



CSIR Achievements [2014-2023]

- The Hon'ble Prime Minister, Shri Narendra Modi, inaugurated the scaled-up plant for production of Hydrazine Hydrate (HH) developed in collaboration of CSIR-Indian Institute of Chemical Technology (IICT), Hyderabad and Gujarat Alkalies and Chemicals Ltd (GACL), Gujarat on October 10th, 2022, as an initiate towards 'Atmanirbhar Bharat'. The plant developed is based on CSIR-IICT's and GACL's jointly patented technology for production of 10,000 tonnes per year of Hydrazine Hydrate. The collaboration of CSIR-IICT and GACL led the process development from laboratory scale to pilot scale, and then to a commercial scale. The scale up ratio from pilot scale to commercial scale has been up to 100 times.



- Hon'ble PM, Shri Narendra Modi dedicated the National Atomic Timescale and Bhartiya Nirdeshak Dravya Pranali to the Nation and laid the Foundation Stone of National Environmental Standards Laboratory on 75 years of CSIR-NPL.




- A **plant based on Wax Deoiling Technology** developed by CSIR-IIP, set up at Numaligarh Refinery, BPCL was dedicated to the Nation by Hon'ble Prime Minister, Shri Narendra Modi. It will produce 50,000 MMTPA of high value Paraffin Wax and 4,500 MTPA of Microcrystalline Wax at the full capacity. This will help cut down the wax import by 50% & save the foreign exchange of about Rs 500 crore/year.



- CSIR's NIMTLI Program has catalysed the development of **indigenous dental implants**. It was developed by IIT Delhi and Maulana Azad Institute of Dental Sciences (MAIDS). This medical device was conceptualized, designed and manufactured at IIT Delhi in collaboration with Maulana Azad Institute of Dental Sciences (MAIDS). The Hon'ble PM issued a letter of appreciation.




 प्रधान मंत्री
 Prime Minister
MESSAGE

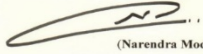
It is heart-warming to learn that an indigenous technology for dental implants has been developed by Council of Scientific and Industrial Research in collaboration with IIT-Delhi and Maulana Azad Institute of Dental Sciences.

We remain firm in our resolve to provide the latest and best treatment as well as make it affordable for the poor and the disadvantaged sections of the society. The indigenously developed technology would surely help make cost effective treatment available to all. The emphasis must also be on "Zero Defect and Zero Effect" while designing and manufacturing products.

The painstaking efforts made by the doctors, scientists and technical experts to develop technology for dental implants will boost the morale of the scientific and technical fraternity.

I congratulate the all involved in the development of the technology and hope that they will continue to work with increased vigour, commitment and dedication in the service of the nation.


May the technology make a lasting contribution in securing health and well-being of the common people of our country.


 (Narendra Modi)

New Delhi
 कार्तिक 15, शक संवत् 1941
 6th November, 2019

Dr. Harsh Vardhan
 Union Minister of Science & Technology,
 Earth Sciences and Health & Family Welfare
 209, Anusandhan Bhawan
 2, Raji Marg
 New Delhi - 110001

- CSIR-CSMCRI has developed a technology for recovery of valuable **Potash from spent wash** generated in sugarcane molasses-based alcohol distillery that saves foreign exchanges and prevents hazardous spent wash being discarded into the environment. The effort was appreciated by Hon'ble PM, Shri Narendra Modi.


 प्रधान मंत्री
 Prime Minister
MESSAGE

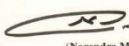
It is heartening to learn that an innovative zero-waste potash technology has been developed by Council of Scientific & Industrial Research (CSIR) and Central Salt and Marine Chemicals Research Institute (CSMCRI), Bhavnagar. The technological breakthrough will help in producing potash from spent wash, converting waste into an environmentally sustainable product.

The development of such zero-waste technology will help in making the distillery sector environmentally sustainable. The upscaling and validation of technology will help the distilleries to produce value-added products from spent wash that will be economically and ecologically viable. The technology will help prevent the contamination of groundwater and other water bodies and also contribute towards restoring degraded land.

Effective waste management continues to be one of our Government's key priorities. The technological breakthrough reinforces our Government's initiatives like 'Swachh Bharat', 'Make in India' and conversion of 'Waste to Wealth'. These attempts can succeed only through community participation and increased synergy between the public and the private sector.

The indefatigable efforts of scientists and technical experts are admirable and worth emulating.

I congratulate the scientists at CSIR, as well as CSMCRI and hope that they will continue to work with increased passion and dedication in the service of the nation.


 (Narendra Modi)

New Delhi
 कार्तिक 17, शक संवत् 1941
 8th November, 2019

Dr. Harsh Vardhan
 Union Minister of Science & Technology.

- Cabinet approved widening access of the TKDL database to users, besides patent offices:** The Cabinet chaired by Hon'ble Prime Minister, Shri Narendra Modi approved the Widening access of the Traditional Knowledge Digital Library (TKDL) database to users, besides patent offices on 17 August 2022. The opening up of the TKDL database to users will drive research & development, and innovation based on India's valued heritage across

diverse fields.

The infographic is divided into two main sections. The left section, titled 'CABINET DECISION 17-08-2022', features the text 'TRADITIONAL KNOWLEDGE DIGITAL LIBRARY' and 'A New Dawn For Indian Traditional Knowledge'. It lists three key points: 1) Cabinet approves widening access of the TKDL database to users, besides patent offices; 2) Will drive research and innovation based on India's valued heritage across diverse fields; 3) Wider adoption of Indian traditional medicines. The right section, titled 'Traditional Knowledge Digital Library', repeats the subtitle and lists four key points: 1) Cabinet approves widening access of the TKDL database to users, besides patent offices; 2) The opening up of the TKDL will drive research and development & innovation based on India's valued heritage across diverse fields; 3) This will facilitate wider adoption of Indian traditional medicines & integration of traditional knowledge with current practices; 4) New manufacturers and innovators to build enterprises based on our valuable knowledge heritage. A final note states: 'In future, more information on Indian traditional knowledge will be added to the TKDL database from the perspective of "3P - Preservation, Protection and Promotion"'. A portrait of Prime Minister Narendra Modi is centered between the two sections.

- **Launch of CSIR's Indigenous E-Tractor, CSIR Prima ET11:** The Hon'ble Minister of State (Independent Charge), Science and Technology and Vice-President, CSIR, Dr. Jitendra Singh, on August 21st, 2023, launched the compact E-Tractor CSIR PRIMA ET11, indigenously designed and developed by CSIR-CMERI to cater to small and marginal farmers of India.



- CSIR facilitated India's **First Ever Biofuel-Powered Flight** paving the way for sustainable and alternative fuels when the first biofuel-powered flight was flagged off from Dehradun to Delhi. The bio-aviation fuel was produced indigenously by CSIR-IIP from Jatropha oil and was based on the patented technology of the institute. In a first, an IAF AN-32 aircraft powered with 10 percent blend of biofuel conducted flight operations at Leh, one of the highest airports in the world.



- CSIR-NAL has successfully developed state-of-art **Indigenous Autoclave Technology** for processing advanced light weight composites that are integral to modern day civil and military airframes.



- CSIR-IIP and GAIL have developed a technology that can convert 1 tonne of **plastic waste** and other Polyolefin products into 850 litres of the cleanest grade of **diesel**.



- CSIR-IICT has developed and patented a **high rate biomethanation technology** known as anaerobic gas lift reactor (AGR) for the generation of biogas and bio manure from organic solid waste like poultry litter, food waste, press mud, cattle manure, organic fraction of municipal solid waste (OFMSW), sewage sludge etc. This has been implemented in more than 20 places across the country including the Bowenpally Vegetable market in Hyderabad.



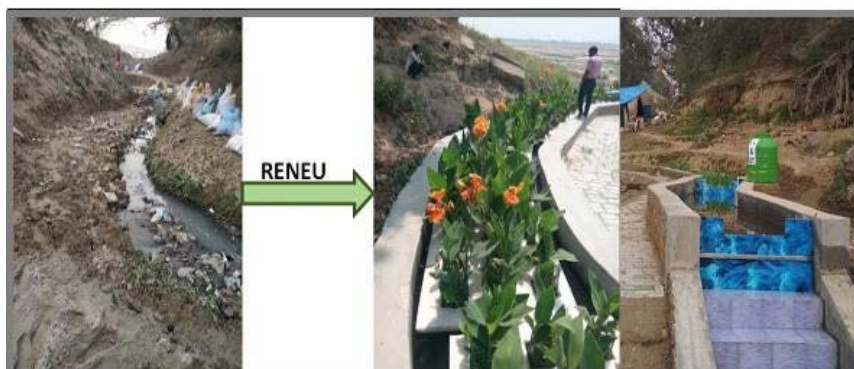
Anaerobic Gas lift Reactor



Nanofiltration set up

- CSIR-NEERI has developed the **RENEU Technology** for the construction of wetlands that are sustainable wastewater treatment processes. RENEU was successfully implemented at Jhunsi, Prayag Raj, in readiness for the Kumbh Mela of 2019, being part of the National

Mission to keep the Ganges clean for the pilgrims during the holy festival.



- The CSIR has conducted **whole genome sequencing** of 1,008 Indians from different populations across the country. The whole genome data is important for building the knowhow, baseline data and indigenous capacity in the emerging area of Precision Medicine. This genome sequencing has enabled benchmarking the scalability of genome sequencing and computational analysis at population scale in a defined timeline.
- Technology for 27 Diagnostic tests for genetic diseases was transferred to Lal Path Labs by CSIR-IGIB.



- CSIR-IICT has signed a **Global Licensing Pact** with Sun Pharma for patents on dermatology, ophthalmology and oncology. Sun Pharma will pay upfront, and milestone linked payments up to Rs 240 crore and royalties to CSIR-IICT from commercialization.
- CSIR-CLRI has developed a **zero-wastewater discharge technology** based on Electro-oxidation (EO) in the pre-tanning phase of the leather manufacturing process.
- CSIR-NAL has developed and transferred the technology of **Drishti Transmissometer** that have been deployed in many airports in India. The transmissometer is a visibility measuring system, useful for safe airport operations and landing. Drishti been installed at several airports in the country and recently the 5th Drishti was installed at the runway of Kempegowda International Airport (KIA).The Bengaluru Airport also installed the indigenous Aviation Weather Monitoring System (AWMS) at its new runway.



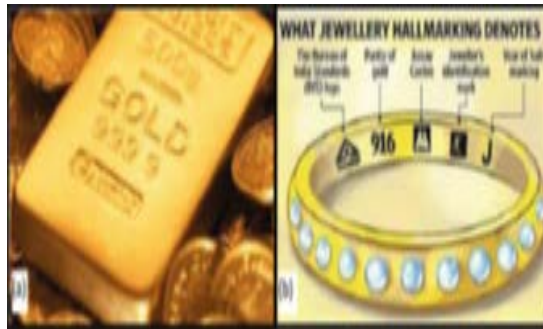
- CSIR-NAL's Octa-Copter:** CSIR-NAL has developed a medium-class BVLOS (Beyond Visual Line of Sight) multi-copter UAV. The UAV is made out of a lightweight carbon fibre foldable structure for ease of transportation and has unique features like autonomous guidance through dual redundant MEMS-based digital Autopilot with advanced flight instrumentation systems. DGCA, Ministry of Civil Aviation, Govt. of India has granted conditional permission to CSIR-NAL for conducting BVLOS flight trials. Subsequently, the NAL drone has completed about 50 hrs of flying to verify the performance parameters and the report is being submitted to MoCA for type approval. NAL's Octa-copter Drone is capable of carrying payload of 20 kg for a duration of 20 minutes. These drones have been configured to suit multiple applications for societal needs. The three applications envisaged are (a) Emergency Medical/ Vaccine Delivery (b) Agricultural Spraying and (c) for Geophysical Survey applications.



- A transfer agreement for the manufacturing of a new variant of **Head-Up Display (HUD)** for the Tejas Fighter Aircraft for commercial production has been signed between CSIR-CSIO, Chandigarh and Bharat Electronics Limited (BEL).



- **Bharatiya Nirdehak Dravya (BND 420)** is India's first home grown high purity gold reference standard developed through a collaboration among the India Government Mint (IGM), Bhabha Atomic Research Centre (BARC), CSIR-NPL and National Centre for Compositional Characterisation of Materials.



- Union environment ministry has designated CSIR-NPL as the **National Verification Agency** for certifying instruments and equipment for monitoring emissions and ambient air quality, which will assist in maintaining standards of instruments and data of air quality being collected.
- Following direction of the Prime Minister's Office to CSIR and Specification formulated by the Committee, constituted by Ministry of Home Affairs, CSIR-CMERI has designed and developed three categories of **Mob Control Vehicle (MCV) prototypes (Heavy, Medium and Tractor based MCV)** with 09 innovative featured technology modules. CRPF-RAF officials had participated in mock trials at CSIR-CMERI Durgapur/Ludhiana and training sessions at 103Bn and 108Bn CRPF-RAF campus. All 3-Categories of MCVs had been demonstrated to the MHA Committee members at CRPF-campus Gurugram and 103 Bn CRPF-RAF campus. DG-CRPF has approved the necessary QR/TD (Qualitative Requirements and Trial Directives) of all 3- categories of MCVs, based on recommendation of MHA committee. Presently all three R&D MCV Prototypes are in the temporary custody of CRPF-RAF at 103 Bn CRPF-RAF campus, Wazirabad, Delhi, under special approval of CSIR, for their acquaintance with the core technology modules and regular practice of CRPF-RAF.



- CSIR-CIMFR has discovered shale gas in two areas in the Gondwana basin in Central India and Godavari basin. The total shale gas discovered so far in the country in these two basins is estimated to be about 63 Trillion Cubic Feet (TCF). It is considered as one of the best sources of non-conventional natural gas.
- A reading device developed by CSIR-CSIO helps the visually impaired by reading the text aloud. The advanced reading machine named “**DivyaNayan**” is a stand-alone, Portable Reading Machine (PRM). The technology has been transferred to CEL Central Electronics Limited (CEL)



- CSIR-NCL has set-up an indigenous process technology to create **Dimethyl Ether (DME)** from methanol. DME is a clean fuel with potential to replace diesel and will be a non-fossil additive to LPG gas. This will also help the Prime Minister UjjwalaYojana program, by reducing LPG imports.



- A first of its kind **Earthquake Warning System** has been developed by CSIR-CSIO. The system can sense tremors, record them and generate an SMS to the concerned action points, in real time. It has been deployed and is operational at Delhi Metro since July 2015.



- **KisanSabha App** has been developed by CSIR-CRRI to connect farmers to the supply chain and freight transportation management system. This portal acts as a one-stop solution for farmers, transporters, and other entities engaged in the agriculture Industry. More than one lakh downloads and also available in regional languages.

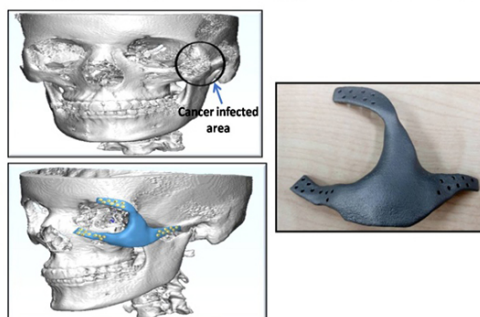


- CSIR has developed a low-cost and portable **Ksheer Scanner**, a technology to detect adulterated milk.

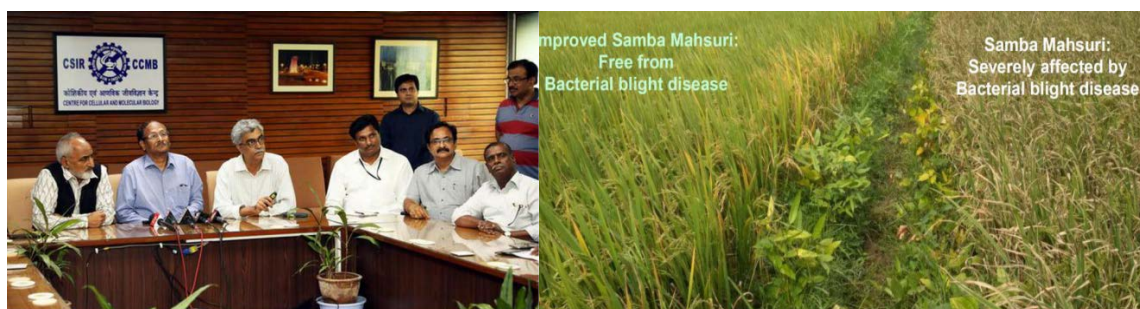


- **3D-Printed Patient-Specific Medical Implants developed:** CSIR-CSIO developed a technology for manufacturing patient-specific medical implants for several human body parts. The technology has been transferred to industry for commercial production and marketing of the product. Patient-specific implants are required in trauma, diseases like cancer, fungal infection or other reconstructive surgeries for specifically targeted patients.

Designed Implant for zygoma cancer patient



- CSIR-CCMB in collaboration with the Indian Institute of Rice Research at Hyderabad has released a new variety of rice that resists pests and is also beneficial for those with diabetes. The new Improved **Samba Masuri (ISM)** rice variety is resistant to Bacterial Blight (BB) and at the same time has the lowest Glycemic Index (GI) at 50.9 among all major rice varieties.



- The new upgraded version of **SARAS PT1N**, a 14-seater passenger aircraft developed by the CSIR-NAL completed a successful maiden flight on 24th January 2018.



- **High-Power S-band, 2.6 MW, Magnetron:** Magnetron, a high-powered vacuum tube, is an essential component for Medical LINAC (Lineal accelerator), which are widely used for external radiation treatment of cancer patients. CSIR-CEERI designed and developed 2.6 MW S-band tunable pulsed Magnetron, which was successfully tested and used as a microwave source, to generate the required X-ray dose using a LINAC system for Cancer

treatment. On July 14, 2020, the technology know-how for S-band Magnetron was transferred to M/s Panacea Pvt. Ltd., Bangalore, known for developing advanced radiotherapy systems for Cancer treatment.



2 MW S-band tunable pulse magnetron

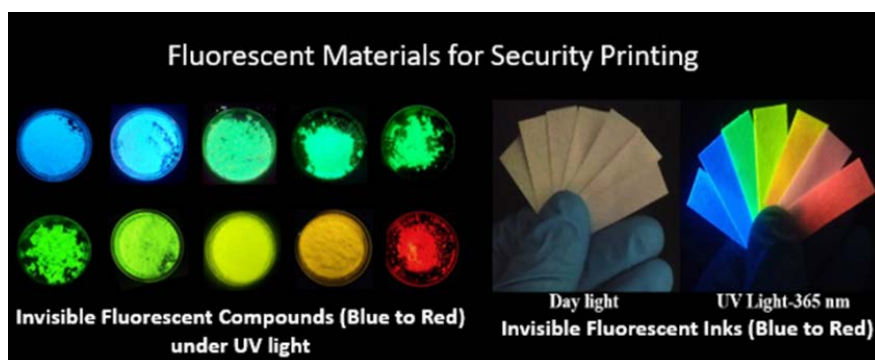


3 MW S-band (2.998 GHz) tunable pulse magnetron



2.6 MW magnetron at it testing in LINAC System

- **Fluorescent Fibers and Ink for Security:** CSIR-NIIST has developed Fluorescent Fibers and Ink for Security. Invisible fluorescent fibers find important use for preventing currency/document/ consumer goods counterfeiting. Fluorescent ink formulations with unique fluorescent signatures has application for security printing.



- **Nutraceutical for Osteoarthritis:** CSIR-CDRI have developed a standardized nano-formulation from *Spinaceaoleracea* (Palak) for prevention and management of osteoarthritis by preventing cartilage damage. This nutraceutical has extra health benefits for osteoarthritic joints in addition to the basic nutritional value found in *Spinaceaoleracea*. It imparts no toxicity and is effective at lower doses with nano formulation. It has been launched with M/s Pharmanza Herbs Pvt. Ltd., Gujarat and its marketing partner namely, Aeran Lab (India) Pvt. Ltd., Thane for marketing, on March 13, 2018 as a Nutraceutical with brand name “Joint fresh”.



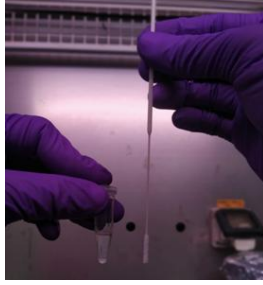
- Red mud-based lead free material for X-ray and CT scanner rooms:** CSIR-AMPRI has designed joint free red mud based radiation shielding tiles. The material is tested by as per AERB norms and semi pilot plant level studies were carried out to further improve density and reduce the thickness of tiles. The technology transferred to M/s Assurays, Noida. Upscaling and installation of developed tiles in X-Ray, CT scanner rooms and Cath-Lab has been done at M/S Saideep Healthcare Pvt Ltd Ahmednagar, Maharashtra by M/s Assurays, Noida.



- DCGI gives approval for use of Hydroxyurea in Sickle Cell Anaemia treatment:** The Drugs Controller General of India (DCGI) approved the use of Hydroxyurea in the treatment of Sickle Cell Anaemia (SCA). The CSIR's Sickle Cell Anaemia Mission is coordinated by the CSIR-Centre for Cellular and Molecular Biology (CCMB), Cipla, with support from CSIR-Indian Institute of Integrative Medicine (IIIM). The committee of experts constituted by Central Drug Standard Control Organisation (CDSCO) approved marketing of Hydroxyurea for treatment for SCA.
- SARS-CoV2 pandemic and CSIR's contributions towards mitigation - Technologies and processes developed:**

CRISPR/ Cas based paper diagnostic test (FELUDA)		
Dry-Swab-Direct-RT-PCR Diagnostic		

Clinical Trials of Ayurveda based drugs



CSIR-IICT assisted and helped in fulfilling “vaccine for all” motto by developing ascalable and cost-effective synthetic process for **Adjuvant molecule** for **Covaxin** – an indigenously developed vaccine for Covid-19 mitigation by Bharat Biotech International Ltd.



with Adjuvant molecule of CSIR-IICT

SwasthVayu Non-invasive Ventilator developed by CSIR-NAL



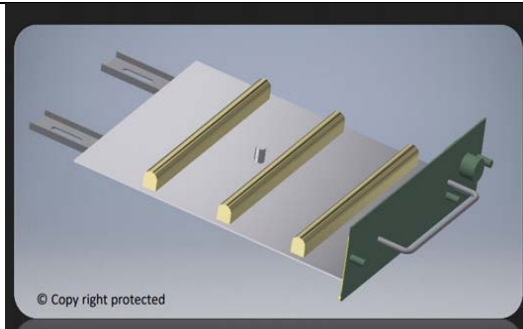
Oxygen Plants set-up by CSIR-IIP



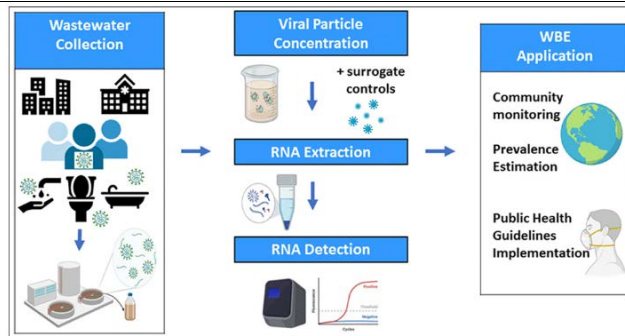
Make-Shift Hospitals for Covid-19 patients developed by CSIR labs



UV Disinfection Systems installed at the four sensitive locations in Parliament House Complex: Lok Sabha Chamber; Central Hall of Parliament; Committee Room No. 62 & 63



Air surveillance for SARS-CoV2 in hospitals and home settings



Octacopter drones for Vaccine delivery



PPE Coveralls developed by CSIR-NAL



- A cost-effective process of Favipiravir for the treatment of COVID-19 patients has been developed by CSIR-IICT. CSIR-IICT developed the process using locally available chemicals to synthesise this Active Pharmaceutical Ingredient (API) and transferred the technology to Cipla. Cipla has launched this in the market as Ciplenza.



- **CSIR Aroma Mission and Floriculture Mission:** CSIR launched the CSIR-Aroma Mission in 2016 which seeks to bring about transformative change in the aroma sector through interventions in agriculture, processing and product development for fuelling the growth of the aroma industry and boosting rural employment. CSIR's Aroma and Floriculture Missions have brought 27,500 hectares under cultivation of aromatic crops. CSIR has also developed entrepreneurship (110) through technologies that promote cultivation and processing of aromatic crops, value-added aromatic crops for high-end aroma chemicals and products. For the first time ever, Asafoetida (*Heeng*) cultivation has been introduced in India and Saffron cultivation has been widened. CSIR enabled the famed **Purple Revolution** by introducing Lavender Cultivation in 10 districts of J&K benefitting more than 1000 farming families. India from being one of the importers of Lemongrass essential oil a few years back, now becomes one of the largest exporters in the world. Indigenous development of Tulip bulb production in Lahaul & Spiti under the Floriculture mission helped reduce the import of planting material.



- **Technological innovation Energy Storage devices:** Under CSIR's Innovation Centre for Next Generation Energy Storage Solutions (ICeNGESS) project, CSIR-CECRI's knowhow on Lithium-Ion Battery Technology was transferred to M/s. Tata Chemicals Ltd., Mumbai. The major objective of the project has been to develop next generation energy storage solutions with 100 MW Li-ion battery production facility creation and augmentation of existing facility to 1000 cells per day, the project also aimed for IPR & Technology development, scale up & production of battery materials, supply chain creation & indigenisation, sustainability of Lithium from Coal and to develop Public Private Partnership (PPP).

- **Gaon Ka Pani Gaon Mein:** CSIR has led a Mission mode project for developing Village Level Water Management (VLWM) Plans for augmenting water resources in selected villages. Mission on **High-Resolution Aquifer Mapping & Management in Arid Regions of North-Western India** has also been launched and implemented in association with the Ministry of Jal Shakti under Jal Jeevan Mission. Use of advanced Heliborne geophysical survey and other scientific studies have been initiated under the Aquifer Mapping Programme of the Mission. So far, 1 lakh Sq. Km Heliborne geophysical survey data has been collected in the states of Rajasthan, Haryana and Gujarat. This survey led into identification of water source at Munjasar, Lohawat Block, Jodhpur District, Rajasthan.

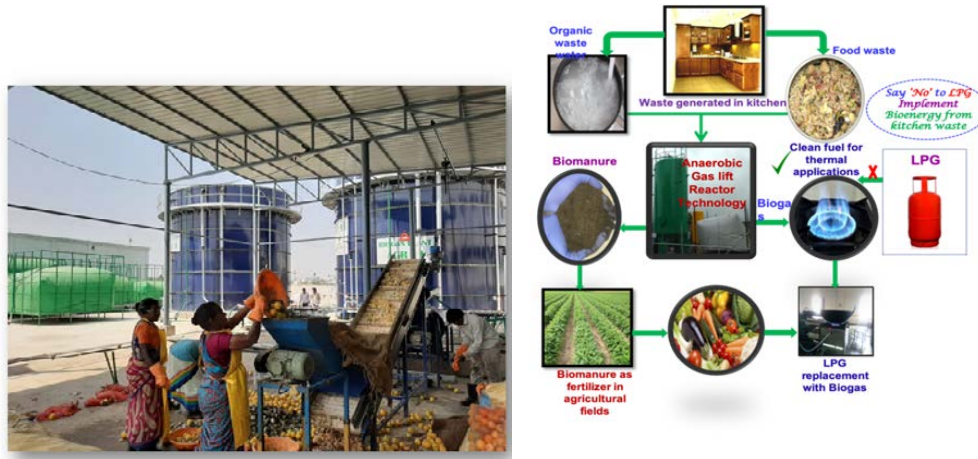


- **Launch of India's first indigenously developed hydrogen fuel cell bus:** India's first indigenously developed bus to run on hydrogen fuel cell been designed and developed by CSIR-NCL and CSIR-CECRI in collaboration with Sentient Labs. The 32-seater bus, equipped with central air conditioning facility, is designed to provide a range of 450 kilometres by utilising 30 kg of Hydrogen. The bus uses hydrogen fuel cells and air to generate electricity for power and can run for 600 km without stopping. The only emission from the bus is water, thus, making it the most environment friendly mode of transportation. The 'Made in India' hydrogen fuel cell bus was launched on 21 August 2022, in Pune.



- **Earthquake & natural disasters—developed technology for reducing property loss:** CSIR-CBRI and CSIR-SERC have been designing structures that can withstand earthquakes, and due emphasis and importance are being given to incorporate this aspect in all designs.

- CSIR focuses 'Waste to Wealth' technologies to supplement the efforts of Swachta Abhiyan:** CSIR has developed many waste to wealth technologies and products such as spent wash from distillery, plastic waste to diesel, industrial solid waste, brine sludge, e-waste, coal-based power industry waste, biomass/agri waste, fertilizer industry waste, lime sludge, marble waste, etc. and these technologies are at various stages of implementation with MSMEs, industries and other partners.



- Steel Slag Road: Steel Slag Valorisation Technology for Conversion of Steel Slag as Road Making Aggregates:** CSIR developed the steel slag valorisation technology to convert waste steel slag as road making aggregates. Processed steel slag aggregates as developed through waste steel slag has been successfully utilized in the construction of India's First Steel Slag Road at Hazira, Surat. Around one lakh ton processed steel slag aggregates were utilized as 100% substitute of natural aggregate in steel slag road construction. For its unique design features Steel Slag Road built through CRRI technology has been inducted in INDIA BOOK of Records and ASIA BOOK OF RECORDS as First Steel Slag Road. Border Roads Organisation (BRO) using the CSIR-CRRI technology has laid a one km road in border area of Arunachal Pradesh.



Inauguration of Steel Slag Road by Minister of Steel Shri R.C.P Singh at Hazira Surat, Gujarat



Aerial view of Steel Slag Road built at Hazira, Surat

- **Design and development of CSIR - TechnoS Raman Spectrometers (CTR Series):** CSIR developed and commercialized Raman spectrometers in a Public-Private Partnership, in a collaboration of CSIR–AMPRI, Bhopal and M/S TechnoS Instruments, Jaipur. Two models of high-end commercial grade Raman Spectrometers, CTR-300 and CTR-150 have been developed and approved for marketing by the industry partner, M/S TechnoS Instruments in January 2022.



- **Maiden flight of HANSA-NG:** CSIR-NAL designed and developed Hansa NG aircraft which is an all composite two seat light trainer aircraft to be used as an ab-initio flying training aircraft for the flying clubs in India, with significant modifications on Hansa 3 aircraft to make it more useful as a trainer aircraft. The newly developed Hansa 3 (NG) made its maiden flight on 3rd September 2021 after obtaining special flight permit by DGCA. The 20-minute sortie saw the first prototype of the Hansa 3 (NG) attain a maximum altitude of 4,000 feet and a speed of 80 knots before it made a successful touch down. Further, the aircraft has successfully completed the sea level trials at Puducherry between February 19 and March 5. The aircraft was flown to Puducherry, covering 140 nautical miles in one and half hours at a cruising speed of 155 km/hr, on 19 February 2022.



- **HANSA-NG Aircraft of CSIR-NAL successfully completed Engine Relight test in Air:** HANSA-NG, 2 seater flying trainer Aircraft, design & developed by CSIR-NAL, successfully completed in-flight engine relight test at DRDO's Aeronautical Test Range (ATR) facility, Challakere on 17 May, 2022. Flight test was carried out at an altitude of 7000-8000 feet with the speed range of 60 to 70 knots by Wg Cdr K V Prakash and Wg Cdr NDS Reddy, Test Pilots from Aircraft and Systems Testing Establishment (ASTE), Indian Air Force (IAF). In-flight engine relight capability of the aircraft was demonstrated with wind milling propeller and starter assisted start. The aircraft handling characteristics & flight parameters were found to be normal during these test flights. The in-flight engine relight test is most critical and important milestone towards certification of the aircraft by DGCA.

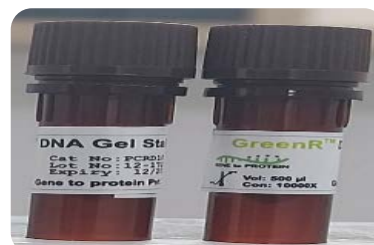


- Development of Indian National Footwear Sizing System:** CSIR-CLRI conducted a nationwide survey on foot dimensions of the Indian population using 3D Digital Imaging technique to establish the Indian Footwear Sizing System. Thirty numbers of 3D Foot Scanners ordered and installed during the last week of September 2021. Synergy Partners were identified, and MoU signed with Central Footwear Training Institute (CFTI), Chennai, CFTI Agra, Government College of Engineering and Leather Technology (GCELT), Kolkata and Muzaffarpur Institute of Technology (MIT), Muzaffarpur. Demographic locations (79 districts) finalized based on the recommendations of National Sample Survey Organization (NSSO). Hands on Training for 90 field staff on 3D foot scanner started on 5th October 2021. A total of 1,01,880 foot measurements have been carried out by the end of March 2022. The Indian National Footwear Sizing System that is being developed will help the populace to get well fitting shoes that adhere to the contours of their feet thus ensuring perfect fit and comfort and also prevent foot debilitations.



- mRNA vaccine development platform:** CSIR-CCMB has set-up a working platform to develop mRNA vaccines, starting with identifying a candidate for COVID-19 vaccine. The mRNA vaccines are modular. In principle, the mRNA can be inserted to make a protein of a pathogen of concern in human cells. This can be used to train the recipient's immune system to evade the real pathogen, if it infects.

- Technology of Nucleic Acid Staining Dye GreenR™:** The dye GreenR™ has been developed by CSIR-CDRI in joint collaboration with industry partner Biotech Desk Pvt. Ltd (BDPL), Hyderabad. The product GreenR™ provides an economical alternative to commercially available dyes that are used to stain DNA/RNA, which are currently imported. It binds to all nucleic acids including genomic DNA, PCR products, plasmids and RNA and fluoresces under blue light or UV exposure. This dye has varied applications in molecular diagnostics and life sciences research. The chemical synthesis of GreenR™ was standardized by CDRI team and the BDPL team has studied its biological applications in real-time PCR and DNA binding. CSIR-CDRI has transferred the technology of the nucleic acid staining dye GreenR™ to GenetoProtein Pvt. Ltd (GPPL), a Start-Up registered in Uttar Pradesh, and the company has already started sampling this product amongst researchers both in academia and industry. The development of this indigenous dye will offer the Indian researcher an alternative to expensive imported dyes and take India a step closer to 'Atmanirbhar Bharat'.

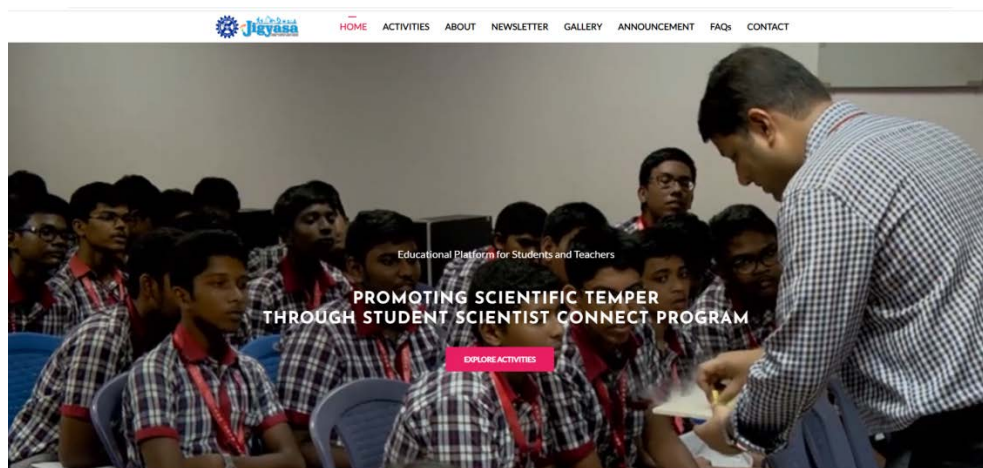


- Medha Plus - A Novel Polyherbal Formulation for Alzheimer's Disease:** Available synthetic drugs only provide symptomatic reliefs targeting single molecule, hence, are unable to address the multi-factorial aspects in Alzheimer's disease (AD) pathogenesis. It is imperative to develop combinatorial drugs that address the multiple molecular targets in AD. Parker Robinson Pvt. Ltd. (India) approached CSIR-IICB for experimental studies on a herbal medicinal formulation 'Medha Plus' (MP) which is a unique combination of aqueous extracts of six therapeutic plants indigenous to South-East Asia and hugely propagated across India - *Brahmi*, *Mandukaparni*, *Sankhpusphi*, *Yastimadhu*, *Kokilaksha* and *Shunthi*. Experimental studies performed at CSIR-IICB showed that MP is an incredible combinatorial drug that targets multiple molecular targets with exemplary neuroprotective properties. An array of behavioral studies showed that MP was able to recover AD-associated memory deficits in both sporadic and familial AD models. MP treatment reduced Amyloid plaques deposits and decreased apoptotic cell death in the hippocampus. Enzymatic assays demonstrated anti-oxidative and anti-acetyl cholinesterase properties of MP. An underlying improvement in synaptic plasticity was observed with MP treatment as well. The ability of multi-constituent MP in reversing cognitive deficits and underlying synaptic health in rodent models of sporadic and familial forms of AD promote it as a frontline candidate drug for clinical trials in AD.
- India's First Indigenously Developed Laser-cooled Caesium Atoms based Primary Frequency Standard:** CSIR-NPL indigenously developed India's first laser-cooled Caesium (Cs) atoms based primary frequency standard NPLI-CsF1. Only a handful of (less than 10) such primary frequency standards, developed worldwide, contribute to the maintenance of international reference time UTC. Apart from international timekeeping, such accurate standard will provide self-reliance in the field of precise Time and Frequency measurement which has measurable economic and strategic implications in the areas of navigation (ISRO's NavIC), telecommunication, smart grids, financial security etc. Millions of Caesium atoms were laser cooled to a few micro kelvin temperature, inside the vacuum chamber of NPLI-CsF1 after many years. Efforts were made to launch the cold atoms, detect them and realize the fountain operation and trademark Ramsey Fringes. Work is underway to make it contribute to International Reference Time (UTC) after a long hiatus. The figure below shows Image of laser-cooled cloud of Caesium atoms, trapped in a magento-optical trap (MOT), captured with an Infrared CCD camera mounted on one of

the viewports on the vacuum chamber. In the bright spot (atomic cloud), more than 10 million Caesium atoms trapped at few micro kelvin temperatures. The cold Caesium atomic cloud is used to realize SI Second in India's first and only indigenously developed Caesium Fountain Primary Frequency Standard.

- **Laboratory Scale Facility creation of 3D printing (3DP):** Extrusion-based research scale 3D concrete printer, installed at CSIR-SERC, was used for development of 3D printable concrete mixes. About 30 trial mixes were prepared to arrive at a successful 3D printable mix which satisfies flowability, buildability, and open time. Various mixes were developed using different industrial by-products (fly ash, silica fume, GGBS) and different types of fine aggregates such as standard sand, river sand and copper slag. Flowability of these mixes were determined by conducting slump test and flow table tests in accordance with ASTM C 1437. Further, extrudability of 3D printable mixes were evaluated by visual inspection method; extruding filaments without clogging, breaking segregating or bleeding. For the determination of buildability, cylindrical/ rectangular specimens for height up to 500 mm (maximum printable height using the printer) is printed; the total number of printed layers were counted and by measuring the vertical strain the buildability was checked. Structural build up behaviour was evaluated using penetration test. Initial setting time and final setting time of printed sample was less compared to companion cast-in-place samples. Grade of the concrete was achieved as M30.
- **"JIGYASA"** is one of the major initiatives taken up by CSIR at national level to widen and deepen CSIR's Scientific Social Responsibility (SSR) by connecting school students to scientists at CSIR. CSIR has signed MoU with Kendriya Vidyalaya Sangathan (KVS), Jawahar Navodaya Vidyalaya. More than 3,00,000 students have benefitted from the programme. Recently, CSIR has engaged with Atal Tinkering Labs of Niti Aayog and aims to adopt 295 Atal Tinkering Labs established by Atal Innovation Mission nationwide to spur STEM based research and innovation interest in students leveraging its scientists and labs. India's first Virtual Science Lab for children under CSIR Jigyasa programme was launched on 22 November 2021.

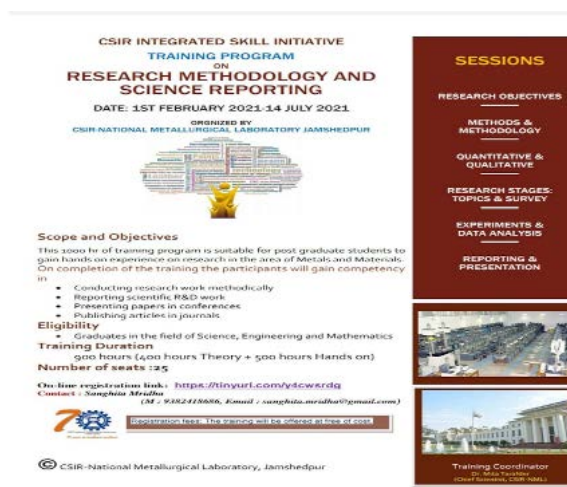




- **Connect global Indian Scientific Community on Digital mode:** CSIR has developed a virtual platform - **PRABHASS** (Pravasi Bharatiya Academic and Scientific Sampark) Portal to connect with the global Indian S&T Diaspora for jointly addressing societal challenges/ problems. Database of over 6000 Diasporas from 47 countries are available.



- **CSIR ‘Skill India Initiative’:** CSIR’s Skill India Initiative aims to equip young minds with the necessary technological skills through exposure to CSIR labs. More than 2 lakh people have been trained under the initiative.



- **Under India’s G20 Presidency, CSIR organized G20 RIIG Conference on Materials for Sustainable Energy gets underway in Ranchi during 02-03 March 2023**

CSIR organized the Research and Innovation Initiative Gathering (RIIG) Conference on “Materials for Sustainable Energy” during 02-03 March 2023 at Ranchi under India’s G20 Presidency.

Various facets of ‘Materials for Sustainable Energy’ were discussed under three sessions, viz., (i) 21st Century Challenges Related to Energy Materials & Devices, (ii) Solar Energy Utilisation and Photovoltaic Technology, and (iii) Materials and Processes for Green Energy. Leading experts were drawn from institutions such as IITs, IISERs, CSIR Labs; industries; think tanks including NITI Aayog; and Indian Energy Storage Alliance.



Dr Srivari Chandrasekhar, Secretary, Department of Science and Technology (DST) and Chair of the RIIG events in India, welcomed the G20 delegates and special invitees. Well known energy experts and policy makers including Dr. V.K. Saraswat (Member NITI Aayog), Dr. G. Satheesh Reddy (Scientific Adviser to Raksha Mantri), Prof. Ashok Jhunjhunwala (IIT Madras), Dr Kalaiselvi, (Secretary, DSIR and DG, CSIR), Prof. Vijayamohan K. Pillai (IISER, Tirupati), Dr. Rahul Walawalkar (Indian Energy Storage Alliance), Dr. Ashish Lele (Director, CSIR-NCL, Pune), Dr. Anjan Ray (Director, CSIR-IIP, Dehradun), Mr Saba Kalam (ISA) and many others deliberated on the main theme and sub-themes of the Conference.

Twenty foreign delegates from ten G20 member countries, six invited guest countries and an international organisation joined the two-day conference. From India, 38 delegates and special invitees from scientific departments, research and academic institutions and industry participated in the RIIG Conference.



- **MoU between CSIR, India and BCSIR, Bangladesh**

In an important milestone in S&T Cooperation between India and Bangladesh, an MoU between CSIR, India and Bangladesh Council of Scientific and Industrial Research (BCSIR) was concluded on 6 September 2022 to establish a broad framework to promote scientific and technological cooperation. The MoU, signed by Dr. N. Kalaiselvi, DG, CSIR and Dr. Md. Aftab Ali Shaikh, Chairman, BCSIR, was exchanged at New Delhi in the presence of Hon’ble Prime Minister of India, Shri Narendra Modi and Hon’ble Prime

Minister of Bangladesh, Ms. Sheikh Hasina.



- **MoU between CSIR, India and AMEXCID, Mexico**

In a landmark milestone in S&T Cooperation between India and Mexico, an MoU on Research, Technology & Innovation cooperation was signed between CSIR, India and the Mexican Agency for International Development Cooperation (AMEXCID) of the Ministry of Foreign Affairs of the United Mexican States.

The MoU shall facilitate cooperation in the areas of research, technological development/deployment, innovation and capacity building, with an objective to expand knowledge and strengthen Intuitional capacities in both the countries. The collaboration would focus in the areas of Aerospace, Electronics Instrumentation & Strategic Sectors; Civil, Infrastructure & Engineering; Ecology, Environment, Earth, Ocean Sciences & Water; Mining, Minerals, Metals & Materials; Chemicals & Petrochemicals; Energy & Energy Devices; Agriculture, Nutrition & Biotechnology; and Healthcare. Special focus on technology and industry collaboration has been structured in the MoU (supporting start-up ecosystem and existing industry through technology partnerships, tailor-making each other's technologies/products and demonstration/deployment, establishing joint outreach centres and capacity building centres).



H.E. Federico Salas Lotfe, Ambassador of Mexico to India and Dr N. Kalaiselvi, DG, CSIR signed the MoU in presence of the Hon'ble Ministers of India and Mexico.

- **MoU between CSIR, India and Institut Pasteur, France**

CSIR, India and Institut Pasteur, France signed an MoU on January 25, 2022 for jointly researching and focusing on emerging and reemerging infectious diseases and inherited disorders and enable delivery of effective and affordable healthcare solutions not only for the people of India and France but for the global good. The MoU provides for developing potential scientific and technological cooperation and networking in advanced and emerging areas of Human Health between scientists and institutes/laboratories of CSIR and Institut Pasteur and its international network.



- **CSIR-NBRI launches improved lotus variety 'Namoh 108'**

CSIR-NBRI launched an improved variety of the national flower Lotus with 108 petals called 'Namoh 108' on 14th August 2023 during the inaugural of the One Week, One Lab campaign of CSIR-NBRI. The Lotus variety is more weather resilient and can flower from March to December. This lotus was brought by NBRI scientists from Manipur to conduct research on it. This is the first Lotus variety whose genome is completely sequenced. This plant will never be extinct or endangered like many other flowers and plants have become. CSIR-NBRI also released apparels made from lotus fibre and perfume 'Frotus' developed from Lotus plants in collaboration with FFDC, Kannauj.

- **CSIR-NAL Launches Q Plane: An All-Electric Hybrid UAV for Last –Mile Delivery and Surveillance**

In a significant step towards advancing the capabilities of unmanned aerial vehicles (UAVs) in India, the CSIR-NAL unveiled the Q Plane – a lightweight all-electric UAV with vertical-take-off-and-landing capability. during the curtain raiser of One Week, One Lab, on 2nd August 2023. Designed for autonomous flight, the UAV has a range of 30 kilometres and endurance of up to 70 minutes.



- **Launch of CSIR-NAL's JALDOST airboat**

JALDOST, an airboat that operates on water, is designed and developed by CSIR-NAL to

remove excess aquatic weed and floating waste from water bodies. The JALDOST has a closed airtight pontoon type hull to make it inherently unsinkable. It has a hybrid propulsion system, comprising air propulsion and paddle wheel propulsion. CSIR-NAL has developed two versions of the airboat — JALDOST Mark-1 and an upgraded version JALDOST Mark-2. The JALDOST Mark-2 has been designed on the specifications given by BBMP and can be used to clean lakes in Bengaluru. It was launched on 2nd August 2023, during the curtain raiser of One Week, One Lab, of CSIR-NAL.



- **Leather made from mango pulp**

A company in India is producing an eco-friendly vegan alternative to synthetic leather by using mango fruits based on the technology developed by CSIR-CLRI. India produces 20 million tons of mango a year, making it the world's largest producer of mango. In India up to 40% of mangoes are abandoned in the fields because they do not meet regulatory and market standards, so they can be used to produce alternative material to leather. The new material is made of 50% mango and degrades faster than polyurethane leather.

- **CSIR-NGRI does a drone survey at Ladakh**

CSIR-NGRI successfully conducted a drone based magnetic survey in the Ladakh region in September 2022 for the first time for an area of about 45 sq.km and the data is currently being analysed by the scientists at CSIR-NGRI. The institute has used a five kilo payload capacity drone carrying an important sensor to record the data for sub-surface level area.

- **CSIR announces Shanti Swarup Bhatnagar Prizes for Science & Technology**

Dr. N Kalaiselvi, Director General, CSIR, on 11 September 2023, announced the winners of the Shanti Swarup Bhatnagar Prize for the year 2022. The prestigious SSB Prize for the year 2022 has been awarded to twelve leading scientists in the seven disciplines. The winners were announced during the inaugural event of One Week, One Lab program, of CSIR-NIScPR, in the presence of Dr. Jitendra Singh, the Hon'ble Minister of State for Science & Technology and Vice President, CSIR.

- **CSIR's first battery recycling pilot facility commissioned in Jamshedpur**

The CSIR-National Metallurgical Laboratory (NML) has commissioned the first Battery Recycling Pilot Facility of the CSIR at Jamshedpur to extract critical metals such as Lithium, Nickel, Manganese and Cobalt. It encompasses 1 Ton per day (TPD) battery dismantling and cathode material separation setup, apart from the integrated large-scale hydrometallurgical facility for extraction and separation of those critical metals.

- **Shanti Swaroop Bhatnagar National Awards presented**

The Hon'ble Minister S&T, Dr Jitendra Singh on 26th September 2023, presented the Shanti Swarup Bhatnagar National Awards to eminent Scientists below the age of 45, at a largely attended 82nd Foundation Day Celebrations Function of CSIR at Bharat Mandapam in New Delhi. Hon'ble Prime Minister Shri Narendra Modi has, in a written message, extended his heartiest congratulations to all the winners of Shanti Swarup Bhatnagar Prize and extended his greetings and best wishes to everyone associated with CSIR for the success of the 82nd CSIR Foundation Day. Dr Jitendra Singh read out the written message sent by the Prime Minister, who could not be physically present because of preoccupations. The Prime Minister's message hailed CSIR for playing a prominent part in serving society, industry and the nation. The message mentioned the Aroma Mission, strides in floriculture, the Purple Revolution ushered in through Lavender cultivation in Jammu and Kashmir, laying of Steel Slag roads along border areas of the country are just some instances of CSIR's contribution in meeting national aspirations.



- **CSIR-NIO discover active submarine volcano in Andaman Sea**

CSIR-National Institute of Oceanography (NIO) has discovered an active submarine volcano (Crater Seamount) in the Andaman Sea, which has been at the epicentre of the seismic zone since it was first observed in 2007. Crater Seamount has the potential to erupt at any time leading to earthquakes and even tsunamis in the Java-Sumatra region. The timing of the eruption, however, cannot be ascertained.

- **Flag Off of "Recycling on Wheels Smart-ER" to Promote Cleanliness and Environmental Responsibility under *Swachhata Hi Seva* (SHS) campaign from CSIR Headquarters in Delhi**

In alignment with the *Swachhata Hi Seva* (SHS) campaign, celebrated from September 15th to October 2nd 2023, Hon'ble Minister S&T, Dr Jitendra Singh inaugurated the "Recycling on Wheels Smart-ER" at CSIR Headquarters in New Delhi on October 2nd 2023. Dr Kalaiselvi, DG, CSIR and Secretary, DSIR, addressing during the inauguration of the Special Campaign 3.0 for institutionalizing *Swachhata* said that all the 37 CSIR labs across the country are engaged with both physical cleaning and e-cleaning that is

processing and weeding out of obsolete files.



- **Research on ongoing declines for the world's amphibians**

A groundbreaking paper published in Nature on 4th October 2023 reveals climate change as a major driver of amphibian decline. Climate change was the primary threat for 39% of species pushed toward extinction since 2004. Dr Karthikeyan Vasudevan of CSIR-CCMB was a part of this global study. <https://www.nature.com/articles/s41586-023-06578-4>
