, DS and Director, CVRDE, and Chairman Women Cell presided over the function and highlighted the role of women towards the growth and progress of the country in various fields.

Dr Kamali Sripal, Special Guest on this occasion, delivered a lecture on "Laugh for Sometime" with focus on the challenges working women face in their daily life and methods to cope with.



Smt Nalini Sivakumar, President, Women's Welfare Association, along with members took part in the celebration and cultural events. Women employees of CVRDE participated in the cultural events and also in the events like walkathon, fireless cookery competition, treasure hunt and team building games. Individual talents like vegetable carving, rangoli and other artwork were showcased during the event. Prizes were distributed to the winners.

Defence Electronics Research Laboratory

Defence Electronics Research Laboratory (DLRL), Hyderabad, celebrated IWD on 8 March 2016. Dr Hemalatha Devi, Director, Tharuni, was the Chief Guest for the occasion. Shri J Shanker Rao, OS and Associate Director, DLRL, presided over the function. Smt Neeta Gogia, Sc G, Co-Chairperson, Women Cell, DLRL, gave the welcome address.

Dr Hemalatha Devi delivered a talk on "Safety of Women". While highlighting safety issues of women at various stages of life from childhood to working life, she emphasized that the upbringing of a girl child should in no way be different from boys. Girls should be encouraged to take classes in self-defence techniques to build confidence and develop an all-round personality. It is of utmost importance to have an institutional mechanism for regular interaction and mentoring of young women by senior women employees to ensure a healthy and safe environment at work place. She also mentioned about the helplines and SMS services available for women in Hyderabad in hour of need.

As part of the programme, fun games and spot events were organized and prizes given to the winners. The laboratory also acknowledged contribution of women employees retiring during the year.



High Energy Materials Research Laboratory

High Energy Materials Research Laboratory (HEMRL), Pune, celebrated IWD on 11 March 2016. Shri DK Kankane, Sc G, Officiating Director, HEMRL, inaugurated the programme. Smt JK Nair, Sc E, Vice Chairperson of Women's Council, HEMRL, highlighted the importance of International Women's Day and Women Council activities carried out during year 2015-2016 in HEMRL followed by the release of the HEMRL's in-house women magazine 'URJA' by officiating Director. Shri DK Kankane, addressed the gathering and highlighted the contributions and achievements of women in various areas of society.

An activity-based training programme on "Self Awareness for Women Employees (SAFE)" was conducted by Wisdom Solutions. About 130 HEMRL women employees participated in the event which included sessions on self awareness, confidence building, expressing oneself, etc. Various activities like finding the business partner, get to know the persons, etc., were also carried out. Enacting drama to identify product name such as Jumbo Makeup Kit, Digital Homes, James Bond car etc., was also carried out in which, women employees participated with great enthusiasm.

Various games were arranged like Tower clock, balloon race, straws in the hair, musical chair, etc., in which the women employees participated wholeheartedly. Women Council also felicitated the women employees who got the promotions in last two years. The day ended with prize distribution for various games.



Electronics & Radar Development Establishment

IWD was celebrated in LRDE on 23 March 2016. Dr Dipshikha Chakravorthy, Professor, IISc., Bengaluru, Smt Vandana Upadhyay, Managing Director, Blues Entertainment India Pvt Ltd., Bengaluru and Smt Manjula Premkumar, Thread Sketcher and Canvas Painter were the guest invitees for the programme. Shri SS Nagaraj, Director, LRDE, presided over the function. As part of the celebration, beautiful thread sketching was done by Smt Manjula Premkumar. The function concluded with cultural events by women folk of LRDE.



Proof & Experimental Establishment

IWD 2016 was celebrated at Proof and Experimental Establishment (PXE), Chandipur in a befitting manner. Shri R Appavuraj, OS and Director, PXE inaugurated the celebration and spoke about the significance of the day. Smt Subasini Jena, Social Worker, Balasore, gave a talk on "Role of Women in Society". Smt Mamata Mohapatra, Women Activist, emphasized on "Women's Empowerment" and Dr CR Sahu of Health Life, Balasore, spoke about "Methods of Stress Management with Yoga."



Research Centre Imarat

Ms Amrapali Kata, IAS, Joint Collector Ranga Reddy District, Telangana, was the Chief Guest. Smt Joita Mukherjee, Sc E, RCI gave the welcome address. Smt Uma Sudhir from NDTV Hyderabad, delivered a lecture on Women Empowerment.

The Chief Guest in her address highlighted importance of women success in all areas of work and felt better team work, understanding between men and women will always lead to accomplishment of goals in all stages of life.

Dr G Satheesh Reddy, SA to RM and Director RCI felt participation of women in all areas of technical and management activities is the need of the hour. Smt P Rama Devi, Sc E, proposed the vote of thanks.



Vehicle Research & Development Establishment

Dr (Smt) Amarjeet Kaur presided over the function. Dr Manmohan Singh, OS and Director, VRDE, gave an inspirational speech regarding women empowerment.

Dr Smita Nisal, Senior Manager, Crompton Greaves was the Chief Guest for the function. She gave a glance of work carried out by successful women industrialist and expectations of society at work and home from working women.

Bone density test for women employees and women residents was conducted as a part of celebration. Women employees of VRDE provided financial support to the physically challenged girl students.

Manpower Development Activities

Conferences/Seminars/Symposia/Training Courses/Meetings

Course on System Modelling

Centre for Artificial Intelligence and Robotics (CAIR), Bengaluru, organized a course on "System Modelling" during 18-22 January 2016 under the Continuing Education Programme (CEP) of DRDO. Smt Mahima Verma, Sc E, briefed about the course.

There were a series of presentations and video lectures focusing on general system theory, system methodologies, system engineering and applications, system modelling concepts, methodologies and key model types like petri nets, event relation graphs, and queuing systems models. The case studies on application of system modelling, which included topics on complex aeronautical system design, development and validation were delivered by scientists from Aeronautical Development Agency (ADA) and Defence Research and Development Laboratory (DRDL), respectively. Theoretical topics were covered by academicians from MS Ramaiah University of Applied Sciences. Topics on petri-nets and event relationship graphs were presented by experienced system consultants from industry.

Participants from CAIR, ADA, Aeronautical Development Establishment (ADE) and Armament Research and Development Establishment (ARDE) attended the course.

Rajbhasha Technical Seminar

A one-day technical seminar titled "Utkarsh" in Rajbhasha was conducted on 16 February 2016 at **Defence Bio-Engineering and Electromedical Laboratory (DEBEL)**, Bengaluru, along with other Bengaluru-based DRDO labs/estts to promote Rajbhasha usage in technical paper presentation.

Shri UK Singh, Director, DEBEL, welcomed the Chief Guest Shri Amar Kumar Pandey, IPS, Additional Director General of Police, Karnataka, and the participants. In his opening remarks, Shri UK Singh expressed that the seminar will encourage scientists and technical staff to use Rajbhasha in their scientific and technical work at all levels. He made an earnest appeal to publish research



work in Rajbhasha and cited Government's initiatives to promote Rajbhasha.

While inaugurating the seminar, the Chief Guest expressed his pleasure to have been given opportunity to spend time with scientists working on very important areas for benefit of Services and the nation. He urged scientists to develop suitable products/technologies for internal security forces also who are increasingly facing law and order problems within the country.

The event was held in five technical sessions where 34 papers were presented by the authors from their work in respective research and development fields. Shri UK Singh, distributed the certificates and prizes to the participants.

Users' Meet on Functional Requirements

A brainstorming workshop and users' meet was held during 23-24 February 2016 at **Defence Institute of Bio-Energy Research (DIBER)** Field Station Pithoragarh. Workshop focussed on interaction with Army and Paramilitary forces. Brig. Rakesh Manocha, SM, Cdr 119(I) Inf. Bde was the Chief Guest. The function was chaired by Dr M Nasim, OS and Director, DIBER. Thirty Commanding Officers of 119 (I) Inf. Bde, 14 Bn Indo Tibetan Border Police, Sema Suraksha Bal and Border Road Organisation attended the workshop.

Dr M Nasim, in his welcome address asked participants to discuss their functional requirements,



like survival garden, utility bunkers, etc., in the changing scenario. Brig. Manocha, in his inaugural address lauded DIBER for its contributions to the Armed Forces. He called for a more frequent interaction between soldiers deployed in Kumaon Region and technical staff of DIBER. He appreciated the efforts of DIBER in providing food security to the Army units, and hoped that functional R&D products like 'Edible Camouflage' will come out soon for the benefit of soldiers.

An open house discussion with the users at the end of the workshop helped compiling the requirements of the army units deployed in the Kumaon Region. The service personnel also requested for regular training courses by DIBER for ex-servicemen who have resorted to agriculture as a profession post retirement.

On 24 February, a workshop was organized for the civil society, which was attended by 25 people from farming community including ex-servicemen and State Government Officers from Agriculture and Forest Departments. Participants discussed their expectations and problems being faced in the hill agriculture and appreciated the efforts being made by DIBER for progress of the region.

Hindi Conference

A one-day Hindi conference on "Unnat Padarth—Chunatiyan avam Nayi Dishayen" was organized by **Defence Materials and Stores Research and Development Establishment (DMSRDE)**, Kanpur, on 4 February 2016. The conference aimed to provide

a common platform to all academicians, scientist and technologist, working in the area of materials science to discuss and deliberate on various DMSRDE advanced material development programmes and also to dwell on the present status and various challenge and opportunities that lie ahead in Rajbhasha Hindi with the aim to promote and spread the knowledge in Hindi. Shri SD Khatri, Sc G, welcomed the dignitaries. Dr Vijay Kumar, Director, CIPET, Bhopal, inaugurated the conference. Shri AK Honda, Chief Engineer, MES, New Delhi, graced the occasion as the Guest of Honour.

Dr N Eswara Prasad, Director, DMSRDE, highlighted the role of advanced materials in modern era in Hindi. Smt Jyoti Srivastava, Sc F, briefly discussed the application and usefulness of advanced material in electronic, textiles and armor, etc., and thanked all for their active participation. Hindi magazine "Navchintan" and DMSRDE Annual Report-2015 were also released on the occasion.

Akhil Bhartiya Sanyukt Vaigyanik Evam Takniki Rajbhasha Sangoshthi

Defence Terrain Research Laboratory (DTRL), DRDO, Metcalfe House, Delhi, organised a one-day "Akhil Bhartiya Sanyukt Vaigyanik evam Takniki Rajbhasha Sangoshthi" on 26 February 2016 at Bhagwantham Auditorium, Metcalfe House, Delhi. The Sangoshthi was conducted jointly by Metcalfe House-based DRDO laboratories and establishments with the theme "Make in India and Digital India-Bharat ke Badhte Kadam".

Shri Leela Dhar Mandloi, Director, Bhartiya Gyanpeeth, was the Chief Guest of the programme and Dr Shashibala Singh, OS and Director, DIPAS was the Guest of Honour. Shri Sunil Sharma, Director, Rajbhasha and Directors of organising laboratories, including Dr RK Jain, OS and Director, JCB; Dr Hari Babu Srivastava, OS and Director, LASTEC; Shri Gopal Bhushan, Director, DESIDOC; Shri Shashi Bhushan Taneja, Director, ISSA; Dr Vijaya Singh, Director, CEPTAM; and Ms Anu Khosla, Director, SAG were also present. Dr MR Bhutyani, Director, DTRL, in his welcome address welcomed the esteemed guests and the participants.

The Chief Guest in his address stressed on the need to use Hindi in science and technology and also quoted some great Indian scientists who made their significant contributions in Indian languages. He congratulated Director, DTRL and team for organising the seminar on such a large scale.

With a great response, not only from DRDO labs but other Technical Organisations like ISRO, ICAR, IARI, educational institutions, private and public sector, a total of 113 articles/research papers were received from 170 authors. The seminar was conducted in four sessions and 32 presentations were made from the selected articles, out of which 10 were awarded as best papers. The seminar was attended by 150 participants from various organisations.

Dr Bhutyani appreciated the efforts made by DTRL and cooperation from sister labs for the grand success of the event.

Workshop on Retirement Plan

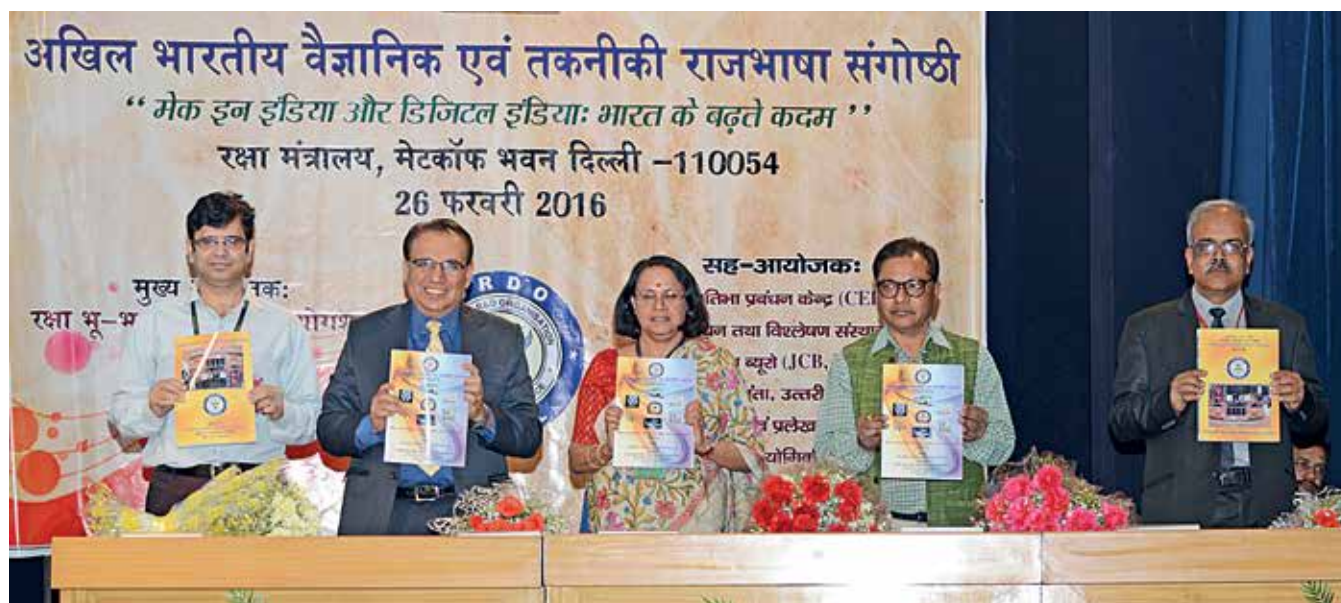
A two-day workshop on "Retirement Plan" was conducted by **Institute of Technology Management (ITM)**, Mussoorie, during 1-2 March 2016 in Defence Electronics Research Laboratory (DLRL), Hyderabad, for the Officers and Staff who are attaining the age of superannuation during this calendar year. Forty-seven participants attended the workshop. Shri M Sankar Kishore, Director, ITM, Mussoorie and Shri J Shanker Rao, Sc H and Associate Director, DLRL inaugurated the workshop.

On the first day, Shri TVP Rao, Sc G (Retd), and Shri Ratan Das, Jt Director, Admin (Retd), dealt on pension benefits and Smt Akhila Jay Kumar briefed about Life Skills.

On the second day Shri S Prakash, Joint Director Admin, Electronics and Radar Development Establishment (LRDE), Bengaluru, and Prof. Jain, Gitam University, explained about retirement benefits and investment plans. Shri OK Singh, Sc G, distributed the participation certificates.

Course on Low Power VLSI Design

Research Centre Imarat (RCI), Hyderabad,



organized a Special CEP course on Low Power VLSI Design using Latest Techniques during 22-26 February 2016 in DAC Conference Hall, RCI. Participants from ADA, ASL, CVRDE, DEBEL, DLRL, LRDE and RCI attended the course. Smt A Mangatayaru, Sc G, Head HRD and Course Director delivered the welcome address. Shri G Venkata Reddy, Sc G, RCI, inaugurated the course and addressed the participants about the importance of the course. Topics covered during the course included: Introduction to CMOS VLSI Design Challenges, Introduction to Low Power VLSI Design and Significance, Low Power Methods: Clock Gating, Multi VDD, Multi Vt etc., Low Power Clock Distribution Circuits, etc.

Rajbhasha Workshop

Research Centre Imarat (RCI), Hyderabad, organised 4th Rajbhasha Workshop on 15 March 2016. Shri T Narasimha Rao, Sc G, Vice-Chairman OLIC, RCI, inaugurated the workshop. Prof. Mushtaq Ahmad, Head Unani Medicine Chair, University of Western Cape, South Africa, delivered a lecture on Significance of Unani and Application in India and South Africa. Dr Munwar Hussain Kazni, Director, Central Research Institute of Unani Medicine, Hyderabad, delivered a lecture on successful treatment of various diseases using Unani medicine.

Shri Kazim Ahmed, Senior Translator, RCI, delivered a lecture on Rajbhasha Rules, Acts, and Provisions.



Agriculture Development Stakeholders Review Meet 2016

Defence Institute of High Altitude Research (DIHAR), Leh, organized Agriculture Development Stakeholders Review Meet 2016 on 25 February 2016. Heads and technical staff of State Department of Agriculture and Horticulture; Shere Kashmir University of Science and Technology (SKUAST), Leh; Krishi Vigyan Kendra, Leh and Nyuma and Central Arid Zone Research Institute (CAZRI), Leh, attended the meet.

The meeting was organized to review the recent developments and appraise the prevailing and emerging problems being faced in the field of agriculture in Ladakh region. The meeting brought out various important issues needed to be addressed.

During the meet each organization had the opportunity to share and learn about new technologies/



efforts being made for agriculture development of Ladakh.

Raising Day Celebrations

Institute of Technology Management, Mussoorie

Institute of Technology Management (ITM), Mussoorie, celebrated its 55th Raising Day on 21 February 2016. Dr S Christopher, Secretary, Department of Defence R&D and DG DRDO was the Chief Guest on the occasion. Dr Manas K Mandal, DG (LS), Shri MH Rahaman, OS and CC R&D (TM), Dr SC Sati, OS and DG (NS&M), Dr SS Negi, OS and Director IRDE, Dr RS Pundir, Director, DEAL and Shri Benjamin Lionel, Head, Programme Director, also graced the occasion.

Shri M Sankar Kishore, Director ITM, in his Welcome Address, highlighted the initiatives taken by ITM in the areas of off-campus/in-campus training programmes and virtual lecture series. He also reflected upon the progress made by ITM during 2015.

Dr S Christopher appreciated the efforts made by the ITM in the areas of Techno-Managerial Training. He highlighted various other efforts to further strengthen the training mandate of ITM and emphasized on the importance of human relations and team building. Shri MH Rahaman, in his address, brought out the importance of technology management courses offered by ITM. Shri Sushil Sharma, Welfare Officer, ITM presented a brief report on the various welfare activities and measures taken for the employees during the year 2015.

Laboratory-level DRDO Awards and Cash awards were presented by Dr S Christopher to the meritorious employees. Mementos were also presented to personnel

who completed 25 years of services in DRDO. A sapling was also planted by the Chief guest on the occasion. Dr DK Panda, Sc F, proposed the vote of thanks.

Solid State Physics Laboratory, Delhi

As part of Solid State Physics Laboratory's (SSPL) 54th Raising Day celebrations, 1st Sir JC Bose memorial oration was delivered by Dr VK Aatre, former SA to RM, on 3 February 2016 at Kothari Auditorium, DRDO Bhawan. The event was preceded by felicitation function and address by Dr S Christopher, Secretary Department of Defence R&D and DG DRDO to honour Dr VK Aatre on being awarded Padma Vibhushan and Dr Satish Kumar, DS and DG (MSS) on being awarded Padma Shri.

Further celebrations were held on 4 February 2016 at SSPL, where Dr RK Sharma, OS and Director SSPL, welcomed honorable Chief Guest Dr KD Nayak, DS and DG (MED & CoS) along with distinguished guests from DRDO HQ and Delhi-based Lab Directors. SSPL employees and alumni along with their families graced the occasion.

Laboratory-level awards were presented to employees for their outstanding contributions during the year 2015. Mementoes were presented to SSPL employees who completed 25 years of dedicated service. Various sports events and special events for children of SSPL employees were organized on this occasion and trophies were distributed to position holders. The occasion was made colorful with the lovely performances by SSPL employees and their wards during cultural programme. The ceremony concluded with a vote of thanks by Smt Anuradha Dhau, Sc F, who coordinated the event along with a dedicated team.



Personnel News

Awards

Vigyan Pratibha Samman 2016

Shri Sudhir Kumar Mishra, OS and Chief Controller R&D (BrahMos) and CEO and MD BrahMos Aerospace was honoured with the first Vigyan Pratibha Samman instituted by the Madhya Pradesh Council of Science and Technology in the 5th Bhopal Vigyan Mela on 19 February 2016. The award was presented by Shri Babulal Gaur, Hon'ble Minister of Home, Government of Madhya Pradesh. Professor Pramod K Verma, DG and Scientific Adviser to the Government of Madhya Pradesh and Shri Tapan Bhowmik, Chairman, MP State Tourism Development Corporation were also present on the occasion.



Bioved Fellowship

Dr Atul Grover, Sc D, Defence Institute of Bio-Energy (DIBER), Haldwani, has been conferred Fellowship by Bioved Research Institute of Agriculture, Technology and Sciences during 18th Indian Agricultural Scientists and Farmers Congress 2016 held at Allahabad.

Young Scientist Award

Ms Sadhana Singh of DIBER was awarded "Young Scientist Award" during the International Conference on Advancing Frontiers in Biotechnology, Sustainable Agriculture and Health held at Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad during 25-26 February 2016.

Ms Sadhana Singh also won the "Best Paper Presentation Award" during the International Conference on Bioinformatics and Systems Biology 2016 held at Indian Institute of Information Technology, Allahabad.



Fellowship of Indian College of Nuclear Medicine

Dr RK Sharma, Sc G, Addl Director, Institute of Nuclear Medicine and Allied Sciences (INMAS), Delhi, has been conferred Fellowship of the Indian College of Nuclear Medicine, an academic wing of the Society of Nuclear Medicine, India during its convocation ceremony held at JIPMER, Pudicherry, on 27 February 2016.

Academician of APAM



Dr Chandra Prakash, Sc G, Solid State Physics Laboratory (SSPL), Delhi, has been elected Academician of Asia Pacific Academy of Materials (APAM). The honour was conferred upon him for his outstanding contribution to the field of Electroceramics.

Higher Qualification Achieved



Shri Shubhashisa Sahoo, Sc D, Centre for Artificial Intelligence and Robotics (CAIR), Bengaluru, has been awarded PhD in Engineering Design by the Indian Institute of Technology Madras, Chennai, for the thesis titled "Design and Implementation of a Heading Angle Controller for an Autonomous Ground Vehicle."

National Safety Day Celebration

Defence Electronics Research Laboratory

National Safety Week is celebrated to make aware the people about how to get prevented from the industrial accidents by exhibiting widespread safety awareness programmes. Defence Electronics Research Laboratory (DLRL), Hyderabad, celebrated 45th National Safety Day/Week during 28 February to 4 March 2016 to enhance the safety awareness among employees. Dr CG Balaji, DS and Director, DLRL, inaugurated the National Safety Day celebrations. Shri J Shanker Rao, OS and Associate Director, N Seetharamaiah, Sc G, Chairman, Safety Committee, Safety Committee members, senior scientists, officers and staff actively participated in the safety programmes. Safety Pledge was administered to the employees.

During the campaign varieties of specific activities were displayed to the employees. Invited talks on Road Safety by Shri AV Renganath, IPS, DCP, Hyderabad, and Health Safety on Lung Disease due to Environmental Pollution by Dr N Ravindra, MD, from Global Hospital, Hyderabad, posters display of safety messages and slogans, just-a-minute safety competition, banner exhibition, drama/skit and songs, etc., were organised during the week.

Safety Awards were distributed to the winners of the competitions held during the campaign. During training session, employees were taught about the testing and examination of electrical safety, fire control, first aid knowledge, etc.



Dr CG Balaji delivering inaugural address

High Energy Materials Research Laboratory

The National Safety Week was celebrated at High Energy Materials Research Laboratory (HEMRL), Pune from 4th to 10th March 2016. Various programmes were arranged during the week. As a prelude to National Safety Week, safety badges were distributed to all the employees.

On 4 March 2016 Safety Quiz was conducted under two categories, viz., Scientists, Technical Officers and STAs and non-technical officers/staff. First three winners in each category were awarded with prizes and certificates. Slogan competition in English, Hindi and Marathi on Safety, Health and Environment was organised and the best three slogans from each language were awarded with prizes and certificates. Fire-fighting demo was organized for the employees of HEMRL to create awareness about fire safety. Safety Health and Environment (S.H.E) Bulletin containing various articles pertaining to safety, health and environment was released and best three articles from the bulletin were awarded with prizes.

Based on safety performance during the year 2016, GPS, and Instrumentation Divisions were awarded Safety Trophies as Best Project Division and Support Division, respectively.

Comde SK Patel, Director DQRS, DRDO HQ, Delhi, was the Chief Guest of the function and gave presentation on Improving Safety Culture. Shri KPS Murthy, OS and Director, HEMRL, in his address highlighted the importance of safety during handling of various high energy materials. Comde Patel, and Shri Murthy, distributed Safety trophies.



Release of S.H.E. Bulletin

Proof & Experimental Establishment

The 45th National Safety Day was celebrated at Proof and Experimental Establishment (PXE), Chandipur, on 4 March 2016. To mark the occasion, Dr Aravind Kumar, Assistant Professor, Department of Chemical Engineering, National Institute of Technology (NIT), Rourkela, delivered a lecture on “Application of Safety Devices for Industrial Use”. Shri R Appavuraj, OS and Director, PXE, gave a motivational lecture on “Safety Culture and Practices”.

Different safety awareness programmes like safety quiz, safety speech and poster display, etc., were also organized. The winners were facilitated with awards by Shri R Appavuraj.



Sports Round-Up

DRDO West Zone Cricket Tournament

High Energy Materials Research Laboratory (HEMRL), Pune, conducted DRDO West Zone Cricket Tournament from 18 to 22 January 2016 at Ammunition Factory, Cricket Ground, Kirkee, Pune. Tournament was inaugurated by Shri DK Kankane, Sc G, Associate Director, HEMRL.

Teams from six DRDO west zone labs, viz. HEMRL, Armament Research and Development Establishment (ARDE), Research and Development Establishment (Engineers) [R&DE (E)], Vehicles Research and Development Establishment (VRDE), Naval Materials Research Laboratory (NMRL), Advanced Centre for Energetic Materials (ACEM), and Mobile Systems Complex (MSC), participated in the tournament.

HEMRL won the tournament and ACEM was the runner-up. Awards for Man of the Match, Man of the Series, Best All Rounder, Best Batsman, Best Bowler, Best Wicketkeeper, etc. were also distributed.

Dr RK Pandey, Sc G and Officiating Director HEMRL, gave away the trophies and medals to the winner and runners-up team.



DRDO: Harnessing Science for Peace and Security

The Beginnings – Defence Science

In continuation of series of articles based on the monograph, "Defence Research and Development Organisation: 1958-1982", by Shri RP Shenoy, former Director of Electronics Research and Development Establishment (LRDE), Bengaluru, published by Defence Scientific Information and Documentation Centre (DESIDOC), Delhi in 2006.

Introduction

Historically, nations had fought their wars with weapons developed before the outbreak of the conflict and produced these in large numbers with the onset of hostilities. Because of a lack of organised approach, the time normally taken to realise a weapon from concept through stages of research, development, testing, production in large numbers, training of the soldiers to use the weapon, and formulation of the tactics by the commanders, was far too long. No radical innovation, leading to the development and production of weapon systems, was therefore attempted during earlier wars and scientists and technologists were never taken into the military other than as combatants. The first break from this tradition came about in the World War I by the introduction of poison gas by the Germans and the tank by the Britishers. These were developed after the hostilities had commenced and were aimed at breaking the stalemate of the trench warfare. However, it was during the World War II that the break from the earlier tradition was final by the formation of essentially a civilian organisation which innovated for the military during the war period and provided the Allied Forces led by the USA, new weapon systems such as, the microwave radar, proximity fuse, and atomic bomb, to name a few, which tilted the balance against the Axis Forces led by the Nazis. In the immediate aftermath of the war, geopolitical considerations led to the Cold War which polarized the developed world into two main blocks holding distinct ideologies, with the USA being the leader of the Western Block

and the USSR the leader of the other. The advice of Dr Vannevar Bush, that, "It is essential that the civilian scientists continue in peacetime some portion of these contributions to national security which they have made so effectively during war", was accepted and the close association of the scientists with the military continued in the USA. In the decades after the cessation of the war, the US Department of Defense became instrumental in the development of electronics, aerospace engineering and other technologies, and sciences related to military operations. Integrated circuits, real-time applications of computers, software, supersonic aircraft and space technology, came into being and were progressed at a rapid pace that normally would not have been possible in the commercial competitive environment of that time.

S&T Activities related to Defence Before Independence

Conditions Before World War II

The major military and economic power on the side of the Allies in the beginning of the World War II was Britain, which had an empire including India, to defend against the Germans and the Japanese. Even though in the period between the two wars, the admirals and the generals in Whitehall had shown little interest in science and technology, the threat of a major war, under which the country had lived for some years, had turned the thoughts of many of its talented scientists – even as early as 1934 – to problems of national defence before the hostilities had begun. The success of a scientific solution to the menace of the German magnetic mines to the Allied shipping was instrumental in bringing science and scientists of Britain fully into the war from its very early days. As the war waged, the British scientists from the universities were asked to participate in the problems concerning military requirements.

On the other hand, the policy followed by the British in India towards

scientific and technical education, scientific and industrial research and development was in keeping with their role as colonial rulers. Even though India had a long and rich history of distinct indigenous techno-scientific traditions, the colonial policy did not encourage generation of technical knowledge or ensure its integration into the knowledge base existing in the country. Colonial, commercial and Government imperatives set the parameters for the transfer and absorption of new technologies by the local population. For example, the colonial Government had set up, by the turn of the last century, a dozen scientific institutions such as the Geological Survey of India but the work done by these organisations were specifically aimed to serve the commercial interests of the British. During World War I, when the lack of industrial development in the country and the uncertainty of imports affected the supply of manufactured goods, the colonial Government responded by setting up an Indian Industrial Commission (IIC). The IIC in its report suggested that manufacturing activities would have to be preceded by adequate scientific and technical services which were deficient in the country. In spite of limitations imposed by the colonial rule, local efforts and achievements in education had resulted in the country having a scientific and technical workforce by the time World War I had been declared in Europe. In the beginning of the 1930's, even after repeated demands by the provincial Governments, scientists such as the Nobel Laureate Sir CV Raman, Dr JC Bose and some prominent British scientific workers, the colonial Government in India resisted pressure to set up a central body for scientific and industrial research similar to the Department of Scientific and Industrial Research (DSIR) set up in Britain after World War I. Later, even after the Governor General of India was advised by the British Government to set up an organisation similar to the DSIR in UK, it was not accepted on financial grounds. Instead, the Bureau of Scientific

and Industrial Research (BSIR) was set up under Mr A Ramaswamy Mudaliar, Commerce Member of the Governor General's Executive Council with Dr Shanti Swarup Bhatnagar as the scientist-in-charge. The scope of BSIR was limited to war-related research in collaboration with academic laboratories. For example, the Indian Institute of Science in Bangalore, was involved in training a considerable number of technicians in testing and calibration of electrical and radio instruments, in the repair of mechanical appliances for the Royal Air Force, and in the production

of chemicals and gases for the fighting services. Even with meagre budget of Rs 500,000, BSIR by 1941 was able to work out a number of processes at the laboratory level for utilization by industry and thus established the case for greater funding by the Government. Mainly through the efforts of Mr Mudaliar and Dr Bhatnagar, in 1942 the Council of Scientific and Industrial Research (CSIR) was formed as an autonomous body with a research grant of one million rupees. However, throughout the war period, the application of the colonial policy in the domain of scientific

research and cooperation excluded Indian scientists and scientific and industrial organisation from receiving valuable scientific inputs in such fields as nuclear energy, guided missiles, chemical and metallurgy of processes, new materials, and so on, while their counterpart in Canada, Australia and New Zealand were given access to the data. Given this policy of exclusion from major war related information and efforts in scientific and industrial areas and a small budget, CSIR could play only a marginal role of substitution of products which were in short supply.

EMU (R&D) Delhi wins 31 Trophies at Pusa Horticulture Show

EMU (R&D), Delhi, won 31 prizes during the Garden Competition organized by Delhi Agri-Horticulture Society (DAHS) at Indian Agricultural Research Institute (IARI), Pusa, New Delhi, during 27-29 February 2016. The trophies won are:

- ✧ DAHS Challenge Cup for BEST Mini Garden attached to Institutions, Embassies, Hotels and Clubs in Delhi and New Delhi.
- ✧ DAHS Challenge Cup for the Best Small Garden in Delhi and New Delhi in a Govt allotted accommodation.
- ✧ DAHS Challenge Cup for the Best Small Garden attached to Institutions, Embassies, Hotels and Clubs in Delhi and New Delhi.
- ✧ DAHS Challenge Cup for Best Large Public Garden in Delhi and New Delhi.
- ✧ DAHS Challenge Cup for Best Potted Plants
- ✧ Verma and Company Challenge Cup for Best Large Garden attached to Institutions, Embassies, Hotels and Clubs in Delhi and New Delhi.



- ✧ Second Prize for the Best Medium Garden attached to Institutions, Embassies, Hotels and Clubs in Delhi and New Delhi.
- ✧ Second Prize in the category of Small Gardens attached to Institutions, Embassies, Hotels and Clubs in Delhi and New Delhi, respectively.

Social Activity

Blood Donation Camp at DEAL

Defence Electronics Applications Laboratory (DEAL), Dehradun, organised 8th voluntary Blood Donation Camp on 15 February 2016, under the aegis of IMA Blood Bank, Dehradun. The camp was inaugurated by Dr RS Pundir, Director, DEAL. Dr JC Arora and Dr Manish Sharma supervised the camp. DEAL employees participated in the camp with great zeal and enthusiasm. Overall 19 units of blood was donated.

