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In The News

S&T Minister Announces 'Green' Technology Breakthrough at CSIR-CLRI



DR. HARSH VARDHAN, Union Minister for Science and Technology, recently announced a novel, biodegradable dispersing agent developed by the Central Leather Research Institute (CLRI), which enables the chrome tanning of leather with just half the normal usage. The Minister who announced the breakthrough on 23 March 2015, called it a “paradigm shift”.

The new development ensures saving of water by 15 million litres per day in the Indian leather sector alone – and an estimated 200 million litres per day if this revolutionary technology is applied globally. Apart from huge water conservation, the development is also aimed at abatement of the effluent problem, curtailing process steps, time economy and

cost saving. The “enzymatic intervention” completes in just 30 minutes the fibre opening process which till now takes up to 72 hours.

“This is good news for the Prime Minister’s ‘Make in India’ agenda. Our leather and leather goods industry is on the verge of unique competitiveness,” Dr Harsh Vardhan said.

Later, the Hon’ble Minister released the ‘first copy’ of the MODEUROP Colour Card for the Autumn Winter 16/17 season (eighteen months ahead of the season) in the presence of Dr. M.O. Garg, Director General, CSIR; Prof. Dr. A.B. Mandal, Director, CSIR-CLRI; Dr. Sudeep Kumar, Head, PPD, CSIR and Team CSIR-CLRI Shoe Design & Development Centre.

Dr. Harsh Vardhan also visited various laboratories in CSIR-CLRI. He addressed the Scientists and Staff and applauded their efforts in developing technologies and products in the domain of leather technology.

Dr Harsh Vardhan also interacted with the industry. The industrialists present were Shri N. Shafeeq Ahmed (MD, SSC Shoes), Shri K.R. Vijayan (President, Indian Shoe Federation), Shri P. Gopalakrishnan (Sellam Chemicals), Shri R. Ramesh Kumar (ED, CLE), Shri Atanu Poddar (LANXESS

India), Shri J. Arun (LANXESS India), Mr Tuncay Deriner (Stahl India) and Mr Gopinath (MV Health Care). He appreciated the efforts of the industry and the partnership they have with CSIR-CLRI. The sector is increasingly becoming green-technology oriented due to the efforts of CSIR-CLRI.

Dr. Harsh Vardhan appreciated that CSIR-CLRI had made major achievements with regard to the Government's 'Make in India' push while at the same time providing essential services to the masses and also high-science based technologies to the medium, small and micro enterprises. He also appreciated that the laboratory had helped countries like Ethiopia with their technologies and products. He was happy with the Institute's attempts to internationalize its out-

reach. He emphasized and motivated the scientists to use a combination of natural materials such as pine apple leaf fabric, banana fabric with leather forms, which could lead to the next generation fashion fabrics.

The Minister was extremely impressed and congratulated the scientists for the successful and enduring partnership among the trinity of academy, research and industry in the leather sector, spun around CLRI over a period of sixty six years. He also noted that the Institute offers B.Tech., M.Tech. and Ph.D. in leather and footwear sciences through the Anna University, which could set an example for other sectors to emulate and contribute to the Prime Minister's National Skill Development Programme for inclusive employment generation.

An Eco-friendly Technology to Treat Water from CSIR-IICT



The Indian Institute of Chemical Technology (CSIR- IICT), Hyderabad has developed a technology to manufacture hydrazine hydrate, which is used in agrochemicals, pharmaceuticals and water treatment. The technology's pilot project was demonstrated recently at Gujarat Alkalies & Chemicals Ltd, Vadodara (GACL), to overwhelming appreciation.

Hydrazine hydrate is used in several industrial operations such as in certain organic pigments for dyes, as reagent for photography, anticorrosion additive in the water circuits of thermal and nuclear plants, oxygen scavenger in the water of industrial boilers and high pressure steam generators, refining of precious metals, recovery of metals from pickling and surface treatment solutions, and treatment of liquid and gas wastes.

Since the process developed by CSIR-IICT is based on hydrogen peroxide, it reduces the adverse impact of pollutants on environment and living conditions.

CSIR-IICT has even signed an agreement with GACL for development of hydrazine hydrate technology. GACL will shortly establish a commercial plant initially of 8,000 TPA of 80 per cent hydrazine hydrate based on IICT technology and detailed designs.

CSIR-SERC comes up with Cheap, Durable Alternative to Wood & Bricks



Scientists of the CSIR-Structural Engineering Research Centre (SERC), Chennai have come up with an alternative to wood and bricks that is not only cheap but durable as well.

The alternative is a steel mesh plastered with cement mortar. CSIR-SERC scientists have developed cupboards, roof rafters, water tanks and even toilets and bathrooms with the new technology replacing conventional bricks. While replacing bricks

can cut costs by 30%, in the case of wood replacement the expenses can be brought down by 50%. The technology, however, requires skilled labour.

The technology can be used to make thin and lightweight panels and sections, which can be used in boats, window frames, and storage structures. The reinforcement or steel mesh can also be moulded into the desired shape allowing for offbeat architectural designs.

Dr. Harsh Vardhan Lauds Out-of-the-Box Thinking at CSIR-NAL

Dr Harsh Vardhan, Union Minister of Science and Technology and Earth Sciences and Vice-President, CSIR visited CSIR-National Aerospace Laboratories, Bengaluru, on 5 April 2015. While addressing the Scientists and Staff of NAL he emphasized everyone's role in the Prime Minister's 'Make-in-India' programme.

Aerospace and Defence has already been identified to be at the heart of 'Make in India' and with more than five decades of experience in providing indigenous technologies to these strategic sectors, CSIR-NAL is uniquely poised to underpin Prime Minister Narendra Modi's call to raise the percentage of domestic procurement from 40% to 70% in the next five years, he said.

Dr. Harsh Vardhan pointed out that Aerospace and Defence is globally a very highly competitive area, defined by technology denial regimes and highly proprietary systems. Further, he remarked that aerospace is an area marked by large investments and long gestation periods but nevertheless it is imperative to develop streams of innovation that provide significant long-term payoffs in terms of import substitution as well as cutting-edge technologies.

The Minister observed that it was this far-sightedness in supporting aerospace R&D



with the establishment of CSIR-NAL in 1959 that resulted in its key technology successes for the strategic sector like the aerospace grade carbon fibres, carbon fibre composite airframe components and Fly-by-wire Flight

Control Laws for the Tejas light combat aircraft programme which were all denied under the technology control regime.

The Minister, who was accompanied by Dr. M.O. Garg, Director-General, CSIR, and Shri Shyam Chetty, Director, NAL, visited various test facilities in CSIR-NAL which included NAL's technologies and product display exhibition in the Advanced Composites Division, Forward Velocity Sled Test Facility of STTD, the SARAS Flight Simulator, Acoustic Test Facility (ATF), National Trisonic Aerodynamic Facility (NTAF), Micro Air Vehicle Aerodynamics Tunnel and the Golden Jubilee Aircraft Hangar. At the ATF and NTAF, he recognised CSIR-NAL's efforts towards India's space programme, the latest being acoustic qualification of subsystems for GSLV-D5

and the aerodynamic characterisation of the LVM3 launcher.

Dr. Harsh Vardhan complimented the scientists and staff on the numerous spin-off products developed including India's largest Autoclave for Airworthy Composite Processing, the first indigenous transmissometer (DRISTI) for measuring runway visibility, the first indigenous electronic target (DHVANI) for the Indian Army, technologies for Radome design, active noise control, smart materials and surface modification. Such spinoffs demonstrated out-of-the-box thinking and were imperative for the Prime Minister's 'Make-in-India' programme, he said.

Remarking on the need for inclusive innovation, he commended CSIR-NAL technologies that have significant societal impact such as solar selective coating for industrial and domestic solar water heaters, coatings to enhance tool wear resistance and wind-solar hybrid wind turbine system to power off-grid remote areas.

He congratulated CSIR-NAL on its many laurels, the latest being the "Best Laboratory



Award 2014” from Brahmos Aerospace for its breakthrough technology development and outstanding contributions. These awards were a testimonial to the sincerity and commitment of the scientists who persevered despite the well-known challenges in aerospace.

As the only aerospace laboratory in the civilian sector, he appreciated the efforts of CSIR-NAL towards civil aircraft development starting with the 2-seater HANSA in 2000, the 14-seater SARAS in 2004 and the 5-seater CNM-5 in 2011 which has the distinction of being the country’s first public-private partnership (with

Mahindra Aerospace).

Dr. Harsh Vardhan emphasised the need for increased linkages with private industry that would enable quick commercial realisation of the developed technologies while recognising that the aerospace and defence industry in India was majorly in the government sector.

He met with the representatives of private industry as well as various government organisations supported by CSIR-NAL and called for greater synergy towards meeting both strategic goals as well as spin-off civilian products.



R&D Highlights

Solid Industrial Waste – A Resource Geo-material for Civil Construction

Flyash and Red Mud are two major solid industrial wastes generated from the coal-based thermal power plant and aluminum industry respectively. India produces about 110 million ton/yr of Flyash of which only 33% is utilized in various construction components.

The Red Mud which is generated @1.0–1.6 tons/ton of Alumina is a solid waste from the Aluminium industry. Unfortunately, Red Mud all over the world has not found any use so far and as a result it is stored in the red mud pond. Due to the characteristics of fine particle, dumping and storing of these waste materials causes environmental and space problems.

Scientists at the CSIR-Central Building Research Institute are trying to explore the mechanical and environmental suitability of these industrial wastes as a resource material.

The present study investigated the engineering and environmental suitability of Red Mud as a resource geo-material for civil construction. Strength and compressibility characteristics

of stabilized and unstabilized red mud are being investigated.

To increase the strength of red mud, cement was added in percentage of dry weight of red mud. The water content of the mix is kept constant at 40% of the dry weight of red mud. The effect of cement content on strength improvement of stabilized red mud has been investigated for different rest periods.

Figure 2 shows that by increasing the percentage of cement, strength also increases. Strength is also observed to increase with

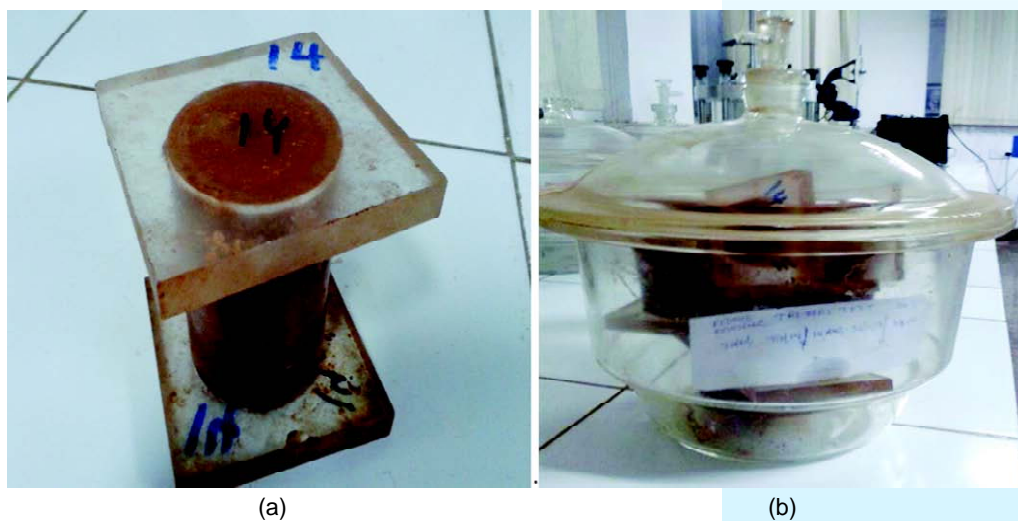


Fig.1 (a) & (b): Sample Preparation and Stored for Different Rest Periods

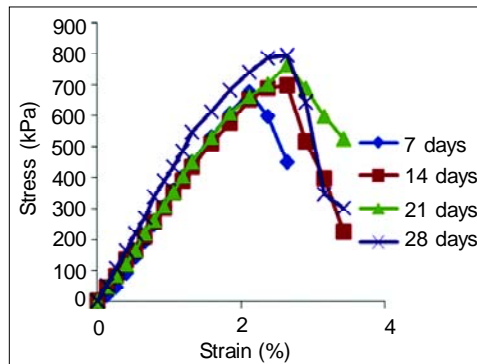


Fig. 2: Stress vs. Strain of Stabilized Red Mud



Fig. 3: Failure Pattern of Red Mud with 8% Cement

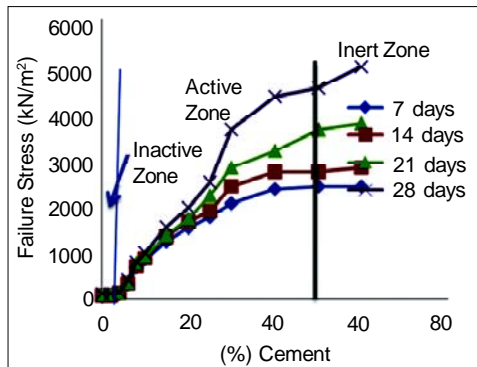


Fig. 4: Failure stress vs. % of Cement

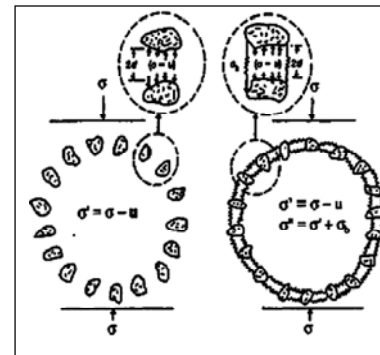


Fig. 5: Possible Clay Fabric and its Cimentation (Nagaraj et al. 1990)

increase in the rest period. Figure 3 shows that stabilized sample fails in shear, whereas unstabilized sample fails in bulging. Figure 4 shows the strength improvement of stabilized red mud with percentage of cement for different rest periods. Based on the UCS strength of stabilized sample, three zones are clearly identified: (a) Inactive zone: strength does not improve much with addition of cement (0-4% cement); (b) Active zone: strength improves significantly in this zone with addition of cement (4-50% of cement); (c) Inert zone: strength almost remains constant with increasing percentage of cement beyond active zone (50-80% of cement).

This behavior is observed for all the rest periods under consideration. This behavior is explained with formation of cement matrix in a cement stabilized soil. In inactive zone, due to small amount of cement, the numbers of inter-cluster bonds are less and it does not impart any significant gain in strength. In the active zone, due to availability of cement, significant numbers of inter-cluster bonds are formed and impart

a significant gain in strength of the stabilized sample. In the inert zone, no more bonds are formed than the active zone and so strength remains almost constant with increasing amount of cement. A similar behavior is observed in cement stabilized with fly ash.

The compressibility characteristics namely the coefficient of consolidation, compression index and co-efficient of compressibility for stabilized Red Mud have been evaluated for different % of cement and rest period.

Figures 6-8 show the different compressibility characteristics of stabilized red mud. Co-efficient of consolidation

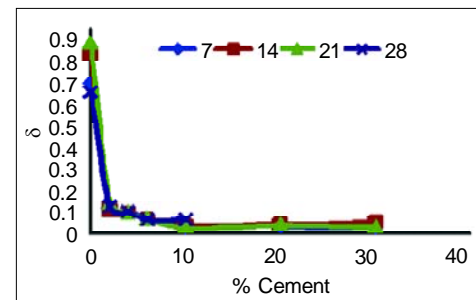


Fig.6: Compression Index vs. % of Cement

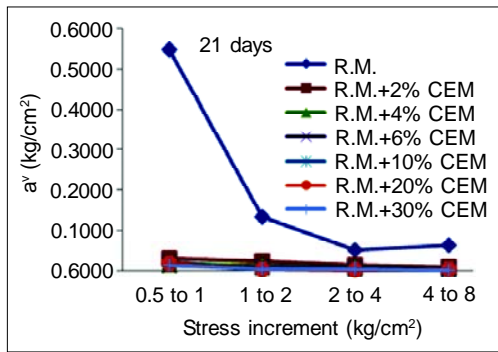


Fig.7: Co-efficient of Compressibility vs. % of Cement

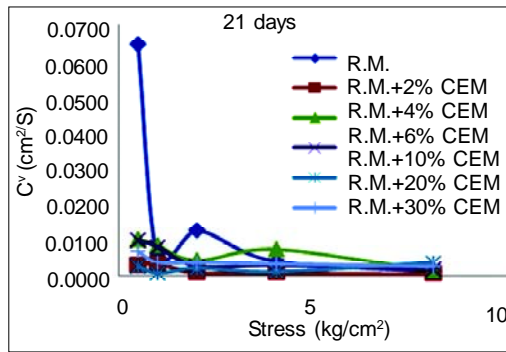


Fig. 8: Co-efficient of Consolidation vs. Stress



decreases with increasing percentage of cement which signifies time rate of consolidation also decreases. The co-efficient of compressibility and compression index decreases with increasing percentage of cement. The compression index almost becomes constant when percentage of cement exceeds 10%. Decreasing trend of compressibility index signifies the magnitude of settlement decreases with increasing

percentage of cement.

To find out the environmental suitability, leaching of the heavy metals from the stabilized red mud was also carried out. Microstructural analysis of stabilized and unstabilized sample of red mud was also carried out.

M. Samanta, A. Ghosh, S. Maiti, D. Kumar and Z. Ahmed at CSIR-CBRI

Moisture Sensor for On-line Measurement of Moisture in Coconut Chips

CSIR-CEERI Chennai Centre was approached by M/s Marico Limited, Puducherry for on-line assessment of moisture content of copra at its Puducherry plant. High moisture content makes the copra vulnerable to fungal and pestilential attack. The Centre entered into an MoU with M/s. Marico for the trials.

An NIRS filter-type moisture sensor system was configured and enhanced with wireless transmitter/receivers, and suitable repeaters to communicate the measured data to a remote PC at the control room (Fig. 1). The system was

installed and commissioned at M/s Marico Ltd. and its functioning has been found satisfactory (Fig. 2). Based on the feedback, the system will be suitably modified and improved for on-line measurement and control.



Fig. 1: Copra moisture remote display at Marico



Fig. 2: Copra moisture sensor installation at Marico

Advanced System for Food Quality Inspection (E-Sense)

Food quality and its freshness are important parameters for human health. India is the second largest producer of fruits and vegetables. However, it faces challenges in the detection and control of quality of fruits and vegetables.

The quality characteristics of food that are acceptable to consumers depend on different parameters like taste, aroma, freshness, safety, color and shape. Food spoilage and damage may occur due to change in weather, heavy use of pesticides or improper processing and handling in the food industry. Some of the issues identified behind food spoilage are:

- Fruit and vegetable harvesting
- Judgment of shelf-life
- Hazards and disease attacks
- Pesticide residues
- Adulteration

Several varieties of fruits and vegetables exist in the Indian food industry. Still there is no generalised system available that can predict the life cycle, as well as the diseases of the fruit and vegetables. There is an essential need for a portable and cheap system to predict the freshness and quality of seasonal fruits and vegetables.

For the detection of food freshness and quality, an advanced embedded e-Sense

system (Fig. 1) using various non-contact techniques was developed by scientists at the CSIR-CEERI Chennai Centre and tested with tomato (which is widely and readily available throughout the year). Different non-destructive techniques were explored and tested during the ripening stage of various food samples. e-Sense software algorithms, excitation circuit and data analysis tools were used for tuning the system. The developed e-Sense system gives a good indication about freshness and quality of the food sample (tomato).

A single technology-based system or method is not possible for detecting the food quality and freshness. The developed e-Sense system consists of three sub-systems: e-Nose, e-Ultra and e-Vision. ARM based development board was used for integrating these sub-systems and the decision making. Each sub-system will determine a few aspects of food freshness and quality. The e-Nose system comprises of metal oxide gas sensor arrays which detect the aroma of the food sample. The e-Ultra system comprises of ultrasonic sensors which will determine the firmness and stiffness of the food sample. The e-Vision system comprises of camera and optical sensors to determine the concentration of lycopene and various carotenoids.

The e-Sense system is able to identify and predict unknown bacteria attack, shelf-life, maturity index and degree of sweetness.

The system has also been compared with the commercially available systems like Alpha FOX versions (Table 1) on the basis of various parameters

There is an essential need for more data collection and training to generalise the system for



Fig. 1: Advanced system for food quality inspection

Table 1: Comparison of e-Sense system with various commercial systems



Comparison Parameters	Alpha FOX 2000	Alpha FOX 3000	Alpha FOX 4000	E-Sense System
Technique Used	Aroma	Aroma	Aroma	Aroma, Optical, Ultrasonic, Image
Sensing Nodes Company	6 Alpha MOS	12 Alpha MOS	18 Alpha MOS	19 CEERI
Cost (lacs)	6	8	10	2
Other Features	6 LCD display	6 LCD display	6 LCD display	Touch screen
Human Interface	-	-	-	GUI

different food samples. The idea was to develop a generic system for quality detection of various food samples like vegetables, fruits and bakery items. The system can be converted

into commercial product by automating food sample placement, miniaturisation of electronics with dedicated embedded system and micro pump for suction.

Micro Inverter for Decentralised Power Generation

A grid-connected micro-inverter, powered by photovoltaic panels has been developed at the CSIR-CEERI Chennai Centre. High-efficiency operation with maximum power transfer from photovoltaic panels was the salient feature of the system.

The photovoltaic inverter was capable of delivering maximum 300 W power to the grid at close to unity power factor. The micro-

inverter normally operates in grid-connected mode delivering maximum power available from photovoltaic panels. In case of grid failure, the inverter can be operated in a stand-alone mode supplying power to local loads. Batteries are not used for inverter operation, resulting in no running cost of the system.

Detailed specifications of the system are given in Table 1.

Table 1: Electrical specifications of 300 W grid connected micro-inverter

Parameter	Min	Typ.	Max	Units	Comments	
Pv input voltage	27	35	55	V	Designed for standard low voltage PV panels	
Pv input power	70	250	300	W		
Grid Voltage	175	220	265	V	220 +/- 20 % rms.	
Grid frequency	47.5	50	52.5	Hz	50 +/- 5 %	
Grid current (loutput)	0.31	1.13	1.36	A		
Pout	70	250	300	W		
Anti islanding method	-	< 12	-	ms	Active detection method	
Output current THD	-	< 5	-	%	At nominal load	
PF	-	< 0.98	-		From 100 W up to 300 W	
Efficiency	MPPT	-	~ 99	-	%	PV voltage ripple <0.5V Vpp at sinusoidal loading 230 W
	DC-DC Conv	94.6	96	96.8	%	60 W-350 W
	Inverter	96.9	97	97.2	%	60 W-300 W

Figure 1 shows hardware prototype of the system. Figures 2.1-2.3 show test results during different operating conditions. Figure 2.4 shows the micro-inverter behavior during utility islanding detection.

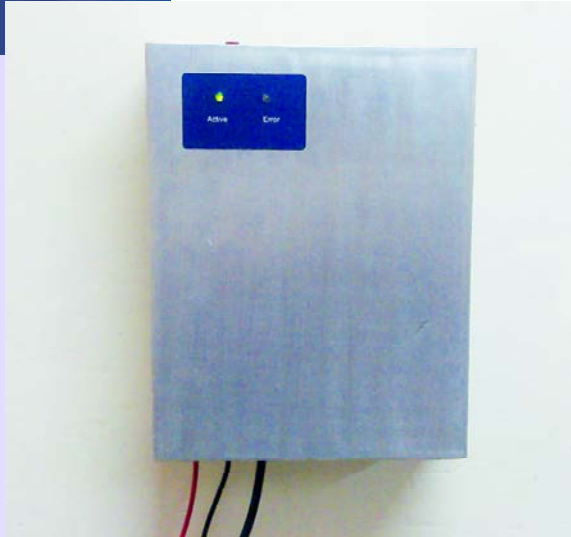
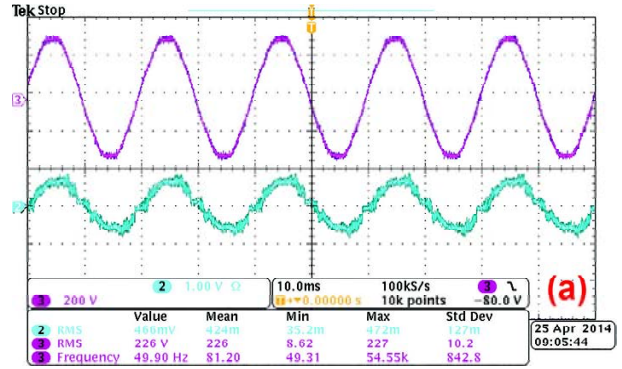
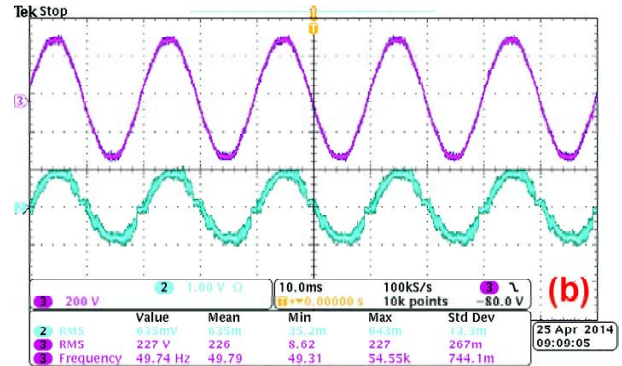


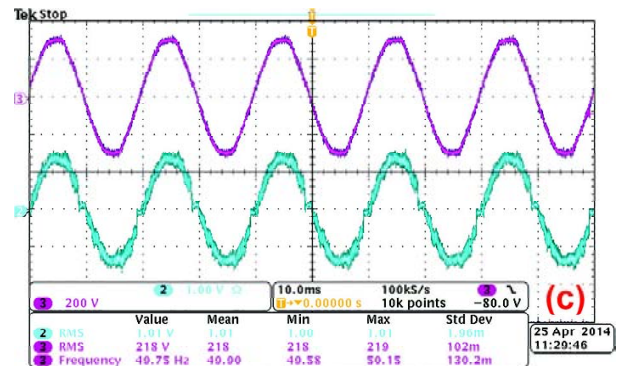
Fig. 1: Prototype of PV-grid connected micro-inverter



(a) Pout = 100 W



(b) Pout = 145 W



(c) Pout = 220 W

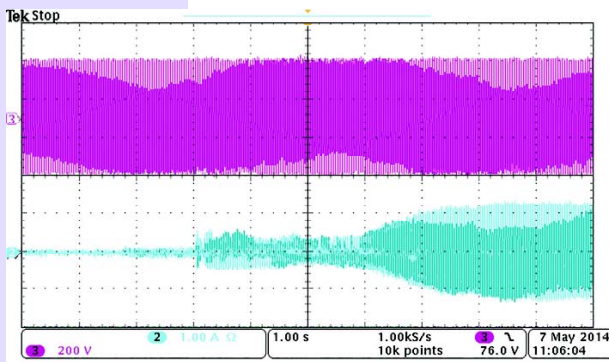


Fig. 2.1: Inverter output waveform during Start-up

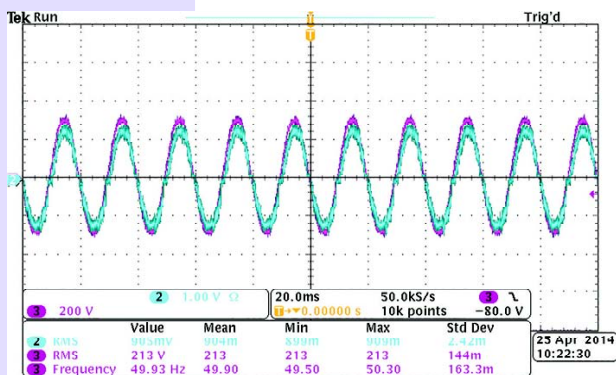


Fig. 2.2: Inverter output current synchronised with grid voltage

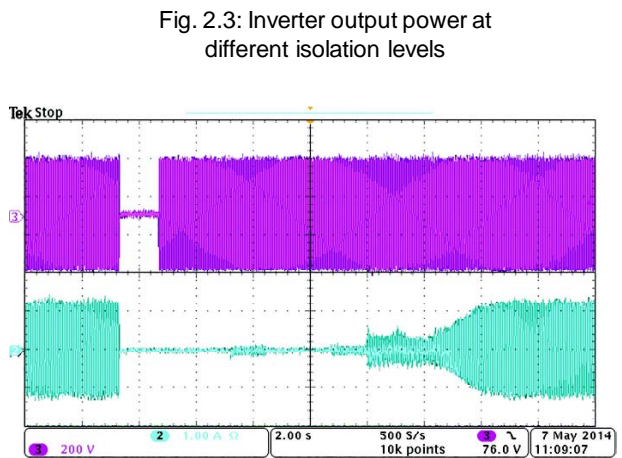


Fig. 2.4: Inverter output current during islanding

Conferences

OSICON-15 at CSIR-NIO, Goa

The inaugural function of OSICON-15, the IV National Conference of the Ocean Society of India, was held on 23 March 2015 at the CSIR-National Institute of Oceanography, Dona Paula, Goa. The Conference was organized by the Ocean Society of India (OSI) and CSIR-National Institute of Oceanography, Goa. The

main theme of the Conference was “Oceanic Processes along the Coasts of India”.

The attending delegates were welcomed by the President of the Ocean Society of India and the Director of the CSIR-National Institute of Oceanography Dr. S.W.A. Naqvi. Dr. Naqvi highlighted the importance and peculiarities of the northern Indian Ocean and the role it plays in the global climate.

The Convener of the conference Dr. V. Ramaswamy, Chief Scientist, CSIR-NIO, in his report stated that nearly 250 delegates from 26 Research Institutes and Universities from all over India were attending the conference. More than 225 papers were received and after peer review 81 were selected for oral presentation and 148 for poster presentations. The Conference had

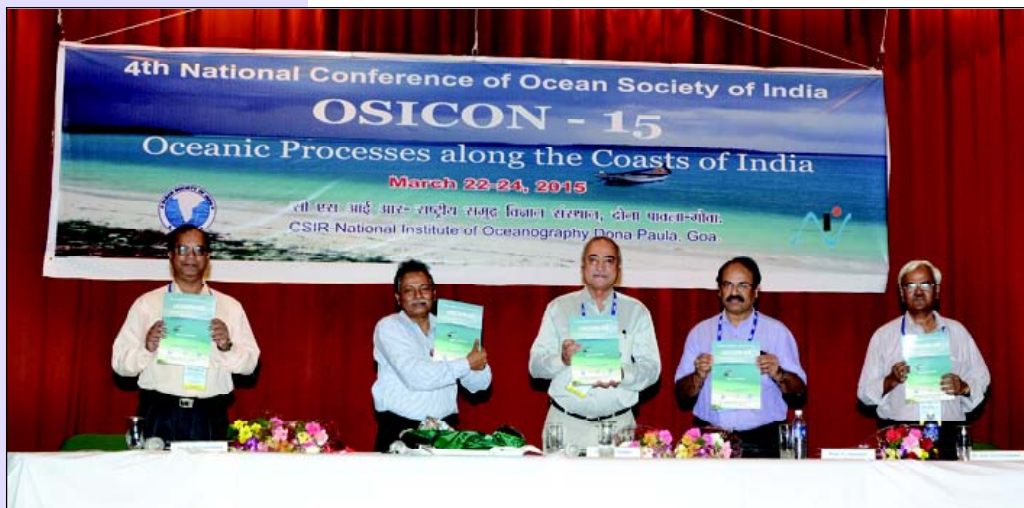


A view of the inaugural function

two Plenary Sessions and six Parallel Sessions, covering the fields of Coastal Processes, Indian Ocean Variability and Monsoon, Ocean Biogeochemistry, Marine Geosciences, Marine Biology and Ocean Technology and Acoustics, each chaired by eminent scholars and science communicators. Seven eminent oceanographers were invited for giving plenary talks.

The OSI, which is a Registered Society with over 400 members, has a mission aimed at providing a forum for sharing the knowledge and experiences of individuals, scientific institutions and industrial organizations in science, technology, engineering and allied fields of the ocean. The conference was supported by financial grants from the Ministry of Earth Sciences (MoES), New Delhi; Department of Science Technology and Environment (DSTE), Govt. of Goa; Naval Research Board (NRB), Ministry of Defence; Department of Science and Technology (DST), New Delhi, and National Center for Antarctic and Ocean Research (NCAOR) among others.

The inaugural address was delivered by eminent



climate scientist, Prof. B.N. Goswami Former Director of IITM and now Pisharoty Chair of MoES in IISER, Pune. He stressed the need to understand the linkages between atmosphere and oceans which will help us predict the monsoons better. He suggested that the various scientific societies should get together to understand and solve the problems faced by the country. He also stressed that young researchers, college and even school students must be encouraged to take up earth science studies so that they can better understand and help mitigate the problems related to climate change.

The keynote address was given by Prof. R. Ramesh, a leading Earth Scientist and Climatologist of the Physical Research Laboratory, Ahmedabad who spoke about the importance of environmental controls on new and primary production in the Arabian Sea and Bay of Bengal.

Dr. M. Dileep Kumar, an eminent oceanographer from CSRI-NIO, was felicitated for his contributions to oceanography.

The vote of thanks was proposed by Treasurer of OSI, Dr. A.S. Unnikrishnan, Chief Scientist CSIR-NIO.



Science Awareness Programmes

Science Awareness Programme for School Children by CSIR-IICB

Dr. Snehasikta Swarnakar, Senior Scientist, CSIR-IICB was invited to the higher secondary school “Belpukur Uchha Balika Vidyalaya”, Belpukur village, Nadia district, West Bengal on 20 February 2015 for addressing the students. The purpose of the lecture was to develop science awareness and to enlighten the youngsters to enjoy scientific knowledge.

Dr. Swarnakar talked about various scientific facts lucidly in the regional language. She talked about the treasures of Nature, the benefits of medicinal plants in everyday life, the function of cells, intricate facts of cellular organelles, deoxyribonucleic acid (DNA), packaging and many more important facts that are included in the children's curriculum. Also, the revolutionary discoveries of Gregory Johan Mendel, Arthur Kornberg, James Watson, Francis Crick, Charles Darwin



Dr. Swarnakar delivering lecture to the school students

and many such legendary stalwarts in the field of cell and chemical biology were mentioned to kindle their wisdom.

More than 300 students from class VII to X attended the lecture along with school teachers. The interactive session at the end of the programme was equally interesting.

CSIR-NEIST celebrates its 54th Foundation Day



Bharat Ratna Prof. C.N.R. Rao, FRS, National Research Professor, JNCASR, Bengaluru, delivering the 54th CSIR-NEIST Foundation Lecture. Other dignitaries on the dais are (from left), Dr. R.C. Boruah, Outstanding Scientist, Dr. D. Ramaiah, Director, CSIR-NEIST and Mrs Indumathi Rao.

CSIR-North East Institute of Science & Technology, Jorhat celebrated its 54th Foundation Day on 18 March 2015 with a day-long programme. Bharat Ratna Prof. C.N.R. Rao, FRS, National Research Professor, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru graced the event as Chief Guest and delivered the Foundation Day Lecture while Mrs Indumathi Rao was present as Guest of Honour.

Delivering his lecture, on 'Science in India' Prof. Rao posed the question, "When will India be great?" He went on to say that

without being strong in science, a country cannot prosper. India has to work fast to keep pace in the area of global research to make a mark. India needs many better research Institutes with modern equipment facilities and more recruitment of bright scientists in the system, Prof. Rao said. He advised to focus on doing quality science despite all odds in respect to poor government allocation in fund and infrastructure facility. One has to come out from selfishness to do good science and seniors should help juniors bring out their best potential, he said.

Mrs Indumathi Rao in her address emphasized on improving the education system and motivating students to bring out the best potential from them. It is the teacher and the education system that can motivate the poorest student. The students get a self-fulfilling prophecy which contributes a lot towards their development and self esteem. The poorest student must feel as the brightest chap and through this process even if only a few students get transformed we will be approaching towards a great India, she commented.

Dr. D. Ramaiah, Director, CSIR-NEIST delivered the welcome address and introduced the Chief Guest to the audience. The programme was largely attended by eminent scientists, guests, members of the



Mrs Indumathi Rao delivering her speech as Guest of Honour on the occasion

media and members of the CSIR-NEIST fraternity, both old and new.

On the occasion, the Institute's "Highlights 2014–2015" was released by the Chief Guest. Also, members of the staff who superannuated during the year 2014–2015 were felicitated and Certificates of Appreciation were awarded to staff members who showed exemplary performance during 2014–2015. The programme concluded with vote of thanks proposed by Dr. R.C. Boruah,

Outstanding Scientist, CSIR-NEIST. The day was also observed as 'Open Day' during 9.00 am to 12.00 pm. About 500 students from various schools of Jorhat along with teachers visited the institute.

Prof. Rao also inaugurated the S.S. Bhatnagar Building for Advanced Analytical Facility at CSIR-NEIST on 18 March 2015, besides visiting various divisions of the Institute and interacting with the scientists.



Lectures

CSIR-NEIST Organises Public Lecture by Prof. C.N.R. Rao



Prof. C.N.R. Rao delivering the public lecture at District Library, Jorhat

CSIR-NEIST, Jorhat organised a public lecture for school and college students on 19 March 2015 at District Library, Jorhat. Prof. C.N.R. Rao, FRS, National Research Professor, Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru delivered the lecture before a galaxy of scientists, eminent personalities from Jorhat district administration, Assam Science Society-Jorhat branch and students from various schools and colleges of Jorhat and nearby districts. About 1000 students of standard IX to college level (B.Sc) from different schools and colleges of Jorhat and nearby districts attended the lecture.

Delivering his lecture on "Celebration

of Science: Glorious Past and Challenging Future", Prof. Rao spoke about science and stories of great discoveries in science. Prof. Rao in his very elaborative lecture highlighted the discoveries that celebrated their centenary year in 2011 and 2012. The discovery of atomic structure by Rutherford, Super-conductivity by Kamerlingh Onnes, X-Ray Crystallography by W.L. Bragg and X-Rays by Roentgen are some that he emphasized in his lecture.

Prof. Rao also mentioned the Solvay Conference of 1911 and 1927 which he called as the Golden Age of Science. The



The audience attending the lecture

fundamental contribution by Lavoisier in Chemistry earned him the title of 'Father of Chemistry', he informed. Other great discoveries of Dalton, Michael Faraday, Dimitri Mendeleev, Glenn Seaborg, Frederick Wohler, G.N. Lewis and Linus Pauling are some he further detailed in his lecture. Encouraging the students, he urged them to always have an inquisitive mind for doing science. "Pick an area where no research has been done," opined Prof. Rao in his message to the budding students.

Mrs Indumathi Rao who attended the programme as the Guest of Honour presented a Multimedia Demonstration on "Nano World" which showed basic aspects of Nano Science and Nano Technology and its wide applications.

Earlier, Dr. D. Ramaiah, Director, CSIR-NEIST delivered the welcome address and briefly introduced the Chief Guest to the audience. The programme concluded with vote of thanks by Dr. R.C. Boruah, Outstanding Scientist, CSIR-NEIST.

Prof. Ganesh Pandey delivers Prof. K. Venkataraman memorial lecture at CSIR-NCL

CSIR-National Chemical Laboratory (CSIR-NCL), Pune organized the Twelfth Prof. K. Venkataraman Memorial lecture on 11 March 2015. Prof. Ganesh Pandey, Director, Centre of Biomedical Research (CBMR), Lucknow and former outstanding scientist of CSIR-NCL delivered a talk on "Complex Natural Product Structures, a Driving Force for Innovations in Organic Chemistry".

Prof. Ganesh Pandey talked about the total synthesis of the complex natural products having various medicinal properties. He mentioned that the idea behind developing a synthetic methodology is not

just adding one more method but it should also be practical and applicable with new advantages. He said that, "Organic chemists should always look for innovations!" He said that a new approach for drug discovery is essential and natural products play a crucial role in this. He mentioned that 68% of drugs today have their own origins in natural products. Prof. Pandey revealed a diverse set of alkaloids with complex architectures, their promising anticancer properties and their potential as new drug molecules. A unifying theme comprising the utilization of an optically active azabicyclo[2.2.1] heptanone structural framework and their analogs that

can address the synthesis of these diverse natural products was put forward by Prof. Pandey with a prerequisite to develop novel methodologies in a highly regio- and enantio-selective manner.

In dealing with the synthesis of the key building blocks, some of the major aspects such as how the reaction parameters are optimized to switch between the enantiomers were explained and diverse methodologies that were developed in the context of the synthesis of the natural products, such as Lepadiformine, Cylindricine, Gracilamine, Asphidophilline A, Dendrobine, Amaryllidaceae were described by



Prof. Ganesh Pandey delivering the Prof. K. Venkataraman Memorial lecture

Prof. Pandey. With simple illustrations, the synthetic challenges faced during these endeavours were also shared.

He also presented some of their recent efforts on the enantioselective total synthesis of stenine and the biological synthesis of vincristine, vinblastine, jerantinine, tabersonine and vincadifformine. The vincadifformine-vinca alkaloid needs special mention. A short route for the synthesis of both the enantiomeric natural products in a single synthesis was developed employing the Claisen rearrangement for constructing the contiguous quaternary centers present in this molecule. He also briefly shared the

synthesis of aspidospermidine where vinylation was employed. Prof. Pandey concluded with a quotation stating, “Nature gives you problems, Chemistry finds the solutions and Biology has the last word.”

Earlier, Dr. Sourav Pal in his welcome remarks recalled the memories of Prof. K. Venkataraman former CSIR-NCL Director during 1957-1966 and first Indian Director after Prof. J. W. McBain and Prof. G. I. Finch. He formally introduced the speaker Prof. Ganesh Pandey who had worked at CSIR-NCL before shifting to CBMR. The lecture was organized under the auspices of the NCL-Research Foundation.



Women's Day Celebrations

Women's Day Celebration at CSIR-CGCRI

CSIR-Central Glass and Ceramic Research Institute, Kolkata, organized a talk to mark the occasion of the International Women's Day. Dr. Swati Bhattacharjee, Fulbright Fellow and Chief Reporter-District, *Ananda Bazar Patrika* delivered the talk “50 Shades of Pink: Gender Inequality in South Asia”, on 9 March 2015.

Dr. Swapan Kumar Das, Scientist G and Acting Director on 9th March, welcomed Dr. Swati Bhattacharjee and the assembled guests. Dr. Shyamal Kumar Bhadra, Head, Human Resource Development Group and Advisor Technology Management addressed the audience and highlighted the importance of marking this day. Dr. P. Sujatha Devi, Principal Scientist, who was instrumental in organising this programme introduced Dr. Bhattacharjee to the audience.

Dr. Swati Bhattacharjee began her talk by saying that earmarking one day for Women was not tokenism but that it served the larger purpose of allowing one to dedicatedly analyse the situation, to reflect, to introspect, to speak out and to share experiences. She pointed out that in the course of just 100 years (which is roughly



Dr. Swati Bhattacharjee delivering her talk

just three generations), women have come a long way. From a grandmother who was most likely to not have had formal education or job prospects to a generation that had education but did not always step out to hold jobs to the current generation that takes employment as a default condition – the change has been exceptionally rapid. However, this transition is not a linear one as these generational-steps co-exist in India.

Dr. Bhattacharjee spoke about the many inequalities that women battle in life. Be it the inequality of numbers where 60-68 million women are missing in India. Added to this are 5-6 lakh girl foetuses that are denied birth every year for the simple reason that they are female. The figures of missing women correspond well to the number of fatalities during World War II, she said, and these deaths are invisible ones occurring during times of peace! The Nobel prize-winning economist Amartya Sen had calculated that there were 100 million missing women in the world as of 1990. He also had pointed out the neglect that the girl child suffers in comparison to a male child when it came to access to nutrition and healthcare. Little seems to have changed since then. Girl foetuses are still denied birth, girl children are neglected to the extent that many die, teenage girls are brutalized to death, young women are burnt for dowry...this is a silent genocide and the missing women may well represent the entire population of a small nation! What mindset prompts such behaviour in a wide swath of society? And is there a solution?

Unequal access to resource is a constraint that women face whether it is with respect to education or ownership of land. Paradoxically, although only 12 per cent of the country's agricultural land was owned by women; it was they who shouldered the lion's share of the burden of toiling in the fields. In a nation where agricultural land is a major asset, women do not have significant ownership despite the Succession Act of 2005 which gives daughters a share of the parental land. Partly this is because of a lack of awareness and partly because of deeply ingrained cultural conditioning wherein a woman equates the amount spent on her wedding as recompense. Also, many women hesitate to scupper relations with their brothers by asking for a share in the paternal property.

Even the businesses that women control are largely insignificant in terms of turnover;

about 98 per cent of these are micro-enterprises. Professional women fare only slightly better. In the media, even the most familiar faces on television are often marginalized when it comes to covering important "beats." Many are not decision-makers. Only 5 per cent of the members of the police force are women and 10 per cent are judges. The figures for women members in the Indian Parliament are also quite low. Dr. Bhattacharjee asked all institutions, including scientific ones, where there are many female research students, to take a long and hard look at the number of women they have in important posts such as Directors or members of Management Councils, etc.

Dr. Bhattacharjee said that women often faced harassment at work and also a lack of promotion (glass ceiling). She drew attention to certain "silent demands" of women which included redress for the situation where women had to trudge long hours to fetch water or collect biomass for use as fuel. She touched upon the need for sanitary toilets which would not only introduce hygienic practices and restore dignity but also confer some protection to a woman who was extremely vulnerable to attacks when using open toilets late at night or early in the morning. Of course the underlying crying needs of adequate healthcare and education remained paramount for all women.

Dr. Bhattacharjee admitted that just celebrating Women's Day once a year was not enough to find a solution but enumerated certain areas which, if addressed, would go a long way towards assuring equality. Her list included: Inheritance Rights; Freedom from violence; Greater access to higher education, Equal opportunity at the workplace and Non-patriarchal system.

A memento was presented to Dr. Swati Bhattacharjee on behalf of the Institute. The program ended with vote of thanks by Ms. Sumana Majumdar, SO, Vigilance.

Technology Facilitation Centre, CSIR contacts Women's Self-Help Group



8th March is celebrated as Women's Day worldwide and perhaps one of the best demonstrations of empowered women-hood was on display at Srirampur Gram Panchayat, Purbashthali, Bardhaman, West Bengal, where the members of the Sarbjaya Mahila Swanirbhar Sangha had gathered for a programme that was a part of the capacity building initiative of the National Rural Livelihoods Mission (NRLM).

Dr. Debashis Bandyopadhyay and Shri Indranil Biswas, both Scientists at CSIR-Central Glass and Ceramic Research Institute and representing the MSME-Technology Facilitation Centre (TFC) visited Srirampur Gram Panchayat, Purbashthali, Bardhaman, West Bengal on that day at the invitation of the National Bank for Agriculture and Rural Development (NABARD). Shri Swapan Debnath, Minister of State Micro and Small Scale Enterprises and Textiles, West Bengal, and members of the local self government also graced the occasion with their presence.

The MSME-Technology Facilitation Centre, as its name implies, seeks to empower the MSMEs of West Bengal through appropriate technological mentoring and intervention using CSIR technologies and/or technologies from other knowledge institutions of the country so as to drive the economic prosperity of the state. The TFC is located in the premises of the CSIR-CGCRI.

Under the aegis of the Sarbjaya Mahila Swanirbhar Sangha (SMSS) there are 195 Women's Self-Help Groups with a total of 2110 members and 31 Self-Help Groups for men with a total of 357 members. The SMSS encourages its members to set up businesses of their own and provides loans on easy terms to do so. Currently its members are involved in marketing packaged drinking water under the name Unique Aqua. This packaged drinking water is purified using RO, UV, Activated Carbon and it is ozonized.

Members of SMSS also sell puffed rice (*Muri* or *Murmurey*) the USP of which is that it has been dry roasted by hand. Another

item that the members of SMSS deal in is paddy that has been de-husked using the uber traditional foot-powered de-husking implement called *dbeki*. The unpolished rice grains are called *dbeki chhata chaal*. This de-milled rice is sold as brown rice in many markets and malls. This type of rice is considered to be more nutritious as the outer covering of the grain is retained; 22 members of SMSS associated with the business of selling paddy de-husked in this manner earn about ? 3500-4000 per month. The *Muri* and *dbeki chhata chaal* are sold under the name *Dhan-Dhannay*.



A member of SMSS with Partha Mandal of NABARD and Debashish Bandyopadhyay with packets of Dhan-Dhanya

Access to knowledge or information about appropriate technologies is a challenge for the MSME sector. Thus, many continue to persevere using labour intensive, inefficient traditional processes. NABARD invited the TFC so that the SSMS could explore the TFC as a platform that the Self-Help Groups (SHGs) could gainfully source S&T interventions for their benefit.



A view of the audience

Annual Flower Shows at CSIR-NBRI



Judges examining one of the entries during the Rose and Gladiolus show



A view of the Chrysanthemum and Coleus show



Shri Ram Naik, Governor, Uttar Pradesh along with Dr. C.S. Nautiyal, Director, CSIR-NBRI and the prize winners at the Chrysanthemum and Coleus show

CSIR-National Botanical Research Institute, Lucknow has been regularly organizing two Annual Flower Shows for the past four decades. This year the Annual Chrysanthemum and Coleus show was held on 13 & 14 December 2014 and the Rose and Gladiolus show on 17 & 18 January 2015 at the Central Lawn of the Institute.

CSIR-NBRI is maintaining more than 225 germplasm collections of chrysanthemum comprising almost all colours and types. New varieties of chrysanthemum developed through traditional and modern methods were also displayed during the show. A total of 95 exhibitors participated in the show and 375 prizes including 23 running challenge cups/shields/trophies were awarded to the successful competitors.

Honorable Governor of Uttar Pradesh, Shri Ram Naik was the Chief Guest and Ms. Juthika Patankar, Principal Secretary to the Governor, was the Guest of Honour at the Chrysanthemum and Coleus show.

Shri Ram Naik, in his address applauded the contribution of CSIR-NBRI in the field of floriculture especially in developing several varieties of chrysanthemum for public use. Appreciating the development of floriculture in Uttar Pradesh Shri Ram Naik further exhorted that a lot of work still needs to be done in this sector if it has to compete in the international market. He expressed the need to extend floriculture in rural areas, which may be a source of income leading to improvement in the economic condition of the villagers.

On the occasion, two books viz. "Gramin Vikas Hetu Harit Pradyogikiya" authored by Dr. S.K. Tewari and Dr. C.S. Nautiyal and "Padap Pariveshodwar (Ganga Nadi Pradushan Ka Prabandhan)" with Dr. U.N. Rai as the lead author were also released by the Honorable Governor.

During the Rose and Gladiolus show, the Institute displayed its finest collection of about 50 Gladiolus varieties. Technical information on commercial cultivation of Gladiolus, Gerbera and Rose was also displayed. Shri J.S. Mishra, Founder Chairman, Gomti Action Parivar, Rishikesh, was the Chief Guest and Shri Rajan Shukla, IAS, Principal Secretary, UPDASP, Lucknow, was the Guest of Honour at the prize distribution function.

Dr. C.S. Nautiyal, Director, CSIR-NBRI, while welcoming the Chief Guest and Guest of Honour said that NBRI has been instrumental in helping the farmers and the commercial growers in self-sustaining their livelihood. On the occasion, "KESAR", a new variety of chrysanthemum developed by CSIR-NBRI, was released by the Chief Guest. The public got a unique opportunity to interact with scientists of NBRI working in the area of floriculture. They also got first-hand information on agro-technology, techno-economics, commercial cut flower varieties and many other cultivation practices



CSIR News is profiling all the CSIR laboratories throwing light on the significant areas they work in and their achievements.

CSIR-Centre for Cellular & Molecular Biology, Hyderabad

From DNA Fingerprinting to conservation of endangered species, from far-reaching genetic studies to efforts at containing infectious diseases and genetic disorders, the CSIR-Centre for Cellular & Molecular Biology, Hyderabad has contributed immensely in the field of molecular biology.

CSIR-CCMB was established on 1 April 1977 with a vision to do world-class basic research in biological sciences and is equipped on par with the best laboratories anywhere in the world. The primary emphasis is on doing basic research in biological sciences, including the areas of Biophysics and Biochemistry, Cell Biology and Development, Genetics and Evolution, Molecular Biology, Genomics and Proteomics, and Biotechnology and Biomedicine.

The other objectives of the Centre are to aid the development of biotechnology in India, conduct training courses in modern biology, promote centralized national facilities for new and modern techniques in the inter-disciplinary areas of biology, interact with industry carrying out basic and applied work, and to collect, collate and disseminate information relevant to biological research.

Over the years, CCMB has made significant contributions and gained national and international recognition. It has been chosen as a Centre of Excellence by UNESCO Global Network of Molecular and Cell Biology. The Third World Academy of Sciences, Italy designated CCMB as South Centre of Excellence in research and training. CCMB has received CSIR Technology Awards four times for its technological achievements. In addition Federation of Indian Chambers of Commerce and Industry recognized CCMB's efforts by the award for outstanding achievements in science and technology. It incubated the first Indian



biotechnological company that launched the genetically engineered hepatitis-B vaccine.

CCMB has also been selected as a Member of the Human Proteome Organisation (HUPO), USA and a potential partner of the International Coffee Genomics Network (ICGN), Paris, France.

RESEARCH ACHIEVEMENTS

Molecular basis of sex determination:

Isolation of highly conserved sex chromosome-specific minor satellite DNA from the female branded krait (Bkm) snake paved the way for identifying a sex and tissue specific Bkm-binding protein, which was found to be involved in modulating chromatin conformation and activity of sex chromosomes.

DNA fingerprinting technology:

CCMB developed, for the first time in India, a Bkm derived probe for DNA fingerprinting as fallout of the work on the mechanism of sex determination. This probe is being extensively used for forensic investigation, paternity determination and seed stock verification.

Molecular diagnosis of common genetic disorders: CCMB is extending its services to reduce the burden of genetic disorders in the society by taking up molecular diagnosis, carrier analysis, predictive diagnosis, prenatal diagnosis and genetic counseling.

First gene knockout mouse: CCMB has joined the select club of institutions from a few advanced nations by successful production of a gene knockout mouse strain for the first time in India. It has genetically engineered a mutant strain that lacks a milk protein gene known as Kappa Casein; in the absence of gene females are healthy and can produce pups but these females are unable to produce milk.



Birth of Blacky by artificial insemination: CCMB has for the first time, succeeded in producing a fawn of the endangered blackbuck antelope through estrus induced artificial insemination. This is the first time ever that a non-surgical intra vaginal insemination has produced a baby antelope.

Novel system for screening and validation of anticancer drugs: Transgenic fruit flies have been generated, which enable targeted expression of human protein encoded by the gene Adenomatous polyposis coli (Apc), a tumour suppressor gene. Individuals with defective Apc are vulnerable to colon cancer. CCMB has been using human Apc-induced eye deformities as an in vivo assay system to identify and validate potential anti cancer drugs.

Origin of the vanishing Andamanese: CCMB scientists analysed the DNA from Andamanese hair locks and members of the three present day Andamanese tribes. The genetic data which included maternally inherited mitochondrial DNA sequencing and paternal Y chromosome markers, has revealed that two tribes in the Andamans are the descendants of the people who migrated about 70,000 years ago from Africa. This is considered to be a path-breaking work showing that Onge and Great Andamanese (negreto tribes) have evolved in the Andaman Islands in genetic isolation independently.

Development of disease-resistant rice varieties: Samba Mahsuri is considered as one of India's finest rice varieties because of its high yield and exceptional quality characteristics. However, it is susceptible to several pests and diseases, including bacterial leaf blight (BLB). In collaboration with the Directorate of Rice Research, Hyderabad, CCMB developed BLB-resistant Samba Mahsuri derivatives retaining the original traits of yield and quality.

First ever evidence of bacteria from the stratosphere: For the first time in the world, CCMB conducted analysis of samples of air collected from the stratosphere and identified four new species of bacteria.

DNA microchip for ophthalmic infections: CCMB has designed and developed unique probes for identifying 15 microorganisms that cause ophthalmic infections in our country, along with several hospitals in India. A multiplex PCR-based chip has been developed for diagnosing all eye infections. This product was recognized as the 'Product of the Year' in 2008 and also received Asia-Pacific Technology Award for meeting the "Unmet Needs" in 2009.

Conservation Facility (LaCONES): One of the most significant contributions of CCMB has been towards conservation of the country's endangered species. DNA-based studies on wildlife at the CCMB have paved the way for a new national facility, the Laboratory for the Conservation of

Endangered Species (LaCONES) aimed at the conservation of endangered animals through the use of biotechnological intervention. Among the wide range of objectives initiated under this project are monitoring of genetic variation using modern techniques such as DNA fingerprinting, establishment of cell banks and gene banks through cryopreservation of semen, eggs and embryos of endangered species, and the development of assisted reproductive technologies such as artificial insemination, in-vitro fertilization as well as embryo transfer and cloning.



The LaCONES facility

Translational Research: CCMB has taken a pioneering step to set up a new Clinical Research Facility for stem cells and regenerative medicine in collaboration with the Nizam's Institute of Medical Sciences (NIMS), Hyderabad. This will house facilities for Cell and Tissue Engineering, Regulatory RNA in Development and Disease, Stem Cell Research and Functional MRI, in Phase I.



Clinical Research Facility

State-of-the-Art Facilities: CCMB has succeeded in acquiring up-to-date and multi-user facilities for Proteomics, Automated DNA sequencing, Microarrays, Advanced Microscopy and Imaging, Advanced Spectroscopy I & II, Flow Cytometry, Transgenic and Knock-out Mice, Confocal Microscopy, X-Ray Crystallography, Transmission, Scanning and Cryo Electron Microscopy, a prefabricated BSL3, NMR (600MHz) Micro imaging and High Resolution Spectroscopy, Laboratory animals with SCID and nude mice, Bioinformatics, Digital imaging and Digital photography, -200C Walk-in Cold Room for storage of fine chemicals and many other major facilities.

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Honours & Awards

CSIR-NEIST Scientist receives CRSI Bronze Medal



Dr. Dipak Kumar Dutta, Chief Scientist, Materials Science Division, CSIR-NEIST, was awarded with the prestigious CRSI Bronze Medal and a Certificate for his significant contributions in Chemistry by the president of CRSI, Chemical Research Society of India (CRSI), on 8 February 2015, in its 17 CRSI National Symposium in Chemistry, during 6-8 February 2015 held at CSIR-NCL, Pune.

Nominations are invited for **G N Ramachandran Gold Medal for Excellence in Biological Sciences & Technology - 2015**

The Council of Scientific & Industrial Research (CSIR) invites nominations for the **G N Ramachandran Gold Medal for Excellence in Biological Sciences & Technology for the year 2015**. The award is bestowed every year to an outstanding Indian scientist, who has made conspicuously important contributions, applied or fundamental, in the inter-disciplinary subject / field of Biological Sciences and Technology. The award would be given for the work done primarily in India during ten years preceding the year of the award.

Nominations addressed to Scientist Incharge, SSB YSA Unit, Human Resource Development Group, CSIR Complex, Library Avenue, Pusa, New Delhi 110 012 should be sent as per prescribed pro-forma (Original + one copy) along with reprints of five most significant publications of the last 10-year's period by **31 May 2015**. The details of the award and the prescribed pro-forma for nomination may be downloaded from the website www.csirhrdg.res.in

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